



# INDUSTRIAL HYGIENE SAMPLING GUIDE

for

# COMPREHENSIVE INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

Sep 17, 2025



**NAVY AND MARINE CORPS FORCE HEALTH PROTECTION COMMAND**  
**• DEFENSE CENTERS FOR PUBLIC HEALTH – PORTSMOUTH**

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## INTRODUCTION

This guide contains a compilation of sampling and analytical method recommendations for specific chemicals which the Navy has in-house analytical capability through its two Comprehensive Industrial Hygiene Laboratories (CIHLs) located in Norfolk, VA and San Diego, CA. This guide is a concise reference for the industrial hygienist in the proper submission of industrial hygiene (IH), environmental, bulk and biological samples. This guide lists the analyte or substance, the Chemical Abstracts Service Registry Number (CAS #) for the substance, analytical method used by the CIHL in performing the analysis, reporting limit (RL), sampling media, recommended air volume, sampling rate, special instructions for the industrial hygienist submitting the sample, and location of the CIHL, which can analyze the sample.

Customers should submit samples to the CIHL located nearest them. If that CIHL does not have the desired analytical capability, call or email the CIHL to verify what capabilities exist at that location. The CIHL will work with the requestor to obtain the required service by:

1. Confirming that the other CIHL can do the analysis
2. Sending the sample out for contract analysis, if applicable
3. Assisting the customer to identify a CIHL that the customer can contract with directly for the analysis.

Since both CIHLs are constantly updating their analytical services, always check with the closest CIHL first.

Each CIHL welcomes comments and suggestions regarding its services, additional method development requirements, alternate sampling techniques, and any other input. All questions regarding CIHL service/capability should be addressed to the CIHL which provides the service. Working hours are generally 0730 to 1600 hours Monday through Friday. All comments concerning CIHL program management and additions, corrections, and changes to this guide, should be addressed to the CIHL Directors.

## LABORATORY ORGANIZATION

The mission of the Navy and Marine Corps Force Health Protection Command (NMCFHPC) is to be the Navy and Marine Corps center for public health services, and to provide leadership and expertise to ensure mission readiness through disease prevention and health promotion in the support of the National Military Strategy. The CIHLs' specialize in qualitative and quantitative analyses of samples that support mission by providing

objective, accurate, and reliable data for occupational health and IH investigations, assessments, recommendations, and risk management.

On 1 October 1989, all Navy medical department CIHLs, then named Consolidated Industrial Hygiene Laboratories, became part of the then Navy Environmental Health Center (NEHC) - now NMCFHPC. The following information for the two CIHLs is provided:

**1** - Navy Environmental and Preventive Medicine Unit - Five  
Comprehensive Industrial Hygiene Laboratory (CIHL) Detachment  
West  
3235 Albacore Alley  
San Diego, CA 92136-5199

Laboratory Director  
Phone: (619) 556-7084 DSN: 526-1427  
FAX: (619) 556-1492

CIHL Det West Phone: (619) 556-7070  
DSN: 526-7070 FAX: (619) 556-1492  
Email: [usn.san-diego.navenpvntmedufive.list.nepmu5-cIHL-custsupp@health.mil](mailto:usn.san-diego.navenpvntmedufive.list.nepmu5-cIHL-custsupp@health.mil)  
CIHL

**2** - Navy Environmental Preventative Medicine Unit-Two  
Industrial Hygiene Laboratory (CIHL) Detachment East 1285 West  
D Street, Bldg U-238  
Norfolk, VA 23511-3394

Laboratory Director  
Phone: (757) 953-6562; DSN: 377-6562  
FAX: (757) 953-7213

CIHL Det East Phone: (757) 953-6622  
DSN: 377-6622 F A X : (757) 953-7213

## **GENERAL POLICY**

The CIHLs provide analytical support services for samples submitted through the BUMED Industrial Hygiene Program Offices (IHPO). The analytical services available at the CIHLs are primarily designed for quantitative analyses of occupational health samples and selected IH samples. The CIHLs will not accept samples taken on contract workers per the OPNAV 5100.23. CIHL results cannot be used in support of contract requirements.

## SPECIFIC POLICIES

### POLICY ON STANDARD OPERATING PROCEDURES AND LOCAL OPERATING PROCEDURES

Standardization among the CIHLs is an essential part of the CIHL program. Each CIHL has written Standard Operating Procedures (SOP) that document guidance and procedures for analytical methods, quality assurance and quality control programs, and general administration of analytical procedures. Based on analytical methods from the National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA), each CIHL develops, validates, and implements analytical methods used. Written SOPs are based on these validated methods. Historical records are kept of the start and stop dates of implemented procedures.

### POLICY ON SAMPLE ACCEPTANCE/REJECTION

Sample submissions must be accompanied by an appropriate completed NMCPHC 5100/13, 5100/14, or 5100/16 form (Note: Every information category must be completed.) when submitted by the industrial hygienist. Forms should not be modified from the Navy accepted form. Samples must be properly preserved, as appropriate, packaged and shipped by the proper method. Refer to the Sample Packaging and Shipping Requirements Section. Properly documented, preserved, packaged, and shipped samples will be accepted by the CIHL and analyzed as routine unless the submission is marked "URGENT". Urgent samples must arrive by a one- or two-day express shipping service. Urgent samples must be previously approved by the CIHL director. Urgent samples are reserved for situations such as a work stoppage or a suspected overexposure.

If samples are taken incorrectly and/or incompletely documented, every effort will be made by the CIHL to obtain the necessary information to convert the invalid sample into a valid sample. Samples will only be returned to the customer when requested by the customer. Documentation may be returned for correct completion; however, the samples will remain at the CIHL.

To assure a quick CIHL turnaround time, please ensure samples are taken according to this guide, shipped appropriately, and the submission forms are correct and complete.

When samples are received and are not able to be corrected for validity (e.g., fiber counts submitted on PVC filters), the customer will be notified by phone, and/or e-mail to determine the disposition of the sample(s). Such samples will be returned to the customer upon the customer's request, only.

Do not send expired media or media that will expire within a short amount of time. Media that is expired or about to expire might be rejected. The CIHL will notify the customer to determine the best course of action. However, sample analysis must occur prior to expiration of media.

#### POLICY ON ANALYTICAL METHODS

Rarely are analytical methods either complete or fully comprehensive to preclude some interpretation, change or modification of the method. (NOTE: This is the reason for the requirement that an SOP be available at each CIHL.) Most methods are single analyte methods while most samples contain multiple contaminants. Most analytical methods used by the CIHLs are taken from the analytical methods published by NIOSH or OSHA. Since OSHA does not require specific analytical methods, unless stated in a stressor- specific standard, any method (e.g., ASTM, scientific literature, journal articles, etc.) can be used if it meets NIOSH criteria of accuracy within  $\pm 25\%$  at the 95% confidence level. All NIOSH and OSHA methods in this document are potentially "modified methods". The modification is necessary because of the variance in analytical columns (types, sizes); desorbing agents; digesting acids/bases; analytical equipment conditions (temperatures, pressures, flow rates). All these modified methods are evaluated and validated for the NIOSH accuracy of  $\pm 25\%$  at the 95% confidence level by each CIHL, and the method changes are documented as modifications.

#### POLICY ON COEFFICIENTS OF VARIATION

Randomly distributed errors occurring in IH sampling are normal and are commonly included in analytical reports as the coefficient of variation (CV). The CV is a useful index for differentiating the true mean of known data points and CIHL reported data. The total CV ( $CV_T$ ) of the sampling and analytical method is based on a statistical standard normal deviation for 95% two- sided confidence limits. The statistical decision techniques developed by NIOSH and OSHA are implemented in the CIHLs' use of the CVs. In order to obtain accurate CVs contact the CIHL that completed the analysis. The CVs can vary based on instrumentation and will be updated annually.

For Time-Weighted Average (TWA) sampling, the CV criteria originally adopted by NIOSH of  $\pm 25\%$  accuracy, with 95% confidence limits, is usually cited, but accuracy specifications may vary from one standard to the next. Substances which have Permissible Exposure Limits (PELs), but for which no specific standard has been promulgated, do not have specific accuracy requirements. For these substances, the CIHLs consider the method acceptable

(e.g., OSHA, NIOSH, literature cited methods) if it can meet the  $\pm 25\%$  accuracy requirement with 95% confidence.

## POLICY ON REPORTING ANALYTICAL RESULTS

The CIHLs are reporting air samples results in "total mass of contaminant per sample" in micrograms (mcgs) and in milligram per cubic meter ( $\text{mg}/\text{m}^3$ ). Blanks submitted with the samples are only reported in "total mass of contaminant per sample" in mcgs. The CIHL will notify the customer when the blank values are elevated more than normal. It is the responsibility of the customer to take the analytical results and compute TWAs as necessary. If you need assistance, please contact your local industrial hygienist or the CIHL. It is not unusual for the Limit of Quantification (LOQ) of an analyte to vary periodically. Instrumental conditions and environments may vary and this variation often affects the LOQ. If you envision detection levels (e.g., a short duration sample) to be a problem, please contact the CIHL performing the analyses, preferably before collecting the sample.

## POLICY ON SPIKED SAMPLES OR FIELD-SUBMITTED QC SAMPLES

The CIHLs are required by their accreditation through the American Industrial Hygiene Association Laboratory Accreditation Programs (AIHA LAP), LLC to have a comprehensive quality assurance/quality control (QA/QC) program which involves, at a minimum:

- A written QA/QC plan,
- A designated Quality Assurance/Quality Control Coordinator (QA/QCC) responsible for the QA/QC program,
- Participation in the Proficiency Analytical Testing (PAT) programs for all categories (Fields of Testing) of analytes performed for the customer, that are on the CIHL's AIHA scope of accreditation,
- Records which demonstrate the routine introduction of quality control samples of known content along with samples for analysis,
- Records which demonstrate routine checks, calibrations, maintenance of equipment and instruments that are performed to ensure adequate performance,
- Quality control data stored in an accessible manner,
- Routine checks made of procedures and reagents, and
- Inter-laboratory, as well as intra-laboratory, QC.

Occasionally the customer may feel uncomfortable with laboratory results and therefore "challenge" the QA/QC program of the laboratory by submitting blind QA/QC samples to the laboratory.

The only recommended method of challenging the CIHL is purchasing past PAT rounds from the AIHA and submitting these as controlled spikes. Literature articles have proven that side by side duplicate monitoring very rarely produces duplicate samples. The use of a duplicate sampling manifold will not produce duplicate samples; however, this method of sampling is superior to the use of two independent sampling systems side by side. Contact the AIHA (phone number (703) 846-0765) for the purchase of PAT metals, solvents, fibers, and crystalline free silica samples.

PLEASE NOTIFY THE CIHL ONCE YOU RECEIVE THE RESULTS OF YOUR QC SAMPLE SO THE CIHL MAY DOCUMENT ITS QA/QC PROGRAM TO INCLUDE THIS BLIND QC SAMPLE. THIS SAMPLE THEN WILL BE IDENTIFIED IN THE CIHL'S DATABASE AS A TRUE QC BLIND. The CIHL will recharacterize the results for this sample in the Laboratory Information Management System (LIMS) database if you have identified the sample as a field sample (e.g., assigned fictitious breathing zone sample information).

## POLICY ON BLANK MEDIA

The CIHLs follow NIOSH policy for submitting blanks and ask the customer to submit two (2) blanks with each batch of samples. One should be a "Field Blank". A "Field Blank" is an unopened cassette/tube/etc. taken to the work site where the sampling will be performed. The blank cassette/tube/ etc. is then opened on site and immediately closed, sealed and labeled. NO air is pumped through the "Field Blank". This "Field Blank" is used to check for contamination due to sampling process and the background contamination due to the work site. If sampling is occurring on multiple days, then a field blank is required per day of sampling. The second blank submitted should be a "Media Blank". A "Media Blank" is an unopened cassette/tube/etc. from the same lot number as the sampling cassettes that is NEVER opened. This blank is sealed, labeled, and sent off to the CIHL with the "Field Blank" and the samples. The "Media Blank" is used to check the media analyte background levels. Note that these blanks should be labeled with field sample ID numbers and listed on the sample request form as the type of blank that they are along with the samples.

If you are sampling for different types of analytes in the same operation, please submit a complete set of blanks for each type of analyte. For example, if you are sampling for cellosolves and toluene, even though both are collected on charcoal tubes the samples are processed differently so you should submit two sets of charcoal tube blanks with your request. If you are sampling over multiple days, you need a field blank per sampling day, but only one media blank when the media is from the same lot number. If you are using multiple lots of the same media, the CIHLs need "Media blanks" to

represent each lot of media used for the samples. Please consult the CIHL if you are uncertain whether more than one set of blanks may be needed.

Blanks are treated and analyzed the same way as samples. If the total amount of analyte found exceeds the Limit of Quantification (LOQ) for that analyte, then the results are reported as the total amount of analyte per blank (e.g., 0.7 µg of Cd). If the amount found is less than the LOQ then the result is reported as less than the LOQ (e.g., < 0.5 µg of Cd). Note that it is not unusual for the LOQs to vary depending on the instrument used for the analysis, the methodology and other experimental factors. If you are concerned about potential problems with the LOQ because of short sampling times, please contact the CIHLs. There are ways that a lab can modify the procedure which will increase sensitivity and lower the LOQ but they must know your requirements IN ADVANCE. Some labs have validated the LOQ of a method to its lowest possible concentration. Contact and discuss with the CIHL first.

The CIHLs follow NIOSH policy concerning the blank correction. In short, blank value(s) are NOT SUBTRACTED from sample values unless stated otherwise on the CIHL Report. If the Industrial Hygienist is concerned about high blank values (i.e., possible contamination) they should contact the CIHL for assistance in determining the correct course of action. However, it is ultimately the responsibility of the Industrial Hygienist to decide if the sample values should be blank corrected.

#### POLICY ON USE OF DISCLAIMERS

The CIHLs recognize that there are field situations when samples cannot be taken according to required sampling methods (e.g., "a once in a lifetime opportunity sample"). In such cases, the CIHL will usually analyze the sample if taken on appropriate sampling media, and report a result possibly accompanied by one of the disclaimer statements listed below:

- **INSUFFICIENT AIR VOLUME** - The air volume is less than the amount recommended for this method. Consequently, the coefficient of variation (CV) published for the method may not apply. Professional judgment should be used in the interpretation of results.
- **QUESTIONABLE FLOW RATE** - The flow rate differs from the recommended method's rate. Therefore, professional judgment should be used in the interpretation of results.
- **INCORRECT SAMPLING MEDIUM** – If the incorrect media is used, the CIHL will reject the samples.
- **NON-NIOSH/NON-OSHA METHOD** - The analytical method is not one currently recommended by NIOSH, OSHA or the latest edition of this guide. Therefore, professional judgment must be used in the interpretation of results.

- SHIPPING ERROR - Bulk samples were received in the same shipping package as air samples for the same contaminant, therefore, possible cross contamination. Samples were not preserved or did not arrive at the CIHL within the recommended shipping time. Therefore, professional judgment must be used in the interpretation of results.
- BLANK(s) NOT SUBMITTED – No field blank was submitted as required by the sampling and analytical method. Therefore, professional judgment must be used in the interpretation of results.
- OTHER - Other CIHL specific comments requiring a disclaimer.

## **QUALITY ASSURANCE (QA)**

The CIHLs are accredited by Commission on Laboratory Accreditation and AIHA LAP, LLC and holds a certification from the Clinical laboratory Improvement Program (CLIP) which requires participation in all applicable round robin Proficiency Testing (PT) programs. The AIHA LAP, LLC accreditation program specifies operational guidelines for maintaining satisfactory performance, including qualified personnel, proficiency in analytical testing, adequate facilities, quality controls, equipment maintenance, documentation, and site audits. In addition to this accreditation program, CIHLs participate in several quality control programs for monitoring daily performance. Both internal and external quality control samples are analyzed to assure accuracy and precision of results.

Some of the QA techniques used include replicate analyses, spiked controls, commercial reference controls, daily instrument calibration, control charts, regression analyses, data review, reagent, and media blanks. Each CIHL maintains its own SOPs, which entails extensive description of the QA and QC programs. Please address specific QA questions to the CIHL performing the analytical work.

## **LABORATORY ANALYTICAL EQUIPMENT**

The primary analytical instrumentation located in each CIHL consists of gas chromatographs, atomic absorption spectrophotometers (graphite furnace), ultraviolet/visible spectrophotometers, high performance liquid chromatographs, ion chromatographs, microbalances, semi-micro balances, inductively coupled plasma (ICP) optical emission and/or mass spectrometers, and gas chromatograph/mass detectors. The X-ray diffractometer is only present in the CIHL in San Diego. The microscopes (both phase contrast and polarizing light) are only present in the CIHL in Norfolk.

## **SUBMISSION REQUIREMENTS**

SAMPLE SUBMISSION FORM

Air samples must be submitted on forms NMCPHC 5100/13 and 5100/14. Bulk or wipe samples must be submitted on form NMCPHC 5100/16. Copies of these forms or similar sample sheets and instructions for completion are provided in the Industrial Hygiene Field Operations Manual (IHFOM) (available on the NMCFHPC website) or may be requested from the CIHLs. When requesting personal samples, sampled individual needs to be labeled as GS or Active Duty. When filling out the form all stressors requested must be recorded on the sample submission form. For example, when sampling for metals or silica and submitting matched weight filters, indicate if gravimetric analysis is requested.

Do not make alterations on the forms or create your own forms.

## **BIOLOGICAL SAMPLES**

Biological samples must be submitted with sample submission documentation containing at least the following:

- Name of medical treatment facility submitting samples,
- Name of person submitting samples,
- Date of collection,
- Date of submission,
- Name of person sampled (i.e., patient first and last name),
- Sample number [Complete Department of Defense identification number of the patient and the CHCS number],
- Age of person sampled (required for blood lead samples only),
- Date sample was collected,
- Name of test requested,
- Occupational code of patient,
- Patient's command UIC.

Because most medical treatment facilities use a computerized system for medical records, biological samples submitted for blood and urine cadmium, urine beta-2-microglobulin ( $\beta$ -2-MG), blood lead and Zinc Protoporphyrin (ZPP), and urine mercury may be submitted with a computerized transmittal list. Please refer to section below entitled "ROUTINE BIOLOGICAL SAMPLES" for specific guidance on this transmittal list.

Biological samples for blood lead/ZPP and urine mercury may be submitted on Standard Form 557 (Miscellaneous Chemistry Request). The request must be signed and dated by the submitting MD, RN, PA, or Hospital Corps person. All biological samples must be properly packaged and labeled in accordance with Navy, Federal, State, and local regulations. It is recommended that a commercial express package delivery service be used to transport samples to the CIHL (i.e., FedEx). Please contact the carrier for their shipping and labeling

requirements. In general, the samples must be placed in a sealed, waterproof primary container that contains absorbent material sufficient to absorb all possible leakage. The primary container must then be placed in a sealed, secondary container. The secondary container can then be placed in an outer container for shipment. All containers should be adequately cushioned, so the samples do not become loose and move during shipment. Freezer ice packs shall be used to keep the samples cold. Do not use ice or dry ice, and do not freeze the samples. An Etiological Agent/Biomedical Material label must be affixed to the outside of the outer shipping container.

When samples are sent by U.S. Postal Service (USPS), Express Mail Delivery is required. Each package of samples using USPS cannot contain more than a total of 50 milliliters (1.7 ounces) of sample. If more than 50 milliliters of samples (e.g., approximately 7 blood lead samples) are sent to the lab, consider using a commercial express package delivery service. For more information on the shipment of samples, consult U.S. Postal Service Publication 52 entitled " Hazardous, Restricted, or Perishable Mail" dated July 1999 and NAVSUPINST 4610.31A entitled "Preparation of Medical Material Requiring Freeze or Chill Environment for Shipment."

## **SAMPLING REQUIREMENTS**

Always review the preferred method of sampling given in this guide and amplified by the appropriate analytical method (e.g., NIOSH or OSHA analytical method manuals, etc.). If the recommendation cannot be followed, contact the laboratory prior to sampling for additional guidance.

The recommended air volumes provided in this guide are usually a range of volumes, with the higher value recommended for most of the sampling. The lower air volume should only be used when: 1) the exposure may be at an unsafe/unhealthy exposure level such as an exposure exceeding the Time-Weighted Average (TWA) value given in OSHA's Final Rule Limits, 2) the application of a Short-Term Exposure Limit (STEL) or a Ceiling value is applicable to the substance, and 3) the operation limits the amount of sampling time. In the last two cases the maximum recommended sampling rate should be used to obtain as much sample volume as possible. As a general rule, the recommended sampling volumes will allow a detection limit of 10-50% of the TWA.

## **SAMPLE PACKAGING AND SHIPPING REQUIREMENTS**

(See Biological Samples Section for requirements on shipping Biological Samples.)

Small sample media such as sorbent tubes and filter cassettes should be bound together (i.e., rubber band) or placed in plastic bags to reduce the possibility of being overlooked or discarded. Sample cassettes and sorbent tubes should NOT be wrapped in tape. Simply affix a legible sample submission number (preferably a preprinted label) to each sample and blank and neatly package it to avoid shipping damage. Never ship air samples and bulk solvent (i.e. fuels, naphthas) samples in the same shipping package.

Send all metal wipe samples in hard wall containers. The method requires rinsing of the container.

Submit separate request forms for each type of analyses as follows: Segregate and ship your samples in individual categories of air, bulk, wipe, and biological samples subdivided by inorganic and organics. Do not intermix your samples for hexavalent chromium and other metals on the same forms.

Many solvents can be analyzed simultaneously unless they are incompatible. Always check compatibility information to ascertain the organic contaminants collected on charcoal tube media are compatible with each other and with the analytical procedure. Call the CIHL regarding compatibility when in doubt. Please note that hexavalent chromium, mercury, and organic tin are analyzed separately and may not be combined with other metal analyses. Individual metals may be ordered or an ICP metal scan may be requested. Unusual situations requiring additional analyses should be coordinated with the CIHL prior to sample collection.

Most determinations require a minimum of two blanks (one field and one media) or one blank for every ten samples submitted, whichever is larger. The blanks are analyzed by the CIHLs and reported as micrograms ( $\mu\text{g}$ ) of "contaminant" per sample (e.g., per filter, per tube, etc.).

The preferred method for samples that require refrigeration shipment is in Styrofoam boxes with freezer packs or frozen gel blocks. Do not use ice for it will melt and leak and may damage the samples. Do not use dry ice for it will freeze samples and may damage the media/matrix. Hand-carried samples may be transported in ice double-bagged in plastic zip-lock bags to avoid leakage. Upon arrival, notify CIHL staff so samples can be processed accordingly. Do not use ice or dry ice when shipping by U.S. Postal Services or commercial delivery services.

Shipping containers shall be appropriately labeled when required such as "fragile", "refrigeration required" etc.

All samples and materials being packaged, labeled and shipped are governed by Federal, State and local regulations. Compliance with these regulations is the responsibility of the person/command submitting the samples. In the case of unusually large shipments or high priority samples, please contact the CIHL prior to submission.

## **SAMPLE TURNAROUND TIMES**

Samples will be analyzed on a "first come, first served" basis. Urgent samples will be given special priority and analyzed in one to five (5) working days when the CIHL has been notified in advance of the shipment, sufficient production capacity is available and the samples have arrived by expedited shipment, e.g., hand delivery within 24 hours, FedEx overnight or USPS express mail. More than 90% of routine samples are analyzed within twelve (12) working days after receipt of the sample. If you have not received your analytical report after 15 working days, please notify the CIHL to check on the status of the samples.

## **SAMPLE COMPATIBILITY**

Since sampling and analytical methods are normally evaluated for a single analyte, care should be taken in the interpretation of a method's CV. When in doubt concerning multi-component samples, take individual samples. The following compounds require special processing for analysis and consequently the CIHL cannot analyze for other compounds in the same sample:

- Acetic Acid
- Acetonitrile
- All isocyanates
- Ammonia
- 2-Butanone
- Butyl Cellosolve
- Camphor
- Cellosolve - All cellosolves can be analyzed from the same tube, e.g., butyl-, methyl-, etc.; however, cellosolves and common organics cannot be analyzed from the same solid sorbent tube.
- Chlordane
- Chromic Acid or Chromium VI
- Coal Tar Pitch Volatiles
- Cresols
- Ethylene glycol
- Ethylene oxide
- Ethyl ether
- Formaldehyde

- Hydrazine
- Methanol
- Methyl Cellosolve
- Methyl methacrylate
- 2-Nitropropane
- PCBs
- PGDN (Otto Fuel II)
- Phenol

The following groups of compounds require special processing for analysis. More than one compound within each group can be analyzed in the same sample, but compounds outside the group are incompatible and cannot be analyzed from the same sample:

- Group I – Ethyl Alcohol, Isopropyl Alcohol, and t-Butyl Alcohol
- Group II – n-Butyl Alcohol, sec-Butyl Alcohol, iso-Butyl Alcohol, and n-Propyl Alcohol
- Group III – Iso-Amyl Alcohol, Diacetone Alcohol, and Cyclohexanol
- Group IV – 2-Methoxyethanol, 2-Ethoxyethanol, and 2-Butoxyethanol

The SKC 575 passive monitors list analytes that can be analyzed on the samplers. It is important to note that not all analytes listed have been validated. Some analytes are listed as calculated. Only analytes that have full, bilevel or partial validation can be analyzed using the 575 monitors.

Both CIHLs are accredited under Commission on Laboratory Accreditation and CLIP.

Consult the section on Submission Requirements for Biological Samples for general policies of sampling, packaging, labeling, and shipping biological samples.

### **BLOOD LEAD AND ZINC PROTOPORPHYRIN**

Samples for blood lead and zinc protoporphyrin must only be collected in Becton Dickinson (BD) Vacutainer Systems. Any requests to change manufacturers must be communicated to the CIHL. The CIHL must validate the tube prior to selection.

Top Color	Description
Dark Blue	K <sub>2</sub> EDTA tube for whole blood (Specifically for trace metal)
Tan	K <sub>2</sub> EDTA tube for whole blood. The tube is certified to contain less than 0.01ppm lead.

Samples must be thoroughly mixed with the K2EDTA immediately following collection. Keep samples refrigerated (do not freeze) and hand deliver or ship to the nearest CIHL using priority shipping methods. Use an insulated shipping container, such as a Styrofoam shipper.

For shipping long distances, freezer packs and express delivery are required.

## **CADMIUM PANEL**

Cadmium panel includes blood and urine samples. The blood sample will be analyzed for cadmium and the urine sample will be analyzed for cadmium and  $\beta$ -2-microglobulin ( $\beta$ -2-MG), a type of tumor marker. High levels of  $\beta$ -2-MG can be indicative of a kidney disease possibly related to toxic level of cadmium exposure. Since the limits of cadmium and  $\beta$ -2-MG in urine are measured in micrograms per gram of creatinine ( $\mu\text{g/g creat.}$ ), the medical CIHL submitting the blood and urine samples, will also ensure creatinine results for each patient's urine sample are available so the ratios can be calculated. The pH of the urine sample should be measured to ensure level is adjusted accordingly prior to submitting the urine sample. Blood samples should be submitted in royal blue-top (EDTA) tubes and urine samples in a plastic container. Keep samples refrigerated and ship to CIHL San Diego using priority shipping methods. Use Parafilm<sup>®</sup> around the lid of the plastic bottle of the urine sample. Use an insulated shipping container, such as a Styrofoam container. For shipping long distances, freeze packs and express delivery are required.

## **URINE MERCURY**

See the section on Submission Requirements for Biological Samples for general policies of sampling, packaging, labeling and shipping biologicals.

Per BUMED INSTRUCTION 6260.2, dated 7 November 1988, biological monitoring for mercury is no longer required. The potential for personnel exposure to elemental mercury vapor has been greatly reduced by the use of pre-encapsulated amalgams. IH surveys have shown routine use of pre-encapsulated amalgams does not result in overexposure of dental personnel to elemental mercury vapor. Therefore, per this BUMED instruction, neither biological sampling nor air sampling is specifically required. Occasionally mercury urine may be prescribed by an occupational health professional as circumstances warrant.

If urine mercury analysis is necessary, collect the sample (first morning void, if possible) in the standard drug screening plastic bottle (NSN 6640-00-165-5778) and add 100 milligrams of potassium persulfate, a preservative. Please do not send more than 20 milliliters of urine per sample. Hand tighten the lid, place parafilm around the

lid, and place each bottle in a zip-lock bag to contain any leakage during transit to the CIHL. Refrigerate during storage and ship, as soon as possible, in an insulated shipping container, using freezer packs (gel blocks) and express delivery.

## **BULK SAMPLE SUBMISSIONS**

The primary function of the CIHLs is the analysis of breathing zone air samples to document occupational exposure levels. The CIHLs do not analyze bulk samples to determine whether a product meets manufacturer's specifications. Information for the latter is available by writing the manufacturer and requesting product literature and Safety Data Sheets. Products for which this information is not available should not be used in the Navy system. Bulk samples should be submitted to the CIHLs only under the following conditions:

- When the CIHL requests a bulk, as is required in the analytical method (e.g., PCBs, Naphthas, etc.). Do not send paint samples.
- When all other means of obtaining information on the chemical composition of the material have been exhausted and prior approval has been given by the CIHL Director.
- When the operation is determined to yield bulk material that can be toxic to the workers' environment.

## **SIZE-SELECTIVE SAMPLING FOR PARTICULATES**

Information on size-selective samplers is listed below to include flow rates dependent on the sampling device.

### *Inhalable Samplers*

ZEFON: <https://www.zefon.com/inhalable-samplers>

Zefon inhalable sampler: 2 LPM

SKC: <https://www.skinc.com/categories/inhalable-samplers>

Button inhalable sampler: 4 LPM

IOM inhalable sampler: 2 LPM

IFV Pro sampler: 1 LPM (used for pesticides, polyromantic hydrocarbons, inorganic acids, and explosives)

Respirable Samplers

SKC: <https://www.skcinc.com/categories/respirable-dust-samplers>

SKC aluminum cyclone: 2.5 LPM (meets ISO 7708/CEN and 2016 OSHA final rule for crystalline silica, specified in NIOSH methods, suitable for ACGIH TLVs.)

SKC G-1 cyclone: 2 LPM for 4 micron 50% cut-point (safe for underground mine use, meets MSHA for silica and DPM sampling, and ISO 7708/CEN and 2016 OSHA final rule for crystalline silica) 3 LPM for 3.5 micron 50% cut-point 1.7 LPM or 2 LPM with DPM (diesel particulate matter) cassette

SKC GS-3 cyclone: 2.75 LPM (meets ISO 7708/CEN and 2016 OSHA final rule for crystalline silica)

SKC plastic cyclone: 3 LPM (designed to meet ISO/CEN criteria)

PPI disposable samplers: 2 LPM, 4 LPM, 8 LPM (meets ISO 7708/CEN and 2016 OSHA final rule for crystalline silica)

PPI reusable samplers: 2 LPM, 4 LPM, 8 LPM (meets ISO 7708/CEN and 2016 OSHA final rule for crystalline silica)

ZEFON: <https://www.zefon.com/cyclone-assembly-10mm-dorr-oliver-nylon>

SENSIDYNE: <https://www.sensidyne.com/shop/dorr-oliver-size-selection-cyclone.php>

Dorr-Oliver: 1.7 LPM 4 micron cut-point (meets NIOSH requirements for 10 mm nylon cyclones (silica and nuisance dust))

*Thoracic Samplers*

SKC: <https://www.skcinc.com/categories/thoracic-particulate-samplers> Used for sampling metalworking fluids, cotton dust or hard metals

PPI Thoracic (disposable): 2 LPM (matches ISO 7708/CEN size-selective criteria)

PPI Thoracic (reusable): 2 LPM (matches ISO 7708/CEN size-selective criteria)

## CHROMIUM AND CHROMATES

Chromium metal, (or total Chromium) Cr(II) and Cr(III) compounds are collected on mixed cellulose ester filters (MCEF) and analyzed using ICP. Hexavalent Chromium (Cr(VI)) compounds are collected using Polyvinyl Chloride (PVC) filters. MCEF filters have a high background for Cr(VI).

Chromium in the +6 oxidation state (i.e., Cr(VI) or Hexavalent Chromium), chromic acid, chromium trioxide, all chromates and dichromates must be collected on PVC filters, with backup pads. If other filter materials are used, the Cr(VI) may be reduced to the Cr(II) or Cr(III) states and thus give a diminished value for CrVI. Note: There is no need to separate the filter from the backup pad prior to shipping the sample. Simply ship the PVC filters in their sampling cassettes.

OSHA has issued a revised version of the OSHA ID-215 method for hexavalent chromium sampling. Method Number ID-215 (version 2), Control Number T-ID215-FV-02-0604-M. The significant modification (related to sample collection) in the method is that when using the 37 or 25 mm PVC filter with cellulose back-up pad for welding operations, or chromium plating operations, special handling requirements have been added.

A summary of the special handling requirements *for samples collected from welding or plating operations* follows:

- Samples collected on PVC filters from welding or plating operations must be shipped overnight to the CIHL within 24 hours of sampling.
- Samples collected on PVC filters from welding operations must be analyzed within 8 days of sampling or be stabilized at the CIHL upon receipt.
- Samples collected on PVC filters from chromium plating operations must be analyzed within 6 days of sampling or be stabilized at the CIHL upon receipt.
- Please make sure that the shop operation is plainly stated on your IH Air Sample Survey Form, e.g., welding, plating, painting, abrasive blasting. This allows the CIHL to verify that expedited analysis is not required but the examples of painting and abrasive blasting do NOT imply that samples arising from those operations require special handling or expedited analysis.

Your analytical results could potentially be jeopardized if the above requirements are not adhered to. The CIHLs will preserve the samples with the appropriate buffers when received in the CIHL if the samples cannot be analyzed within the days required by the new method changes.

## ENVIRONMENTAL LEAD SAMPLES

Both CIHLs are accredited by AIHA LAP, LLC under the Environmental Lead CIHL Accreditation Program (ELLAP) and accept paint chips and dust wipes for lead analyses.

## FIBER COUNTS AND ASBESTOS IDENTIFICATION

CIHLs performing asbestos analyses must be proficient in the appropriate quality assurance (QA) programs. For fiber counts and bulk asbestos identification the appropriate QA program is the AIHA Proficiency Analytical Testing (PAT) program. CIHL Norfolk is proficient in the PAT program and also accredited by AIHA LAP, LLC under the Industrial Hygiene Laboratory Accreditation Program (IHLAP) and accepts air and bulk samples for asbestos analyses.

## POLYCHLORINATEDBIPHENYLS (PCBs)

IH analysis of PCBs does not satisfy Toxic Substance Control Act (TSCA) requirements for waste disposal.

## SILICA (CRYSTALLINE SILICA) ANALYSIS

This method determines silica ( $\alpha$ -quartz and cristobalite) in respirable and total dust by the OSHA method. The sample filter used is a 5  $\mu$ m PVC filter. An SKC Cat No. 225-8-01 (low silica homopolymer PVC), the Omega SILICAL PVC filters, or equivalent low silica homopolymer PVC filter should be used. The respirable dust sample is collected at 1.7 LPM to obtain 800 to 1,000 liters of air. A smaller air volume may be used if filter loading greater than 2.0 milligrams is expected.

Bulk samples can be semi-quantitatively analyzed for  $\alpha$  - quartz and cristobalite.

## CONVERSION FACTORS

In a metal scan, Iron (Fe), Zinc (Zn) and Vanadium (V) concentrations (in  $\text{mg}/\text{m}^3$ ) are reported instead of the metal oxide concentrations (i.e.,  $\text{Fe}_2\text{O}_3$ ,  $\text{ZnO}$ , and  $\text{V}_2\text{O}_5$ ) for which one is sampling. Therefore, a conversion factor must be used to "convert" the reported result for the metal to the equivalent concentration of the metal oxide for comparison with the PEL/Threshold Limit Values (TLV) listed for the oxide. The following are examples of how to calculate a conversion factor and use it to calculate the concentration of metal oxide:

## CONVERSION OF ZINC TO ZINC OXIDE

Calculate the conversion factor -  $\text{MW of ZnO} / \text{MW of Zn} = 81.4 / 65.4 = 1.245$

Multiply the conversion factor times the result reported as Zn to obtain the amount of ZnO. The correction factor is applied to any Zn results reported by the lab that should be assessed as ZnO.

The OSHA PELs and American Conference of Governmental Industrial Hygienists (ACGIH) TLVs are for ZnO (zinc oxide); therefore, the conversion factor is used for results reported as Zn for ZnO exposures. The OSHA PELs are for total dust, or as a fume, and the ACGIH TLVs are for the respirable fraction. If sampling for ZnO as a dust is performed to compare against the TLV for ZnO as a respirable dust, it would then typically be sampled as a respirable dust.

Technically, that means sampling with a cyclone. (However, if the total dust result (typical sampling method for metal scan) is below the respirable TLV then there should not be an exposure problem since the sampling method would overestimate the respirable fraction. But, if the total dust sample result exceeds the TLV, then the IH should sample the respirable fraction to accurately assess ZnO as compared to the respirable TLV.) This discussion on respirable fractions does not affect ZnO total dust or fume results for comparison to the total dust or fume PELs.

### **CONVERSION OF VANADIUM TO VANADIUM PENTOXIDE**

Calculate the conversion factor - MW of  $V_2O_5$  / MW of  $V_2$  = 181.9 / 101.9 = **1.785**

Multiply the conversion factor times the result reported as V to obtain the amount of  $V_2O_5$ .

The correction factor is applied to any Vanadium (V) results reported by the lab that should be assessed as  $V_2O_5$ .

The OSHA PELs are for  $V_2O_5$  (vanadium pentoxide); therefore, the conversion factor is used for results reported as V for  $V_2O_5$  exposures. The OSHA PELs are for respirable dust, or as a fume. If sampling for  $V_2O_5$  as a dust is performed to compare against the OSHA PEL for  $V_2O_5$  as a respirable dust, it would then typically be sampled as a respirable dust.

Technically, that means sampling with a cyclone. (However, if the total dust result (typical sampling method for metal scan) is below the respirable PEL then there should not be an exposure problem since the sampling method would overestimate the respirable fraction. But, if the total dust sample result exceeds the PEL, then the IH should sample the respirable fraction to accurately assess  $V_2O_5$  as compared to the respirable PEL.) This discussion on respirable fractions does not affect  $V_2O_5$  fume results for comparison to the fume PEL. The ACGIH TLV is for  $V_2O_5$  as V; therefore, no conversion factor is needed.

## CONVERSION OF IRON TO IRON OXIDE

Calculate the conversion factor - MW of Fe<sub>2</sub>O<sub>3</sub>/MW of Fe<sub>2</sub> = 159.7 / 111.7 = 1.43

Multiply the conversion factor times the result reported as Fe<sub>2</sub> to obtain the amount of Fe<sub>2</sub>O<sub>3</sub>.

The correction factor is applied to any Fe<sub>2</sub> results reported by the lab that should be assessed as Fe<sub>2</sub>O<sub>3</sub>.

The OSHA PEL and ACGIH TLV is for Fe<sub>2</sub>O<sub>3</sub> (iron oxide), therefore, the conversion factor is used for results reported as Fe<sub>2</sub> for Fe<sub>2</sub>O<sub>3</sub> exposures. The OSHA PEL is for fume, and the ACGIH TLV is for the respirable fraction. If sampling for Fe<sub>2</sub>O<sub>3</sub> as a dust is performed to compare against the TLV for Fe<sub>2</sub>O<sub>3</sub> as a respirable dust, it would then typically be sampled as a respirable dust.

Technically, that means sampling with a cyclone. (However, if the total dust result (typical sampling method for metal scan) is below the respirable TLV then there should not be an exposure problem since the sampling method would overestimate the respirable fraction. But, if the total dust sample result exceeds the TLV, then the IH should sample the respirable fraction to accurately assess Fe<sub>2</sub>O<sub>3</sub> as compared to the respirable TLV.) This discussion on respirable fractions does not affect Fe<sub>2</sub>O<sub>3</sub> fume results for comparison to the fume PEL.

## CONVERSION OF CRVI TO CHROMATES (AS CrO<sub>3</sub>)

Calculate the conversion factor - MW of CrO<sub>3</sub>/atomic weight of CrVI = 99.9 / 51.9 = 1.92

Multiply the conversion factor times the result reported as CrVI to obtain the amount of CrO<sub>3</sub>.

The correction factor is applied to any CrVI results reported by the lab that should be assessed as CrO<sub>3</sub>.

- Chromic Acid (CAS # 7738-94-5): The OSHA PELs for chromates as CrO<sub>3</sub> apply only to any operations or sectors for which the exposure limit in the OSHA Cr(VI) standards for the various industries is stayed or is otherwise not in effect. The results reported by the CIHL when using a **PVC** filter are as total Cr(VI); therefore, the conversion factor is used to convert these sampling results to as CrO<sub>3</sub>, as needed for assessing these operations or sectors for chromate compounds where the OSHA Cr(VI) standards do not apply.
- Hexavalent Chromium Cr(VI) (CAS # 18540-29-9): However, **NO** conversion factor is used if sampling and assessing chromate compounds covered under the OSHA Cr(VI)

standards where the results are reported as Cr(VI). This is because the OSHA Cr(VI) standards' PEL is as Cr(VI) and not as CrO<sub>3</sub>. This also holds true when comparing Cr(VI) results reported from the lab to ACGIH TLVs for chromate compounds where the TLVs are as Cr(VI).

- **Note:** CIHL results reported for an **MCEF** filter are for "total Cr", that is, all forms of chromium. Therefore, you may overestimate certain chromium exposures if there are other forms of chromium generated by the process being evaluated. Also, Cr(VI) compounds cannot be determined if sampled on a MCEF; MCEF filters have a high background for Cr(VI).

## SOURCES FOR ANALYTICAL SUPPLIES

### MANUALS

The NIOSH analytical manuals may be obtained from:

<https://www.cdc.gov/niosh/docs/2003-154/default.html>

The OSHA analytical manuals may be obtained from:

<http://www.osha.gov/dts/sltc/methods/index.html>

ACGIH Publications

1330 Kemper Meadow Drive Cincinnati, OH 45240-1634

Phone: (513) 742-2020 FAX: (513) 742-3355

[Publications #4542, #4544 and #4545] <http://www.acgih.org/>

### FILTERS AND SORBENT TUBES

Filters and sorbent tubes may be obtained from several sources; however, this manual cites SKC order number for filters and tubes (listed in the SPECIAL INSTRUCTIONS column in the CIHL Sampling Guide), simply because of convenience and uniformity.

Special attention should be given to SKC Guide to NIOSH/OSHA Air Sampling Standards which is in the SKC Comprehensive Catalog and Air Sampling Guide (Request free copy from SKC.)

SKC, Inc. World Headquarters 863 Valley View Road

Eight Four, PA 15330-9614

Phone: (800) 752-8472 FAX: (800) 752-8476

Website: <http://www.skcinc.com/> SKC, Gulf Coast 9827

Whithorn Drive

Houston, TX 77095-5027

Phone: (800) 225-1309 FAX: (800) 752-4853

SKC, West

P.O. Box 4133

Fullerton, CA 92634-4133

Phone: (800) 752-9378 FAX: (800) 752-1127

Supelco, Inc. Supelco Park  
Bellefonte, PA 16823-0048  
Phone: (800) 247-6628 FAX: (800) 447-3044  
Technical information only phone: (800) 359-3041 Website: <http://www.sigma-aldrich.com/>

#### PASSIVE MONITORS

SKC, Inc. World Headquarters 863 Valley View Road  
Eight Four, PA 15330-9614  
Phone: (800) 752-8472 FAX: (800) 752-8476  
Website: <http://www.skcinc.com/>

SKC, Gulf Coast 9827 Whithorn Drive  
Houston, TX 77095-5027  
Phone: (800) 225-1309 FAX: (800)752-4853

SKC, West  
P.O. Box 4133  
Fullerton, CA 92634-4133  
Phone: (800) 752-9378 FAX: (800) 752-1127

3 M Company  
Occupational & Environmental Safety Division 3 M Center, Bldg 224-5S-04  
St. Paul, MN 55144-1000  
Phone: (800) 752-3623 (Federal System Group orders) Technical information only phone:  
(800) 243-4630 Website: <http://www.3m.com/>

#### SAMPLE COLLECTION BOTTLES, VIALS, AND SUPPLIES

##### GSA ADVANTAGE

Website: <https://www.gsaadvantage.gov> Government Scientific Source  
Website <https://www.govsci.com>

##### Supelco, Inc.

Supelco Park, Bellefonte, PA 16823-0048 Phone: (800) 247-6628  
Website: <http://www.sigma-aldrich.com/>

##### SKC, Inc.

863 Valley View RD  
Eighty Four, PA 15330-9614 Phone: (800) 752-8472  
Website: <http://www.skcinc.com/>

#### DUST WIPE MEDIA

##### Ghost Wipe

Available from Environmental Express, 490 Wando Park Blvd., Mt. Pleasant, CA 29464  
Phone: (800) 343-5319

Website: <http://www.envexp.com/>

NOTE:

The mention of specific company names and products does not constitute endorsement by the CIHLs, NMCFHPC, or Department of Navy (DoN). Similarly, the omission of a specific company name or product does not imply that they or their product is not recommended for use it only means that this is not and cannot be an all-inclusive listing.

## **ABBREVIATIONS**

C	Contract laboratory
N	Norfolk IH laboratory (CIHL East)
S	San Diego IH laboratory (CIHL West)
@	At the concentration of AMBERSORB. Special type of adsorption tube
aq	Aqueous
CAS#	Chemical Abstract Service registry number
CIHL	Comprehensive Industrial Hygiene Laboratory
CHROMOSORB	Special type of adsorption tube
CT	Charcoal tube (see special instructions for part number)
CV	Coefficient of Variation
FLORISIL	Special type of adsorption tube
FLT	Filter
GFF	Glass fiber filter
HOPCALITE	Special type of adsorption tube for Mercury vapor
ICP	Inductively Coupled Plasma (analyzes multiple metals per sample)
INHOUSE	Laboratory method developed within the organization
L	Liters
LPM	Liters per minute

LOD	Limit of Detection (an amount equal to three times the standard deviations of the analytical noise or three times that of a blank, whichever is more appropriate)
LOQ	Limit of Quantitation (the lowest concentration at which a contaminant can be reliably and accurately quantitated)
0.8 MCEF	Mixed cellulose ester filter, 0.8 micrometer pore size
mg/m <sup>3</sup>	Milligrams per cubic meter
ml	Milliliters
mm	Millimeter
MW	Molecular weight
NIOSH	National Institute for Occupational Safety and Health
NOS	Not otherwise specified
ORBO	Adsorption tube trade marked by Supelco
OSHA	Occupational Safety and Health Administration
OVS	OSHA Versatile Sampler--Special collection device for pesticides, available from SKC # ST 226-30-16.
ppm	Parts per million
PTFE	Polytetrafluoroethylene filter
PVC	Polyvinylchloride filter, 5 micrometer pore size
QCC	Quality Control Coordinator
SG	Silica gel sampling tube
ST	Sorbent tube
TENAX	Special type of adsorption tube
µm	Micrometer
XAD	Special type of adsorption tube

INDUSTRIAL HYGIENE SAMPLING GUIDE for COMPREHENSIVE INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

Alphabetical Listing

CIHL SAMPLING GUIDE 2024

SUBSTANCE	CAS NO	METHOD (modified) *not modified	LOQ* (ug)	SAMPLING MEDIA	SAMPLE** VOLUME (L)	SAMPLING RATE (LPM)	INSTRUCTIONS	LAB
ACETIC ACID	64-19-7	OSHA PV2119	6	CT (100/50)	48	0.2	ST 226-01 Not compatible with other organics.	C
ACETONE	67-64-1	NIOSH 1300	10	CT (100/50) 3M OVM, 575	0.5 - 3	0.01 - 0.2	ST 226-01, 575-002 or 3M 3520	ALL
ACETONE	67-64-1	OSHA 69	10	CT (130/65)	3	0.05	ORBO 91 Carbo-sieve S-III CMS	N
ACETONITRILE	75-05-8	NIOSH 1606	10	CT (400/200)	1 - 25	0.01 - 0.2	ST 226-09 Not compatible with other organics. Stable for at least 30 days at 5°C. Ship cold.	N
ACIDS, INORGANIC (HBr)	10035-10-6	OSHA ID-165SG	2	SG (400/200) prewashed, or ORBO 53	3 - 100	0.2 - 0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
ACIDS, INORGANIC (HCl)	7647-01-0	OSHA ID-174SG	1	SG (400/200) prewashed, or ORBO 53	7.5	0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
ACIDS, INORGANIC (HF)	7664-39-3	OSHA 110	1	0.8 um MCEF with treated backup pad	90 (TWA) 22.5 (STEL)	1.5	FLT 225-9001 Particulate F on MCE and HF on impregnated backup pad	N
ACIDS, INORGANIC (H3PO4)	7664-38-2	OSHA ID-165SG	2	SG (400/200) prewashed, or ORBO 53	3 - 100	0.2 - 0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
ACIDS, INORGANIC (H3PO4)	7664-38-2	OSHA 111	1	0.8 um MCEF	960	2	FLT 225-5 Remove filter and ship in glass vial; send blanks	N
ACIDS, INORGANIC (HNO3)	7697-37-2	OSHA ID-165SG	1	SG (400/200) prewashed, or ORBO 53	3 - 100	0.2 - 0.5	ST 226-10-03 (may contain high sulfate) Supelco 2-0265M is preferred; send blanks	ALL
ACIDS, INORGANIC (H2SO4)	7664-93-9	OSHA ID-165SG	3	SG (400/200) prewashed, or ORBO 53	96	0.2	ST 226-10-03 (Contains a high sulfate background) ORBO 53 (Supelco 20265) s preferred; send blanks	ALL
ACIDS, INORGANIC (H2SO4)	7664-93-9	OSHA ID-113	1	0.8 um MCEF	480	2	FLT 225-5 Remove filter and ship in glass vial.	ALL
ACRYLAMIDE	79-06-1	OSHA PV2004	2	XAD-7	120	1	ST 226-57	C
ACRYLONITRILE	107-13-1	NIOSH 1604	1	CT (100/50)	3.5- 20	0.01 - 0.2	ST 226-01 Not compatible with other organics.	N
ALDEHYDE SCREEN	Contact lab for list	NIOSH 2016 (Modified)	1	2,4-DNPH Silica Gel or GFF; Waters XPO SURE 2,4-DNPH Pouch media	1-15 12- 96	0.03-1.5 0.2 Long Term 1.5 Short Term	SKC ST 226-119, 226-119-7, 226-120, Waters WATO 47205 or UME <sub>x</sub> 100. Refrigerate & ship to laboratory promptly.	S
ALUMINUM and compounds as (Al) except Al <sub>2</sub> O <sub>3</sub>	7429-90-5	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF Wipe	5-100 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
ALUMINUM and compounds as (Al) except Al <sub>2</sub> O <sub>3</sub>	7429-90-5	OSHA ID-206	1	0.8 um PVC	480	2	225-803	N
AMMONIA	7664-41-7	NIOSH 6016	5	SILICA GEL/(SULFURIC ACID)	1.5-24	0.1-0.5	ST 226-10-06	C
AMYL ACETATE, iso-	123-92-2	NIOSH 1450	5	CT (100/50), OVM	1 - 10	0.01 - 0.2	ST 226-01 or 3510 Ship cold	ALL
AMYL ACETATE, n-	628-63-7	NIOSH 1450	5	CT (100/50), OVM	1 - 10	0.01 - 0.2	ST 226-01, or 3510 Ship cold	ALL
AMYL ACETATE, sec	626-38-0	NIOSH 1450	5	CT (100/50), OVM	1 - 10	0.01 - 0.2	ST 226-01, or 3510 Ship cold	ALL
AMYL ALCOHOL, iso	123-51-3	NIOSH 1405	10	CT (100/50), OVM	1 - 10	0.01 - 0.2	ST 226-01, or 3510 Not compatible with other organics.	ALL
ANTIMONY (Sb)	7440-36-0	NIOSH 7300 (S) OSHA ID-206 (N)	2	0.8 um MCEF Wipe	50-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
ARSENIC and compounds as As	7440-38-2	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF Wipe	30-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
ARSENIC and compounds as As	7440-38-2	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-5	N

\*\*Volumes are suggestions from the method.  
OVM and 575 are passive monitors. SKC produces 575 and 3M OVMS.

LOQ-Limit of Quantitation (subject to change)

Lab: All-Both labs. N-Norfolk. S-San Diego. C-Contract lab

INDUSTRIAL HYGIENE SAMPLING GUIDE for COMPREHENSIVE INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

Alphabetical Listing

CIHL SAMPLING GUIDE 2025

SUBSTANCE	CAS NO	METHOD (modified) <i>*not modified</i>	LOQ* (ug)	SAMPLING MEDIA	SAMPLE VOLUME (L)**	SAMPLING RATE (LPM)	INSTRUCTIONS	LAB
ASBESTOS IDENTIFICATION OF BULK MATERIAL		NIOSH 9002*	< 1 %	Bulk, Clear 4"x4" ZipLok	<10 Grams, 2x2x2 cm		4"x4" Zip-lok bag 8105-00-837-7753	N
BARIUM (Ba)	7440-39-3	NIOSH 7300	2	0.8 um MCEF wipe	50-2000NIOSH 480 OSHA	1.4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
BENZENE	71-43-2	OSHA 1005V2.1	2	CT (100/50),575, OVM	12 TWA 0.75 STEL	0.01 - 0.2	ST 226-01, 575-001, 575-002, or 3510	ALL
BENZYL ALCOHOL	100-51-6	OSHA PV 2009	10	XAD-7	24	0.2	ST 226-95 Not compatible with other organics.	ALL
BENZYL ALCOHOL	100-51-6	In-house contact lab	10	CT (100/50)	2-10	0.01-0.2	ST 226-01 or ST 226-09 Not compatible with other organics.	S
BENZYL CHLORIDE	100-44-7	NIOSH 1003	10	CT (100/50), OVM	10	0.1 - 0.2	ST 226-01, or 3510	N
BERYLLIUM and compounds as Be except for Beryllium oxide	7440-41-7	NIOSH 7300 (S) OSHA ID-206 (N)	0.05	0.8 um MCEF wipe	50-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
BERYLLIUM OXIDE	1304-56-9	OSHA125G		0.8 um MCEF	30-480	2	FLT 225-5	N
BISPHENOL A	80-05-7	OSHA 1018	0.4	GFF	240	1.0	FLT-225-7 Ship sample overnight with cold packs. Store sample in freezer.	C
BROMINE	7726-95-6	NIOSH 6011	1.6	1 Teflon pre-filter & 1 Silver membrane filter	8 - 360	0.3 - 1.0	FLT-225-9006 Protect from light	C
BROMOFORM (tribromomethane)	75-25-2	NIOSH 1003	10	CT (100/50), OVM	4 – 70 NIOSH 1 - 10 OSHA	0.01 - 0.2	ST 226-01or 3510	ALL
BROMOPROPANE, -1	106-94-5	NIOSH 1025	10	CT (100/50),575, OVM	1 - 12	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3M OVM	S
BROMOPROPANE, -2	75-26-3	NIOSH 1025	10	CT (100/50)	1 - 12	0.01 - 0.2	ST 226-01	S
BUTADIENE 1,3	106-99-0	OSHA 56 or NIOSH 1024	1	CT Treated OVM, or Coconut Charcoal	3 OSHA, 5-25 NIOSH	0.05 OSHA, NIOSH 0.01-0.5	ST 226-73, 3520 After sampling store in freezer and ship cold	C
BUTANONE, 2- (See Methyl Ethyl Ketone or MEK)	78-93-3	NIOSH 2500 or OSHA 1004	10	Anasorb 747 (140/70) 575 or OVM	0.25 - 12 NIOSH; 12 OSHA	0.01 - 0.2 NIOSH; 0.5 OSHA	ST 226-81A or 226-01, 575-002 or 3510. NIOSH Method compatible with MIBK or Acetone. OVM suggests refrigerating and to expedite shipping.	ALL
BUTOXYETHANOL (butyl cellosolve)	111-76-2	OSHA 83 or NIOSH 1403	10	CT (100/50), 575 or OVM	48 OSHA; 2-10 NIOSH	0.01- 0.05 NIOSH 0.1 OSHA	ST 226-01,575-002 or 3510 Not compatible with other organics. Store in FREEZER.	ALL
BUTYL ACETATE, iso-	110-19-0	NIOSH 1450	5	CT (100/50) or OVM	1 - 10	0.01 - 0.2	ST 226-01 or 3M OVM Ship cold	ALL
BUTYL ACETATE, n-	123-86-4	NIOSH 1450	5	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3M OVM Ship cold	ALL
BUTYL ACETATE, sec-	105-46-4	NIOSH 1450	5	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-001,575-002 or 3M OVM Ship cold	ALL
BUTYL ACETATE, tert-	540-88-5	NIOSH 1450	5	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3M OVM Ship cold	ALL
BUTYL ALCOHOL, iso-	78-83-1	NIOSH 1405	10	CT (100/50),OVM	2 - 10	0.01 - 0.2	ST 226-01 or 3510 Not compatible with other organics. Store in freezer	ALL
BUTYL ALCOHOL, n-	71-36-3	NIOSH 1405	10	CT (100/50),OVM	2- 10	0.01 - 0.2	ST 226-01, or 3510 Not compatible with other organics. Store in freezer	ALL
BUTYL ALCOHOL, sec-	78-92-2	NIOSH 1405	10	CT (100/50),OVM	2 - 10	0.01 - 0.2	ST 226-01 or 3510 Not compatible with other organics.	ALL

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INDUSTRIAL HYGIENE SAMPLING GUIDE for COMPREHENSIVE INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

CIHL SAMPLING GUIDE 2025

Alphabetical Listing

SUBSTANCE	CAS NO	METHOD (modified) <i>*not modified</i>	LOQ* (ug)	SAMPLING MEDIA	SAMPLE VOLUME (L)**	SAMPLING RATE (LPM)	INSTRUCTIONS	LAB
BUTYL ALCOHOL, tert-	75-65-0	NIOSH 1405	10	CT (100/50) <sub>2m</sub> OVM	2 - 10	0.01 - 0.2	ST 226-01 or 3510 Not compatible with other organics.	ALL
BUTYL GLYCIDYL ETHER (BGE)	2426-08-6	NIOSH 1616	10	CT (100/50),575, OVM	15 - 30	0.01-0.2	ST 226-01, 575-002, or 3510	N
BUTYL LACTATE	138-22-7	OSHA PV 2080	20	CT (100/50)	10	0.2	ST 226-01, Not compatible with other organics	N
CADMIUM and compounds as Cd	7440-43-9	NIOSH 7300 (S) OSHA ID-206 (N)	0.05	0.8 um MCEF Wipe	13-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
CADMIUM and compounds as Cd	7440-43-9	OSHA ID-206	0.05	0.8 um PVC	480	2	FLT 225-803	N
CADMIUM PANEL (Blood & Urine) (Includes Blood Cd, Urine Cd, Ur B2-Microglobulin.		AA-GFF + In-House Methods	0.3	EDTA vacutainer (Royal Blue Top)	3-mL Whole Blood; plus 5- mL random urine sample		Mix blood thoroughly immediately after collection; Adjust Urine pH to 6-8 after collection. Refrigerate urine & ship cool using overnight courier service	S
CALCIUM and compounds as Ca	7440-70-2	OSHA ID-206	1	0.8 um MCEF	5-200 NIOSH 480OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	N
CAMPHOR	76-22-2	NIOSH 1301	50	CT (100/50) or OVM	1 - 25	0.01 - 0.2	ST 226-01 3500/3520 Not compatible with other organics.	C
CARBARYL (Sevin)	63-25-2	OSHA 63	1	OSHA Versatile Sampler (OVS) XAD-2 + GFF	60	1.0	ST 226-30-16	ALL
CARBON BLACK	1333-86-4	NIOSH 5000	0.03	Tared 5um PVC or dual MCEF	30-570	1 - 2	FLT 225-8-01 or FLT 225-8202 (matched weight)	ALL
CARBON DISULFIDE	75-15-0	NIOSH 1600	10	CT (100/50) 575, OVM	2-25	0.01 - 0.2	ST 226-01 3500/3520, or 575-001Not compatible with other organics.	C
CARBON TETRACHLORIDE	56-23-5	NIOSH 1003	10	CT (100/50), 575, OVM	3-150	0.01 - 0.2	ST 226-01, 575-001, or 3M OVM	ALL
CATECHOL	120-80-9	OSHA PV 2014	30	OVS-7	100	1.0	ST 226-57	N
CHLORINE	7782-50-5	NIOSH 6011	0.6	1 Teflon pre-filter & 1 Silver membrane filter	2-90	0.3-1	FLT-225-9006 Protect from light	N
CHLOROBENZENE	108-90-7	NIOSH 1003	10	CT (100/50), 575, OVM	1.5 – 40	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3M OVM	ALL
CHLOROBENZYLIDENE MALONONITRILE (CS GAS)	2698-41-1	NIOSH P&CAM304	0.5	OVS-Tenax	90	1.5	ST 226-56	N
CHLOROFORM (Trichloromethane)	67-66-3	NIOSH 1003	5	CT (100/50), 575, OVM	1 - 50	0.01 - 0.2	ST 226-01, 575-001 or 3510	ALL
CHLORPYRIFOS ( <i>Dursban</i> )	2921-88-2	OSHA 62	1	OSHA Versatile Sampler (OVS)	480	1.0	ST 226-30-16	C
CHROMIUM and compounds as total Cr	7440-47-3	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF, wipe	5-1000 NIOSH OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost Wipe	ALL
CHROMIUM and compounds as total Cr	7440-47-3	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-803 Analysis cannot be combined with total chromium.	N

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CHROMIUM VI (Hexavalent Chromium, CrO <sub>3</sub> )	18540-29-9	OSHA ID-215V2	0.05	5 um PVC <u>PVC</u> Wipe	960	2	Send to the lab immediately after sampling. Chrome plating operations must be stabilized within 6 days of sampling. Welding operations must be stabilized within 8 days of sampling. Analysis cannot be combined with total chromium.	ALL
COBALT and compounds as Co	7440-48-4	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8um MCEF Wipe	25- 2000 NIOSH OSHA	480 1-4 NIOSH 2 OSHA	FLT 225-5 Ghost Wipe	ALL
COBALT and compounds as Co	7440-48-4	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-803	N
COPPER dust/Fume as Cu	7440-50-8	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8um MCEF Wipe	5-1000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5 Ghost wipe	ALL
COPPER dust/Fume as Cu	7440-50-8	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-803	N
CRESOL (ALL ISOMERS)	1319-77-3	NIOSH 2546	26	XAD-7 (100/50)	1 - 24	0.01- 0.1	ST 226-95	N
CUMENE (isopropyl benzene)	98-82-8	NIOSH 1501	10	CT (100/50), 575	1 - 30	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3510	ALL
CYANIDES, as HCN	74-90-8	NIOSH 6010	1	GF & Soda Lime (200/600)	2- 90	0.025-0.05	FLT 225-710 & ST 226-210 Must contact the laboratory prior to sampling. There is only a five day hold time from sampling for the filter	C
CYCLOHEXANE	110-82-7	NIOSH 1500	10	CT (100/50), 575, OVM	2.5-5	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3510	ALL
CYCLOHEXANOL	108-93-0	NIOSH 1405	10	CT (100/50), OVM	1 - 10	0.01 - 0.2	ST 226-01, or 3510 Not compatible with other organics.	ALL
CYCLOHEXANONE	108-94-1	NIOSH 1300	10	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-002, or 3510	ALL
CYCLOHEXANONE	108-94-1	OSHA 01	10	<u>Chromosorb</u> 106	10	0.2	ST 226-110	N
CYCLOHEXENE	110-83-8	NIOSH 1500	10	CT (100/50) or OVM	5-7	0.01 - 0.2	ST 226-01 or 3510	ALL
CYCLOHEXYLAMINE	108-91-8	OSHA PV 2016	2	COATED XAD-7	10	0.1	ST 226-98	N
CYCLONITE (RDX)	121-82-4	OSHA PV2135	1	GFF	120	1.0	FLT 225-7	N
DDVP ( <u>Dichlorovos</u> )	62-73-7	OSHA 62	0.7	OVS-2	480	1.0	ST 226-30-16	N
DESFLURANE	57041-67-5	OSHA 106	5	ANASORB 747 (140/70), 575,	3	0.05	ST 226-81A, and 575-002. Store samples at reduced temperatures. Ship cold.	ALL
DIACETONE ALCOHOL	123-42-2	NIOSH 1405	10	CT (100/50), <u>OVM</u>	1 - 10	0.01 - 0.2	ST 226-01, or 3520 <u>compatible</u> with some other alcohols. Not compatible with other organics.	ALL
DIAZINON	333-41-5	OSHA 62	1	OSHA Versatile Sampler (OVS) XAD-2 + GFF	480	1.0	ST 226-30-16	N
DIBUTYL PHTHALATE (DBP)	84-74-2	OSHA 104	5	OVS- <u>Tenax</u>	240	1.0	ST 226-56	N
DICHLOROBENZENE, 1,2- (ortho)	95-50-1	NIOSH 1003	10	CT (100/50), 575, OVM	1 -10	0.01 - 0.2	ST 226-01, 575-001, 575-002, 3510 Samples stable for 30 days.	ALL
DICHLOROBENZENE, 1,4- (para)	106-46-7	NIOSH 1003	10	CT (100/50), 575, OVM	1 - 8	0.01 - 0.2	ST 226-01, 575-001, 575-002, 3510 Samples stable for 30 days.	ALL
DICHLOROETHANE, 1,1-	75-34-3	NIOSH 1003	5	CT (100/50), 575, OVM	0.5 - 15	0.01 - 0.2	ST 226-01, 575-001 or 3M OVM	ALL
DICHLOROETHANE, 1,2- (Ethylene dichloride)	107-06-2	NIOSH 1003		CT (100/50), 575, OVM	1 - 50	0.01 - 0.2	ST 226-01, 575-001, or 3510 Samples stable for 30 days.	ALL

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DICHLOROETHYLENE, 1,2-	540-59-0	NIOSH 1003	10	CT (100/50),575, OVM	0.2- 5	0.01 - 0.2	ST 226-01, 575-001 or 3M OVM	S
DIESEL EXHAUST PARTICULATE		NIOSH 5040	2	QUARTZ PRECLEANED Quartz Filters Preloaded	142 L @ 40 µg/m3	2 - 4	Samples must be collected open faced or with a cyclone for even deposition across the filter. 225-401	C
DIESEL FUEL MARINE		NIOSH 1550 (N) OSHA 48 (S)	75	Large CT (200/400)	1-20	0.01-0.2	ST 226-09 Provide 2 ml bulk sample with the SDS. Ship bulk separately.	ALL
DIETHYLENE GLYCOL MONOBUTYL ETHER (BUTYL CARBITOL)	112-34-5	OSHA PV 2095	10	CT (100/50)	10	0.2	ST 226-01, Not compatible with other organics	N
DI-(2-ETHYL HEXYL) PHTHALATE (DEHP)	117-81-7	OSHA 104	10	OVS-Tenax	240 TWA 15 STEL	1.0	ST 226-56	N
DIETHYL PHTHALATE (DEP)	84-66-2	OSHA 104	10	OVS-Tenax	240 TWA 15 STEL	1.0	ST 226-56	N
DIETHYLENE TRIAMINE (DETA)	111-40-0	OSHA 60	1	XAD-2 with 1-Naethylisothiocyanate	10	0.1	ST 226-30-18	S
DIISOBUTYL KETONE	108-83-8	NIOSH 1300	10	CT (100/50) 575, OVM	1 – 10	0.01 - 0.2	ST 226-01,575-002 or 3510	ALL
DIMETHYLFORMAMIDE (DMF)	68-12-2	NIOSH 2004	10	SG (150/75)	15 80	0.01 - 1.0	ST 226-10	N
DIMETHYLACETAMIDE (N,N)	127-19-5	NIOSH 2004	10	SG (150/75)	15 - 80	0.01 - 1.0	ST 226-10	N
DIMETHYL PHTHALATE (DMP)	131-11-3	OSHA 104	10	OVS-Tenax	240 TWA 15 STEL	1.0	ST 226-56	N
DINITROTOLUENE, 2,4-	121-14-2	OSHA 44	1	GFF-Tenax	60	1.0	ST 226-56	N
DINITROTOLUENE, 2,6-	606-20-2	OSHA 44	1	GFF-Tenax	60	1.0	ST 226-56	N
DIOCTYL PHTHALATE (DOP)	117-84-0	OSHA 104	10	OVS-Tenax	240 TWA 15 STEL	1.0	ST 226-56	N
DIOXANE (1,4 Diethylene dioxide)	123-91-1	NIOSH 1602	10	CT (100/50), OVM	0.5 – 15 L	0.01 - 0.2	ST 226-01 or 3510	ALL
DIPROPYLENE GLYCOL METHYL ETHER	34590-94-8	OSHA 101	10	CT (100/50) or OVM	10	0.1	ST 226-01 OR 3510 Not compatible with other organics.	N
D-LIMONENE	5989-27-5	OSHA PV 2036	10	CT (100/50)	10	0.2	ST 226-01 Not compatible with other organics.	N
DIVINYL BENZENE	108-57-6	OSHA 89	70	CT TBC Treated, OVM	12	0.5	ST 226-73, 3510	N
DURSBAN (Chlorpyrifos)	2921-88-2	OSHA 62	1	OSHA Versatile Sampler (OVS) XAD-2	60-480	1.0	ST 226-30-16	N
DUST (RESPIRABLE)		NIOSH 0600	50	TARED 5um PVC + CYCLONE or PPI-IOM or Button Sampler (inhalable fraction)	20-400	1.7 nylon cyclone 2.2 HD cyclone 2.5 Al Cyclone 2.0 LPM PPI 2.0 LPM IOM 4.0 LPM Button	PVC, FLT 225-8201 or 225-8202 (matched wt) FIELD 225-3871-PW (PPI preloaded and pre-weighed) SKC 225-360 (Button Do not exceed 2mg dust on filter.	ALL
DUST (TOTAL NUISANCE)		NIOSH 0500	50	Tared 5um PVC Filter or matched weight MCEF	7-133	1.0 - 2.0	FLT 225-8201 or 225-8202 (matched wt) FIELD. Do not exceed 2mg dust on filter.	ALL
ELEMENTAL CARBON (Diesel Particulate)		NIOSH 5040	2-10	Quartz-Fiber (Heat treated)	142 L minimum Volume.	1-4	ST 225-401 (Call lab for special media) Media supplied & shipped. Samples must be collected open face or with a cyclone.	C
EPICHLOROHYDRIN	106-89-8	NIOSH 1010	10	CT (100/50)	2-30	0.01 - 0.2	ST 226-01	ALL

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ETHANOLAMINE (Aminoethanol)	141-43-5	OSHA PV2111	5	XAD-2 with 1-Naphthylisothiocyanate	10 L=TWA 1.5 L=STEL	0.1	ST 226-30-18	S
ETHOXYETHANOL, 2- (Ethyl cellosolve)	110-80-5	NIOSH 1403	10	CT (100/50)	1 - 6	0.01 - 0.05	ST 226-01 Not compatible with other organics. Store in FREEZER.	N
ETHOXYETHYL ACETATE, 2- (Cellosolve acetate)	111-15-9	NIOSH 1450	10	CT (100/50)	1 - 10	0.01 - 0.02	ST 226-01 Not compatible with other organics. Store in FREEZER. Ship cold.	N
ETHYL ACETATE	141-78-6	NIOSH1457	10	CT (100/50), 575, OVM	6	0.01 - 0.2	ST 226-01, 575-001, 575-002, or 3510	ALL
ETHYL ACRYLATE	140-88-5	OSHA 92	10	CT TBC Treated	12	0.05	ST 226-73 ship cold	N
ETHYL ACRYLATE	140-88-5	NIOSH 1450	10	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-002, or 3510 Ship cold	ALL
ETHYL ALCOHOL (ETHANOL)	64-17-5	NIOSH 1400	10	CT (100/50), 575, OVM	0.1 - 1.0	0.01-0.05	ST 226-01, 575-002, 3520 Not compatible with other organics. Refrigerate shipment.	ALL
ETHYL BENZENE	100-41-4	NIOSH 1501	5	CT (100/50), 575, OVM	1 - 24	0.01 - 0.2	ST 226-01, 575-001, 575-002, 3510	ALL
ETHYL BUTYL KETONE (3-heptanone)	106-35-4	NIOSH 1301	10	CT (100/50), OVM	1 - 25	0.01 - 0.2	ST 226-01, 3510	ALL
ETHYL ETHER	60-29-7	NIOSH 1610	10	CT (100/50), OVM	0.25 - 3.0	0.01 - 0.2	ST 226-01 or 3520 Not compatible with other organics. Stable for 14 days per method.	ALL
ETHYL ETHOXY PROPIONATE	763-69-9	OSHA PV2025	2.4	CT (100/50)	10	0.2	ST 226-01 Not compatible with other organics.	N
ETHYL FORMATE	109-94-4	NIOSH 1452	10	CT (100/50), 575, OVM	10	0.01 - 0.2	ST 226-01, 575-001 or 3510	S
ETHYLENE DIAMINE (EDA)	107-15-3	OSHA 60	3.7	XAD-2 with 1-Naphthylisothiocyanate	10	0.1	ST 226-30-18	S
ETHYLENE DICHLORIDE (1,2-Dichloroethane)	107-06-2	NIOSH 1003	5	CT (100/50)	1 -50 (3 optimum)	0.01 - 0.2	ST 226-01. Samples stable for 30 days.	ALL
ETHYLENE GLYCOL	107-21-1	NIOSH 5523	10	OVS-XAD (200/100)	5 - 60	0.5 - 2.0	ST 226-57	N
ETHYLENE GLYCOL DINITRATE (EGDN)	628-96-6	NIOSH 2507	0.6	Tenax GC (100/50)	3 - 100	0.2-1.0	Supelco 2-0832 (ORBO 402) or SKC 226-35-03	C
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	112-07-2	OSHA 83	7.2	CT (100/50)	48	0.1	ST 226-01 Not compatible with other organics. Store samples cold	N
ETHYLENE OXIDE	75-21-8	OSHA 49 OR OSHA 1010V2	2	OVM, ANASORB 747 TREATED HBr	15 minutes - 8 hours	0.0493	3M 3551 EtQ Monitor or 226-178 before sampling store media in freezer. After sampling refrigeration.	C
FIBER COUNT (Personal Monitoring or Area Clearance Sampling)		NIOSH 7400	5.5 f/100 fids	0.8 um MCEF (25 mm)	400	0.5 - 2.5 (Pers) 1.0- 16 (Area)	FL/CL 225-321 or 225-321A Adjust volume for fiber density = 100-1300 f/mm2. Do not overload filter.	N
FIBROUS GLASS (As Total Nuisance Dust)		NIOSH 0500	50	Tared 5um PVC Filter or matched weight MCEF	7 - 133	1.0 - 2.0	FLT 225-8-01 or 225-8202 (matched wt)	N
FIBROUS GLASS (by fiber count)		NIOSH 7400	5.5 f/100 fids	0.8 um MCEF (25 mm)	400	0.5 - 2.5	FL/CL 225-321 or 225-321A Adjust volume for fiber density = 100-1300 f/mm2. Do not overload filter.	N

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FORMALDEHYDE	50-00-0	NIOSH 2016	1	2,4-DNPH Silica Gel <u>umex</u>	1-15	0.03-1.5	SKC ST 226-119 and 226-119-7, UMAX. Refrigerate & ship to lab promptly.	ALL
FORMALDEHYDE	50-00-0	NIOSH 2016	1	Waters XPO SURE; 2,4-DNPH Pouch media	22.5 to 96	0.2 Long Term 1.5 Short Term	Waters WATO 47205. Refrigerate & ship to lab promptly.	ALL
GASOLINE	8006-61-9	NIOSH 1550	75	<u>CI</u> (100/50) OVM	1.3- 20	0.01 - 0.2	ST 226-01, or 3M OVM 3510 Provide 2ml bulk sample. Ship bulk separately.	N
GASOLINE	8006-61-9	OSHA 48	50	CT (100/50)	10	0.01-0.2	ST 226-01 or 3M OVM Provide 2ml bulk sample. Ship bulk separately.	S
GLUTARALDEHYDE	111-30-8	NIOSH 2532	0.5	2,4-DNPH Silica Gel	1-30	0.05-0.5	SKC ST 226-119 or WATO 47205	ALL
GLUTARALDEHYDE	111-30-8	OSHA 64	0.5	2,4-DNPH GFFs	15 -480	1.0	SKC 225-9003	N
<u>HEPTANE, n-</u>	142-82-5	NIOSH 1500	10	<u>CI</u> (100/50),575, OVM	4	0.01 - 0.2	ST 226-01 575-001, 575-002 or 3510	ALL
HEPTANONE, 3- (Ethyl Butyl Ketone)	106-35-4	NIOSH 1301	10	CT (100/50), OVM	1 - 25	0.01 - 0.2	ST 226-01 or 3510	ALL
HEPTANONE, 2- (Methyl n-Amyl Ketone)	110-43-0	NIOSH 1301	10	CT (100/50),575, OVM	1 - 25	0.01 - 0.2	ST 226-01,575-002 or 3510	ALL
HEXACHLOROETHANE	67-72-1	NIOSH 1003	10	CT (100/50)	3-70	0.01 - 0.2	ST 226-01 or 3M OVM	S
HEXAMETHYLENE DIISOCYANATE (HDI)	822-06-0	OSHA 5002	1	Treated 37mm GFF	15	1.0	FLT 225-9002 or Call LAB for coated filters; Sample open faced. Keep media cold and ship cold.	N
HEXAMETHYLENE DIISOCYANATE (HDI)	822-06-0	OSHA 5002 (Modified)	0.35	Treated 37mm GFF	15 - 240	1.0	Call LAB for coated filters; Sample open faced.	S
HEXAMETHYLENE DIISOCYANATE (HDI Oligomers)	28182-81-2	OSHA 5002 (Modified)	1	Treated 37mm GFF	15 - 240	1.0	Call LAB for coated filters; Sample open faced.	S
HEXAMETHYLENE DIISOCYANATE BIURET (HDIB)	4035-89-6	OSHA PV 2030	1.1	Treated 37mm GFF	15	1.0	FLT 225-9002 or Call LAB for coated filters; Sample open faced. Keep media cold and ship cold.	N
HEXAMETHYLENE DIISOCYANATE HOMOPOLYMER	28182-81-2	OSHA PV 2125	0.35	Treated 37mm GFF	15	1.0	Call LAB for coated filters; Sample open faced. Keep media cold and ship cold.	N
HEXANE, n-	110-54-3	NIOSH 1500	10	CT (100/50), <u>575 OVM</u>	4	0.01 - 0.2	ST 226-01,575-001, 575-002 or 3M OVM	ALL
HEXANONE, 2- (Methyl n-Butyl Ketone or MBK)	591-78-6	NIOSH 1300	10	CT (100/50),575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-002, or 3M OVM	ALL
HEXONE (Methyl Isobutyl Ketone or MIBK)	108-10-1	NIOSH 1300	10	CT (100/50),575, OVM	1 - 10	0.01 - 0.2	ST 226-01,575-002 or 3M OVM Store refrigerated after sampling and ship cold.	ALL
HEXYLENE GLYCOL	107-41-5	OSHA PV2101	10	CT (100/50)	3	0.2	ST 226-01, Not compatible with other organics	N
HYDROGEN CYANIDE, as CN	74-90-8	NIOSH 6010	1	Soda Lime (200/600)	2 - 90	0.05-0.2	ST 226-210	C
HYDROGEN CHLORIDE	7647-01-0	OSHA 174SG	1	SG (400/200) prewashed, or ORBO 53	7.5	0.2 - 0.5	ST 226-10-03 (may contain high sulfate) <u>Supelco 2-0265M</u> is preferred; send blanks	ALL
HYDROGEN FLUORIDE	7664-39-3	OSHA ID 110	1	0.8 um MCEF	90 (TWA) 22.5 (STEL)	1.5	FLT 225-5 or 225-9001	N
HYDROGEN SULFIDE	7783-06-04	NIOSH 6013	11	CT (400/200), washed, sulfur-free	1.2 - 40	0.1 - 1.5 recommend 0.2	<u>Supelco</u> ORBO 34	S

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CIHL SAMPLING GUIDE 2024

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HYDROGENATED MDI (HMDI, not HDI)	5124-30-1	OSHA PV 2092	0.7	Treated 37mm GFF	60	1.0	FLT 225-9002. Call LAB for coated filters; Sample open faced. Note: HMDI is not the same chemical as HDI Keep media cold and ship cold.	N
HYDROQUINONE	123-31-9	NIOSH 5004	10	0.8 um MCEF	30 -180	1 - 3	FLT 225-5 Immediately after sampling, field desorb the filter in glass bottle with 10 mL of 1% acetic acid and ship.	C
IRON FUME and particulate as Fe	1309-37-1	NIOSH 7300 (S) OSHA 206 (N)	5	0.8 um MCEF, wipe	5-100 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5; Ghost Wipe	ALL
IRON FUME and particulate as Fe	1309-37-1	OSHA 206	5	0.8 um PVC	480	2 OSHA	FLT 225-803	N
ISOFLURANE	26675-46-7	OSHA 103	5	ANASORB 747 (140/70), 575, OVM	12	0.05	ST 226-81A, 575-002, OR 3510 Store samples at reduced temperatures. Ship cold.	ALL
ISOPHORONE	78-59-1	NIOSH 2508	20	CT (100/50)	2 - 25	0.01 - 1.0	ST 226-81A	N
ISOPHORONE DIISOCYANATE	4098-71-9	OSHA PV 2092	0.3	Treated 37mm GFF	60	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced. Keep media cold and ship cold.	N
ISOPHORONE DIISOCYANATE	4098-71-9	OSHA 5002	0.3	Treated 37mm GFF	60	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced. Keep media cold and ship cold.	S
JP4	50815-00-4	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3 -20	0.01 - 0.2	ST 226-01 Provide 1 ml bulk sample with the SDS. Send Bulk separate from samples.	ALL
JP5	64741-77-1	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3 - 20	0.01 - 0.2	ST 226-01 Provide 1 ml bulk sample with the SDS. Send Bulk separate from samples.	ALL
JP8	64742-81-0	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3 - 20	0.01 - 0.2	ST 226-01 Provide 1 ml bulk sample with the SDS. Send Bulk separate from samples.	ALL
KEROSENE	8008-20-6	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3 - 20	0.01 - 0.2	ST 226-01 Provide 2 ml bulk sample. Send Bulk separate from samples. Please provide SDS.	ALL
LEAD in Bulk Paint	7439-92-1	NIOSH 7300 (S) OSHA ID-206 (N)	0.01%	Dry paint chips	500 mg (~size of two quarters)	N/A	Ship dry paint chip material in 4"x4" Zip- <del>lok</del> bag 8105-00-837-7753 or use a sample vial.	ALL
LEAD in Dust Wipes	7439-92-1	NIOSH 7300 (S) OSHA ID-206 (N)	1-10 ug	Ghost Wipes--(Pre-moistened)	Do either the IH 10 x 10 cm or the HUD 1 ft sq wipe area	Include 2 Blank wipes per batch.	Environmental Express Cat # 4210. Ship each wipe in a sample vial. Must be a hard wall container.	ALL
LEAD in Air and inorganic compounds as Pb	7439-92-1	NIOSH 7300 (S) OSHA ID-206 (N)	10.5 (S)	0.8 um MCEF	50-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
LEAD in Air and inorganic compounds as Pb	7439-92-1	OSHA ID-206 (N)	1	0.8 um PVC	480	2 OSHA	FLT 225-803	N
LEAD In blood	7439-92-1	NIOSH 8003 lab modified	< 3 ug/dL	K <sub>2</sub> EDTA trace metal vacutainer	3 ml Whole Blood		Mix thoroughly immediately after collection; refrigerate shipment using overnight courier service. Do not ship on dry ice.	ALL
LITHIUM	7439-93-2	OSHA ID-206	5	0.8 um MCEF	100	2 OSHA	FLT 225-5; Collect separately	N
MAGNESIUM OXIDE FUME as Mg	1309-48-4	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	5-67 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
MAGNESIUM OXIDE FUME as Mg	1309-48-4	OSHA ID-206 (N)	1	0.8 um PVC	480	2	FLT 225-803	N
MALATHION	121-75-5	OSHA 62	0.5	OSHA Versatile Sampler (OVS) XAD-2	60	1	ST 226-30-16	C
MANGANESE (Mn)	7439-96-5	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCE, wipe	5-200 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5, Ghost wipe	ALL
MERCURY PARTICULATE as Hg	7439-97-6	OSHA ID-145	0.05	0.8 um MCEF	10	2	FLT 225-5	C

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Mercury in wipe	7439-97-6	OSHA ID-145	0.1	Ghost wipe			Ghost wipe/ <del>paint</del> tests	C
MERCURY VAPOR as Hg	7439-97-6	NIOSH 6009	0.05	ANASORB C300 (200mg)	2 - 100	0.15 - 0.25	ST 226-17-1A Send two unexposed for blanks	S
MERCURY in urine	7439-97-6	NIOSH P&CAM165 lab modified	5 ug/L	Drug screening bottle			Immediately add 100 milligrams potassium persulfate as preservative. Ship refrigerated using overnight courier service.	S
MESITYL OXIDE	141-79-7	NIOSH 1301	2	CT (100/50), 575, or OVM	25	0.2	ST 226-01 or 3500/3520, 575-001	C
METAL SCAN-ICP (14 Metals) (Al, As, Cd, Co, Cr, Cu, Fe, Mo, Mn, Ni, Pb, Sr, V, Zn)		NIOSH 7300 (S) OSHA ID-206 (N)	1-5 call lab	0.8 um MCEF, PVC filters, PVC wipe	480	2	Standard metals for cutting, welding, abrasive blasting operations. Additional metals can also be added by request.	S
METAL SCAN-ICP (14 Metals) (Al, As, Be, Cd, Co, Cr, Cu, Fe, Mo, Mn, Ni, Pb, Sr, V, Zn)		NIOSH 7300 (S) OSHA ID-206 (N)	1-5 call lab	0.8 um MCEF, PVC wipe	480	2	Standard metals for cutting, welding, abrasive blasting operations. Additional metals can also be added by request.	N
METHANOL (Methyl Alcohol)	67-56-1	NIOSH 2000 or OSHA 5001	10	SG (100/50) or Anasorb 747	1 - 5	0.02 - 0.2	ST 226-51 Not compatible with other organics. Use larger tubes when high quantities of methanol are expected ST 226-10. ST 226-82 for OSHA 5001	ALL
METHOXYETHANOL, 2- (Methyl cellosolve)	109-86-4	NIOSH 1403	10	CT (100/50) OVM	6 - 50	0.01 - 0.5	ST 226-01 or 3510 Not compatible with other organics. Store in FREEZER. Ship cold.	N
METHOXYETHANOL, 2- (Methyl cellosolve)	109-86-4	OSHA 53	10	CT (100/50), OVM	10	0.1	ST 226-01 or 3510 Not compatible with other organics. Store in FREEZER. Ship cold.	N
METHOXYETHYL ACETATE, 2-	109-49-6	OSHA 53	10	CT (100/50)	10	0.1	ST 226-01 Not compatible with other organics. Store in FREEZER. Ship cold.	N
METHYL ACETATE	79-20-9	NIOSH 1458	10	CT (100/50), OVM	7	0.01 - 0.2	ST 226-01, or 3520. Store in refrigerator and ship cold.	ALL
METHYL CHLOROFORM (1,1,1-Trichloroethane)	71-55-6	NIOSH 1003	10	CT (100/50)	0.1-8	0.01 - 0.2	ST 226-01. Samples stable for 30 days.	ALL
METHYL ETHYL KETONE (2-Butanone or MEK)	78-93-3	NIOSH 2500	10	Anasorb 747 (140/70) 575, OVM	0.25 - 12	0.01 - 0.2	ST 226-81A, 575-002 or OVM. NIOSH Method compatible with MIBK or Acetone	ALL
METHYL ETHYL KETONE (2-Butanone or MEK)	78-93-3	OSHA 1004	10	OVM, 575			575-002, OVM	N
METHYL ISOBUTYL KETONE (MIBK) HEXONE	108-10-1	NIOSH 2555 or OSHA 1004	10	ANASORB 747 (140/70)	0.25-12 NIOSH 12 OSHA	0.01 - 0.2 NIOSH 0.05 OSHA	ST 226-81A. NIOS H Method compatible with MEK or Acetone. Refrigerate samples	ALL
METHYL ACRYLATE	96-33-3	OSHA 92	10	CT TBC Treated 575, OVM	12	0.05	ST 226-73, 575-002 or 3510	N
METHYLAL	109-87-5	NIOSH 1611	10	CT (100/50)	1 - 3	0.01 - 0.2	ST 226-01 Not compatible with other organics.	N
METHYLAMINE	74-89-5	NIOSH 2010	1	Silica	3-30	0.1-1.0	ST 226-10 or 226-15	C
METHYLCYCLOHEXANE	108-87-2	NIOSH 1500	10	CT (100/50), 575, OVM	4	0.01 - 0.2	ST 226-01, 575-002 or OVM	ALL
METHYLENE BIS-CHLOROANILINE, 4,4',2- (MOCA)	101-14-4	OSHA 71	0.05	GFF Treated	100	1	FLT 225-9004 Transfer to vial w/ 2ml DI water.	C
METHYLENE BISPHENYL ISOCYANATE, 4,4'- (MDI)	101-68-8	OSHA 47	0.5	Treated 37mm GFF	15 - 240	1.0	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	N
METHYLENE BISPHENYL ISOCYANATE, 4,4'- (MDI)	101-68-8	OSHA 47 & OSHA 5002	0.5	Treated 37mm GFF	15- 240	1.0	Call LAB for coated filters; Sample open faced.	S

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METHYLENE CHLORIDE (Dichloromethane)	75-09-2	NIOSH 1005	2	Two CT (100/50), 575, OVM	0.5 – 2.5	0.01 - 0.2	ST 226-01,575-001 OR 3M OVM Tubes in series; separate & cap ship to LAB. Samples are stable for 30 days.	ALL
METHYLENE CHLORIDE (Dichloromethane)	75-09-2	OSHA 1025		Anasorb 747	12 TWA 0.75 STEL	0.050	ST 226-81A	
METHYLENE DIANILINE, 4,4'-	101-77-9	OSHA 57	0.01	GFF Treated	100	1.0	FLT 225-9004 Transfer to vial w/ 2ml DI water.	N
METHYL ISOAMYL KETONE	110-12-3	OSHA PV2042	10	CT (100/50),575 OVM	10	1.0	ST 226-01,575-002 OR 3510 Ship cold.	ALL
METHYL METHACRYLATE	80-62-6	OSHA 94	2	CT TBC Treated	3	0.05	ST 226-73 Store samples cold.	ALL
METHYL-2-PYRROLIDINONE	872-50-4	OSHA PV2043	2	CT (100/50)	10	0.2	ST 226-09	C
MINERAL SPIRITS	8052-41-3	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3 – 20	0.01 - 0.2	ST 226-01 Provide 2 ml bulk sample with the SDS. Send bulk separately from samples.	ALL
MOLYBDENUM (Mo)	7439-98-7	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	5-67 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
MOLYBDENUM (Mo)	7439-98-7	OSHA ID-206	1	0.8 um PVC	480 OSHA	2	FLT 225-803	N
MORPHOLINE	110-91-8	NIOSH 2010 OSHA PV2123	0.4 10	silica gel XAD-7, phosphoric acid treated	20 L  10	≤0.2  0.1	ST 226-10 or 226-15  ST 226-98	C
NAPHTHALENE	91-20-3	OSHA 35	4	CHROMOSORB 106 (100/50)	10	0.2	ST 226-110	ALL
NAPHTHAS (REFINED PETROLEUM SOLVENTS)	8030-30-6	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50), OVM	1.3– 20	0.01 - 0.2	ST 226-01 OR OVM Provide 2 ml bulk sample. Send bulk separately from samples.	ALL
NICKEL (Ni)	7440-02-0	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF, wipe	5-1000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5, Ghost wipe	ALL
NICKEL (Ni)	7440-02-0	OSHA ID-206	1	0.8 um PVC	480 OSHA	2	FLT 225-803	N
NITROGEN DIOXIDE	10102-44-0	OSHA ID-182	1	Molecular Sieve Tube	3	0.2	ST 226-40-02	ALL
NITROGEN DIOXIDE / NITRIC OXIDE (NOX)	10102-43-9	OSHA ID-182 & OSHA ID-190	1	Molecular Sieve Tube	3	0.01 - 0.025	ST 226-40A	ALL
NITROGLYCERIN (NG)	55-63-0	NIOSH 2507 & OSHA 43	0.6	TENAX (100/50)	3-100	0.2 - 1.0	ST 226-35-03	N
NITROPROPANE, 1-	108-03-2	OSHA 46	0.4	XAD-4 (80/40)	4	0.01 - 0.1	ST 226-93	S
NITROPROPANE, 2-	79-46-9	OSHA 46	0.4	XAD-4 (80/40)	4	0.01 - 0.1	ST 226-93	S
NONANE	111-84-2	NIOSH1500	10	CT (100/50),575 or OVM	4	0.01-0.2	ST 226-01, 575-002 OR 3510	N
N-METHYL-2-PYRROLIDINONE	872-50-4	OSHA PV 2043	10	CT (100/50), 575, OVM	10	0.2	ST 226-01, 575-001 or 3520. Not compatible with other organics (PV2043)	ALL
OCTANE, n-	111-65-9	NIOSH 1500	10	CT (100/50) 575, OVM	4	0.01 - 0.2	ST 226-01, 575-001, 575-002 or 3520	ALL
OIL MIST, (MINERAL and others)		NIOSH 5524	50	PTFE-2 um (Clean)-PW	960	2	Call LAB for media. Provide 2 ml bulk mineral oil sample with the SDS.	C
ORGANIC SCREEN	ASK LAB	IN HOUSE METHOD		CT (100/50)	2-25	0.01-0.2	ST 226-01 OR OVMS	ALL

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OZONE	10028-15-6	OSHA ID 214	1	Two Treated GFF (nitrite- impregnated) Arial	90-120	0.25 – 0.5	Call LAB for instructions on filters. Special order limited shelf filters: SKC 225-9014 and send 4 extras.	N
PARACHLOROBENZOTRIFLUORIDE	98-56-6	NIOSH 1026	15	CT	0.1-10	0.01-0.2	ST 226-01	N
PARATHION	56-38-2	OSHA 62	1	OVS XAD -2 + GFF	480	1.0	ST 226-30-16	C
PARTICULATES <u>N,O,R</u>		NIOSH 0500	50	Tared 37-mm, 5 µm PVC filter	7 L @ 15 mg/m3 - 133 L 15 mg/m3	1 to 2 L/min	FLT 225-5-37	
PENTACHLOROPHENOL (PCP)	87-86-5	OSHA 39/45	1	GFF + two XAD-7 (80/40)	48	0.01 – 0.2	ST 226-97 & FLT 225-7	C
PENTANE, n-	109-66-0	NIOSH 1500	10	CT (100/50), 575, OVM	4	0.01-0.2	ST 226-01, 575-001 or OVM	ALL
PENTANONE, 2- (Methyl Propyl Ketone)	107-87-9	NIOSH 1300	10	CT (100/50),575, OVM	1 – 10	0.01 – 0.2	ST 226-01, 575-002, or OVM	ALL
PERCHLOROETHYLENE (Tetrachloroethylene)	127-18-4	NIOSH 1003	5	CT (100/50), 575, OVM	1.0 – 40	0.01 – 0.2	ST 226-01, 575-002, or 3M OVM	ALL
PERMETHRIN	52645-53-1	OSHA In-House	1	37mm GFF	60	1.0	ST 225-7	N
PETROLEUM DISTILLATE FRACTIONS	8002-05-9	OSHA 48	50	CT (100/50)	3	0.2	ST 226-01. Provide 2 mL bulk sample.	S
PETROLEUM ETHER	8032-32-4	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50)	1.3-20 NIOSH OSHA	0.01-0.2 NIOSH 0.2 OSHA	ST 226-01. Provide 2 mL bulk sample. Send bulk separately. Provide SDS with bulk sample.	ALL
PHENOL	108-95-2	OSHA 32	1	XAD-7 (100/50)	24	0.1	ST 226-95 Not compatible with other organics.	ALL
PHENYL-1-CYCLOHEXENE, 4-	4994-16-5	OSHA IN HOUSE	1	CT (100/50)	10	0.2	ST 226-01	C
PHENYL GLYCIDYL ETHER (PGE)	122-60-1	NIOSH 1619	10	CT (100/50)	80 - 150	0.01 - 1.0	ST 226-01 OR 3M OVM	N
POLYNUCLEAR AROMATIC HYDROCARBONS (PNAH)		NIOSH 5506	0.2	PTFE + XAD2 (150/75)	200 - 1000	2	FLT 225-17-07 & ST 226-30-04 Ship immediately in Aluminum foil wrapped glass vial.	C
POTASSIUM (K)	7440-09-7	NIOSH 7303	10	0.8 um MCEF/PVC	30-960	1 - 4	FLT 225-5; Collect separately.	C
PROPYL ACETATE, iso-	108-21-4	NIOSH 1454	10	CT (100/50)	0.1-9	0.01 - 0.2	ST 226-01	ALL
PROPYL ACETATE, n-	109-60-4	NIOSH 1450	10	CT (100/50), 575, OVM	1 - 10	0.01 - 0.2	ST 226-01, 575-001, OR OVM. Ship cold	ALL
PROPYL ALCOHOL, iso	67-63-0	NIOSH 1400	10	CT (100/50)	0.3 - 3	0.01 - 0.2	ST 226-01 Not compatible with other organics. Store in FREEZER. Ship cold.	ALL
PROPYL ALCOHOL, n-	71-23-8	NIOSH 1401 & 1405	10	CT (100/50)	1 - 10	0.01 - 0.2	ST 226-01 Not compatible with other organics. Store in FREEZER. Ship cold.	ALL
PROPYLENE GLYCOL DINITRATE (PGDN OR OTTO FUEL)	6423-43-4	NIOSH 2507	0.5	Tenax (100/50)	3-100	0.2 - 1.0	ST 226-35-03 2 blanks are required. Not compatible with other organics.	ALL
PROPYLENE GLYCOL ETHYL ETHER	1569-02-4	OSHA 99	10	CT (100/50)	10	0.01	ST 226-01 Not compatible with other organics.	N
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2	OSHA 99	10	CT (100/50)	10	0.1	ST 226-01 Not compatible with other organics.	N
PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE	108-65-6	OSHA 99	10	CT (100/50), OVM	10	0.1	ST 226-01, OR3510 Not compatible with other organics.	ALL
PYRETHRUM	8003-34-7	OSHA 70	1	OSHA Versatile Sampler (OVS) XAD-2 + GFF	60	1.0	ST 226-30-16	ALL

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PYRIDINE	110-86-1	NIOSH 1613	20	CT (100/50)	18 - 150	0.01 - 1.0	ST 226-01 Not compatible with other organics.	S
RDX (Cyclonite)	121-82-4	OSHA In-House	1	GFF	120	1	FLT 225-7	N
SELENIUM COMPOUNDS as (Se)	7782-49-2	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	13-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
SELENIUM COMPOUNDS as (Se)	7782-49-2	OSHA ID 206	1	0.8 um PVC	480	2	FLT 225-803	N
SEVIN (Carbaryl)	63-25-2	OSHA 63	1	OSHA Versatile Sampler (OVS) XAD-2 + GFF	60	1	ST 226-30-16	C
SEVOFLURANE	28523-86-6	OSHA 103	5	ANASORB 747 (140/70)	12	0.05	ST 226-81 A	ALL
SILICA (CRYSTALLINE, CRISTOBALITE)	14464-46-1	OSHA ID-142 NIOSH 7500	10	5 um PVC + Cyclone PPI or IOM no cyclone	816 400-1000 L	Nylon = 1.7; Aluminum = 2.5; HD cyclone = 2.2	FTL 225-5-37-P; CYCL 225-105 FLT 225-8202 with dust analysis FLT 225-803 (not pre-weighted)	S
SILICA (CRYSTALLINE, QUARTZ)	14808-60-7	OSHA ID-142 version 4 NIOSH 7500	10	5 um PVC + Cyclone PPI or IOM no cyclone	816 400-1000 L	Nylon = 1.7; Aluminum = 2.5; HD cyclone = 2.2	FTL 225-5-37-P; CYCL 225-105 FLT 225-8202 with dust analysis FLT 225-803 (not pre-weighted)	S
SILVER and soluble compounds as Ag	7440-22-4	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	250-2000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
SODIUM (Na)	7440-23-5	NIOSH 7303	10	0.8 um MCEF	30-960	1 - 4	FLT 225-5; Collect separately	C
SODIUM HYDROXIDE as Hydroxide <i>can request Na, Li, or K</i>	1310-73-2	NIOSH 7401-titration test	20	1.0 um PTFE	70-1000	1 - 4	FLT 225-1715. Acid aerosols may cause a negative interference. <i>Does not differentiate between metal types.</i>	C
STODDARD SOLVENT (PD-680)	8052-41-3	NIOSH 1550 (N) OSHA 48 (S)	75	CT (100/50), 575, OVM	1.3 - 20	0.01 - 0.2	ST 226-01, 575-001 OR 3M OVM Provide 2 ml bulk sample with the SDS. Send bulk sample separate from samples.	ALL
STRONTIUM (Sr)	7440-24-6	NIOSH 7300 (S) OSHA 206 (N)	1	0.8 um MCEF, Wipe	10-1000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5, ghost wipe	ALL
STRONTIUM (Sr)	7440-24-6	OSHA 206	1	0.8 um PVC	480	2	FLT 225-803	N
STYRENE (MONOMER)	100-42-5	NIOSH 1501	10	CT (100/50), 575, OVM	1 - 14	0.1 - 1.0	ST 226-01, 575-002 OR OVM	ALL
STYRENE (MONOMER)	100-42-5	OSHA 89	10	CT TBC Treated	12	0.05	ST 226-73	N
SULFUR DIOXIDE	7446-09-5	OSHA 1011	0.5	Silica Gel/glass fiber filter	12 TWA 7.5 STEL	0.05 TWA 0.5 STEL	ST 226-177	N
TETRACHLOROETHYLENE (Perchloroethylene)	127-18-4	OSHA 1001	5	CT (100/50)	1 - 10	0.05	ST 226-01	ALL
TETRAHYDROFURAN	109-99-9	NIOSH 1609	10	CT (100/50), 575, OVM	1-9	0.01-0.2	ST 226-01, 575-002 OR OVM	ALL
TIN (Inorganic Compounds) as Sn	7440-31-5	NIOSH 7300 (S) OSHA 206 (N)	1	0.8 um MCEF, wipe	5-1000 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5, Ghost Wipe	ALL
TIN (Inorganic Compounds) as Sn	7440-31-5	OSHA	1	0.8 um PVC	480	2	FLT 225-803	N
TITANIUM DIOXIDE	13463-67-7	NIOSH 0500	50	Tared PVC	100	2	FLT 225-8-01. <i>Preweighed</i> filter required or 225- 8202 (Matched wt)	ALL
TITANIUM	7440-32-6	OSHA ID-206	50	0.8 um MCEF	480-960	2	FLT225-5	N
TOLUENE	108-88-3	NIOSH 1501	5	CT (100/50), 575, OVM	1 - 8	0.01 - 0.2	ST 226-01, 575-001, 575-002 OR 3510	ALL
TOLUENE-2,4-DIISOCYANATE (2,4-TDI)	584-84-9	OSHA 5002	0.5	Treated 37mm GFF	15 - 240	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	ALL

\*\*Volumes are suggestions from the method.  
OVM and 575 are passive monitors. SKC produces 575 and 3M OVMs.

LOQ-Limit of Quantitation (subject to change)

Lab: All-Both labs, N-Norfolk, S-San Diego, C-Contract lab

INDUSTRIAL HYGIENE SAMPLING GUIDE for COMPREHENSIVE INDUSTRIAL HYGIENE LABORATORIES (CIHLs)

Alphabetical Listing

CIHL SAMPLING GUIDE 2024

SUBSTANCE	CAS NO	METHOD (modified) <i>*not modified</i>	LOQ* (ug)	SAMPLING MEDIA	SAMPLE VOLUME **(L)	SAMPLING RATE (LPM)	INSTRUCTIONS	LAB
TOLUENE-2,6-DIISOCYANATE (2,6-TDI)	91-08-7	OSHA 5002	0.5	Treated 37mm GFF	15 - 240	1	FLT 225-9002 or Call LAB for coated filters; Sample open faced.	ALL
TRIBROMOMETHANE	75-25-2	NIOSH 1003	5	CT (100/50)	1 - 10	0.01 - 0.2	ST 226-01 or OVM Samples stable for 30 days.	ALL
TRICHLOROETHANE, 1,1,2-	79-00-5	NIOSH 1003	5	CT (100/50)	2 - 60	0.01 - 0.2	ST 226-01 Samples stable for 30 days.	ALL
TRICHLOROETHANE, 1,1,1- (Methylchloroform)	71-55-6	NIOSH 1003	5	CT (100/50)	1 - 8	0.01 - 0.2	ST 226-01 Samples stable for 30 days.	ALL
TRICHLOROETHYLENE	79-01-6	NIOSH 1003	5	CT (100/50),575, OVM	1 - 30	0.01 - 0.2	ST 226-01,575-001, 575-002 or 3510 Samples stable for 30 days.	ALL
TRICHLOROPROPANE (1,2,3 TCP)	96-18-4	NIOSH 1003	5	CT (100/50), <u>575.OVM</u>	1 - 60	0.01 - 0.2	ST 226-01, 575-001 or 3510 Samples stable for 30 days.	ALL
TRITHANOLAMINE	102-71-6	OSHA PV2141	182	GFF	100	1	FLT 225-7	N
TRIETHYLENE TETRAMINE (TETA)	112-24-3	OSHA 60	3.7	XAD-2 with 1- <u>Naphthylisothiocyanate</u>	10	0.1	ST 226-30-18	S
TRIGLYCIDYL ISOCYANURATE, 1,3,5	2451-62-9	OSHA PV2055	2	GFF Treated <u>w/</u> HBr	60	1	CALL SKC FOR SPECIAL MEDIA	N
TRIMETHYLAMINE	75-50-3	OSHA PV2060	20	COATED XAD-7	20	0.2	ST 226-98	C
TRIMETHYLBENZENE, 1,2,3-	526-73-8	OSHA 1020	10	CT (100/50), 575, OVM	12	0.05	ST 226-01, 575-001, 575-002 or 3510	ALL
TRIMETHYLBENZENE, 1,2,4-	95-63-6	OSHA 1020	10	CT (100/50), 575, OVM	12	0.05	ST 226-01, 575-001, 575-002 or 3510	ALL
TRIMETHYLBENZENE, 1,3,5-	108-67-8	OSHA 1020	10	CT (100/50), 575, OVM	12	0.05	ST 226-01, 575-001, 575-002 or 33510M OVM	ALL
TRINITROTOLUENE, 2,4,6- (TNT)	118-96-7	OSHA 44	1.2	<u>GFF+Tenax</u> (100/50)	60	0.1 - 1.0	FLT 225-7 & ST 226-35-03 or ST 226-56	N
TURPENTINE	8006-64-2	NIOSH 1551	75	CT (100/50)	1 - 10	0.01 - 0.2	ST 226-01 Provide 2 ml bulk sample with the SDS. Ship bulk separate from the samples to prevent contamination.	ALL
VANADIUM FUME & DUST as V	1314-62-1	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	50-2000 NIOSH	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
VANADIUM FUME & DUST as V	1314-62-1	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-803	N
VINYL CHLORIDE (MONOMER)	75-01-4	NIOSH 1007	0.04	Two CT (100/50)	0.7 - 5	0.05	ST 226-01 Tubes in series; separate & cap. Ship to LAB immediately. The hold time is 10 days. The lab needs the time to process the samples.	N
VINYL ACETATE	108-05-4	OSHA 51	1	AMBERSORB XE 347, <u>575.OVM</u>	24	0.1	<u>Supelco</u> ORBO 92 (160/80), <u>SKC</u> 575-002 or OVM Store samples in refrigerator until sent to the lab. Ship cold.	N
VINYL TOLUENE	2503-15-4	NIOSH 1501	10	CT (100/50), <u>575.OVM</u>	24	0.2	ST 226-01,575-001, or 3510	N
VINYLDENE CHLORIDE	75-35-4	OSHA 19	10	CT (100/50)	3	0.2	ST 226-01	N
VM & P NAPHTHA	8032-32-4	NIOSH 1550 (S) OSHA 48 (N)	75	CT (100/50), OVM	1.3– 20	0.01 - 0.2	ST 226-01 or 3M OVM Provide 2 ml bulk sample with the SDS. Send the bulk separate to prevent contamination of samples.	ALL
XYLENE DIAMINE, m-	1477-55-0	OSHA 105	0.33	Two Treated GFF	15	1	SKC 225-9004	C
XYLENES (all isomers, <u>o,m,p</u> -)	1330-20-7	OSHA 1002	10	CT (100/50), <u>575.OVM</u>	12 - 23	0.05	ST 226-01,575-001,575-002 OR 3510	ALL

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Alphabetical Listing

CIHL SAMPLING GUIDE 2024

SUBSTANCE	CAS NO	METHOD (modified) <i>*not modified</i>	LOQ* (ug)	SAMPLING MEDIA	SAMPLE VOLUME **(L)	SAMPLING RATE (LPM)	INSTRUCTIONS	LAB
ZINC and compounds as Zn	7440-66-6	NIOSH 7300 (S) OSHA ID-206 (N)	1	0.8 um MCEF	5-200 NIOSH 480 OSHA	1-4 NIOSH 2 OSHA	FLT 225-5	ALL
ZINC and compounds as Zn	7440-66-6	OSHA ID-206	1	0.8 um PVC	480	2	FLT 225-803	N
ZINC PROTOPORPHYRIN in blood	15442-64-5	Lab method	5 ug/dL	K <sub>2</sub> EDTA trace metal vacutainer			Mix thoroughly immediately after collection; refrigerate shipment using overnight courier service	ALL

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LOQ-Limit of Quantitation (subject to change)

Lab: All-Both labs, N-Norfolk, S-San Diego, C-Contract lab

## CIHL Norfolk Metals Reporting Limits

Analyte: ICP	Reporting Limit - Air
Be, Cd, Sr	0.05 µg
Li	0.5 µg
Ag, Ba, Co, Cu, Mg, Mn, Mo, Ni, Pb, Se, Ti, V	1 µg
As, Cr, Sb	2 µg
Al, Fe, Sn Zn	5 µg
Ca	10 µg
Analyte: ICP-MS	Reporting Limit - Air
As, Ba, Be, Cd, Co, Mn, Mo, Ni, Pb, Sb, Sr, Ti, V	0.05 µg
Cu	0.5 µg
Cr, Fe, Zn	1 µg
Al, Mg	2.5 µg
Sn	5 µg
Analyte	Reporting Limit - Bulk
Be	0.1 µg
Cd	1 µg
Ag, As, Ba, Co, Cu, Mn, Mo, Ni, Pb, Sb, Sr, Ti, V	5 µg
Cr, Mg, Sn, Zn	10 µg
Al	20 µg
Fe	100 µg

## CIHL Norfolk Metals Reporting Limits

Analyte	Reporting Limit - Swipe
Be, Cd, Li	1 µg
Ag	2 µg
Pb, Sr	5 µg
Ba, Co, Cr, Cu, Mn, Mo, Ni, Sb, Sn, Ti, V	10 µg
As, Al	50 µg
Fe	100 µg
Ca	200 µg
Zn	250 µg

<b>SAN DIEGO REPORTING LIMITS FOR ICPMS</b>			
<i>Metal</i>	<i>Air (µg)</i>	<i>Wipes (µg)</i>	<i>Bulk (µg, %w/w)</i>
Aluminum (Al)	5.0	50	5, 0.01
Antimony (Sb)	0.5	2	5, 0.01
Arsenic (As)	0.5	2	0.5, 0.001
Barium (Ba)	0.5	2	5, 0.01
Beryllium (Be)	0.05	2	0.05, 0.0001
Cadmium (Cd)	0.05	2	0.05, 0.0001
Chromium (Cr)	0.5	2	0.5, 0.001
Cobalt (Co)	0.5	2	5, 0.01
Copper (Cu)	0.5	2	5, 0.01
Iron (Fe)	5.0	50	5, 0.01
Lead (Pb)	0.5	2	0.5, 0.001
Magnesium (Mg)	5.0	50	5, 0.01
Manganese (Mn)	0.5	2	5, 0.01
Molybdenum (Mo)	0.5	2	5, 0.01
Nickel (Ni)	0.5	2	5, 0.01
Selenium (Se)	0.5	2	5, 0.01
Silver (Ag)	0.5	2	5, 0.01
Strontium (Sr)	0.5	2	5, 0.01
Tin (Sn)	0.5	2	5, 0.01
Vanadium (V)	0.5	2	5, 0.01
Zinc (Zn)	5.0	50	5, 0.01