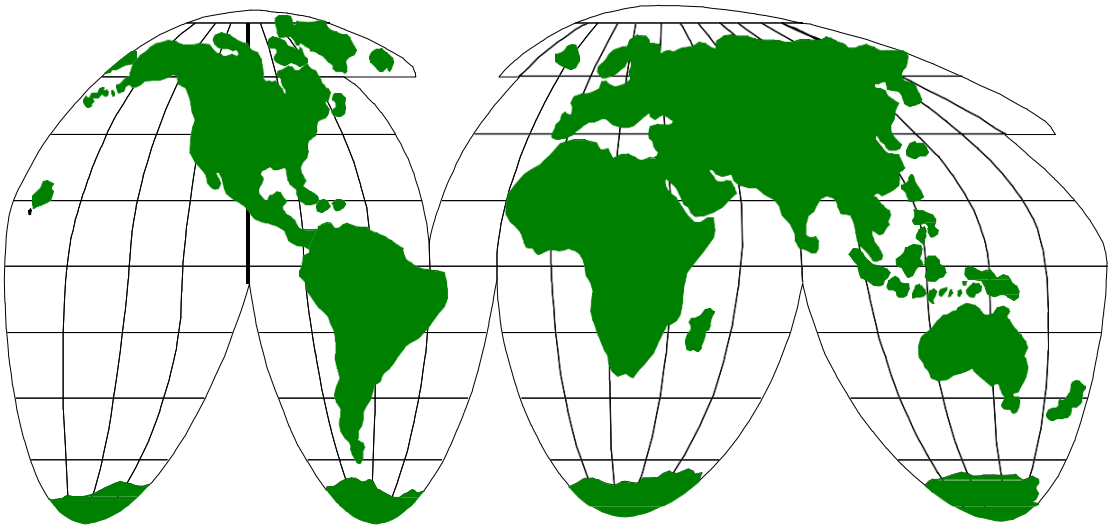
U.S. ARMY PUBLIC HEALTH CENTER

INDUSTRIAL HYGIENE SAMPLE ANALYSIS GUIDE

TECHNICAL GUIDE 141



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TG 141: INDUSTRIAL HYGIENE SAMPLE ANALYSIS GUIDE, JANUARY 2022

WAYS TO COMMUNICATE WITH APHC-LS	
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CHAPTER 1
INTRODUCTION

1.1 Purpose

This technical guide (TG) provides information and guidance to industrial hygiene (IH) customers in using the services of the U.S. Army Public Health Center (APHC) laboratory.

1.2 References

Appendix A contains a list of references which provide information about regulatory requirements, reference methods, and sample collection techniques. The references listed include, but are not limited to, pertinent regulatory and Army documents, other APHC TGs, and selected scientific publications.

1.3 THE APHC Customer Support Services and Industrial Hygiene Procedure List

Appendix B contains three sections—

- Section B–1: Provides information about the Customer Support Services available at the APHC laboratory.
- Section B–2: Explains terms used in the listing of APHC Laboratory Sciences IH procedures.
- Section B–3: Lists the APHC Laboratory Sciences IH test procedures and gives specific information about the sampling, collection, and special handling requirements for each analyte.

1.4 Information about Industrial Hygiene Monitoring Supplies

Appendix C provides suggested sources for IH monitoring supplies.

1.5 APHC-LS LIDS Documents

Appendix D provides examples of APHC-LS LIDS documents throughout this document. Reproducing these documents is permitted and encouraged.

1.6 Abbreviations and Terms

The Glossary explains the abbreviations and terms used in this document.

1.7 Quality Assurance

The APHC laboratory maintains quality systems that meet the requirements of national and international laboratory accrediting bodies such as the American Industrial Hygiene Association (AIHA®) and the International Organization for Standardization (ISO®). Check with the APHC laboratory about their current accreditation status. The APHC laboratory is responsible for ensuring the quality of the work it performs.

1.8 Communications with the Laboratory

Good communication is the key to customer satisfaction. It is critical for the success of a project for customers and laboratory staff members to work together from the earliest planning stages of a project until after the final reports have been issued.

CHAPTER 2
INDUSTRIAL HYGIENE AIR, WIPE, AND BULK MATERIAL SAMPLE COLLECTION

2.1 General Information

2.1.1 IH Procedure Lists

Appendix B provides guidelines for IH sample collection and shipment, summarizes recommended parameters for sampling, and indicates any special instructions or requirements for each analyte. The APHC-LS Industrial Hygiene Procedure List is in Appendix B-3 of this guide. Also, see Chapter 3 for detailed information to consider before collecting samples.

2.1.2 Reference Methods

The reference methods listed and the information and guidelines given in the APHC-LS IH Procedure List are from documented procedures published by—

- The National Institute for Occupational Safety and Health (NIOSH). The Occupational Safety and Health Administration (OSHA).
- The U.S. Environmental Protection Agency (EPA).
- The ASTM International.
- Manufacturers of sampling media.
- Professional scientific publications.

2.2 Recommended Sample Flow Rates and Air Collection Volumes

The sampling parameters recommended in this TG's IH Procedure List should be used whenever possible. When these parameters are used under normal sampling conditions—

- The test result should be accurate for the sample being collected.
- The limit of quantitation (LOQ) for the analytical measurement system (the instrumentation and the method used for testing) can be met.
- The possibility of sample breakthrough is minimized.
- The final sample concentration will generally range between 0.1 and 2 times the threshold limit value (TLV®) parameter for most analytes.

The air collection volumes recommended in the Procedure List are optimized to minimize problems with sample breakthrough. However, it is important to keep in mind that:

- Factors such as high humidity or the presence of adsorbing compounds may significantly reduce this safety factor. The sampling plan should take these factors into consideration.
- Higher than recommended air collection volumes should be used only when required by an approved sampling plan because of the possibility of sample breakthrough or overloading.
- The sampling plan should be evaluated to help ensure, whenever possible, that sample volumes based on the mass LOQ of the method will be a sufficient volume so that the

concentration LOQ will be one-tenth of the appropriate exposure limit.

2.3 Departures from Recommended Sampling Parameters

Sampling situations may arise where departures from the recommended sample flow rates and air collection volumes are necessary. When such departures are required, they should be used only when based on an approved sampling plan.

Departures from recommended guidelines may be necessary if—

- The concentration of the analyte in question is expected to be high. An air collection volume at or near the lower limit of the recommended range should be used in this situation.
- Filter sampling in dusty areas is required. A lower than recommended total air collection volume should be used when sampling in this environment.
- The concentration of the analyte in question is expected to be much lower than the TLV or permissible exposure limit (PEL) parameter. An air collection volume at or near the upper limit of the recommended range should be used in this situation.
- The minimum air collection volume needed to obtain an adequate concentration of the desired analytes under these conditions can be calculated using the following formula:

$$\text{Minimum Air Collection Volume (in L)} = \frac{LOQ}{E*F}$$

Where:
LOQ = Analytical Limit of Quantitation (micrograms (µg))
E = Exposure Limit (milligram per cubic meter (mg/m^3))
F = Estimate of the Exposure Limit in the Sampling
Environment expressed as a percent (in decimal form) of the Standard TLV or PEL parameter. For example, if it is estimated that the sampling environment is 10% of the TLV, “0.1” would be used. The exposure limit is converted from mg/m to milligram per liter (mg^3/L) by the conversion factor noted in the equation (1 m^3 = 1,000 L).
Specific needs or considerations to use when sampling for different types of analytes are given in later sections of this chapter.

2.4 Calculating Measurement Error – SAE Using Laboratory Method Uncertainty

The Sum of Absolute Errors (SAE) is a measure of uncertainty and can be calculated from the analytical and pump coefficients of variation (CV).

SAE Using Laboratory Method Uncertainty

$$SAE = \sqrt{(CV_A)^2 + (CV_P)^2}\ X\ 1.645$$

Where:
CV_P = Pump Coefficient of Variation, if unknown use 0.05
CV_A = Analytical Coefficient of Variation

Source: U.S. Air Force, 2016, Pg. 123.

Please contact the laboratory IH email address to obtain the CV_A for your method. The determination of CV_P is the responsibility of the IH.

2.5 Field Blanks

Field blanks are quality control samples used in the sampling process, which are required for each set of samples and every type of IH collection media.

- Field blanks measure potential contamination from the collection media itself that can occur during shipping, handling, and storage.
- Field blanks must always be from the same lot number as the sample tubes, filters, or monitors used for sampling. If more than one lot number is used for sampling, then blanks from each lot number are required.
- Field blanks should be opened very quickly in the sampling area and then resealed immediately; no air is drawn through.
- Field blanks should have a sampling time of 0 minutes on the associated laboratory paperwork.

A minimum of 1 field blank must be submitted for every 10 samples from the same sampling set, or any fraction thereof, even if there is only 1 sample in the set. All test procedures require an absolute minimum of one field blank.

NOTE: A set is one or more samples that are collected and submitted for analysis at the same time for the same contaminant(s). A sample set is also referred to as a sample batch.

- Many analytes require a minimum of 2 or more field blanks even if the number of samples in the set is less than 10.
- Always review the referenced method for a specific analyte before collecting or submitting samples.

2.6 Media Blanks

Media blanks are quality control samples which are simply new, unopened samplers that are sent to the laboratory with the exposed samplers. A minimum of one media blank is required in addition to field blanks.

- Media blanks measure the potential contamination from the collection media itself.
- They may be needed as a reference for some analytical methods.
- They must always be from the same lot number as the sample tubes or monitors used for sampling. If more than one lot number is used for sampling, then blanks from each lot number are required.

Always review the referenced method for a specific analyte before collecting or submitting samples to determine if more than one media blank is required.

Potential high background contamination from the collection media may require the submission of additional media blanks. This is of particular concern when lower air volumes are collected. The submission of at least three media blanks allows for the statistical analysis of the results to help determine if there is a significant difference between the blank collection media and the field samples.

Media blanks are never opened by the IH or sample collector. They are opened by the laboratory performing the test procedure immediately before analysis.

2.7 Filter Sampling

2.7.1 Overview

Filter sampling is used to evaluate potential airborne particulate hazards, such as dusts, fumes, mists, and aerosols. For filter sampling, a pump is used to actively pull a known volume of air through a filter appropriate for the hazard. After the particulate matter (PM) has been deposited on the filter, the concentration (mass) of the analyte of interest can be determined by analytical methods, which include microscopic counting, gravimetric analysis, atomic absorption, atomic emission, or mass spectrometric techniques.

2.7.2 Particle Size Selection

Particle size determines the deposition site within the respiratory tract and the subsequent health effect. In 1993, the ACGIH first recommended that particle-size selective TLVs be developed for inhalation hazards in the workplace. For those substances that have not been reviewed, the original label for particles/particulates (formerly considered "total dust") has been retained. For substances that have been reviewed, the ACGIH now recommends that particle-size selective TLVs be expressed in three forms: inhalable, thoracic, and respirable. The appropriate collection media (i.e., cassette / cyclone / Institute of Occupational Medicine (IOM)) should be used when size specific sampling is required. The criteria for particle size TLV classifications are shown in Table 2–1.

Table 2-1. The ACGIH Particle-Size Criteria for Airborne Particulate Matter

PARTICULATE MASS	AED	HAZARDOUS DEPOSITION AREA	50% AED CUT POINT
Inhalable	0 µm – 100 µm	Materials that are hazardous when deposited anywhere in the respiratory tract.	100 µm
Thoracic	0 µm – 25 µm	Materials that are hazardous when deposited anywhere within the lung airways and the gas-exchange region.	10 µm
Respirable	0 µm – 10 µm	Materials that are hazardous when deposited in the gas-exchange region.	4 µm

Legend:
AED = aerodynamic equivalent diameter
µm = micrometers

2.7.3 Different Types of Industrial Hygiene Filters

There are several types of filters used for airborne hazard sampling. The type of filter required for a specific analyte for each test is given in the IH Procedure List in Appendix B-3. Appendix C contains a list of suggested sources for collection filters. ACGIH has developed particle-size selective TLVs for a wide range of contaminants which requires different sampling procedures for many analytes. Refer to the ACGIH Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs) Book.

2.7.4 Metals, Particulate, and Oil Mist Sampling

Use the appropriate sampling rate to meet or exceed the minimum recommended volume for reliable analysis.

Use care to prevent filter overloading when collecting air samples for metals during sanding and grinding operations because of the short-term generation of large volumes of particulate materials.

2.7.5 Conversion of Sample Results from an Element to a Compound Containing that Element

In order to convert a sample result from an element to a compound containing that element, the following formula should be used:

$$RC = RR * \frac{MWC}{MWE}$$

Where:
RC = Result for Compound (mg/m^3)
RR = Reported Result for Element (mg/m^3)
MWC = Molecular Weight (MW) of Desired Compound
MWE = Molecular Weight of Reported Element

2.7.6 Simultaneous Sampling for Multiple Analytes

Some air contaminants may be collected and analyzed on the same filter; however, there may be problems with interference or filter overload that may affect the analyses. Questions regarding analyte compatibility should be directed to the APHC-LC IH consultant. Additionally, analytes requiring individual filter sampling are noted within the Special Instructions portion of the IH Procedure List (Appendix B-3).

2.8 Solid Sorbent Tube Sampling

2.8.1 Overview

Many gases and vapors are collected using solid sorbent sample tubes, which usually consist of a glass tube containing two sections of a solid adsorbent material. When air is actively pulled through the tube, airborne gases and vapors are adsorbed by the first sorbent section while the second section serves as a backup in case analyte breakthrough occurs. The first and second sections of the sorbent tube are analyzed separately in order to monitor breakthrough into the second section. Prior to laboratory analysis, the sorbent material is removed from the sampling tubes, and the analytes of interest are extracted and analyzed.

2.8.2 Different Types of Solid Sorbent Tubes

There are several types of solid sorbent tubes used for IH sample collection. The specific type of tube required for each test is listed in the APHC-LS Industrial Hygiene Procedure List in Appendix B-3. Appendix C contains a list of suggested sources for solid sorbent tubes.

2.8.3 Simultaneous Sampling for Multiple Analytes

Some air contaminants may be collected and analyzed on the same solid sorbent tube; however, there may be problems with interference or sample overload that may affect the analysis. Questions regarding analyte compatibility should be directed to the APHC-LC IH consultant. Additionally, analytes requiring individual filter sampling are noted within the Special Instructions portion of the IH Procedure List (Appendix B-3).

2.8.4 Capacity of Charcoal Tubes

The adsorptive capacity of charcoal tubes and passive monitors may be reduced by:

- High humidity (greater than 50% relative humidity) in combination with high ambient temperatures.
- Very high humidity (greater than 80% relative humidity) with normal ambient temperatures.

To reduce the probability of breakthrough and sample loss, do not exceed one-half of the recommended maximum sample volume under the above conditions.

2.9 Passive Monitor Sampling

2.9.1 Overview

Some gases and vapors can be sampled without a monitoring pump using special passive monitors or badges. Several different types of collection media can be used in these badges, including solid adsorbents, liquid medium, chemically impregnated tape, and reagent-filled tubes. No matter what kind of media is used, the analyte of interest is collected in the badge by diffusion when the air sample comes into contact with the collection media. Instructions and limitations of the monitors are described in the manufacturer's user's manual and should be carefully followed. Always record the manufacturer, model, series and serial number (if available) of the passive monitor on the sampling form, so that the appropriate sampling/uptake rates are used for concentration calculations for the particular chemicals being analyzed. Most monitors require a minimum air flowrate over the diffusion membrane to prevent creating an artificially low stressor concentration at the membrane, and may not be appropriate for area sampling.

Consult the manufacturer or APHC-LS IH Consultant for minimum required air flowrates and suitability for use as an area monitor. Several other points and precautions to note are:

- Passive monitors are usually designed for full shift sampling of gases and vapors. Particulates, such as dust, may coat the monitor's diffusion membrane and invalidate the results.
- In high humidity environments, some organic vapor monitors may experience problems due to competition of water vapor for adsorption sites (on the charcoal, for example) leading to underestimation of the actual concentrations.
- Ensure that the diffusion membranes are not torn during sampling, which invalidates the sample.
- Since monitors are small and light-weight, they are easily turned over so that the sampling face is not exposed or may be covered by loose clothing, again invalidating the results.
- Passive monitors are typically not recommended for ceiling or short-term exposure sampling, unless specified by the manufacturer.
- Passive monitors should not be used for collecting unknown organic vapors.

2.9.2 Simultaneous Sampling for Multiple Analytes

Mixtures of several solvents may be collected and analyzed by the same procedure if the same type of passive monitor and a similar sampling time are used. However, there may be problems with interference or sample overload that may affect the analyses. Questions regarding analyte compatibility should be directed to the APHC-LC IH consultant. Additionally, analytes requiring individual filter sampling are noted within the Special Instructions portion of the IH Procedure List (Appendix B-3).

2.10 Surface Sampling

2.10.1 Overview

The collection of surface contaminants, generally referred to as “wipe sampling,” is an important IH technique to estimate contamination on a variety of surfaces, including those in work areas, homes, outdoor areas, and skin. When implemented following a validated method, the technique is a quick and easy means of assessing the level of contamination that may reside on the surface. Wipe samples can be taken to assess exposure to lead, chromium, and other metals, and also a variety of organic compounds, including pesticides, explosives, and other known toxic or irritant compounds. Procedures can vary widely, depending on the contaminant of interest and the surface sampled. The procedure used for collecting a specific analyte on a given surface is an important part of whether or not the results generated will be representative of the contamination. The National Lead Poisoning Prevention Program has documented procedures for wipes and sample collection (OSHA 2021 ASTM 2020).

2.10.2 Sampling Procedures

- *Wipe Sampling Media.* Refer to the Industrial Hygiene Procedure List (Section B-3) for the specific analyte(s) to be sampled.
- *Wipe Template.* A template of known dimensions should be used to outline the sample area. The template material (e.g., aluminum, plastic, disposable manila paper) must be compatible with the wetting agent, and must not introduce contamination.
- *Sample Collection.* Refer to the EPA guide for lead dust sampling guidance: https://www.epa.gov/sites/production/files/documents/ldstguide.pdf (EPA 2021). Refer to Appendix E in this document for hazardous drug sampling guidance.

2.11 Asbestos Sampling and Optimal Filter Loading for Fiber Count Analysis by Phase Contrast Microscopy

2.11.1 Optimize the Sample Flow Rate

The OSHA regulations specify a sample flow rate of 0.5 to 2.5 liters per minute (LPM). However, in order to obtain optimal fiber loading in clean work areas, higher sample flow rates (up to 16 LPM) are sometimes necessary. The higher flow rate is required to achieve an appropriate fiber density for counting the fibers under the microscope for the laboratory analysis. Refer to past sampling data, if available, to determine appropriate sample flow rates and sampling times.

2.11.2 Optimize the Sample Loading

When a fiber density (E) between 100 to 1,300 fibers per square millimeter (f/mm^2) is achieved, then optimum sample loading has been accomplished. A fiber density in this range allows for more accurate counting of the asbestos fibers under the microscope. Using past data expressed as a fiber count (C) in fibers per cubic centimeter (f/cc), the optimum sample loading and/or the volume required to achieve it can be calculated using the following formula:

$$E = \frac{C * V * 1{,}000}{A_c}$$

Where:
E = Fiber density (f/mm^2)
C = Fiber concentration in f/cc (fiber count result from past data)
V = Volume sampled (L)
A_c = Collection area (A 25-mm filter has an effective collection area of 385 mm^2)

2.11.3 Optimize the Sample Flow Rates and Time for Best Fiber Density

Sampling should be done at a sample flow rate greater than 0.5 LPM. The sampling time necessary to produce a fiber density of 100 to 1,300 f/mm^2 can be calculated using the formula below. This range for fiber density allows for optimum accuracy when performing the fiber count. The OSHA PEL time-weighted average (TWA) for asbestos is 0.1 f/cc.

$$t = \frac{Ac * E}{Q * C * 1{,}000}$$

Where:
t = Sampling Time (minutes)
Ac = Collection Area (A 25-mm filter has an effective collection area of 385 mm^2)
E = Fiber density (f/mm^2)
Q = Flow rate (LPM)
C= Fiber concentration (f/cc)

2.11.4 Optimize the Air Collection Volume

Usually, air collection volumes between 400 and 2,000 L are adequate to achieve a suitable sample detection limit, which is above the PEL. However, if the sampling environment is very clean and the final air collection volume is too low, the fiber density obtained on the sample filter may not be adequate.

- For expected low-fiber concentrations (significantly less than 0.1 f/cc), air collection volumes within a range of 3,000 – 10,000 L are often required to ensure a quantifiable fiber count on the fibers and to achieve a detection limit, which is lower than the OSHA PEL TWA.
- When using high-air collection volumes, care must be taken not to overload the filter with ambient background dust, which may bias the asbestos analysis and make it difficult to obtain accurate fiber counts.

2.12 Radiochemical and Health Physics Laboratory Analyses

2.12.1 General Information

For information regarding ionizing radiation air and wipe sampling, refer to the APHC-LS Industrial Hygiene Procedure List (Appendix B-3) in this guide. For information regarding radiation bioassay sampling, refer to the APHC TG 211 (APHC 2012).

2.12.2 Points of Contact for Radiochemistry Guidance/Consultation

For questions not answered in this guide regarding radiochemical, health physics, and ionizing radiation, please contact one of the programs listed below. The point of contact (POC) will provide the appropriate interaction needed with other APHC personnel.

- For nonionizing radiation concerns to include laser, optical and radiofrequency emission, contact the Program Manager for Laser/Optical Radiation at DSN 584-3353/3932 or (410) 436-3353/3932
- For potential personnel exposures to radioisotopes and ionizing radiation or other health physics concerns, contact the Program Manager for Health Physics at DSN 584-3502 or (410) 436-3502.
- For sampling and sample collection questions, contact the APHC-LS IH consultant at DSN 584-2208 or (410) 436-2208.

CHAPTER 3
FACTORS TO CONSIDER BEFORE COLLECTING SAMPLES

3.1 Overview

3.1.1 Factors for Laboratory Analyses

Several factors necessary for successful laboratory analyses should be considered *before samples are collected*. These factors include—

- The most appropriate analytes for the project.
- Special sampling or collection requirements.
- Special instructions, handling, or shipping requirements.
- Sample priority designations.
- Safety considerations: sample or site history.

3.1.2 Statistical Evaluation

The number of samples required for compliance monitoring should be based on statistical evaluation of the worker exposure to hazardous material. A general discussion on statistics as they relate to sampling strategy can be found in *Occupational Exposure Sampling Strategy Manual* (NIOSH 1977) and also in *A Strategy for Assessing and Managing Occupational Exposures* (AIHA 2006). Questions concerning an individual analytical method's CV should be directed to the APHC-LS IH consultant.

3.1.3 Army Guidance for Air Exposure Limits

The Army's guidance, as specified in Department of the Army Pamphlet (DA Pam) 40-11, *Preventive Medicine*, on exposure limits for hazardous materials in air is based on the most stringent limit (DA 2020). Where there are multiple limits (i.e., OSHA PEL and ACGIH TLV) for a particular hazard, the more restrictive limit should be used for compliance monitoring. Other airborne exposure limits may be applicable to Soldiers during training/combat scenarios during use of military-unique tactical equipment, munitions, and weaponry. Consult APHC Industrial Hygiene Field Services Division concerning these types of situations at DSN 584-3118 or commercial (410) 436-3118.

3.1.4 Available Test Methodologies

The APHC IH Laboratory Procedure List (Appendix B-3) offers IH customers a centralized source of the information they need to know for proper sampling of the analytes tested at the APHC laboratory. The APHC IH laboratory continually updates the analyses available to IH customers. If the test methodology desired for a project is not on the APHC IH Laboratory Procedure List, please contact the APHC-LS IH consultant for updated information on test methodologies available. Some tests are not performed routinely but are available upon special request.

3.2 Sample Analysis Priority Designations

Sample analysis priorities are critical in determining the turnaround times (TATs) and the cost for each analysis. Samples are assigned processing priority based on three assigned sample analysis priorities: Standard, High-Priority, and Top-Priority. Table 3-1 summarizes the guidelines for APHC-LS sample analysis priorities. Unless otherwise specified, all samples are assigned standard priority.

> **NOTE:** High- and top-priority requests must be coordinated in advance with the laboratory. A brief justification is required when requesting elevated priority. Requests may be denied if justification is insufficient (i.e., situations not related to immediate worker health threats, work stoppages, high visibility/impact projects). Short holding times are not sufficient justification. The laboratory makes every effort to meet holding times regardless of the priority.

Table 3-1. Guidelines for APHC-LS Sample Analysis Priorities

	STANDARD	HIGH PRIORITY	TOP PRIORITY
Basic Selection Criteria	Routine analytical response is involved	Rapid analytical response is desired	Fastest analytical response possible is needed – typically reserved for work stoppages or health emergencies
Costs	APHC-LS published fee	Fee surcharge applied	Fee surcharge applied
TAT	14 calendar days from receipt in the laboratory	8 calendar days from receipt in the laboratory. Prior laboratory approval required.	5 calendar days or less from receipt in the laboratory. Prior laboratory approval required

Legend:
TAT = turnaround time
Notes:
The TAT for each analysis should be determined as part of the project requirements and by mutual agreement with APHC-LS.
The specific TAT for each sample can be analysis and project dependent; some analyses cannot accommodate high- or top- priority requests; subcontracted analyses may result in extended TATs.
The TATs may be affected by the number of samples involved for each analysis.

3.3 Additional Sample or Project Considerations

3.3.1 Sample Safety Considerations

The laboratory personnel must be informed about samples that are known or suspected of containing hazardous materials, either chemical or biological, before the samples are submitted.

- Appropriate precautionary measures must be taken to protect everyone who will have any contact with these kinds of samples.
- Information concerning hazards, or possible hazards, must be part of the communication process with APHC-LS and clearly indicated on all the paperwork (for example, LIDS 9) and on the samples.

3.3.2 Special Instructions, Handling, or Shipping Requirements

These requirements are indicated on the APHC Laboratory IH Procedure List, Appendix B-3. The APHC-LS IH consultant can be contacted for clarification and advice with respect to these requirements.

3.3.3 Chain-Of-Custody Requirement

Chain-of-custody (CoC) is a procedure that provides accountability and documentation of sample integrity from the receipt of the sample in APHC-LS until disposal or consumption. A sample is usually handled under CoC if there is a possibility that the results may be used in litigation. It is project specific and determined by the industrial hygienist performing the sampling. Appendix D contains a copy of the CoC document, LIDS 235, which must be completed by the project officer. The document can also be accessed at http://phc.amedd.army.mil/topics/labsciences/lsm/pages/lids.aspx. You must contact the lab prior to sample submission if you require a legal CoC.

CHAPTER 4
REQUEST FOR LABORATORY SERVICES AND SAMPLING MEDIA

4.1 Sample Coordination Requirements

4.1.1 Army Customers

Refer to Appendix B, Section B-1, for information on Customer Support Services.

4.1.2 IH Customers Outside of the Army Medical Department Channels

Customers should coordinate sampling activities with the local installation industrial hygienist. If this cannot be arranged, a Memorandum of Agreement (MOA) must be established between APHC-LS and the requesting organization, and funds transferred prior to sample analysis. Contact the APHC-LS IH Consultant.

4.2 Request for Services

The project officer should contact the IH Group at: usarmy.apg.medcom-aphc.list.industrial-hygiene-lab-analysis-inqu@mail.mil when requesting media and before submitting samples for analysis. Media should only be requested for scheduled sampling projects, not for general restocking purposes. Please allow 7 calendar days for media requests to be delivered. APHC-LS may be able to accommodate quicker media deliveries, but it is not guaranteed. The following information is necessary when requesting sampling media from the lab:

- Specific analyte(s) to be sampled.
- Number of samples (including field and media blanks).
- Sampling method (i.e., active air sampling/passive air sampling/wipes).
- Sampling date (if known).
- Commercial shipping address (APO addresses will result in significant delays).

NOTE: Large sampling projects (~25 samples or more) must be coordinated with the APHC-LS IH consultant to ensure the lab's analytical capacity is not exceeded.

CHAPTER 5
SUBMITTING SAMPLES TO THE LABORATORY

5.1 Required APHC Shipping Documents

A LIDS 9 form should be submitted electronically, and a physical copy should be printed and included in the box with the samples during shipment. If printing is not possible, include a note with the LIDS 9 ID number in the box with the samples. This document serves as advanced notice of incoming samples. If, for whatever reason, the form cannot be completed and submitted electronically, please email a copy of the form to our "SAMPNEWS" inbox prior to samples arriving at the lab: usarmy.apg.medcom-aphc.mbx.dls-sampnews@mail.mil

> **NOTE:** When submitting **Radiation** samples, a Chain of Custody form (LIDS 235) should be filled out, rather than a LIDS 9 form.

APHC Laboratory Sample Submission Forms:
https://phc.amedd.army.mil/topics/labsciences/lsm/Pages/LIDS.aspx

5.2 Modifying Requests for Laboratory Services

Contact APHC-LS immediately for any change to a processed LIDS 9. Submit all changes through "SAMPNEWS." This e-mail system is the most effective means of communicating with us because all APHC-LS staff members have access to this mailbox.

5.3 Sample Rejection

Samples that do not meet the acceptance criteria for a valid sample are subject to rejection. Efforts will be made to accept samples, if possible. Sample management and technical staff members have the authority to reject samples. The laboratory will initiate contact with the appropriate project officer or industrial hygienist resource. At APHC-LS, a sample rejection document is used for documentation and states:

- Who rejected the sample.
- The reason for the rejection.
- When the project officer was notified.

When a project officer or other approving authority makes a decision to reject samples, the request will be documented (at APHC-LS) and the report for the sample will be qualified.

Rejected samples will either be properly disposed of or returned to the customer by laboratory personnel. The disposition or return is documented on the sample rejection document and/or other applicable documents.

5.4 Sample Field Identification and Labeling

Identify each sample with the unique sample identification (Sample ID) assigned locally, at the time of collection, by the industrial hygienist resource or the sample collector.

- A consecutive numbering system is recommended to avoid duplication of numbers; **the sample ID MUST NOT EXCEED 15 characters in length.**
- Clearly differentiate between samples, field blanks, and media blanks.
- Accurately reference each sample on the paperwork included in the shipment**; the ID on the sample label must be an EXACT MATCH for the ID on the paperwork.**
- Double check paperwork for errors before submitting to APHC-LS.

Complete each sample label as required. Figure 5-1 outlines the information needed on each sample label.

PRINT EACH LABEL NEATLY
USE PERMANENT WATERPROOF INK

1. SAMPLE ID (Maximum of 15 Characters)
2. DATE OF COLLECTION
3. SAMPLE TIME/VOLUME (If Applicable)

Figure 5-1. Required Information for Each Field Sample Label

5.5 Sample Packing Instructions

Complete the following steps when packing samples for shipment:

1. Contact the laboratory prior to shipping samples if there are any concerns about proper packing or shipping of samples.

2. Know which types of samples require special handling, packing, or shipment. The Special Instructions in Appendix B-3, IH Lab Procedure List indicates any special sample requirements.

3. Verify that all samples are capped tightly.

4. Never ship bulk liquid samples in the same shipping container as air samples. This is necessary to avoid contamination of the air samples.

5. Mark the liquid level in sample containers (such as bulk samples) with indelible ink. If a sample leaks during shipment, the project officer will be contacted, and a decision will be made as to whether the sample needs to be recollected.

6. Place an absorbent in the shipping container if liquid samples are being shipped. This

is absolutely necessary if any samples contain, or are suspected of containing, hazardous material. Be sure to include enough material to absorb all the liquid in the shipment if sample leakage occurs. Any leakage from the container will halt the transportation by the carrier.

7. Use suitable packing materials to prevent breakage of samples.

    - Wrap each glass container with enough packing material to prevent contact with other containers or the outer box. The samples should be packed to withstand a 6-foot drop.
    - Seal small vessels containing liquids in plastic bags or aluminum foil depending on the analysis requested. This practice ensures sample integrity and prevents contamination of an entire shipment if a sample leaks.

8. Use refrigerants and a cooler or Styrofoam® box, when necessary, to maintain the samples at the temperature required for special handling and shipping. The Special Instructions in the Procedure List (Appendix B-3) indicate this requirement.

    - Store samples in a refrigerator until just before packing. If samples must be frozen, store in the freezer.
    - Pre-cool shipping containers to 4ºC before shipping, if possible.
    - Use pre-frozen gel blocks whenever possible. Do not allow blocks to come in direct contact with the samples. Keep samples and gel blocks sealed in one or more plastic bags. Always send for next-day delivery (a.m. is better than p.m.). Any leakage from the container will halt the transport by the carrier, so be careful to seal well.
    - Use ice as a refrigerant only when gel blocks are not available. When ice is used, it must be sealed in heavy double-layered plastic bags to prevent leakage as the ice melts.
    - Use dry ice only when special sample requirements require its use. Verify shipping regulations before shipping samples.

5.6 Shipment Requirements and Specifics

All samples should be shipped to the APHC-LS Sample Management Lab:

ATTN: Sample Management Laboratory
U.S. Army Public Health Center
8988 Willoughby Road BLDG E-2100
Aberdeen Proving Ground, MD 21010

Table 5–1. Shipment Requirements and Specifications

1. STANDARD ANALYSIS SAMPLES	**CAN BE SENT BY:** • Priority First Class Mail • Certified U.S. Mail. • Commercial carriers such as FedEx® or UPS. • Hand carried to Building E-2100, APG South. **NOTE: Do Not Send Hazardous Materials by:** (1) **U.S. Mail.** Consult with carrier and reference Department of Transportation (DOT) shipping requirements when applicable. (2) **Registered Mail.** It is not delivered directly to Building E-2100.
2. PRIORITY SAMPLES OR SHIPMENTS WITH SAMPLES THAT REQUIRE SPECIAL HANDLING	• Shipped by Overnight Express (e.g., FedEx or UPS). • Hand carried to Building E-2100, APG South.
3. FEDEX/COMMERCIAL CARRIER SPECIFICS	• Packages shipped overnight arrive by 1200 the next day. • Samples cannot be received on Sunday.
4. SHIPMENTS ARRIVING OUTSIDE NORMAL DUTY HOURS (M-F, 0700–1600 except Federal Holidays)	• Require advance arrangements with the Sample Management Laboratory before the samples are shipped. This is necessary to ensure samples are properly received and processed.
5. SHIPMENTS MUST COMPLY WITH ALL APPLICABLE REGULATIONS	• The DOT • State and local governments • Hazardous waste • Radiochemical • Biohazard • U.S. Customs Declarations

APPENDIX A
REFERENCES AND INTERNET ADDRESSES OF INTEREST

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INTERNET ADDRESSES OF INTEREST

APHC Homepage
https://phc.amedd.army.mil/Pages/default.aspx

APHC-Industrial Hygiene
https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/default.aspx

APHC-Laboratory Sciences
https://phc.amedd.army.mil/organization/ls/Pages/default.aspx

NIOSH
https://www.cdc.gov/niosh/index.htm

OSHA
https://www.osha.gov/

EPA
https://www.epa.gov/

U.S. Air Force Research Laboratory
https://www.afrl.af.mil/711HPW/USAFSAM/

U.S. Navy Public Health Center
https://www.med.navy.mil/Navy-Marine-Corps-Public-Health-Center/

ACGIH Home Page
https://www.acgih.org/

American Chemical Society Division of Chemical Health and Safety
https://dchas.org/

AIHA
https://www.aiha.org/

American College of Occupational and Environmental Medicine
https://acoem.org/

APPENDIX B
APHC LABORATORY SUPPORT SERVICES
AND
INDUSTRIAL HYGIENE PROCEDURE LIST

B-1. APHC-LS SUPPORT SERVICES

B-1.1 General Information

Table B–1 lists various means of communicating with APHC-LS staff members. Please consult APHC TG 214, *APHC-LS Customer Service Manual,* for additional information on our laboratory Services.

Table B-1. Means of Communicating with the APHC-LS–Main Laboratory

Telephone	**DSN:** 584-2208 **Commercial: Main Line:** (410) 436-2208 **International:** 001-410-436-2208
Email	**IH Inquiries and Media Requests:** usarmy.apg.medcom-aphc.list.industrial-hygiene-lab-analysis-inqu@mail.mil **Sample shipments and LIDS 9 submissions:** usarmy.apg.medcom-aphc.mbx.dls-sampnews@mail.mil
Internet	For information, see the APHC-LS Public Website Home Page at: http://phc.amedd.army.mil/topics/labsciences/pages/default.aspx To submit an analytical request: http://phc.amedd.army.mil/topics/labsciences/lsm/Pages/LIDS.aspx
Shipments	**For Sample Shipments:** U.S. Army Public Health Center ATTN: Sample Management Laboratory 8988 Willoughby Rd., BLDG E-2100 Aberdeen Proving Ground, MD 21010-5403

B-1.2 The APHC-LS Industrial Hygiene Consultant

The APHC-LS IH Consultant offers customers the assistance they need to make sound decisions concerning the analytical and technical aspects of their projects.

This assistance involves sampling and collection advice, completing media requests, as well as, information concerning proper quality assurance factors, such as ensuring appropriate field

blanks are collected and special handling and shipping requirements are met.

The APHC-LS IH consultant should also be involved in coordinating special and priority projects.

B-1.3 "SAMPNEWS": An E-Mail Mailbox

"SampNews" is an e-mail mailbox established to offer APHC-LS customers a convenient, effective, and efficient way to exchange information with the laboratory.

The use of this mailbox facilitates the communication process with APHC-LS because messages on "SampNews" can be—

- Accessed simultaneously by all appropriate APHC-LS staff members. Responses can be made quickly and directly.
- Answered quickly. Questions about the status of samples and laboratory reports are addressed promptly.
- Used to contact the laboratory about incoming samples. Duplicate copies of a completed LIDS 9 can be electronically submitted.

TABLE B-2. APHC-LS INDUSTRIAL HYGIENE CUSTOMER SUPPORT SERVICES

CUSTOMERS NEED	APHC-LS IH CONSULTANT	SAMPNEWS E-MAIL
Request for Sampling Media	X	
Choice of the most appropriate sample analysis priority	X	
Technical information on analyses.	X	
Coordination of priority, complex, or special projects.	X	
Guidance pertaining to requirements for sample collection or shipping.	X	
Details concerning sample processing and status reports.	X	
Advance notification of incoming samples by submission of a duplicate LIDS 9 document.		X
Notification of PROJECT modifications after a LIDS 9 has been received or processed.		X

B-1.4 DUTY HOURS FOR THE APHC MAIN LABORATORY

Routine duty hours are from 0700 to 1600 hours Eastern Time, Monday through Friday, except for federal holidays.

Special arrangements must be made with the Sample Management Laboratory prior to the shipment of any samples that will arrive outside of APHC-LS routine duty hours. These arrangements are necessary to ensure appropriate APHC-LS personnel will be available to receive, process, and preserve the samples.

B-2. APHC-LS INDUSTRIAL HYGIENE PROCEDURE LIST EXPLANATION OF TERMS

AIR COLLECTION VOLUME:	The recommended range (minimum-maximum) for the total volume of air in liters (L) to be collected during the sampling process. See Chapter 2 for a detailed discussion concerning air sample collection.
ANALYTE NAME:	The name of the chemical as it appears in the Reference Method Most synonyms are listed and cross-referenced in this list.
CHEMICAL ABSTRACTS SERVICE (CAS) NUMBER	A number assigned by the CAS, which offers a concise, unique means of material identification. It identities specific chemicals except when followed by an asterisk (*), which signifies a compound (often naturally occurring) of variable composition.
COLLECTION MEDIA:	The type of collection media required and detailed information concerning the specific requirements for the listed analyte.
REFERENCE METHOD:	The analytical methodology used for sample analysis. Information from the Reference Method serves as the basis for the other parameters in the Procedure List.
LIMIT OF QUANTITATION (LOQ)	The “expected” limit that can be reliably achieved within specified limits of precision and accuracy during routine sample analyses, by the reference method, usually listed in micrograms per sample. Other LOQ units may be fibers per square millimeter (asbestos) or micrograms per gram or liter for bulk samples.

SAMPLE FLOW RATE: The recommended range (minimum-maximum) in liters of air per minute, which can be used in collection of the sample. After the sample flow rate has been selected, the appropriate sampling time should be determined by dividing the recommended collection volume by the sampling rate. See Chapter 2 for a detailed discussion concerning air and bulk material sample collection.

SPECIAL INSTRUCTIONS: Any comments or special requirements necessary when collecting, handling, or shipping samples that are to be tested for the selected analyte.

APPENDIX B-3
INDUSTRIAL HYGIENE PROCEDURE LIST

The information in this guide may not be complete or current. It is always best-practice to refer to the most up-to-date reference method prior to sampling. Additionally, this list may not be all-inclusive. If you have questions about an analyte or method that is not listed, contact the APHC-LS IH consultant: usarmy.apg.medcom-aphc.list.industrial-hygiene-lab-analysis-inqu@mail.mil

ACETIC ACID [CAS # 64-19-7]
Reference Method: OSHA-PV2119
LOQ: 10 micrograms (µg)/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 48 (No range given in reference method)
Special Instructions:

1. Submit the samples to the laboratory for analysis as soon as possible after sampling. If delay is unavoidable, store the samples in a refrigerator.
2. Ship any bulk samples separate from the air samples.

Passive Monitor Sampling Media: N543AT
LOQ: 3 µg/sample
Special Instructions: Return samples to the laboratory within 14 days of the sampling event.

ACETONE [CAS # 67-64-1]
Reference Method: NIOSH 1300, 4th Edition
LOQ: 30 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 0.5-3
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N566AT
LOQ: 50 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. Shipment: refrigerated.

ACETONITRILE [CAS # 75-05-8]
Reference Method: NIOSH 1606, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1-25
Special Instructions:

1. Protect samples from light.
2. Refrigerate samples after collection.
3. Interferences: samples containing greater than 15% methanol or other alcohols.
4. Sample stability: at least 30 days at 5 degrees Celsius (ºC).
5. Shipment: keep cold; pack securely for shipment.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 10 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. For the N566 badge a minimum sampling time of 30 min is required to meet the TLV.
4. Sample stability: at least 30 days at 5 ºC.
5. Shipment: keep cold; pack securely for shipment.

ACID GASES

Acid Gas	CAS Number	LOQ (µg/sample)
Hydrobromic acid	10035-10-6	5
Hydrochloric acid	7647-01-0	5
Hydrogen Cyanide*	74-90-8	2.6
Hydrofluoric	7664-39-3	5
Nitric Acid	7697-37-2	5
Phosphoric Acid	7664-38-2	5
Sulfuric Acid	7664-93-9	5

Reference Method: OSHA 165SG. * NIOSH 6010
Collection Media: Solid Sorbent Tube [Washed Silica Gel] or Filter Cassette [37mm Quartz];
* Solid Sorbent Tube [soda lime, 600 mg/200 mg with glass fiber pre-filter]
Sample Flow Rate: Minimum-Maximum (LPM): 0.2 *(0.025-0.05)
Air Collection Volume: Minimum-Maximum (L): 96 * (2-90)

ACID GASES (CONT.)

Special Instructions:

1. Interferences: Multiple interferences; contact the APHC-LS IH consultant.
2. Discard prefilter after sampling.
3. Sample stability at least 2 weeks at 25 ºC.
4. Three field blanks minimum per set.

Passive Monitor Sampling Media: N/A

ACROLEIN [CAS # 107-02-8]

Reference Method: OSHA 52
LOQ: not listed (please call the APHC-LS IH consultant to inquire)
Collection Media: Solid Sorbent Tube [Treated XAD-2, SKC 226-117/226-118 or equivalent]
Sample Flow Rate (LPM): 0.1 (No range given in reference method)
Air Collection Volume (L): 48 (No range given in reference method)
Special Instructions:

1. Sample stable at least 18 days at ambient temperature.
2. Media requires freezer storage.
3. Interferences: compounds that contain a carbonyl group.

Passive Monitor Sampling Media: Assay Tech N592

LOQ: not listed (please call the APHC-LS IH consultant to inquire)
Special Instructions: same as above

ALKALINE DUSTS

Alkaline Dust	CAS Number	LOQ (µg /sample)	Collection Volume (L)
Potassium Hydroxide	1310-58-3	56	70-1000 L
Sodium Hydroxide	1310-65-2	24	70-1000L

Reference Method: NIOSH 7401 titrimetric, 4th Edition.
Collection Media: Filter Cassette [37 PTFE 1.0, SKC 225-17-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1–4
Special Instructions:

1. Interferences: acid aerosols.
2. Sample stability: at least 7 days at 25 ºC.
3. Provide 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

ALLYL CHLORIDE [CAS# 107-05-1]
Reference Method: mod. NIOSH 1000
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-09 or equivalent]
Sample Flow Rate Minimum: Maximum (LPM): 0.01–1
Air Collection Volume: Minimum-Maximum (L): 16–100
Special Instructions: Interferences: amines.

Passive Monitor Sampling Media: N/A

ALPHA-METHYLSTYRENE

See “METHYLSTYRENE, ALPHA-”

ALUMINUM

See “METALS”

AMMONIA [CAS # 7644-41-71]
Reference Method: OSHA ID-188/ID-164
LOQ: 20 µg/sample
Collection Media: Solid Sorbent Tube [Treated Anasorb 747, SKC 226-29 or equivalent]
Sample Flow Rate Minimum: Maximum (LPM): 0.1–0.5
Air Collection Volume: Minimum-Maximum (L): 7.5–24
Special Instructions: Interferences: amines.

Passive Monitor Sampling Media: N584AT
LOQ: 5.0 µg/sample
Special Instructions:
1. Media requires refrigeration before and after use.
2. Monitors must be received by the laboratory within two (2) weeks after sampling.
3. Interferences: amines.

n-AMYL ACETATE (N-PENTYL ACETATE) [CAS # 628-63-7]
Reference Method: NIOSH 1450, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10

n-AMYL ACETATE (CONT.)

Special Instructions:

1. Protect samples from light.
2. Interferences: high humidity.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5.0 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

sec-AMYL ACETATE (SEC-PENTYL ACETATE) [CAS # 626-38-0]

Reference Method: NIOSH 1450, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:

1. Interferences: High Humidity.
2. Protect samples from light.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5.0 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ANESTHETIC GASES

Anesthetic Gas	CAS Number	LOQ (µg /sample)	Collection Volume (L)
Desflurane	57041-67-5	5	4
Isoflurane	2667-54-67	5	12
Sevoflurane	28523-86-6	5	12

Reference Methods: Modified OSHA 103/OSHA 106
Collection Media: Solid Sorbent Tube [Anasorb 747, SKC 226-81A or equivalent]
Sample Flow Rate (LPM): 0.05 (No range given in reference method)
Air Collection Volume (L): 12 (No range given in reference method)

ANESTHETIC GASES (CONT.)
Special Instructions: Store and ship refrigerated.

Passive Monitor Sampling Media: N574 AT
LOQ: 3 µg/sample (each analyte)
Special Instructions: Return samples to the laboratory within 14 days of the sampling event.

ANILINE [CAS # 62-53-3]
Reference Method: In-House Method "LC-SOP-50" (contracted)
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Treated XAD-7, SKC 226-98 or equivalent]
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 30 (No range given in reference method)
Special Instructions: None

Passive Monitor Sampling Media: N/A

ANTIMONY

See "METALS"

AROMATIC HYDROCARBONS

Analyte	CAS Number	LOQ (µg /sample)	Volume (L)
Benzene	71-43-2	5	0.5-3
Cumene	98-82-8	10	1-30
Ethyl Benzene	100-41-4	10	1-24
Styrene	100-42-5	10	1-14
Toluene	108-88-3	10	1-8
Xylenes (total)	1330-20-7	20	2-23

Reference Method: NIOSH 1501, 4th Edition
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): Less than or equal to 0.2
Special Instructions: None

AROMATIC HYDROCARBONS (CONT.)

Passive Monitor Sampling Media: N525AT/ N566AT

Analyte	CAS Number	LOQ (µg/sample)
Benzene	71-43-2	2
Cumene	98-82-8	5
Ethyl Benzene	100-41-4	5
Styrene	100-42-5	5
Toluene	108-88-3	5
Xylenes (total)	1330-20-7	15

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. N525 model is recommended for STEL sampling

ARSENIC

See “METALS”

ASBESTOS FIBER COUNT - AIR SAMPLE - BY PHASE CONTRAST MICROSCOPY [CAS # - VARIOUS]

Reference Method: NIOSH 7400, 5th Edition
LOQ: 5.5 fibers/100 fields
Collection Media: Filter Cassette [25MCE 0.8, SKC 225-326 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1.0–16
Air Collection Volume: Minimum-Maximum (L): 400–3,000
NOTE: See NIOSH 7400 (Page 3 and 4, Paragraphs 4, 5, and 6 under “Sampling”) and Chapter 2, paragraph 2.11 of this guide for detailed discussions on Asbestos sample collection.
Special Instructions:

1. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
2. Sample open-faced (collect samples with the open end of the sampler facing downward).
3. Use gloves when handling filters.
4. Ship samples in a rigid container with sufficient packing material to prevent jostling or damage to the cassettes.
5. Fibers are not identified in this procedure.

Passive Monitor Sampling Media: N/A

ASBESTOS – AIR SAMPLE - BY TRANSMISSION ELECTRON MICROSCOPY [CAS # - Various]

Reference Method: NIOSH 7402, 4th Edition
LOQ: 2.4 fibers/mm2
Collection Media: Filter Cassette [25MCE 0.8 or 0.45, SKC 225-326/225-327 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.5–16
Air Collection Volume: Minimum-Maximum (L): 400
NOTE: Air volume should be adjusted to achieve 100–1,300 fibers/mm^2. See NIOSH 7400 (Page 3 and 4, Paragraphs 4, 5, and 6 under "Sampling") and Chapter 2, paragraph 2.11 of this guide for detailed discussions on Asbestos sample collection.
Special Instructions:

1. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
2. Use gloves when handling filters.
3. Ship samples in a rigid container with sufficient packing material to prevent jostling or damage to the cassettes.

NOTE: Analysis is sub-contracted, resulting in extended turn-around times; elevated priority requests may not be possible

ASBESTOS BULK SAMPLE IDENTIFICATION [CAS # - VARIOUS]

Reference Method: EPA 600.0/R93/116
Collection Media: Bulk Material
Sample Flow Rate (LPM): N/A
Air Collection Volume (L): N/A
Special Instructions:

1. Samples should be shipped in double plastic bags or containers.
2. Enough samples should be collected to represent the tested matrices and to cover all the matrices present in the environment to be tested. Contact the IH Technical Consultant for information or guidance.

NOTE: Depending on the type of bulk material, samples may be subcontracted out at the discretion of the contract lab for analysis by NY ELAP 198.6/198.4.

ASPHALT FUMES, TOTAL PARTICUALTE AND BENZENE-SOLUBLE FRACTION [CAS # 8052-42-4]

Reference Method: Mod. NIOSH 5042, 4th Edition
LOQ: 0.2 mg/sample (total particulate); 0.1 mg/sample (benzene-soluble)
Collection Media: Pre-weighed Filter Cassette [Pre-weighted 37PTFE 1.0]
Sample Flow Rate: Minimum-Maximum (LPM): 1–4

ASPHALT FUMES (CONT.)
Air Collection Volume: Minimum-Maximum (L): 28–400
Special Instructions:

1. Blanks: five field blanks per day.
2. Samples can be analyzed for total particulates, benzene-soluble fraction, or both.

Passive Monitor Sampling Media: N/A

BACTERIA, VIABLE - AIR
Reference Method: In-house method (sub-contracted)
LOQ: Please call the APHC-LS IH consultant to inquire
Collection Media: TSA Agar Plate
Sample Flow Rate (LPM): 28 (No range given in reference method)
Air Collection Volume: Minimum-Maximum (L): 28–280
Special Instructions:

1. Standard gram stain identification. Additional bacterial identification may be requested.
2. Analysis is sub-contracted, resulting in extended turn-around times; elevated priority requests may not be accommodated.

BACTERIA, VIABLE - SWAB/CONDENSATE/BULK
Reference Method: In-house method (sub-contracted)
LOQ: Please call the APHC-LS IH consultant to inquire
Collection Media: Swab (1–100 sq. cm), Condensate (1–10 mL), or Bulk material (0.5–100 g)
Special Instructions:

1. Standard gram stain identification. Additional bacterial identification may be requested.
2. Analysis is sub-contracted, resulting in extended turn-around times; elevated priority requests may not be accommodated.

BARIUM

See “METALS”

BENZENE

See “AROMATIC HYDROCARBONS”

1,4-BENZENEDIOL

See “HYDROQUINONE”

BENZYL ALCOHOL [CAS # 100-51-6]
Reference Method: NIOSH 1401, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum -Maximum (L): 2–10
Special Instructions:

1. Sample stability: unknown; store in freezer.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 20 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

BENZYL CHLORIDE [CAS # 100-44-7]
Reference Method: Mod. NIOSH 1003, 3rd Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 6–50
Special Instructions:

1. Sample stability: at least 30 days.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

BERYLLIUM AND COMPOUNDS

See “METALS”

1-BROMOPROPANE

See “HALOGENATED HYDROCARBONS”

BROMOMETHANE

See “METHYL BROMIDE”

BULK AND SPECIAL ANALYSES

Contact the APHC-LS IH consultant for information.

1,3-BUTADIENE [CAS # 106-99-0]
Reference Method: mod. OSHA 56
LOQ: 2 µg/sample
Collection Media: Solid Sorbent Tube [Treated Charcoal, SKC 226-73 or equivalent]
Sample Flow Rate (LPM): 0.05 (No range given in reference method)
Air Collection Volume (L): 3 (No range given in reference method)
Special Instructions: N/A

Passive Monitor Sampling Media: N566AT
Reference Method: mod. NIOSH 1024
LOQ: 2.5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

1-BUTANOL

See “n-BUTYL ALCOHOL”

t-BUTANOL (tert-BUTYL ALCOHOL, 2-METHYL-2-PROPANOL) [CAS # 75-65-0]
Reference Method: NIOSH 1400, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:
1. Protect samples from light.
2. Interferences: high humidity.
3. Sample stability: unknown, store in freezer.
4. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

2-BUTANONE

See “METHYL ETHYL KETONE”

2-BUTOXYETHANOL (BUTYL CELLOSOLVE, ETHYLENE GLYCOL MONOBUTYLETHER, EGBE) [CAS # 111-76-2]
Reference Method: NIOSH 1403, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.05
Air Collection Volume: Minimum-Maximum (L): 2–10
Special Instructions:

1. Sample stability: at least 30 days at 5 ºC.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 10 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

n-BUTYL ACETATE [CAS # 123-86-4]
Reference Method: NIOSH 1450, 4th Edition
LOQ: 50 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1-10
Special Instructions:

1. Store and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

n-BUTYL ALCOHOL (1-BUTANOL) [CAS # 71-36-3]
Reference Method: NIOSH 1401
LOQ: 30 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:

1. Store in a freezer and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
3. Can be sampled along with other alcohols, but must be sampled separately from all other analytes
4. The analytical protocol for this contaminant requires the use of a modifier to the desorption solvent. Because of this requirement, sample separately from other analytes (unless other analytes are also alcohols).

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

BUTYL CELLOSOLVE

See “2-BUTOXY ETHANOL”

CADMIUM

See “METALS”

CARBINOL

See “METHANOL”

CARBON, BLACK [CAS # 1333-86-4]
Reference Method: Mod. OSHA ID-196
LOQ: 0.7 mg/sample
Collection Media: Filter Cassette [pre-weighed 37PVC 5.0]
Sample Flow Rate: Minimum-Maximum (LPM): 2
Air Collection Volume: Minimum-Maximum (L): 480–960
Special Instructions: Can also be analyzed as “Particulates Not Otherwise Regulated (PNOR)”

Passive Monitor Sampling Media: N/A

CARBON, ELEMENTAL [CAS 7440-44-0] (DIESEL PARTICULATE MATTER)
Reference Method: NIOSH 5040, 4th Edition
LOQ: 4 µg/sample
Collection Media: Filter Cassette [25- or 37-mm quartz fiber, SKC 225-40125 or equivalent)
Sample Flow Rate: Minimum-Maximum (LPM): 2–4
Air Collection Volume: Minimum-Maximum (L): 142–19,000
Special Instructions: Sample open-faced.

Passive Monitor Sampling Media: N/A

CARBON TETRACHLORIDE

See “HALOGENATED HYDROCARBONS”

CELLOSOLVE

See “2-ETHOXYETHANOL”

CELLOSOLVE ACETATE, 2EEA

See “2-ETHOXYETHYL ACETATE”

CHLORDANE [CAS # 57-74-9]
Reference Method: OSHA 67
LOQ: not listed (please call the APHC-LS IH consultant to inquire)
Collection Media: Solid Sorbent Tube [GFF/XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1 (No range given in reference method)
Air Collection Volume (L): 480 (No range given in reference method)
Special Instructions: none

Passive Monitor Sampling Media: N/A

CHLOROBENZENE

See “HALOGENATED HYDROCARBONS”

CHLOROFORM

See “HALOGENATED HYDROCARBONS”

CHLORPYRIFOS (DURSBAN)

See “ORGANOPHOSPHORUS PESTICIDES”

CHROMIUM, HEXAVALENT (Cr+6) [CAS #18540-29-9]
Reference Method: OSHA ID-215 (Version 2)
LOQ: 0.03 µg/sample
Collection Media: Filter Cassette (Total) or IOM (Inhalable) [PVC, 37 mm, 5 micron]
Sample Flow Rate (LPM): 1–4 for Cassettes, 2.0 for IOM (No range given in reference method)
Air Collection Volume (L): 960 (No range given in reference method)

Special Instructions:

1. Samples must be shipped overnight to the laboratory within 24 hours of sampling to ensure the samples arrive at the laboratory with adequate time to meet the stated holding times for the following operations.
2. Samples collected from welding operations must be analyzed within 8 days of sampling.
3. Samples collected from plating operations must be analyzed within 6 days of sampling or be stabilized at the laboratory upon receipt.
4. Samples collected from painting operations must be analyzed within 15 days of sampling.
5. All IOMs (used or unused) must be returned to the lab within 2 weeks of the scheduled sampling date.
6. This analysis can also be performed as a wipe method. Sample using a 5-micron, 37-mm PVC filter as the wipe media. Reference method, LOQ, and special instructions remain the same.

Passive Monitor Sampling Media: N/A

CHROMIUM, METAL (Cr 0) - ANALYZED AS “CHROMIUM, TOTAL”

PLEASE CALL THE APHC-LS IH CONSULTANT FOR INFORMATION, IF NECESSARY

CHROMIUM, TOTAL

See “METALS”

CHROMIUM, TRIVALENT (Cr+3) – ANALYZED AS “CHROMIUM, TOTAL”

PLEASE CALL THE APHC-LS IH CONSULTANT FOR INFORMATION, IF NECESSARY

COAL TAR PITCH VOLATILES (BENZENE SOLUBLES)

Analyte	CAS Number	LOQ (µg /sample)	Collection Volume (L)
Anthracene	120-12-7	60	960
Benzo (a) pyrene	50-32-8	60	960
Chrysene	218-01-9	60	960
Phenanthrene	85-01-8	60	960
Pyrene	129-00-0	60	960

Reference Method: OSHA 58, Gravimetric
LOQ: 0.060 mg/sample
Collection Media: Filter Cassette [GFF, GLC 225-709 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 2 (Recommended)
Air Collection Volume: Minimum-Maximum (L): 960 (Recommended)
Special Instructions:

1. Immediately after sampling remove from cassette and place in glass vial.
2. Ship overnight refrigerated and protect from light.

Passive Monitor Sampling Media: N/A

COBALT

See “METALS”

COPPER

See “METALS”

CRESOL, SUM OF ALL ISOMERS [CAS # 1319-77-3 (MIXTURE)]
Reference Method: OSHA 32
LOQ: 12 µg/sample
Collection Media: Solid Sorbent Tube [XAD-7, SKC 226-95 or equivalent]
Sample Flow Rate (LPM): 0.1 (No range given in reference method)

CRESOL, SUM OF ALL ISOMERS [CAS # 1319-77-3 (MIXTURE)] (CONT.)
Air Collection Volume (L): 24 (No range given in reference method)
Special Instructions: If submitting bulk samples, ship separately to avoid contamination.

Passive Monitor Sampling Media: N/A

CUMENE (ISOPROPYLBENZENE)

See “AROMATIC HYDROCARBONS”

CYANIDE [CAS # 74-90-8]
Reference Method: NIOSH 6010, 4th Edition
LOQ: 2.6 µg/sample
Collection Media: Solid Sorbent Tube [Soda Lime, 600 mg/200 mg]
Sample Flow Rate: Minimum-Maximum (LPM): 0.025–0.05
Air Collection Volume: Minimum-Maximum (L): 2–90
Special Instructions:

1. Interferences: H_2S.
2. Discard pre-filter after sampling.
3. Sample stability: at least 2 weeks at 25 ºC.
4. Blanks: at least three field blanks minimum per set.

Passive Monitor Sampling Media: N/A

CYANIDES (AEROSOL AND GAS) [CAS # 74-90-8]
Reference Method: NIOSH 7904, 4th Edition
LOQ: 2.6 µg/sample
Collection Media: Impinger 15 mL 0.1 N KOH, SE
Sample Flow Rate - Minimum-Maximum (LPM): 0.5–1.0
Air Collection Volume - Minimum-Maximum (L): 10–180
Special Instructions:

1. Transfer the impinger solution to a vial for shipping.
2. Interferences: sulfide, chloride, iodide, bromide, cadmium, zinc, silver, nickel, cuprous iron, mercury, and high humidity.
3. Sample stability: analyze within 5 days; particulate on filter may liberate HCN gas.
4. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

CYCLOHEXANE [CAS # 110-82-7]
Reference Method: Mod. NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 2.5–5
Special Instructions: None

Passive Monitor Sampling Media: N525AT/N566
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

CYCLONITE

See “RDX”

CYCLOPHOSPHAMIDE

See “HAZARDOUS DRUGS”

DESFLURANE

See “ANESTHETIC GASES”

DIACETONE ALCOHOL [CAS #123-42-2]
Reference Method: NIOSH 1402, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:
1. Interferences: high humidity.
2. Sample stability: unknown; store in freezer.
3. Blanks: 2 to 10 field blanks per set.

DIACETONE ALCOHOL [CAS #123-42-2] (CONT.)
Passive Monitor Sampling Media: N525AT/N566
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

DIAZINON

See “ORGANOPHOSPHORUS PESTICIDES”

1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE) [CAS # 106-93-4]
Reference Method: NIOSH 1003, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 0.1–25
Special Instructions:
1. Sample stability: 30 days for all analytes.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

o-DICHLOROBENZENE (1,2-DICHLOROBENZENE)

See “HALOGENATED HYDROCARBONS”

p-DICHLOROBENZENE (1,4-DICHLOROBENZENE)

See “HALOGENATED HYDROCARBONS”

1,3-DICHLOROBENZENE

See “HALOGENATED HYDROCARBONS”

1,1-DICHLOROETHANE

See “HALOGENATED HYDROCARBONS”

1,2-DICHLOROETHANE (ETHYLENE DICHLORIDE)

See “HALOGENATED HYDROCARBONS”

1,1-DICHLOROETHYLENE

See “HALOGENATED HYDROCARBONS”

DICHLOROMETHANE (METHYLENE CHLORIDE, METHYLENE DICHLORIDE)
[CAS # 75-09-2]
Reference Method: Mod. NIOSH 1005, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 0.5–2.5
Special Instructions:

1. Collect using two tubes in a series; separate tubes as soon as possible after sample collection.
2. Interferences: high humidity.
3. Sample stability: at least 30 days at 5 ºC.
4. Blanks: 2 to 10 field blanks per set.

Reference Method: Mod. OSHA 59
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-09-02 or equivalent]
Sample Flow Rate (LPM): 0.05 (No range given in reference method)
Air Collection Volume (L): 10 (No range given in reference method)
Special Instructions: N/A

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

DICHLORVOS (DDVP)

See “ORGANOPHOSPHORUS PESTICIDES”

DIESEL EXHAUST

CALL THE APHC-LS IH CONSULTANT FOR INFORMATION

DIESEL PARTICULATES

See “CARBON, ELEMENTAL”

DIISOCYANATES

Diisocyanate	CAS Number	LOQ (µg /sample)	Collection Volume (L)
1,6-HDI	822-06-0	0.1	15 -240
HMDI *	5124-30-1	0.1	15 -240
IPDI *	4098-71-9	0.1	15 -240
MDI **	101-68-8	0.1	15 -240
2,4-TDI	584-84-9	0.1	15 -240
2,6-TDI	91-08-7	0.1	15 -240

Reference Method: OSHA 42/47
Collection Media: Filter Cassette [Treated GFF, SKC 225-9002 or equivalent]
Sample Flow Rate (LPM): 1.0 (No range given in reference method)
Air Collection Volume (L): 15-240
Special Instructions:

1. Media requires freezer storage.
2. Sample open-faced.
3. *Interferences: acid chlorides, anhydrides, and other isocyanates.
4. **Interferences: anhydrides, amines, alcohols, and carboxylic acids.

Passive Monitor Sampling Media: N/A

DIISOCYANATES – HDI MONOMER (CAS# 822-06-0) & HDI OLIGOMER (CAS# VARIOUS, INCLUDING 28182-81-2)
Reference Methods: mod. IRSST Isochek Method
LOQ: 0.03 µg/sample
Collection Media: IsoChek, SKC 225-9022A
Sample Flow Rate (LPM): 1
Air Collection Volume (L): 15

DIISOCYANATES – HDI MONOMER (CAS# 822-06-0) & HDI OLIGOMER (CAS# VARIOUS, INCLUDING 28182-81-2) (CONT.)

Special Instructions:

1. The MOPIP solution should be refrigerated before and after sampling.
2. Samples should be shipped to the laboratory as soon as possible after collection and should be analyzed within 15 days of collection.
3. Isochek samples must be shipped separately from all other organic samples.

Passive Monitor Sampling Media: N/A

DIMETHYLDINITROBUTANE (DMDNB) [CAS # 3964-18-9]

Reference Method: DLS-141; WI-101 (in-house method)
LOQ: 0.06 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-35-03 or equivalent]
Sample Flow Rate (LPM): None listed
Air Collection Volume (L): None listed
Special Instructions: None

Passive Monitor Sampling Media: N/A

DURSBAN

See “ORGANOPHOSPHORUS PESTICIDES”

2,4-DINITROANISOLE (DNAN) [CAS # 119-27-7]

Reference Method: DLS-141; WI-100 (in-house method)
LOQ: 0.08 µg/sample
Collection Media: Solid Sorbent Tube [XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1.0
Air Collection Volume (L): 40–60
Special Instructions: None

Passive Monitor Sampling Media: N/A

2,4-DINITROTOLUENE (2,4-DNT) [CAS # 121-14-2]

Reference Method: OSHA 44
LOQ: 40 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1.0 (No range given in reference method)
Air Collection Volume (L): 60 (No range given in reference method)

2,4-DINITROTOLUENE (2,4-DNT) [CAS # 121-14-2](CONT.)
Special Instructions: The air sampling pump must be certified by NIOSH or Mine Safety and Health Administration (MSHA) as intrinsically safe for use in coal mines.

Passive Monitor Sampling Media: N/A

2,6-DINITROTOLUENE (2,6-DNT) [CAS # 606-20-2]
Reference Method: Modified OSHA 44
LOQ: 40 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1.0 (No range given in reference method)
Air Collection Volume (L): 60 (No range given in reference method)
Special Instructions: The air sampling pump must be certified by NIOSH or MSHA as intrinsically safe for use in coal mines.

Passive Monitor Sampling Media: N/A

1,4-DIOXANE [CAS # 123-91-1]
Reference Method: mod. NIOSH 1602
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate (LPM): 0.01–0.2
Air Collection Volume (L): 0.5–15
Special Instructions: 2–10 field blanks per sample set.

Passive Monitor Sampling Media: AT N525/N566
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

DOXORUBICIN

See “HAZARDOUS DRUGS”

DUST, INHALABLE (INCLUDING WOOD DUST)

See “PARTICULATES NOT OTHERWISE REGULATED (PNOR), INHALABLE” (INCLUDES WOOD DUST)

DUST, RESPIRABLE (INCLUDING WOOD DUST)

See “PARTICULATES NOT OTHERWISE REGULATED (PNOR), RESPIRABLE”

DUST, TOTAL (INCLUDING WOOD DUST)

See “PARTICULATES NOT OTHERWISE REGULATED (PNOR), TOTAL”

EGBE

See “2-BUTOXYETHANOL”

2EE

See “2-ETHOXYETHANOL”

EPICHLOROHYDRIN [CAS # 106-89-8]
Reference Method: NIOSH 1010, 4th Edition
LOQ: 1.5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 2–30
Special Instructions: Sample stable at least 2 weeks at 25 ºC.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 1 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ETHANOL (ETHYL ALCOHOL) [CAS # 64-17-5]
Reference Method: NIOSH 1400, 4th Edition
LOQ: 30 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.05
Air Collection Volume: Minimum-Maximum (L): 0.1–1.0

ETHANOL (ETHYL ALCOHOL) [CAS # 64-17-5] (CONT.)

Special Instructions:

1. Store in freezer and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
3. The analytical protocol for this contaminant requires the use of a modifier to the desorption solvent. Because of this requirement, sample separately from other analytes (unless other analytes are also alcohols).

Passive Monitor Sampling Media: N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-ETHOXYETHANOL (CELLOSOLVE, 2EE) [CAS # 110-80-5]

Reference Method: OSHA 53
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate (LPM): 0.1 (No range given in reference method)
Air Collection Volume (L): l0 (No range given in reference method)
Special Instructions: None

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5.0 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-ETHOXYETHYL ACETATE (CELLOSOLVE ACETATE, 2EEA) [CAS # 111-15-9]

Reference Method: OSHA 53,
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate (LPM): 0.1 (No range given in reference method)
Air Collection Volume (L): 10 (No range given in reference method)
Special Instructions: None

2-ETHOXYETHYL ACETATE (CELLOSOLVE ACETATE, 2EEA) [CAS # 111-15-9] (CONT.)

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5.0 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ETHYL ALCOHOL

See “ETHANOL”

ETHYL ACETATE [CAS # 141-78-6]

Reference Method: NIOSH 1457, 4th Edition

LOQ: 50 µg/sample

Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

Air Collection Volume: Minimum-Maximum (L): 0.1–10

Special Instructions:

1. Store and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5.0 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ETHYL ACRYLATE [CAS # 140-88-5]

Reference Method: Mod. NIOSH 2537, 4th Edition

LOQ: 3 µg/sample

Collection Media: Solid Sorbent Tube [XAD-2, SKC 226-30-04 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.05

Air Collection Volume: Minimum-Maximum (L): 1-8

Special Instructions:

1. Sample stability: 7 days at 25 ºC; 31 days at 5 ºC.
2. Ship using dry ice.
3. Blanks: 2 to 10 field blanks per set.

ETHYL ACRYLATE [CAS # 140-88-5] (CONT.)

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 3 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ETHYL BENZENE

See “AROMATIC HYDROCARBONS”

ETHYL 2-CYANOACRYLATE (ECA) [CAS # 7085-85-0]

Reference Method: OSHA 55

LOQ: 5 µg/sample

Collection Media: Solid Sorbent Tube [Treated XAD-7, SKC 226-98 or equivalent]

Sample Flow Rate (LPM): 0.1 (No range given in reference method)

Air Collection Volume (L): 12 (No range given in reference method)

Special Instructions:

1. Refrigerator samples immediately after collection.
2. Ship overnight refrigerated.

Passive Monitor Sampling Media: N/A

ETHYL ETHER [CAS # 60-29-7]

Reference Method: NIOSH 1610, 4th Edition

LOQ: 5 µg/sample

Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

Air Collection Volume: Minimum-Maximum (L): 0.25–3

Special Instructions:

1. Sample stability: at least 15 days at 5 ºC.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ETHYL METHACRYLATE [CAS # 97-63-2]
Reference Method: Mod. NIOSH 2537, 4th Edition
LOQ: 3 µg/sample
Collection Media: Solid Sorbent Tube [XAD-2, SKC 226-30-04 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.05
Air Collection Volume: Minimum-Maximum (L): 1–8
Special Instructions:

1. Ship using dry ice.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 3 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
1. Return samples to the laboratory within 14 days of the sampling event.

ETHYLENE DICHLORIDE

See “HALOGENATED HYDROCARBONS” (1,2-DICHLOROETHANE)

ETHYLENE GLYCOL [CAS # 107-21-1]
Reference Method: NIOSH 5523, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [XAD-7, SKC 226-57 or equivalent]
Sample Flow Rate (LPM): 0.5–2
Air Collection Volume: Minimum-Maximum (L): 5–60
Special Instructions:

1. Blanks: 2 to 10 field blanks per set.
2. Sample stability: 14 days 5 ºC.
3. Ship overnight refrigerated.

Passive Monitor Sampling Media: N/A

ETHYLENE GLYCOL MONOBUTYLETHER

See “2-BUTOXYETHANOL”

ETHYLENE GLYCOL MONOETHYLETHER

See “2-ETHOXYETHANOL”

ETHYLENE OXIDE (ETO) [CAS # 75-21-8]
Reference Method: OSHA 1010
LOQ: 0.6 µg/sample
Collection Media: Solid Sorbent Tube [Treated Anasorb 747, SKC 226-128 or equivalent]
Sample Flow Rate (LPM): 0.05 (No range given in reference method)
Air Collection Volume (L): 24 (No range given in reference method)
Special Instructions: Ship overnight refrigerated.

ETHYLENE TRICHLORIDE

See “HALOGENATED HYDROCARBONS” (TRICHLOROETHYLENE)

ETO

See “ETHYLENE OXIDE”

FIBERGLASS BY PHASE CONTRAST MICROSCOPY [CAS # - VARIOUS]
Reference Method: NIOSH 7400, Issue 3
LOQ: 5.5 Fibers/100 Fields
Collection Media: Filter Cassette [25MCE 0.8, SKC 225-326 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1–16
Air Collection Volume: Minimum-Maximum (L): 400–3,000
Special Instructions:

1. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
2. Open-faced sampling (collect samples with the open end of the sampler facing downward).
3. Ship samples in a rigid container with sufficient packing material to prevent jostling or damage to the cassettes.
4. Fibers are not identified in this procedure.

Passive Monitor Sampling Media: N/A

FLUORIDE, VAPOR (AEROSOL AND GAS) [CAS # (HF) 7664-39-3]
Reference Method: NIOSH 7902, 4th Edition
LOQ: 2.1 µg/sample
Collection Media: Filter Cassette [37MCE 0.8/Treated Cellulose Pad]
Sample Flow Rate: Minimum-Maximum (LPM): 1–2
Air Collection Volume: Minimum-Maximum (L): 12–800

FLUORIDE, VAPOR (AEROSOL AND GAS) (CONT.)
Special Instructions:

1. Interferences: hydroxide ion, cryolite, and other aerosols.
2. Blanks: 2 to 10 field blanks per set

Passive Monitor Sampling Media: N/A

FLUORIDE (Soluble and total PARTICULATE) [CAS # 16984-48-8]
Reference Method: NIOSH 7902, 4th Edition
LOQ: 2 µg/sample
Collection Media: Filter Cassette [37MCE 0.8/Treated Cellulose Pad]
Sample Flow Rate: Minimum-Maximum (LPM): 1–2
Air Collection Volume: Minimum-Maximum (L): 12–800
Special Instructions: Blanks: 2 to 10 field blanks per set

Passive Monitor Sampling Media: N/A

5-FLUOROURACIL

See “HAZARDOUS DRUGS”

FORMALDEHYDE [CAS # 50-00-0]
Reference Method: NIOSH 2016, 4th Edition
LOQ: 0.1 µg/sample
Collection Media: Solid Sorbent Tube [Treated Silica Gel, ORBO 555/558 or equivalent]
Sample Flow Rate (LPM): 0.4–1.5
Air Collection Volume (L): 1–15
Special Instructions:

1. Media requires freezer storage.
2. Interferences: ozone.
3. Ship overnight refrigerated.
4. Sample stability: at least 34 days at 5 ºC

Passive Monitor Sampling Media: N571AT
Reference Method: OSHA 1007
LOQ: 0.1 µg/sample
Special Instructions: None

GASOLINE

See “NAPHTHAS”

GLUTARALDEHYDE (GLUTARIC DIALDEHYDE, l,5-PENTANEDIAL)
[CAS # 111-30-8]
Reference Method: NIOSH 2532, 4th Edition
LOQ: 0.3 µg/sample
Collection Media: Solid Sorbent Tube [Treated Silica Gel, ORBO 555 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.05–0.5
Air Collection Volume: Minimum-Maximum (L): 1–30
Special Instructions:

1. Stable at least 30 days at 25 ºC.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N581AT
Reference Method: OSHA 64
LOQ: 0.07 µg/sample
Special Instructions: Samples must be received by the laboratory within 4 weeks of sample collection.

HALOGENATED HYDROCARBONS

Halogenated Hydrocarbon	CAS Number	LOQ: Tube; PM (µg/sample)	Volume: Tube (L)
1-Bromopropane	106-94-5	5; 5	0.1–12
Carbon Tetrachloride	56-23-5	50; 5	3–150
Chlorobenzene	108-90-7	50; 5	1.5–40
Chloroform	67-66-3	40; 5	1–50
1,2-Dichlorobenzene (o-)	95-50-1	60; 5	1–10
1,4-Dichlorobenzene (p-)	106-46-7	60; 5	1–8
1,1-Dichloroethane	75-34-3	10; 5	0.5-15
1,2-Dichloroethane	107-06-2	20; 5	1–50
Hexachloroethane	67-72-1	50; 5	3–70
Tetrachloroethylene	127-18-4	20; 5	1–40
Trichloroethylene	79-01-6	20; 5	0.2–30
1,1,2-Trichloroethane	79-00-5	10; 5	2–60
1,1,1-Trichloroethane	71-55-6	5; 5	0.1–8
1,1-Dichloroethylene	75-35-4	5; 5	2.5–7
1,2-Dichloroethylene	540-59-0	10; 10	0.2–5
1,3-Dichlorobenzene	541-73-1	5; 5	1–60

Reference Method: Modified NIOSH 1003, 4th Edition
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

HALOGENATED HYDROCARBONS (CONT.)
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT

Special Instructions:

1. 1-Bromopropane should only be sampled on the N525 AT; analyzed using a modified OSHA PV2061.
2. Trichloroethylene is analyzed using a modified NIOSH 1022.
3. 1,1-Dichloroethylene is analyzed using a modified NIOSH 1015.
4. Include the charcoal scavenger packet with your returned sampling media.
5. Return samples to the laboratory within 14 days of the sampling event.

HAZARDOUS DRUGS

Hazardous Drug	CAS Number	LOQ (ng/sample)
5-Fluorouracil	51-21-8	30
Methotrexate	133073-73-1	30
Ifosfamide	3778-73-2	30
Cyclophosphamide	6055-19-2	30
Doxorubicin	25316-40-9	30
Paclitaxel	33069-62-4	30

Reference Method: DLS-557 (in-house method)
Collection Media: Wipe [ITW Texwipe]
Special Instructions:

1. Prepare 1 field blank for every 20 samples by dipping a swab in wetting solution and placing into a pre-labeled collection vial.
2. Media blanks are not required and will not be analyzed if submitted to the lab.
3. Do no sample immediately after cleaning or decontamination, as this can lead to instrumental interference and inaccurate results. If sampling to ensure efficiency of decontamination, wait time recommended by solution manufacturer prior to sampling.

HDI

See “DIISOCYANATES”

n-HEPTANE [CAS # 142-82-5]
Reference Method: NIOSH 1550, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

n-HEPTANE [CAS # 142-82-5] (CONT.)
Air Collection Volume: Minimum-Maximum (L): 4
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT
Reference Method: NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-HEPTANONE

See “METHYL n-AMYL KETONE”

HEXACHLOROETHANE

See “HALOGENATED HYDROCARBONS”

1,6-HEXAMETHYLENE DIISOCYANATE (HDI)

See “DIISOCYANATES”

HEXAGEN

See “RDX”

n-HEXANE [CAS # 110-54-3]
Reference Method: NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 4
Special Instructions: None.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-HEXANONE

See “METHYL n-BUTYL KETONE”

HEXAVALENT CHROMIUM, (Cr+6)

See “CHROMIUM, HEXAVALENT”

HMX (OCTOGEN) [CAS # 2691-41-0]
Reference Method: Modified OSHA 44
LOQ: 0.5 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1.0
Air Collection Volume: Minimum-Maximum (L): 60
Special Instructions: The air sampling pump must be certified by NIOSH or MSHA as intrinsically safe for use in coal mines.

Passive Monitor Sampling Media: N/A

HYDROCARBONS AS HEXANE, TOTAL [CAS# VARIOUS]
Reference Method: Modified NIOSH 1500
LOQ: 5.0 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate - Minimum-Maximum (LPM): 0.01 – 0.2
Air Collection Volume - Minimum-Maximum (L): 1.3 – 20
Special Instructions: The analytical result for this method will be the sum of all instrument responses present in the sample and quantitated using a n-hexane calibration curve; individual hydrocarbons are not identified.

Passive Monitor Sampling Media: N/A

HYDROCHLORIC ACID (HYDROGEN CHLORIDE)

See “ACID GASES”

HYDROFLUORIC ACID (HYDROGEN FLUORIDE)

See “ACID GASES”

HYDROGEN CYANIDE [CAS # 74-90-8]
Reference Method: NIOSH 7904, 4th Edition
LOQ: 2.6 µg/sample
Collection Media: Filter and Bubbler [0.8 Micron PVC Membrane + 15 ml 0.1N KOH]
Sample Flow Rate (LPM): 0.5–1.0
Air Collection Volume (L): 10–180
Special Instructions:

1. Transfer the impinger solution to a vial for shipping.
2. Interferences: sulfide, chloride, iodide, bromide, cadmium, zinc, silver, nickel, cuprous iron, mercury, and high humidity.
3. Must be analyzed within 5 days; particulate on filter may liberate HCN gas.

Passive Monitor Sampling Media: N/A

HYDROGEN PEROXIDE [CAS # 7722-84-1]
Reference Method: Mod. OSHA 1019
LOQ: 2 µg/sample
Collection Media: Filter Cassette [25mm Quartz Fiber, SKC 225-9030 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1 (2 LPM for Vapor or Mist)
Air Collection Volume: Minimum-Maximum (L): 14–240

Special Instructions:

1. Hydrogen Peroxide on filter can be sampled alone or in front of a tube sampling for peracetic acid (PAA)
2. Protect samples from light
3. Ship overnight refrigerated

Passive Monitor Sampling Media: N587AT
Reference Method: Mod. OSHA VI-6
LOQ: Please call the APHC-LS IH consultant
Special Instructions: Analysis is sub-contracted, resulting in extended turn-around times; elevated priority requests may not be accommodated.

HYDROGEN SULFIDE [CAS # 7783-06-4]
Reference Method: NIOSH 6013, 4th Edition
LOQ: 11 µg/sample
Collection Media: Solid Sorbent Tube [Treated Charcoal, ORBO 34 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.1–1.5 (0.2 Recommended)
Air Collection Volume: Minimum-Maximum (L): 1.2–40

HYDROGEN SULFIDE (CONT.)
Special Instructions:

1. Sample stability: at least 30 days at 25 ºC.
2. Blanks: 2 to 10 field blanks per set.
3. Interferences: SO2.

Passive Monitor Sampling Media: N/A

HYDROQUINONE (HYDROQUINOL, 1,4-BENZENEDIOL) [CAS # 123-31-9]
Reference Method: OSHA PV2094
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Treated XAD-7, SKC 226-98 or equivalent]
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 20 (No range given in reference method)
Special Instructions: Seal the coated XAD-7 tubes with plastic caps immediately after sampling.

Passive Monitor Sampling Media: N/A

IFOSFAMIDE

See “HAZARDOUS DRUGS”

IRON

See “METALS”

ISOAMYL ACETATE (PENTYL ACETATE ISOMER) [CAS # 123-92-2]
Reference Method: NIOSH 1450, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1-10
Special Instructions:

1. Ship overnight refrigerated.
2. Interferences: High humidity.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: SKC 10-030-80
LOQ: 5.0 µg/sample
Special Instructions: None

ISOBUTYL ACETATE [CAS # 110-19-0]
Reference Method: NIOSH 1450, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:

1. Ship overnight refrigerated.
2. Interferences: High humidity.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5.0 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ISOFLURANE

See “ANESTHETIC GASES”

ISOPHORONE [CAS # 78-59-1]
Reference Method: NIOSH 2508, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Petroleum-based Charcoal, 100 mg/50 mg]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–1
Air Collection Volume: Minimum-Maximum (L): 2–25
Special Instructions:

1. Stable at least 7 days at 25 ºC.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 4 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

ISOPROPYLBENZENE (CUMENE)

See “AROMATIC HYDROCARBONS”

JP4

See “NAPHTHAS”

JP8

See “NAPHTHAS”

KEROSENE

See “NAPHTHAS”

LEAD – AIR & WIPE SAMPLES

See “METALS”

LEAD – BULK SAMPLE [CAS # 7439-92-l]
Reference Method: ASTM 1645/1613
LOQ: 40 ppm
Collection Media: Paint Chips
Sample Flow Rate: Minimum-Maximum (LPM): N/A
Air Collection Volume: Minimum-Maximum (L): N/A
Special Instructions: Place 500-mg sample in plastic bag or glass vial. The minimum amount we can analyze is 250 mg.

MAGNESIUM

See “METALS”

MANGANESE

See “METALS”

MAK

See “METHYL n-AMYL KETONE “

MDI - METHYLENE BISPHENYL ISOCYANATE

See “DIISOCYANATES”

MEK

See “METHYL ETHYL KETONE”

MERCURY, PARTICULATES
Reference Method: Mod. NIOSH 6009, 4th edition
LOQ: 0.04 µg/sample
Collection Media: Filter Cassette [37MCE 0.8, SKC 225-3-01A or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.15–0.25
Air Collection Volume: Minimum-Maximum (L): 2–100
Special Instructions:

1. Mercury cannot be analyzed if Gold is present in the sample.
2. Interferences: inorganic and organic mercury compounds.
3. Can be sampled in conjunction with an Anasorb C300, SKC 226-17-1A or equivalent charcoal tube if analysis of the vapor fraction is also required.

Passive Monitor Sampling Media: N/A

MERCURY, VAPOR
Reference Method: Mod. NIOSH 6009, 4th edition
LOQ: 0.06 µg/sample
Collection Media: Charcoal Tube [Anasorb C300, SKC 226-17-1A or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.15–0.25
Air Collection Volume: Minimum-Maximum (L): 2–100
Special Instructions:

1. Mercury cannot be analyzed if Gold is present in the sample.
2. Interferences: inorganic and organic mercury compounds.
3. Can be sampled in conjunction with a 37MCE 0.8, SKC 225-3-01A or equivalent filter cassette if analysis of the particulate fraction is also required.

Passive Monitor Sampling Media: SKC 520-02A
Reference Method: Mod. OSHA ID-140
LOQ: 0.1 µg/sample
Special Instructions:

1. Mercury cannot be analyzed if gold is present in the sample.
2. Interferences: chlorine.

MERCURY, WIPE

Reference Method: Mod. NIOSH 6009, 4th edition
LOQ: 0.04 µg/sample
Collection Media: Filter [37MCE 0.8, SKC 225-5 or equivalent] or Gauze Wipe
Special Instructions:

1. Moisten the filter (wipe) with de-ionized water prior to use.
2. Mercury cannot be analyzed if Gold is present in the sample
3. Interferences: inorganic and organic mercury compounds

METALS, AIR

Metal	CAS Number	LOQ (µg /sample)	Collection Volume (L)
Aluminum	7429-90-5	2.5	5-100
Antimony	7440-36-0	0.5	50-2000
Arsenic	7440-38-2	0.5	5-2000
Barium	7440-39-3	0.5	50-2000
Beryllium	7440-41-7	0.005	1250-2000
Cadmium	7440-43-9	0.25	13-2000
Chromium	7440-47-3	1	5-1000
Cobalt	7440-48-4	0.5	25-2000
Copper	7440-50-8	0.5	5-1000
Iron	7439-89-6	2.5	5-100
Lead	7439-92-1	0.5	50-2000
Magnesium	7439-95-4	2.5	5-67
Manganese	7439-96-5	0.5	5-200
Molybdenum	7439-98-7	0.5	5-67
Nickel	7440-02-0	0.5	5-1000
Selenium	7782-49-2	1	13-2000
Silver	7440-22-4	0.5	250-2000
Strontium	7440-32-6	0.5	10-1000
Thallium	7440-28-0	0.5	25-2000
Titanium	7440-32-6	2.5	5-100
Uranium	7440-61-1	0.5	Not included in reference
Vanadium	7440-62-2	0.5	5-2000
Zinc	7440-66-6	2.5	5-200

Reference Method: Modified NIOSH 7300, 4th Edition
LOQ: See Table for each metal

METALS, AIR (CONT.)

Collection Media:

- Filter Cassette [37MCE 0.8, SKC 225-3-01A or equivalent].
- Cyclone + Filter [37MCE 0.8, SKC 225-01-02 + 225-3-01A or equivalent].
- IOM Sampler [25MCE 0.8, SKC 225-70A + 225-19 or equivalent].

NOTE: Refer to the inspirability requirements for each metal.

Sample Flow Rate: Minimum-Maximum (LPM): 1–4 (cassette), 2 (IOM)

NOTE: If using a cyclone, refer to manufacturer's instructions.

Air Collection Volume: Minimum-Maximum (L): See Table for each metal.

Special Instructions:

1. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
2. Refer to the most recent ACGIH TLV book for sampling inspirability requirements.
3. For information about metals not listed in the above table, please call the APHC-LS IH consultant.

Passive Monitor Sampling Media: N/A

METALS, WIPE

Metal	CAS Number	LOQ (µg/wipe)
Aluminum	7429-90-5	100
Antimony	7440-36-0	10
Arsenic	7440-38-2	5.0
Barium	7440-39-3	4.0
Beryllium	7440-41-7	0.5
Cadmium	7440-43-9	0.5
Chromium	7440-47-3	4.0
Cobalt	7440-48-4	1.3
Copper	7440-50-8	4.0
Iron	7439-89-6	100
Potassium	7440-09-7	100
Lead	7439-92-1	1.3
Magnesium	7439-95-4	200
Manganese	7439-96-5	4.0
Molybdenum	7439-98-7	1.3
Nickel	7440-02-0	1.3
Selenium	7782-49-2	2.5
Silver	7440-22-4	4.0

METALS, WIPE (CONT.)

Metal	CAS Number	LOQ (ug/wipe)
Strontium	7440-24-6	100
Thallium	7440-28-0	5.0
Tin	7440-31-5	5.0
Titanium	7440-32-6	5.0
Vanadium	7440-62-2	1.3
Zinc	7440-66-6	100

Reference Method: EPA Mod. 3050B/EPA 6010B
LOQ: See Table for each metal
Collection Media: Wipe [Aramsco “Lead” Wipes]

NOTE: “Ghost” wipes will only be accepted for lead (Pb) analysis.

Special Instructions:

1. Wipe area is 1 sq. ft. in order to meet EPA exposure limits for Lead.
2. Specify required reporting units on the LIDS 9 submission. Default units are µg/wipe. If the wipe area is specified, mass per unit area can be reported.
3. For information about metals not listed in the above table, please call the APHC-LS IH consultant.

METHANOL (METHYL ALCOHOL, CARBINOL, WOOD ALCOHOL) [CAS # 67-56-1]

Reference Method: NIOSH 2000, 4th Edition
LOQ: 30 µg/sample
Collection Media: Solid Sorbent Tube [Silica Gel, SKC 226-51 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.02–0.2
Air Collection Volume: Minimum-Maximum (L): 1–5
Special Instructions:

1. Store and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
3. The analytical protocol for this contaminant requires the use of a modifier to the desorption solvent. Because of this requirement, sample separately from other analytes (unless other analytes are also alcohols).

Passive Monitor Sampling Media: Assay Tech N546

Reference Method: Mod. NIOSH 1400
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. The 546 badge is not used for STEL sampling.

METHOTREXATE

See “HAZARDOUS DRUGS”

METHYL ACETATE [CAS # 79-20-9]
Reference Method: NIOSH 1458, 4th Edition
LOQ: 20 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 0.2–10
Special Instructions:

1. Store and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYL ACRYLATE [CAS # 96-33-3]
Reference Method: Mod. NIOSH 2537, 4th Edition
LOQ: 3 µg/sample
Collection Media: Solid Sorbent Tube [XAD-2, SKC 226-30-04 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.05
Air Collection Volume: Minimum-Maximum (L): 1–8
Special Instructions:

1. Sample stability: 7 days at 25 ºC; 31 days at 5 ºC.
2. Ship using dry ice.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 3 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYL ALCOHOL

See “METHANOL”

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE)

See “HALOGENATED HYDROCARBONS”

METHYLENE BISPHENYL ISOCYANATE (MDI)

See “DIISOCYANATES”

METHYL BROMIDE [CAS # 74-83-9]
Reference Method: OSHA PV2040
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Anasorb 747, SKC 226-83 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.05–0.2
Air Collection Volume (L): 3 (No range given in reference method)
Special Instructions:

1. Separate tubes after sample collection.
2. Samples must be refrigerated immediately after collection and must be shipped on ice.
3. There is a 14-day hold time for this analysis; Submit samples to the laboratory immediately after collection.

Passive Monitor Sampling Media: N/A

METHYLENE CHLORIDE

See “DICHLOROMETHANE”

METHYL ETHYL KETONE (2-BUTANONE, MEK) [CAS # 78-93-3]
Reference Method: Modified NIOSH 1300, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1-10
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

METHYL ETHYL KETONE (CONT.)

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. Store and ship refrigerated

METHYL n-AMYL KETONE (2-HEPTANONE, MAK) [CAS # 110-43-0]

Reference Method: NIOSH 1301, 4th Edition

LOQ: 5 µg/sample

Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

Air Collection Volume: Minimum-Maximum (L): 1–25

Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYL n-BUTYL KETONE (2-HEXANONE, MBK) [CAS # 591-78-6]

Reference Method: NIOSH 1300, 4th Edition

LOQ: 20 µg/sample

Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]

Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2

Air Collection Volume: Minimum-Maximum (L): 1–10

Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 3 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYL CHLORIDE
Reference Method: NIOSH 1001, 4th Edition
LOQ: Please call the APHC-LS IH consultant
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.1
Air Collection Volume: Minimum-Maximum (L): 0.4–3
Special Instructions:

1. Collect using two tubes in series; separate tubes after collection.
2. Blanks: 2-10 per sample set

Passive Monitor Sampling Media: N/A

METHYL ISOAMYL KETONE (MIAK) [CAS # 110-12-3]
Reference Method: Modified NIOSH 1300, 4th Edition
LOQ: 20 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume: Minimum-Maximum (L): 1-10
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYL ISOBUTYL KETONE (MIBK) [CAS # 108-10-1]
Reference Method: NIOSH 1300, 4th Edition
LOQ: 20 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions:

1. Store and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

METHYL ISOBUTYL KETONE (CONT.)

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.
3. Store and ship refrigerated.

METHYL METHACRYLATE [CAS # 80-62-6]

Reference Method: NIOSH 2537, 4th Edition
LOQ: 4 µg/sample
Collection Media: Solid Sorbent Tube [XAD-2, SKC 226-30-06 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.05
Air Collection Volume: Minimum-Maximum (L): 1–8
Special Instructions: Store and ship refrigerated.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 3 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-METHYL-2-PROPANOL

See “TERT-BUTYL ALCOHOL”

METHYL PROPYL KETONE (MPK, 2-PENTANONE) [CAS # 107-87-9]|

Reference Method: Modified NIOSH 1300, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–10
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

METHYLSTYRENE, ALPHA- [CAS # 98-83-9]
Reference Method: Modified NIOSH 1501, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–30
Special Instructions: The desorption efficiency for this media is concentration dependent; results may be qualified as semi-quantitative.

Passive Monitor Sampling Media: AT N566
LOQ: 10 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

MIAK

See “METHYL ISOAMYL KETONE”

MIBK

See “METHYL ISOBUTYL KETONE”

MOLD, STANDARD - AIR
Reference Method: In-house method (contracted)
LOQ: 1 spore
Collection Media: Zefon 37mm Air-O-Cell
Sample Flow Rate (LPM): 15 (No range given in reference method)
Air Collection Volume: Minimum-Maximum (L): 15–150
Special Instructions: Can also be analyzed for an extended mold screen.

MOLD, STANDARD - TAPE/SWAB/CONDENSATE/BULK
Reference Method: In-house method (contracted)
LOQ: 1 spore
Collection Media: Bio Tape, Swab (1–100 sq. cm), Condensate (1–10 mL), or Bulk material (0.5–100 g)
Special Instructions: Please call the APHC-LS IH consultant for more information.

MOLD, VIABLE - AIR
Reference Method: In-house method (contracted)
LOQ: 1 CFU
Collection Media: PDA Agar Plate
Sample Flow Rate (LPM): 28 (No range given in reference method)
Air Collection Volume: Minimum-Maximum (L): 28–280
Special Instructions:

1. Can also be analyzed for viable thermophilic mold.
2. Viable culture plates must be shipped for Next Day delivery.

MOLD, VIABLE - SWAB/CONDENSATE/BULK
Reference Method: In-house method (contracted)
LOQ: 10 CFU
Collection Media: Swab (1–100 sq. cm), Condensate (1–10 mL), or Bulk material (0.5–100 g)
Special Instructions:

1. Can also be analyzed for viable thermophilic mold
2. Please call the APHC-LS IH consultant for more information

MOLYBDENUM

See “METALS”

MPK

See “METHYL PROPYL KETONE”

NAPHTHALENE [CAS # 91-20-3]
Reference Method: Modified OSHA 35
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Chromosorb, SKC 226-110 or equivalent]
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 10 (No range given in reference method)
Special Instructions: None

NAPHTHAS

Naphtha	CAS Number	Bulk Sample Required?	Passive Monitor?
Gasoline	8006-61-9	No	Yes
Kerosene	8008-20-6	No	Yes
Stoddard Solvent	8052-41-3	No	Yes
Not listed	Other	Yes	No

Reference Method: NIOSH 1550, 4th Edition
LOQ: 100 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1.3–20
Special Instructions:

1. Refer to the above table to determine if a bulk sample is required. The CAS Number must be an exact match to what is listed in the table. If a bulk sample is required, then a bulk sample of 5–10 mL must be shipped to the lab in a separate container to avoid contamination of sample tubes or monitors.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
3. If sampling for jet fuel (i.e., JP-4/JP-8), it is recommended to sample for the primary ingredient in the fuel (i.e., kerosene).

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 100 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

NICKEL

See “METALS”

NITRIC ACID (HNO3)

See “ACID GASES”

NITROGEN DIOXIDE [CAS # 10102-44]
Reference Method: Mod. OSHA ID-182
LOQ: 2 µg/sample
Collection Media: Solid Sorbent Tube [Treated Molecular Sieve, SKC 226-40-02 or 226-40A or equivalent
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 3 (No range given in reference method)
Special Instructions: If using SKC 226-40A, the oxidizer tube requires freezer storage prior to sampling; samples can be analyzed using either mod. OSHA ID-182 or mod. NIOSH 6014.

Passive Monitor Sampling Media: PM 500-200
Reference Method: In-house "IC-SOP-14" (contracted)
LOQ: 0.5 µg/sample
Special Instructions: Samples should be analyzed within 3 weeks of collection.

NITROUS OXIDE [CAS # 10024-97-2]
Active Sampling: N/A
Passive Monitor Sampling Media: Assay 575 Nitrous Oxide
LOQ: 0.4 µg/sample
Special Instructions:
1. Analysis is sub-contracted, resulting in extended turn-around times; elevated priority requests may not be accommodated.
2. Remove the badges from pouches immediately before sampling. Even though the badge is shut, it could still be collecting nitrous oxide.
3. Before and after use, store the badges in a room that has no nitrous oxide.
4. After sampling, place each badge into a return envelope provided. Do not put more than one badge into each envelope.
5. 14-day holding time; please return immediately after sampling.

NITROGLYCERIN (NG) [CAS # 55-63-0]
Reference Method: Modified NIOSH 2507, 4th Edition
LOQ: 0.1 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.2–1.0
Air Collection Volume: Minimum-Maximum (L): 3–100
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

2-NITROTOLUENE (ORTHO-NITROTOLUENE) [CAS # 88-72-2]
Reference Method: Modified NIOSH 2005, 4th Edition
LOQ: 0.5 µg/sample
Collection Media: Solid Sorbent Tube [Silica Gel, SKC 226-10 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.02
Air Collection Volume: Minimum-Maximum (L): 1–30

Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

4-NITROTOLUENE (PARA-NITROTOLUENE) [CAS # 99-99-0]
Reference Method: Modified NIOSH 2005, 4th Edition
LOQ: 0.5 µg/sample
Collection Media: Solid Sorbent Tube [Silica Gel, SKC 226-10 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.02
Air Collection Volume: Minimum-Maximum (L): 1–30
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

NONANE [CAS # 111-84-2]
Active Sampling: N/A

Passive Monitor Sampling Media: N525AT/ N566
Reference Method: Modified NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

OCTACHLOR

See “CHLORDANE”

OCTANE [CAS # 111-65-9]
Reference Method: Mod. NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume (L): 4 (No range given in reference method)
Special Instructions: None

Passive Monitor Sampling Media: N525AT/ N566
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

OCTOGEN

See “HMX”

OIL MIST

See “PARTICULATES NOT OTHERWISE REGULATED (NOR)” OR “MINERAL OIL MIST” [CAS # 8012-95-1]

ORGANOPHOSPHORUS (OP) PESTICIDES

Pesticide	CAS Number	LOQ (µg /sample)	Collection Volume (L)
Chlorpyrifos	2921-88-2	1.6	480
Diazinon	333-41-5	1.5	480
Dichlorvos	62-73-7	0.9	480

Reference Method: NIOSH 5600/OSHA 62
Collection Media: Filter/Solid Sorbent Tube [Treated GFF/XAD-2, SKC 226-30-16]
Sample Flow Rate (LPM): 1.0 (No range given in reference method)

Special Instructions:
1. Sample stability: at least 10 days at 25 °C, at least 30 days at 0 °C.
2. Blanks: 2-10 Field blanks per sample set.

Passive Monitor Sampling Media: N/A

ORTHO-NITROTOLUENE

See “2-NITROTOLUENE”

OZONE [CAS # 10028-15-6]
Reference Method: OSHA ID-214
LOQ: 4 µg/sample
Collection Media: Treated GFF
Sample Flow Rate: Minimum-Maximum (LPM): 0.25–0.5
Air Collection Volume: Minimum-Maximum (LPM): 90–120
Special Instructions:

1. Filters must be received at the laboratory by the date specified on the media.
2. Interferences: particulate nitrate compounds and SO2.

Passive Monitor Sampling Media: N586
LOQ: 0.8 µg/sample
Special Instructions: Badges sampled for less than 270 minutes will be sub-contracted, resulting in extended turn-around times; elevated priority requests may not be accommodated.

PACLITAXEL

See “HAZARDOUS DRUGS”

PAHS

See “POLYNUCLEAR AROMATIC HYDROCARBONS”

PARA-NITROTOLUENE

See “4-NITROTOLUENE”

PARTICULATES NOT OTHERWISE REGULATED (PNOR), INHALABLE
Reference Method: Modified NIOSH 0500, 4th Edition
LOQ: 0.1 mg/sample
Collection Media: IOM Filter [Pre-weighed 25mm PVC 5.0 in disposable IOM]
Sample Flow Rate: Minimum-Maximum (LPM): 2
Air Collection Volume: Minimum-Maximum (L): 30–200

PARTICULATES NOT OTHERWISE REGULATED (PNOR), INHALABLE (CONT.)
Special Instructions:

1. The recommended air volumes are based on the ACGIH TLV of 10 mg/m^3; the maximum air volume may be increased if concentrations of airborne dust are below the TLV.
2. The addition of foam plug enables respirable particulate collection on this media in addition to inhalable particulate, but increases the LOQ from 0.10 mg to 0.50 mg for inhalable particulate.
3. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

PARTICULATES NOT OTHERWISE REGULATED (PNOR), RESPIRABLE
Reference Method: Modified NIOSH 0600, 4th Edition
LOQ: 10 µg/sample
Collection Media: Cyclone + Filter [Pre-weighed PVC 5.0, SKC 225-01-02 + 225-8205 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): Refer to cyclone specifications
Air Collection Volume: Minimum-Maximum (L): 20-400
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

PARTICULATES NOT OTHERWISE REGULATED (PNOR), TOTAL
Reference Method: Modified NIOSH 0500, 4th Edition
LOQ: 10 µg/sample
Collection Media: Filter [Pre-weighed PVC 5.0, SKC 225-8205 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1–2
Air Collection Volume: Minimum-Maximum (L): 7–133
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

PENTACHLOROPHENOL (PCP) [CAS # 87-86-5]
Reference Method: OSHA 39
LOQ: 1 µg/sample
Collection Media: Solid Sorbent Tubes [Two XAD-7 Tubes in Series, SKC 226-97 or equivalent]
Sample Flow Rate (LPM): 0.2 (No range given in reference method)
Air Collection Volume (L): 48 (No range given in reference method)

Special Instructions: Prior to sampling, remove the XAD-7 resin-filled front section of the sampling device and save it. This resin packed tube serves as a cap to trap any PCP which might volatilize from the filter after sampling. Immediately after the completion of sampling, re-attach this section onto the front section of the sampling device for shipment to the laboratory.

Passive Monitor Sampling Media: N/A

PENTANE [CAS # 109-66-0]
Reference Method: Mod. NIOSH 1500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01-0.2
Air Collection Volume (L): 4 (No range given in reference method)
Special Instructions: Sample stability: At least 30 days at 5ºC.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 5 µg/sample
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-PENTANONE

See “METHYL PROPYL KETONE”

1,5-PENTANEDIAL

See “GLUTARALDEHYDE”

PERACETIC ACID (PAA) [CAS # 79-21-0]
Reference Method: In-house Method “LC-SOP-57” (contracted)
LOQ: 2 µg/sample
Collection Media: Filter Cassette + Solid Sorbent Tube [Quartz Filter, SKC 225-9030 or equivalent + Silica Gel Tube, SKC 226-193 or equivalent]
Sample Flow Rate (LPM): 1 (No range given in reference method)
Air Collection Volume (L): 14 (No range given in reference method)
Special Instructions:

1. Analysis is performed as a profile for Peracetic Acid and Hydrogen Peroxide.
2. Sampling must be performed with the filter (analyzed for Hydrogen Peroxide) and tube (analyzed for Peracetic Acid) in series.
3. Air volume is recommended not to exceed 15 L.
4. Ship overnight refrigerated.

Passive Monitor Sampling Media: N/A

PETROLEUM DISTILLATES

See “NAPHTHAS, (NOT LISTED)”

PHENOL [CAS # 108-95-2]
Reference Method: Modified OSHA 32
LOQ: 1 µg/sample
Collection Media: Solid Sorbent Tube [XAD-7 tube, SKC 226-95 or equivalent]
Sample Flow Rate (LPM): 0.1 (No range given in reference method)
Air Collection Volume (L): 24 (No range given in reference method)
Special Instructions: None

Passive Monitor Sampling Media: N/A

PHOSPHORIC ACID (H3PO4)

See “ACID GASES”

PHOSPHORUS, VAPOR [CAS # 7723-14-0]
Reference Method: NIOSH 7905, 4th Edition
LOQ: not listed (please call to inquire)
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-35-03 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 5–100
Special Instructions:

1. Sample stability: at least 7 days at 25 ºC.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

PHOSPHORUS, PARTICULATE [CAS # 7723-14-0]
Reference Method: NIOSH 7303, 4th Edition
LOQ: 15 µg/sample
Collection Media: Filter [37MCE 0.8 or 25MCE 0.8, SKC 226-35-03 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1-4
Air Collection Volume: Minimum-Maximum (L): 250-500,000
Special Instructions:

1. Reported results reflect elemental analysis of the requested metals.
2. Certain compounds may not be solubilized during digestion, resulting in data that may be biased low.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

POLYCHLORINATED BIPHENYLS (PCBs), WIPES [CAS # VARIOUS]

PLEASE CALL THE APHC-LS IH CONSULTANT FOR INFORMATION.

POLYNUCLEAR AROMATIC HYDROCARBONS [CAS #: VARIOUS]
Reference Method: NIOSH 5506, 4th Edition
LOQ: 0.03 µg/sample
Collection Media: Filter and Solid Sorbent Tube [37 mm PTFE, 2 micron AND XAD-2, 100 mg/50 mg]
Sample Flow Rate (LPM): 2 (No range given in reference method)
Air Collection Volume: Minimum-Maximum (L): 200–1,000
Special Instructions:

1. Transfer filter to culture tubes; Wrap sorbent and culture tubes in aluminum foil.
2. Ship overnight at 0 ºC.
3. Sample stability unknown; protect from heat and ultraviolet light.
4. Blanks: 3 to 10 field blanks per set.

Passive Monitor Sampling Media: N/A

POTASSIUM (HYDROXIDE)

See “ALKALINE DUSTS”

N-PROPANOL (N-PROPYL ALCOHOL) [CAS # 71-23-8]
Reference Method: NIOSH 1401, 4th Edition
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum -Maximum (L): 1–10
Special Instructions:

1. Sample stability: unknown; store in freezer.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT
LOQ: 10 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2-PROPANOL (ISOPROPYL ALCOHOL, ISOPROPANOL) [CAS # 67-63-0]
Reference Method: NIOSH 1400, 4th Edition
LOQ: 30 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum -Maximum (L): 0.3–3

2-PROPANOL (ISOPROPYL ALCOHOL, ISOPROPANOL) [CAS # 67-63-0] (CONT.)
Special Instructions:

1. Store in freezer and ship refrigerated.
2. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
3. The analytical protocol for this contaminant requires the use of a modifier to the desorption solvent. Because of this requirement, sample separately from other analytes (unless other analytes are also alcohols).

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

PYRIDINE [CAS # 110-86-1]
Reference Method: Mod. NIOSH 1613
LOQ: 10 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–1.0
Air Collection Volume: Minimum -Maximum (L): 18–150
Special Instructions:

1. The desorption efficiency for this media is less than 75%; results will be qualified as semi-quantitative.
2. Blanks: 2 to 10 field blanks per sample set.

Passive Monitor Sampling Media: N/A

RADIATION, DEPLETED URANIUM – AIR SAMPLE
Reference Method: Please contact the APHC-LS IH consultant for specific method based on project objectives.
LOQ: Please contact the APHC-LS IH consultant for specific method based on project objectives.
Collection Media: Whatman 41 4-inch Paper Filter or equivalent (do NOT use Glass Fiber Filters)
Sample Flow Rate: Minimum-Maximum (LPM): 28.32–141.6
Air Collection Volume: Minimum (L): 1,416 (Breathing Zone) or 2,832 (General Air)

RADIATION, DEPLETED URANIUM – AIR SAMPLE (CONT.)

Special Instructions:

1. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
   a. Date and time sample taken.
   b. Contact information (name and phone number) of person taking sample.
2. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN."

RADIATION, DEPLETED URANIUM – WIPE SAMPLE

Reference Method: Please contact the APHC-LS IH consultant for specific method based on project objectives.

LOQ: Please contact the APHC-LS IH consultant for specific method based on project objectives.

Collection Media: Nu-Con smear, Biodex wipe, Defensap wipe, or equivalent

Special Instructions:

1. Swipe a prepared, blank wipe, using normal pressure, across a 100 cm^2 area. If the available surface area is less than 100 cm^2, swipe the entire surface.
2. The wipe can be either dry or slightly moistened.
3. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
   a. Date and time sample taken.
   b. Contact information (name and phone number) of person taking sample.
4. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN."

RADIATION, GAMMA – AIR SAMPLE (FOR GAMMA EMITTING RADIOISOTOPES ONLY SUCH AS COBALT-60, CESIUM-137, CESIUM-134, ETC.)

Reference Method: DLS 408 (In-house method)

LOQ: 0.5 – 5.0 pCi/sample (depending on count time)

Collection Media: Whatman 41 4-inch Paper Filter or equivalent (do NOT use Glass Fiber Filters)

Sample Flow Rate: Minimum-Maximum (LPM): 28.32–141.6

Air Collection Volume: Minimum (L): 1,416 (Breathing Zone) or 2,832 (General Air)

RADIATION, GAMMA – AIR SAMPLE (FOR GAMMA EMITTING RADIOISOTOPES ONLY SUCH AS COBALT-60, CESIUM-137, CESIUM-134, ETC.) (CONT.)

Special Instructions:

1. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
    a. Date and time sample taken.
    b. Contact information (name and phone number) of person taking sample.
    c. Isotope of interest, if known.
2. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN."
3. Please specify the exact radioisotope of concern. Method can NOT provide a generic gross gamma screening result. All results must be reported as isotope specific.

RADIATION, GAMMA – WIPE SAMPLE (FOR GAMMA EMITTING RADIOISOTOPES ONLY SUCH AS COBALT-60, CESIUM-137, CESIUM-134, ETC.)

Reference Method: DLS 408 (In-house method)
LOQ: 0.5 – 5.0 uCi/sample (depending on count time)
Collection Media: Nu-Con smear, Biodex wipe, Defensap wipe, or equivalent
Special Instructions:

1. Swipe a prepared, blank wipe, using normal pressure, across a 100 cm^2 area. If the available surface area is less than 100 cm^2, swipe the entire surface.
2. The wipe can be either dry or slightly moistened.
3. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
    a. Date and time sample taken.
    b. Contact information (name and phone number) of person taking sample.
    c. Isotope of interest, if known.
4. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN.”
5. Please specify the exact radioisotope of concern. Method can NOT provide a generic gross gamma screening result. All results must be reported as isotope specific.

RADIATION, GROSS ALPHA/GROSS BETA/CARBON-14 – AIR SAMPLE

Reference Method: DLS 437 (In-house method)
LOQ (µCi/sample): $5x10^{-7}$ (Gross Alpha); $1x10^{-6}$ (Gross Beta); $2x10^{-6}$ (Carbon-14)
Collection Media: Whatman 41 4-inch Paper Filter or equivalent (do NOT use Glass Fiber Filters)
Sample Flow Rate: Minimum-Maximum (LPM): 28.32-141.6
Air Collection Volume: Minimum (L): 1,416 (Breathing Zone) or 2,832 (General Air)

Special Instructions:

1. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
    a. Date and time sample taken.
    b. Contact information (name and phone number) of person taking sample.
    c. Isotope of interest, if known.
2. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN."

RADIATION, GROSS ALPHA/GROSS BETA/CARBON-14 – WIPE SAMPLE

Reference Method: DLS 437 (In-house method)
LOQ (Gross Alpha): $5x10^{-7}$ microcurie (µCi)/sample or 1 disintegrations per minute (dpm)/wipe or 1 dpm/100 cm^2; (Gross Beta): $1x10^{-6}$ µCi/sample or 2 dpm/wipe or 2 dpm/100 cm^2 ;(Carbon-14): $2x10^{-6}$ µCi/sample or 4 dpm/wipe or 4 dpm/100 cm^2
Collection Media: Nu-Con smear, Biodex wipe, Defensap wipe, or equivalent
Special Instructions:

1. Swipe a prepared, blank wipe, using normal pressure, across a 100 cm^2 area. If the available surface area is less than 100 cm^2, swipe the entire surface.
2. The wipe can be either dry or slightly moistened.
3. After sampling, place the wipe in an individual folder and clearly mark the folder for easy identification of the sample. Include the following information:
    a. Date and time sample taken.
    b. Contact information (name and phone number) of person taking sample.
    c. Isotope of interest, if known.
4. Place the wipe folder(s) inside a zip-lock bag and seal. Place this zip lock bag inside an envelope. Mark the outside of the envelope "Laboratory Samples – DO NOT OPEN."
5. Please specify the requested reporting units.

RADIATION, NICKEL-63 – WIPE SAMPLE
Reference Method: DLS 414 (In-house method)
LOQ: $3x10^{-6}$ µCi/sample or 7 dpm/sample. If a lower LOQ is required, the sample may be counted for a longer period of time.
Collection Media: Gelman GN-6 filter membrane or equivalent
Special Instructions:

1. The filter is moistened with deionized or distilled water and wiped over the suspected surface (recommended area is 100 cm^2).
2. The filter is then placed directly into either a prepared liquid scintillation cocktail solution or an empty liquid scintillation vial.
3. Clearly mark the vial for easy sample identification, including the date and time of collection and the contact information (name and phone number) of the person taking the sample. DO NOT WRITE ON THE SCINTILLATION GLASS SURFACE OR PLACE TAPE OR STICKERS ON IT.
4. Please specify the requested reporting units.

RADIATION, TRITIUM – WIPE SAMPLE
Reference Method: DLS 411 (In-house method)
LOQ: $4x10^{-6}$ uCi/sample or 10 dpm/sample. If a lower LOQ is required, the sample may be counted for a longer period of time.
Collection Media: Gelman GN-6 filter membrane or equivalent
Special Instructions:

1. The filter is moistened with deionized or distilled water and wiped over the suspected surface (recommended area is 100 cm^2).
2. The filter is then placed directly into a vial containing either deionized/distilled water or, preferably, a liquid scintillation cocktail solution. Tritium samples shipped in water must have 10.0 mL of deionized/distilled water in the vial. The wipe MUST be submitted either under scintillation cocktail or water or it will invalidate the test and be rejected.
3. Clearly mark the vial for easy sample identification, including the date and time of collection and the contact information (name and phone number) of the person taking the sample. DO NOT WRITE ON THE SCINTILLATION GLASS SURFACE OR PLACE TAPE OR STICKERS ON IT.
4. Please specify the requested reporting units.

RDX (CYCLONITE, HEXAGEN) [CAS # 121-82-4]
Reference Method: Modified OSHA 44
LOQ: 0.4 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1.0 (No range given in reference method)
Air Collection Volume (L): 60 (No range given in reference method)

RDX (CYCLONITE, HEXAGEN) [CAS # 121-82-4] (CONT.)
Special Instructions: The air sampling pump must be certified by NIOSH or MSHA as intrinsically safe for use in coal mines.

Passive Monitor Sampling Media: N/A

RESPIRABLE DUST, NUISANCE

See “PARTICULATES NOT OTHERWISE REGULATED (PNOR), RESPIRABLE”

SELENIUM

See “METALS”

SEVOFLURANE

See “ANESTHETIC GASES”

SILICA-CRYSTALLINE, RESPIRABLE [CAS # 14808-60-7]
Reference Method: NIOSH 7500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Cyclone + Filter [37PVC 5.0, SKC 225-01-02 + 225-803 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): Refer to cyclone specifications
Air Collection Volume: Minimum-Maximum (L): 400–1,000
Special Instructions:

1. A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.
2. Samples submitted for this analysis will be analyzed for respirable silica, crystalline quartz by default. Samples can also be analyzed for crystalline cristobalite and tridymite, but this must be specifically requested on the LIDS 9 form.
3. This analysis method can also be performed in conjunction with respirable dust analysis, but this must be specifically requested on LIDS 9 form. A pre-weighed PVC filter must be used (SKC 225-8205 or equivalent).

Passive Monitor Sampling Media: N/A

SILICA-CRYSTALLINE, TOTAL [CAS # 14808-60-7]
Reference Method: NIOSH 7500, 4th Edition
LOQ: 5 µg/sample
Collection Media: Filter [37PVC 5.0, SKC 225-803 or equivalent]
Sample Flow Rate (LPM): 2.0 (No range given in reference method)
Air Collection Volume: Minimum-Maximum (L): 400–1,000
Special Instructions:

1. A minimum of two field blanks or 10 % of the total samples (whichever is greater) must be submitted with each set of samples.
2. Samples submitted for this analysis will be analyzed for total silica, crystalline quartz by default. Samples can also be analyzed for crystalline cristobalite and tridymite, but this must be specifically requested on the LIDS 9 form.
3. This analysis method can also be performed in conjunction with total dust analysis, but this must be specifically requested on LIDS 9 form. A pre-weighed PVC filter must be used (SKC 225-8205 or equivalent).

Passive Monitor Sampling Media: N/A

SILICON [CAS # 7440-21-3]
Reference Method: Mod. NIOSH 7303, 4th Edition
LOQ: 7.5 µg/sample
Collection Media: Filter Cassette [37MCE 0.8 or 25MCE 0.8, SKC 225-3100 or equivalent]
Sample Flow Rate - Minimum-Maximum (LPM): 1-4
Air Collection Volume - Minimum-Maximum (L): 480-960
Special Instructions: Submit 2-10 field blanks per sample set.

Passive Monitor Sampling Media: N/A

SILVER

See “METALS”

SODIUM (HYDROXIDE)

See “ALKALINE DUSTS”

STODDARD SOLVENT

See “NAPHTHAS”

STYRENE

See “AROMATIC HYDROCARBONS”

SULFUR DIOXIDE [CAS # 7446-09-5]
Reference Method: Mod. NIOSH 6004 (Filters) OR Mod. OSHA ID-200 (Tubes)
LOQ: 10 µg/sample
Collection Media: Filter Cassette [Treated 37MCE 0.8] OR Solid Sorbent Tube [Treated Anasorb 747, SKC 226-80 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.5–1.5 (Filters) OR 0.1 (Tubes)
Air Collection Volume: Minimum-Maximum (L): 4–200 (Filters) OR 12 (Tubes)
Special Instructions: Pre-filters can be provided if analysis of sulfates/sulfites is necessary.
Interferences: sulfur trioxide gas.

Passive Monitor Sampling Media: PM 500-200
Reference Method: In-house “IC-SOP-14” (contracted).
LOQ: 2.7 µg/sample
Special Instructions: Samples should be analyzed within 3 weeks of collection.

SULFURIC ACID (H2SO4)

See “ACID GASES”

TCE (TRICHLOROETHYLENE)

See “HALOGENATED HYDROCARBONS”

TDI

See “DIISOCYANATES”

TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

See “HALOGENATED HYDROCARBONS”

TETRAHYDROFURAN [CAS # 109-99-9]
Reference Method: NIOSH 1609, 4th Edition
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum-Maximum (L): 1–9
Special Instructions:

1. Sample stability unknown.
2. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N566AT
LOQ: 5 µg/sample
Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

THALLIUM

See “METALS”

TIN [CAS# 7440-31-5]
Reference Method: OSHA ID-121
LOQ: 3 µg/sample
Collection Media: Filter [0.8 micron, 37MCE]
Sample Flow Rate: Minimum-Maximum (LPM): 2
Air Collection Volume: Minimum-Maximum (L): 480–960
Special Instructions:

1. Sample separately from other metals.
2. Reported results reflect elemental analysis of the requested metals.
3. Certain compounds may not be solubilized during digestion, resulting in data that may be biased low.

Passive Monitor Sampling Media: N/A

TITANIUM

See “METALS”

TNT

See “2,4,6-TRINITROTOLUENE”

TOLUENE

See “AROMATIC HYDROCARBONS”

TOLUENE DIISOCYANATES (TDI)

See “DIISOCYANATES”

TOTAL DUST, NUISANCE

See “PARTICULATES NOT OTHERWISE REGULATED (PNOR), TOTAL”

TOTAL HYDROCARBONS

See “HYDROCARBONS, TOTAL”

TOXICHLOR

See “CHLORDANE”

1,1,1-TRICHLOROETHANE

See “HALOGENATED HYDROCARBONS”

1,1,2-TRICHLOROETHANE

See “HALOGENATED HYDROCARBONS”

TRICHLOROETHENE (TRICHLOROETHYLENE)

See “HALOGENATED HYDROCARBONS”

TRICHLOROETHYLENE

See “HALOGENATED HYDROCARBONS”

TRIMETHYLBENZENES:

Analyte	CAS Number
1,2,3-trimethylbenzene	526-73-8
1,2,4-trimethylbenzene	95-63-6
1,3,5-trimethylbenzene	108-67-8
trimethylbenzenes (total)	25551-13-7

Reference Method: OSHA 1020
LOQ: 5 µg/sample (individual analytes); 15 µg/sample (total)
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01 or equivalent]
Sample Volume (L): 12 (no range given)
Sample Flow Rate: Minimum-Maximum (LPM): 0.05
Special Instructions: None

Passive Monitor Sampling Media: N525AT/ N566AT
Reference method: Modified OSHA PV2091
LOQ: 5 µg/sample (individual analytes); 15 µg/sample (total)
Special Instructions:
1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

2,4,6-TRINITROTOLUENE (TNT) [CAS # 118-96-7]
Reference Method: OSHA 44
LOQ: 0.5 µg/sample
Collection Media: Solid Sorbent Tube [Tenax, SKC 226-56 or equivalent (preferred media) or XAD-2, SKC 226-30-16 or equivalent]
Sample Flow Rate (LPM): 1 (No range given in reference method)
Air Collection Volume (L): 60 (No range given in reference method)
Special Instructions: The air sampling pump must be certified by NIOSH or MSHA as intrinsically safe for use in coal mines.

Passive Monitor Sampling Media: N/A

TRIVALENT CHROMIUM, (Cr+3)

See “CHROMIUM, TRIVALENT”

TUNGSTEN, INSOLUBLE [CAS # 7440-33-7]
Reference Method: OSHA ID-213
LOQ: 5 µg/sample
Collection Media: Filter Cassette [37MCE 0.8, SKC 225-3-01A or equivalent]
Sample Flow Rate (LPM): 2.0 (No range given)
Air Collection Volume: Minimum-Maximum (L): 30-480
Special Instructions:

1. Examples of insoluble tungsten: welding electrodes and alloys (refer to the reference method for more).
2. Sample separately from other metals. Cobalt is the only other metal that can be analyzed for an additional fee.

Passive Monitor Sampling Media: N/A

TUNGSTEN, SOLUBLE [CAS # 7440-33-7]
Reference Method: OSHA ID-213
LOQ: 5 µg/sample
Collection Media: Filter Cassette [37MCE 0.8, SKC 225-3-01A or equivalent]
Sample Flow Rate (LPM): 2.0 (No range given)
Air Collection Volume: Minimum-Maximum (L): 30-480
Special Instructions:

1. Examples of soluble tungsten: biological assays and fire proofing (refer to the reference method for more).
2. Sample separately from other metals. Cobalt is the only other metal that can be analyzed for an additional fee.

Passive Monitor Sampling Media: N/A

VANADIUM

See “METALS”

VINYL ACETATE [CAS # 108-05-4]
Reference Method: Mod. NIOSH 1453
LOQ: 5 µg/sample
Collection Media: Solid Sorbent Tube [Charcoal, SKC 226-01/226-09 or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 0.01–0.2
Air Collection Volume: Minimum -Maximum (L): 1.5–24

VINYL ACETATE [CAS # 108-05-4] (CONT.)

Special Instructions:

1. Sample stability: At least 30 days at 5ºC.
2. Blanks: 2 to 10 field blanks per set.
3. Interferences: acids, bases, and free radical initiators, etc.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 5 µg/sample

Special Instructions:

1. Include the charcoal scavenger packet with your returned sampling media.
2. Return samples to the laboratory within 14 days of the sampling event.

VINYL CHLORIDE [CAS # 75-01-4]

Reference Method: Mod. NIOSH 1007
LOQ: 0.7 µg/sample
Collection Media: 2 Solid Sorbent Tubes in Tandem [Charcoal, SKC 226-01 or equivalent]
Sample Flow Rate (LPM): 0.05 (No range given in reference method)
Air Collection Volume: Minimum -Maximum (L): 0.7-5
Special Instructions:

1. Separate tubes as soon as possible after sample collection.
2. Sample stability: At least 10 days at 25ºC.
3. Blanks: 2 to 10 field blanks per set.

Passive Monitor Sampling Media: N525AT/ N566AT

LOQ: 0.7 µg/sample

Special Instructions:

1. The N525AT badge is recommended for STEL sampling only.
2. Include the charcoal scavenger packet with your returned sampling media.
3. Return samples to the laboratory within 14 days of the sampling event.

VM&P NAPHTHA

See “NAPHTHAS, NOT LISTED”

WELDING FUMES, PROFILE

Metals Included in the Profile: Aluminum, Cadmium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Nickel, and Zinc
Reference Method: Modified NIOSH 7300, 4th Edition
LOQ: Varies (see individual listings under “METALS”)
Collection Media: Filter Cassette [37MCE 0.8, SKC 225-3-01A or equivalent]
Sample Flow Rate: Minimum-Maximum (LPM): 1.0–4.0

WELDING FUMES, PROFILE (CONT.)
Air Collection Volume: Minimum-Maximum (L): Varies (see individual listings under “METALS”)
Special Instructions: A minimum of two field blanks or 10% of the total samples (whichever is greater) must be submitted with each set of samples.

Passive Monitor Sampling Media: N/A

WOOD ALCOHOL

See “METHANOL”

XYLENES

See “AROMATIC HYDROCARBONS”

ZINC

See “METALS”

APPENDIX C
INFORMATION ABOUT INDUSTRIAL HYGIENE MONITORING SUPPLIES

Provided for Reference only.
Sampling supplies can be obtained by contacting the APHC-LS IH consultant in the LS Client Services Division at commercial (410) 436-2208 or DSN 584-2208, or by email:
usarmy.apg.medcom-aphc.list.industrial-hygiene-lab-analysis-inqu@mail.mil

C-1. SUGGESTED SOURCES FOR INDUSTRIAL HYGIENE MONITORING SUPPLIES

The following list of suggested sources for IH monitoring supplies does not imply endorsement by the U.S. Army for these vendors or manufacturers but is intended only to offer assistance in finding appropriate sampling supplies.

NOTE: Refer to Appendix B-3: APHC-LS INDUSTRIAL HYGIENE PROCEDURE LIST for examples of the appropriate collection media for each method.

ARAMSCO, INC.
Telephone: (800) 767-6933
https://www.aramsco.com/

ASSAY TECHNOLOGY
Telephone: (925) 461-8880
https://www.assaytech.com/

FISHER SCIENTIFIC
Telephone: (800) 766-7000
http://www.fishersci.com

MILLIPORE CORPORATION
Telephone: (800) 225-1380
http://www.millipore.com

SIGMA ALDRICH/SUPELCO, INC.
Telephone: (800) 247-6628
http://www.sigmaaldrich.com/supelco

SKC, INC.
Telephone: (800) 752-8472
http://www.skcinc.com

VWR INTERNATIONAL
Telephone: (800) 932-5000
http://www.vwr.com

APPENDIX D

Sample APHC-LS Documents

INDUSTRIAL HYGIENE
SAMPLE SUBMISSION FORM
(For use of this Analysis Request, see USAPHC TG 141; the proponent is MCHB-PH-LAB)

Samples submitted to the Army Public Health Center, Laboratory Sciences, may be subcontracted to an accredited laboratory. If this is not acceptable, please contact Client Services Division at 410-436-2208.

For **DOEHRS-IH XML** file upload only: Choose File No file chosen Load XML

SECTION A: GENERAL INFORMATION

1. Is an SDS Enclosed for Safety Information for Laboratory Personnel? ○ Yes ○ No

2. **Program Number (PHC ONLY)**
GFEBS Project Definition (WBS):
Responsible Cost Center:
3. **POC LAST Name:**
4. **POC FIRST Name:**
Title:
5. **Voice Phone Number:**
6. **Voice DSN:**
7. **Fax Number:**
8. **Email Address:**
9. **Street:**
10. **City:**
11. **State:**
12. **Zip Code + 4:**
13. **Country:**

*14. **Name of Sampled Installation** *(50 Characters Maximum):*

15. **General Project Information and Purpose**
(500 Characters Maximum):

*16. **Priority Requested**
○ Standard ○ High ○ Top
(Standard: 14 Calendar Days; High: 8 Calendar Days; Top: 5-6 Calendar Days)
Please contact the lab prior to sampling for all Top and High Priority requests
*17. **Reason for high/top priority:**

18. **Was project coordinated w/ the lab prior to sample collection?** ○ YES ○ NO

19. **LS Technical Consultant** *(20 Characters Maximum):*
Last Name
First Name

20. **Alternate POC (if available):**
Last Name: **Phone Number:**
First Name: **Email Address:**

21. **If requesting a fuel/naphtha related analysis, is a neat (known/pure) product being submitted to be used as a standard for this analysis?** ○ YES ○ NO

22. **Neat/pure material to use as a standard must be shipped in a separate container from air samples**

*23. **Collection Media Type and Lot Number:**
(Collection Media Type should have catalog # where possible; ex. passive monitor, 3M 3500 or sample tube, SKC 226-01)

23a. **For wipe samples, results will be reported in laboratory default units (most are mass/wipe).**
If a different unit is needed, please specify here (for mass/area units, the area wiped must be provided in Section C).

*24. **Date Shipped:** Shipping overnight by commercial carrier (e.g., FedEx, UPS) is highly recommended; Hexavalent Chromium samples must be shipped overnight.

Figure D–1. Sample LIDS 9, Industrial Hygiene Sample Submission Form

SECTION B: ANALYSIS INFORMATION

- The CAS # for all requested Naphthas/Petroleum Products must be provided
- Specify all individual metals requested
- Use section 32 to provide any additional information
- See Section 29 for information required for Hexavalent Chromium requests.

25. Analytical Method Requested (Refer to TG 141)	*Requested Analysis/Analytes (with CAS #s)

SECTION C: SAMPLE INFORMATION

(Refer to the Instructions page if you need help completing the form.)

*FIELD SAMPLE	DOEHRS ID	*Sample Type GA/BZ/Etc.	CATEGORY	*DATE COLLECTED	EMPLOYEE ID	Area Wiped (ex. 100 cm2, 1 ft2)	TOTAL TIME (MIN)	TOTAL VOLUME (L)	INSPIRABILITY	

***GA: General air sample; BZ Breathing zone

SECTION D: LOCATION AND OPERATION INFORMATION

26. Building/Area *(20 Characters Maximum):*

27. Location Name *(20 Characters Maximum):*

***28. Operation Name** *(50 Characters Maximum):* *Your submission will be titled by this field

29. Operation Employee(s) Perform *(500 Characters Maximum):*
Operation type is required for all Hexavalent Chromium requests
(ex., plating, welding, and paint. If other, please specify)

30. Source of Contaminant *(500 Characters Maximum):*

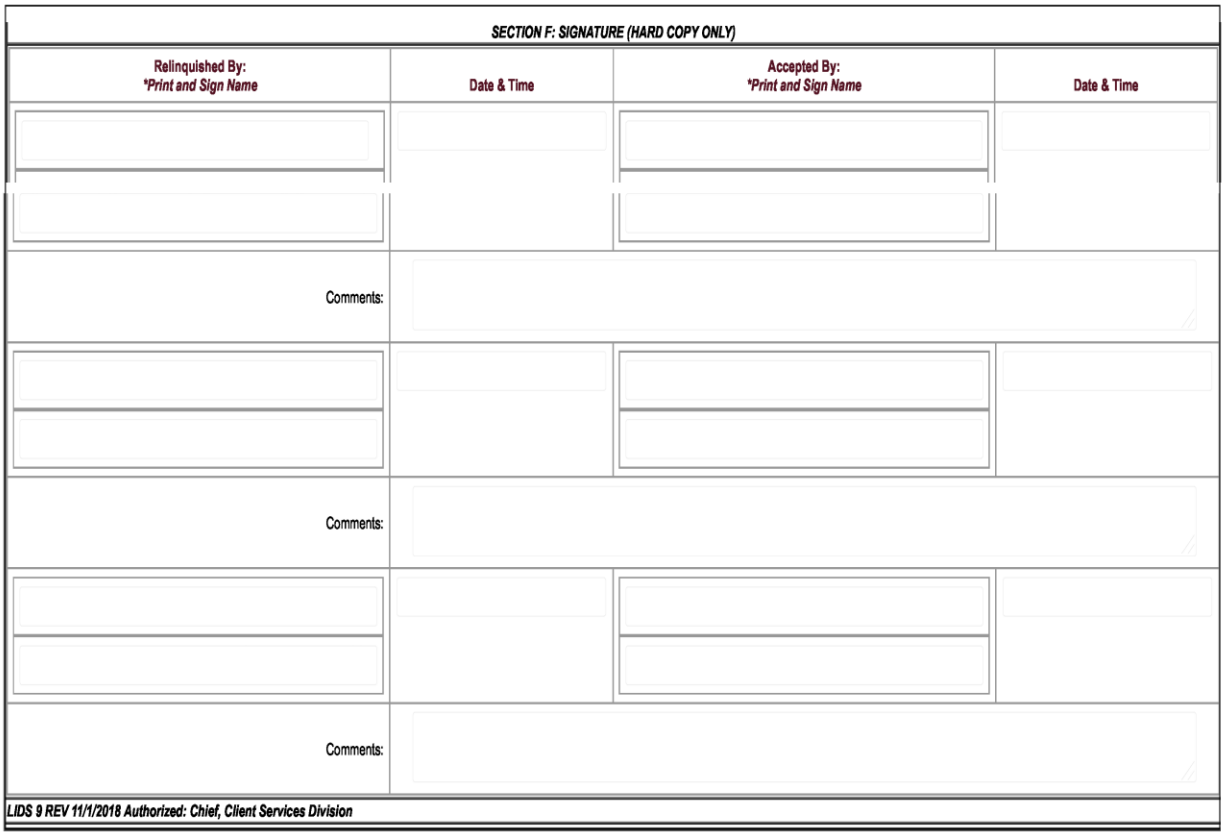
SECTION E: FIELD NOTES/ADDITIONAL COMMENTS

***31. DOEHRS Submitted ?**

○ YES ○ No

32. Field Notes/Comments *(500 Characters Maximum):*

Figure D–1. Sample LIDS 9, Industrial Hygiene Sample Submission Form (Cont.)



SECTION F: SIGNATURE (HARD COPY ONLY)

Relinquished By: *Print and Sign Name	Date & Time	Accepted By: *Print and Sign Name	Date & Time
Comments:			
Comments:			
Comments:			

LIDS 9 REV 11/1/2018 Authorized: Chief, Client Services Division

Figure D–1. Sample LIDS 9, Industrial Hygiene Sample Submission Form (Cont.)

Section A:
For item 24, click on the calendar icon to open up the calendar. Use the calendar to find the date you wish to set. Once the date is located, click on it. Item 23 is required, the form will not process unless you provide a value for "Collection Media and Lot number." Item 23a must be completed for surface wipe samples when you want reporting units that differ from the laboratory's default units. If you want mass/area units, the area wiped must be provided in Section C.

Section B:
In Section B, enter the appropriate data for the columns in the table and then click the SAVE button on the row to save the data to the table. If you need to edit the data, click edit for the row you wish to edit. An Update button along with a Cancel button appears. Make the appropriate changes to fields you wish to edit and when you are finished, click the Update button and the altered data will be saved. You can add as many items to this table as needed. If you used the Load XML button to populate Section B, the sampling method will be listed in the first row followed by the group of analytes.

Section C:
In Section C, enter the appropriate data for the columns in the table and then click the SAVE button on the row to save the data to the table. If you need to edit the data, click edit for the row you wish to edit. An Update button along with a Cancel button appears. Make the appropriate changes to fields you wish to edit and when you are finished, click the Update button and the altered data will be saved. You can add as many items to this table as needed. Media and Field Blanks need to be accounted for in this section in addition to the samples. During the manual entry of a form, the sample type column is required. From the dropdown, select the appropriate Sample type. If you used the Load XML button to populate Section C, the Sample Type column and the Category column will automatically populate. If you find that fields in this section need editing, correct the fields in DOEHRS-IH and generate a new DOEHRS-IH XML file to populate a new LIDS 9 form. Please note that the Employee ID and Area Wiped fields will be empty when using the Load XML button. The Area Wiped field will need to be manually filled out for wipe samples. *Detailed instructions, with screenshots, that outline the steps to create the DOEHRS XML file and then use it to populate the LIDS9 form may be found in the DOEHRS-IH Field Operating Manual.*

Section D:
In Section D, enter the appropriate information while keeping the item's size restriction in mind. This section includes the name by which the project/sampling will be titled on the final report (Item 28). Item 29 must include the operation type (e.g., plating, welding, paint) for hexavalent chromium samples to help ensure that the lab meets method analysis requirements.

Section E:
Please keep in mind the size restrictions of the “Field Notes” item.

Section F:
Section F is to be completed on the Hard copy only. No electronic entries will be saved for this section. For proper Chain of Custody (CoC), please enter your name, then sign and date the LIDS 9 form. A signature can only be added to a hard copy. If samples are relinquished to a delivery service (e.g., FedEx), please note the name of the service provider in the first “Accepted By” cell, and enter the date shipped. Include a hard copy of the completed form (generated by clicking the print button at the bottom of the form) with the samples when they are shipped to the laboratory.

CHAIN OF CUSTODY RECORD

INSTALLATION - ______________________________
PROJECT NUMBER - ______________________________
PROJECT OFFICER - ______________________________
TURN AROUND TIME - (PLEASE X ONE)
___ **STD (28 CALENDAR DAYS)** ___ **HIGH (14 CAL. DAYS)** ___ **TOP (7 CAL. DAYS)**

FIELD SAMPLE ID	DATE SAMPLED	TIME SAMPLED	Grab	Comp	Matrix (See codes)	No. of Containers	PRESERVATIVE (See Codes) / ANALYSIS REQUESTED										

[ ] **<- Total Number of Containers**

Shipment Method - ____________________ **Date Shipped-** ____________

Relinquished By:	Date & Time	Accepted By:	Date & Time	Comment/Remarks

MATRIX CODES: Air(**A**); Biological Liquid(**BL**); Biological Solid(**BS**); Bulk(**B**); Drinking Water(**D**); Frag.(**F**); Oil(**O**); Paint Chip(**P**); Soil/Sediment/Sludge(**S**); Waste Water(**WW**); Water(**W**); Wipe(**WI**)
PRESERVATIVE CODES: 4C - Ice only **H** - HCl+ice **N** - HNO3+ice **S** - H2SO4+ice **Na** - NaOH+ice **AA** - Ascorbic Acid **O** - Other (specify)

Figure D–2. Sample LIDS 235, Chain-Of-Custody Record

Guidance and Instructions for Filling out LIDS 235

Field Personnel: The sample collector is responsible for assuring that proper COC requirements are met during collection of environmental and occupational health sample(s). Field personnel have the responsibility to notify the laboratory prior to shipment that incoming samples are being submitted under COC. All actions associated with COC will be documented on COC documents in the field; information which is assigned to each field sample must include the following:

Source/installation where sample was collected.
Date and time of collection of field sample.
Field assigned sample I.D. number.
Analyses desired for sample.
Sample collector's name.
USAPHC Project Number (if applicable).
Total number of containers per sample.
Date of shipment of sample to laboratory.
Method of shipment (e.g. UPS, Federal Express, hand delivered).
Preservative used, if applicable.

When transferring the "possession" of the container to the next party, i.e. laboratory personnel, the transferring official will sign and record the date/time of transfer on the COC document(s) included with each group of sample(s) for each transportation container. The original COC document(s) must be placed in a sealed plastic bag to prevent wetting and placed inside the respective sample's shipping container. They must also write the name of the carrier (FedEx, UPS, etc) in the "Relinquished to" box of the COC. Transportation containers will then be sealed with tamper proof shipping tape and forwarded to the laboratory for subsequent analyses. This USAPHC COC document (LIDS 235) can also be viewed and obtained at the USAPHC public website @ http://phc.amedd.army.mil/topics/labsciences/lsm/Pages/LIDS.aspx

Lab Personnel: Unless hand carried, transportation containers must be shipped to the laboratory via common carrier (UPS, Federal Express, etc.). Common carriers should abide by Department of Transportation regulations governing shipment of COC sample(s). Upon receipt of containers from a common carrier or from the customer, COC shall be relinquished to the laboratory sample receiving area. Any evidence of tampering (e.g. breakage of seal) during shipment by common carrier must be documented upon receipt and inspection of transportation containers by sample receiving personnel during duty hours or by those individuals assigned such responsiblity during non-duty hours. Responsible off-duty personnel shall follow guidelines of the non-duty sample receipt policy. As soon as sample(s) is/are transferred to analytical laboratory personnel, custody must be formally relinquished to them. If, for any reason, the chain is broken between transfer of sample(s) from field to sample receiving/responsible off-duty personnel, or from transfer of sample(s) from sample receiving/responsible off-duty personnel to the laboratory, a contingency plan will be implemented to determine cause of breakage of chain and to perform corrective action to reconstruct chain, if possible.

LIDS 235 REV 3 DEC 11 Authorized: Section Chief, SML **PAGE 2 OF 2**

Figure D–2. Sample LIDS 235, Chain-Of-Custody Record (Cont.)

Hazardous Drug Sampling Kit Request Form

US Army Public Health Center

Laboratory Sciences Directorate

Date of Request:

Customer Ship-To Address:

Location Name:

Point of Contact (POC):

POC Phone Number:

POC Email Address:

Shipping Address:

City: State: Zip Code:

Customer Request:

Date Kit is Required:

Total Number of Samples Required (including field blanks):

NOTE: For each sample, the following will be provided: 1 swab, 1 vial, and 1 template. One 20-mL vial of wetting solution will also be provided for every 20 samples.

ADDITIONAL Requests (i.e., extra wetting solution, templates, etc.):

Analyte(s) Requested (Place a "X" next to requested analytes):

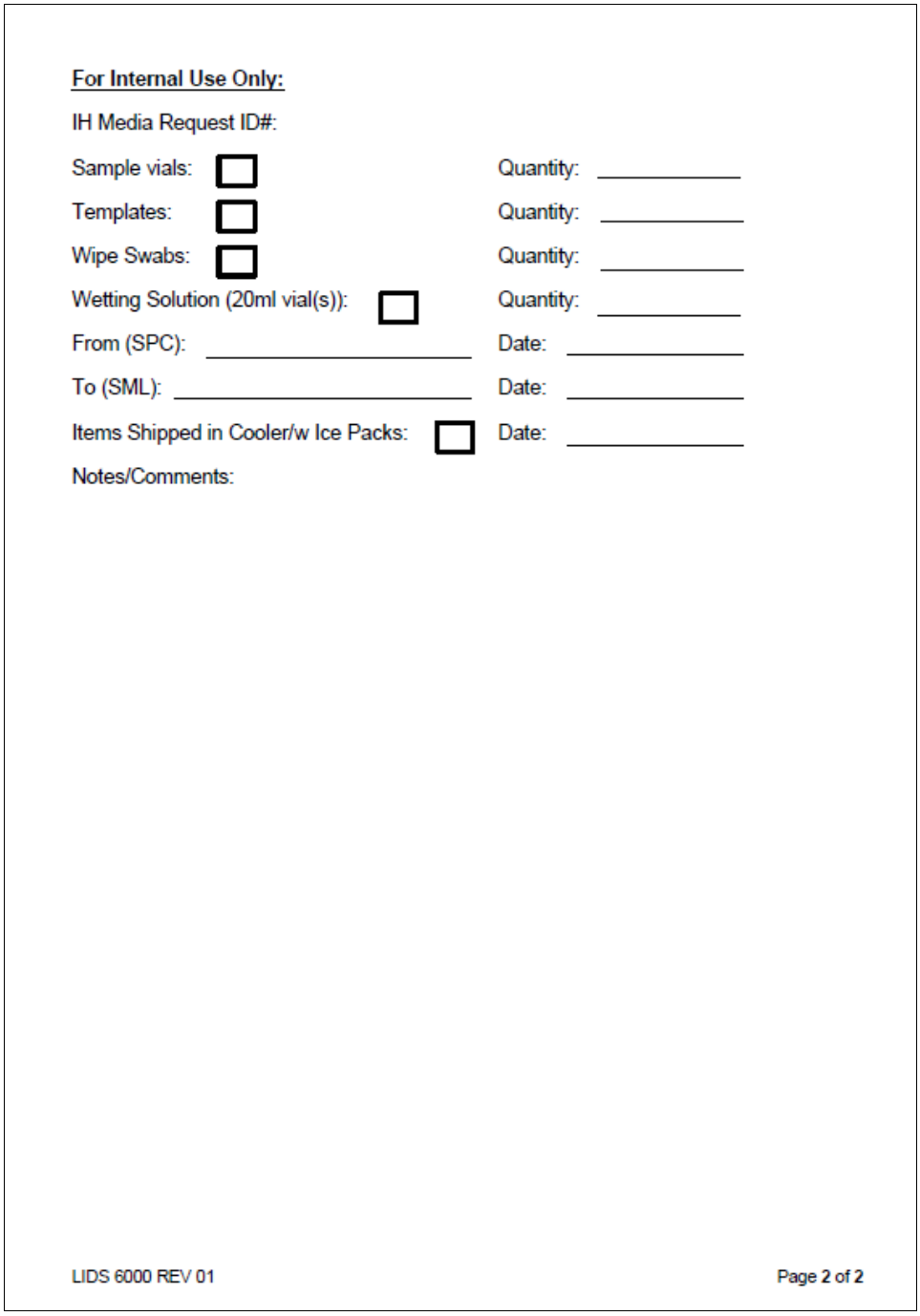
5-Fluorouracil ___ Methotrexate ___ Ifosfamide ___
Cyclophosphamide ___ Doxorubicin ___ Paclitaxel___

Standard Turnaround Time (TAT) for Hazardous Drug Analysis is 28 days, if expedited TAT is needed, please include a justification below:

NOTE: Your justification will be reviewed and you will be notified of the final decision. Typically, work stoppages, known worker exposure, and similar situations will warrant an expedited TAT.

LIDS 6000 REV 01 Page 1 of 2

Figure D-3. Sample LIDS 6000, Hazardous Drug Sampling Kit Request Form



For Internal Use Only:

IH Media Request ID#:

Sample vials: ☐ Quantity: _____

Templates: ☐ Quantity: _____

Wipe Swabs: ☐ Quantity: _____

Wetting Solution (20ml vial(s)): ☐ Quantity: _____

From (SPC): _____ Date: _____

To (SML): _____ Date: _____

Items Shipped in Cooler/w Ice Packs: ☐ Date: _____

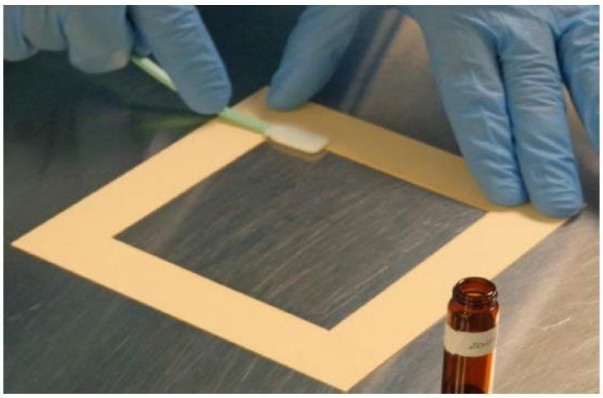
Notes/Comments:

LIDS 6000 REV 01 Page 2 of 2

Figure D-3. Sample LIDS 6000, Hazardous Drug Sampling Kit Request Form (Cont.)

APPENDIX E
Hazardous Drug Surface Wipe Sampling Checklist

- ☐ Label collection vial (ex. 082917INPT01).
- ☐ Don two pairs of disposable gloves (new gloves are required for each sample taken).
- ☐ Don other personal protective equipment (PPE) required for the area you are sampling. This may include gowns, booties, head covering, and respiratory protection. **NOTE:** Use of respiratory protection requires enrollment in a respiratory protection program and medical clearance.
- ☐ Define sampling area by applying 100 cm^2 template. (If location cannot accommodate a template, note and describe the surface sampled.)
- ☐ Retrieve swab from packaging material (Do Not Touch Swab End).
- ☐ Wet swab with methanol wetting solution. Ensure swab is moist but not over saturated. The preferred method of wetting is to dip swab into methanol solution and drag swab across lip of vial to remove excess methanol.
- ☐ Place flat end of swab within the borders of template and depress handle to ensure full surface of swab is in contact with the work surface. Wipe the surface, right to left ensuring all of templated surface is covered**.**



- ☐ Lift swab and turn over. Depress swab, ensuring the full swab surface is in contact with the work surface. Wipe the surface top to bottom, ensuring the entire template surface is covered.
- ☐ Place sampled swab into pre-labeled collection vial.
- ☐ Using snips, remove the handle of swab. Ensure removal of majority of swab handle.
- ☐ Seal sample vial.
- ☐ Doff gloves and discard with used template. Doff any other PPE and dispose of properly.

NOTE: Prepare one field blank for every 20 samples by dipping a swab in wetting solution and placing into a pre-labeled collection vial. Media blanks are not required and will be discarded if received by the lab. Store and ship refrigerated. If there is a delay in shipping the samples to the lab, store in a freezer. Samples have a 60-day holding time.

GLOSSARY

SECTION I. ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Aerodynamic equivalent diameter
AEL	Airborne Exposure Limit
AIHA	American Industrial Hygiene Association
APHC	Army Public Health Center
APG	Aberdeen Proving Ground
BEI	Biological Exposure Indices
C	Ceiling
ºC	degrees Celsius
CAS	Chemical Abstracts Service
cc	cubic centimeter
CE	Cellulose ester
CFR	Code of Federal Regulations
CoC	Chain of custody
CONUS	Continental United States
CV	Coefficient of variation
DA	Department of the Army
DLS	Directorate of Laboratory Sciences (formerly)
DOD	Department of Defense
DOT	Department of Transportation
EL	Excursion Limit
ETO	Ethylene oxide
f/cc	Fibers per cubic centimeter
f/mm^2	Fibers per square millimeter
Hg	Mercury
ID	Identification
IH	Industrial Hygiene/Hygienist
IOM	Institute of Occupational Medicine
ISO	International Organization of Standards
L	Liters
LIDS	Laboratory Information Documentation System
LIMS	Laboratory Information Management System
L/min	Liters per minute
LOQ	Limit of Quantitation
LPM	Liters per minute
LS	Laboratory Sciences
µg	microgram
MCE	mixed cellulose ester

mg	milligram
mg/L	milligrams per Liter
mg/m^3	milligram per cubic meter
mm	millimeters
mm^2	millimeters squared
min	minute
MSHA	Mine Safety and Health Administration
MW	Molecular Weight
Na	Sodium
NaOH	Sodium Hydroxide
NI-CAD	Nickel-cadmium
NIOSH	National Institute for Occupational Safety and Health
NSN	National Stock Number
OCONUS	Outside Continental United States
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PC	Polycarbonate
PCB	Polychlorinated biphenyls
PEL	Permissible Exposure Limit
PEL-C	Permissible Exposure Limit-Ceiling
PEL-STEL	Permissible Exposure Limit-Short Term Exposure Limit
PEL-TWA	Permissible Exposure Limit-Time Weighted Average
PM	Particulate Matter
POC	Point of contact
PPE	Personal Protective Equipment
ppm	Parts per million
PTFE	Polymer of tetrafluoroethylene
PVC	Polyvinyl Chloride
QA	Quality assurance
QC	Quality control
SDS	Safety Data Sheets
STEL	Short-Term Exposure Limit
STP	Standard temperature and pressure
TAT	Turnaround time
TEA-IMS	Triethanolamine-impregnated molecular sieve
TG	Technical Guide
TLV®	Threshold Limit Value (registered trademark of ACGIH)
TLV-C®	Threshold Limit Value-Ceiling
TLV-STEL®	Threshold Limit Value-Short Term Exposure Limit
TLV-TWA®	Threshold Limit Value-Time Weighted Average
TWA	Time-Weighted Average
UPS	United Parcel Service
USEPA	U.S. Environmental Protection Agency

SECTION II. TERMS

Air Collection Volume (in Liters)
The recommended volume of air in liters to be collected for each sample. The value is based on the reference method. In most cases a range for minimum and maximum accepted volumes are given.

Action Level
A substance-specific exposure level applicable to certain OSHA regulated substances whereby certain actions are required (for example, air sampling, employee training, medical monitoring, and record keeping). Where there is a substance-specific OSHA standard, consult the appropriate standard for exact requirements.

Analyte
The element or compound an analyst seeks to determine or measure; the compound of interest.

Batch
A group of samples prepared at the same time in the same location using the same method.

Ceiling (C) Level
A contaminant concentration that should not be exceeded during any part of the working exposure.

Chain-of-Custody (CoC)
Legal documentation of the possession and handling of a sample from the time of collection until final disposition.

Code of Federal Regulations (CFR)
A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Collection Media
The filter, solid sorbent, tube, or liquid specified for sampling.

Duplicate Samples
Samples collected simultaneously from the same source, under identical conditions, into separate containers. They are analyzed independently.

Excursion Limit (EL)
In health and safety regulations, the maximum exposure an individual may have over a short period (usually 30 minutes), as opposed to a Short Term Exposure Limit (STEL), which has shorter averaging period. For substances that have an 8-hour TWA, but no STEL, excursions in worker exposure levels may exceed 3 times the 8-hour TWA for no more than a total of 30 minutes during a work day, and under no circumstances should exceed 5 times the 8-hout TWA.

Field Blanks
Quality control samples introduced into the sampling process to detect contamination that can occur during shipping and storage. Field blanks are required for every type of collection media. They must always be from the same lot number as the sample tubes, filters, or monitors used for sampling. If more than one lot number is used for sampling, then blanks from each lot number are required. Field blanks are created exactly like “normal” samples except they are only opened briefly in the field, and they do not have air pumped through them.

Hazardous Material
Any substance having the potential to cause a physical or health hazard. This is based on its potential for burning, exploding, or otherwise causing an injury to workers or the likelihood that exposure will result in acute or chronic health effects among employees.

Limit of Quantification (LOQ)
As used in this document, the lowest concentration of a contaminant that the laboratory will routinely report for all samples, barring sample-related interferences.

Matrix
The predominant material of which the sample to be analyzed is composed. Matrix is not synonymous with phase (liquid or solid).

Media Blanks
Media blanks are quality control samples that are often necessary in addition to field blanks when adsorbent (or sorbent) collection media is used. They detect contaminants that may be in the sorbent and they may be needed as a reference in spectrophotometric methods. Media blanks must always be from the same lot number as the sample tubes or monitors used for sampling. If more than one lot number is used for sampling, then blanks from each lot number are required. The media blank is never opened until it is received by the laboratory for analysis.

Occupational Exposure Limit (OEL)
A general term for the upper limit of a workplace health hazard that most workers can be exposed to without harming their health. There are different OELs for different workplace health hazards, such as the amount of a chemical in the air or the loudness of noise. OELs have many sources; among them are legal standards (i.e., set by OSHA), professional association guidelines ACGIH TLVs or German MAKs, and government recommendations (NIOSH Recommended Exposure Limits).

Permissible Exposure Limit (PEL)
A legally enforceable (in the U.S.) occupational exposure standard established by OSHA or by a state-run program accepted by OSHSA. Most PELs are time-weighted average concentrations for a normal 8-hour workday and a 40-hour work week, which shall not be exceeded. However, PELs may also be “Ceiling” values or “Excursion Limits.” PELs are accepted to be a concentration to which nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse effects.

Permissible Exposure Limit-Ceiling (PEL-C)
The employee's exposure, which shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute TWA exposure, which shall not be exceeded at any time over a working day.

Permissible Exposure Limit-Short-Term Exposure Limit (PEL-STEL)
The employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified in a parenthetical notation below the limit. If another time period is specified, the TWA exposure over that time period shall not be exceeded at any time during the working.

Permissible Exposure Limit-Time-Weighted Average (PEL-TWA)
The employee's average airborne exposure in any 8-hour work shift of a 40-hour workweek which shall not be exceeded.

Preservation
Techniques that retard physical and/or chemical changes in a sample after it has been collected.

Quality Assurance (QA)
All planned and systematic actions necessary to ensure that the overall quality control program is being effectively implemented and that laboratory data are of the requisite accuracy.

Quality Control (QC)
A planned system of activities which provides a level of quality that meets the needs of users. It is also the process through which a laboratory measures its performance, compares its performance with standards, and acts on those differences.

Quality System
The organizational structure, responsibilities, procedures, activities, capabilities, and resources that together ensure that laboratory services satisfy data requirements.

Safety Data Sheet (SDS)
A concise, descriptive chemical data sheet that follows the guidelines established by OSHA. It serves as the basis for written hazard communication programs.

Sample Flow Rate (Liter/minute; LPM)
The recommended range in Liters of air per minute (LPM), which can be used in collection of the sample. After selection of the sampling flow rate, the appropriate sampling time can be determined by dividing the recommended collection volume by the sampling rate.

Sample Set
One or more samples that are collected and submitted for analysis at the same time for the same contaminant(s). A sample set is also referred to as a sample batch.

Short-Term Exposure Limit (STEL)
A STEL is defined as a 15-minute TWA exposure, which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA. Exposure above the TLV- TWA up to the STEL should not be longer 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range. An average period other than 15 minutes may be recommended when this is warranted by observed biological effects. The STEL is not an independent exposure limit, but rather supplements the 8-hour TWA in cases where there are recognized acute effects from a substance whose toxic effects are primarily chronic.

Threshold Limit Value (TLV)
Threshold Limit Values (TLVs) refer to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects. The American Conference of Governmental Industrial Hygienists (ACGIH) sets the TLVs to help evaluate work-place health hazards. Army Regulation 40-11 “Army Public Health Program” requires that the most stringent OEL be followed. Oftentimes, the TLV is the most stringent PEL, therefore it is most frequently used.

Threshold Limit Value Excursion Limit
If the short-term exposure values in a given situation have a geometric standard deviation of 2.0, 5% of all values will exceed 3.13 times the geometric mean. If a process displays a variability greater than this, it is not under good control and efforts should be made to restore control. This concept is the basis for the following excursion limit recommendations which apply to those TLV-TWAs that do not have STELs.

Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a workday, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.

The approach is a considerable simplification of the idea of the log-normal concentration distribution, but it is considered to be more convenient to use by the practicing industrial hygienist. If the exposure excursions are maintained within the recommended limits, the geometric standard deviation of the concentrations will be near 2.0 and the goal of the recommendations will be accomplished. When the toxicological data for a specific substance are available to establish a STEL, this value takes precedence over the excursion limit, regardless of whether it is more or less stringent.

Threshold Limit Value-Ceiling (TLV-C)
The concentration that should not be exceeded during any part of the working exposure.
In conventional industrial hygiene practice, if instantaneous monitoring is not feasible, then the TLV-C can be assessed by sampling over a 15-minute period except for those substances that may cause immediate irritation when exposures are short.

Threshold Limit Value-Short-Term Exposure Limit (TLV-STEL)
The concentration to which workers can be exposed continuously for a short period of time without suffering from: (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded.

It is not a separate independent exposure limit; rather, it supplements the TWA limit where there are recognized acute effects from a substance whose toxic effects are primarily from a chronic nature. STELs are recommended only where toxic effects have been reported from high short-term exposures in either humans or animals.

Threshold Limit Value-Time-Weighted Average (TLV-TWA)
The time-weighted average concentration for conventional 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Torr
The pressure exerted by 1 mm of mercury. Standard atmospheric pressure is 760 torr.