
Surface Limits

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Chubb Global Risk Advisors

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2018 ACGIH NIC for O-Phthalaldehyde

- TLV – SL Surface Limit 25 ug/ 100 cm²
- Skin Notation
- Dermal Sensitization (DSEN)

- Air limit = 0.6 ug/m³ TLV – C Ceiling (RSEN)
- 5% soluble in water

Wipe History and Concerns

- Ingestion
- Sensitization
- Irritation
- Dose
- Work area verses non work area (lunchroom, equipment sales or disposal)

Ingestion - Absorptivity

- Particle size - paint chip verses dust - five fold increase from 200 to 6 um
- Solubility – chemical , formula and matrix
- Residence time

OSHA Surface Limits

Letters of Interpretation

OSHA standards do not include surface contamination criteria or quantifications for skin absorption. (June 21, 1985). Currently there are no OSHA standards that specify surface contamination exposure limits. However, do require appropriate provision of personal protective equipment, housekeeping, decontamination, and related procedures to control surface contamination hazards.

OSHA can use General duty clause and can and does reference other standards especially in non work areas, outside required signed areas and lunch rooms, etc.

OSHA Standards



Standards >
Hazards and Solutions >
Evaluating Exposure >
Additional Resources >

Standards

This section highlights OSHA standards, letters of interpretation (official letters of interpretation of the standards), other federal standards and national consensus standards related to surface contamination.

OSHA

General Industry (29 CFR 1910)

- 1910 Subpart H, Hazardous materials
 - 1910.120, Hazardous waste operations and emergency response [related topic page]
- 1910 Subpart Z, Toxic and hazardous substances [related topic page]
 - 1910.1001, Asbestos [related topic page]
 - 1910.1018, Inorganic arsenic [related topic page]
 - 1910.1025, Lead [related topic page]
 - 1910.1026, Chromium (VI) [related topic page]
 - 1910.1027, Cadmium [related topic page]
 - 1910.1030, Bloodborne pathogens [related topic page]
 - 1910.1044, 1,2-dibromo-3-chloropropane
 - 1910.1045, Acrylonitrile
 - 1910.1050, Methyleneedianiline

Construction Industry (29 CFR 1926)

- 1926 Subpart D, Occupational health and environmental controls
 - 1926.55, Gases, vapor, fumes, dusts, and mists
 - 1926.60, Methyleneedianiline
 - 1926.62, Lead
- 1926 Subpart Z, Toxic and hazardous substances
 - 1926.1101, Asbestos
 - 1926.1127, Cadmium

Letters of Interpretation

- OSHA standards do not include surface contamination criteria or quantifications for skin absorption. (June 21, 1985). Currently there are no OSHA standards that specify surface contamination exposure limits. However, do require appropriate provision of personal protective equipment, housekeeping, decontamination, and related procedures to control surface contamination hazards.

Other Federal

Note: These are NOT OSHA regulations. However, they do provide guidance from their originating organizations related to worker protection.

Environmental Protection Agency (EPA) Standards

- 40 CFR 761.125, Requirements for PCB spill cleanup. Sections (c)(3) and (c)(4) contain information pertinent to surface contamination.

National Consensus

Note: These are NOT OSHA regulations. However, they do provide guidance from their originating organizations related to worker protection.

State Standards

There are twenty-eight OSHA-approved State Plans, operating state-wide occupational safety and health programs. State Plans are required to have standards and enforcement programs that are at least as effective as OSHA's and may have different or more stringent requirements.



OSHA Sampling and Analytical Methods

HEXAVALENT CHROMIUM



Method number: W4001

Target concentration: 0.050 $\mu\text{g}/100 \text{ cm}^2$

Procedure: Wipe samples are collected by using firm hand pressure to move a 37-mm diameter polyvinyl chloride (PVC) filter, 5- μm pore size, across the surface of interest. An alternate medium for rough surfaces is a 37-mm binderless quartz fiber filter. Samples are digested with multiple buffered solutions. After dilution, an aliquot of this solution is analyzed for hexavalent chromium (Cr(VI)) by ion chromatography with postcolumn derivatization of the Cr(VI) with 1,5-diphenyl carbazide and detected by a UV-vis detector at 540 nm.

Special requirements: In chrome plating environments, wipe samples taken on a PVC filter or an uncoated binderless quartz fiber filter, should be placed in a vial containing 5 mL of an aqueous solution containing 10% Na_2CO_3 with 2% NaHCO_3 immediately after sampling to eliminate the interference from the acid used in the chrome plating process. An alternate medium which does not require extraction in the field is a binderless quartz fiber filter coated with 1% NaOH.

Reliable quantitation limit: 3 ng/sample

Status of method: Evaluated method. This method has been subjected to the established evaluation procedures of the Methods Development Team.

OSHA Sampling and Analytical Methods



UNITED STATES
DEPARTMENT OF LABOR



Find it in OSHA



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[Sampling and Analytical Methods](#) / 1,6-Hexamethylene Diisocyanate

1,6-Hexamethylene Diisocyanate

OSHA Method W4002 | March 2002

[Sampling and Analytical Method](#)

[Related Chemical Information](#)

Search Sampling and Analytical Methods

Go!

For problems with accessibility in using figures and illustrations, please contact the Salt Lake Technical Center at 801-233-4900.

These procedures were designed and tested for internal use by OSHA personnel. Mention of any company name or commercial product does not constitute endorsement by OSHA.

Method no.:	W4002
Control no.:	T-W4002-FV-01-0203-ACT
Target concentration:	340 µg/100 cm ²
Procedure:	Samples are collected by using firm hand pressure to move the 4.75 in. × 4.75 in. Ghost Wipe across the surface of interest. Before sampling, the media are moistened with 0.5-mL 50:50 isopropanol:water. After sampling, immediately place the media in vials containing 5 mL of a derivatizing reagent solution. The samples are prepared, then analyzed by high performance liquid chromatography(HPLC) using fluorescence (FL) and ultraviolet (UV) detectors.
Reliable quantitation limit:	0.962 µg
Special Requirements:	The time interval, from beginning to collect the sample, until the sample is placed in the vial containing the derivatizing reagent, should not exceed three minutes.
Status of method:	Evaluated method. This method has been subjected to the established evaluation procedures of the Methods Development Team.

Internal Guideline

- “Acquired” Guideline for Arsenic contamination
- **Average Arsenic Surface Cleanup Level = 170 ug/100 cm²**
- Surface cleanup levels are intended to provide guidance for housekeeping and equipment decontamination. While they are based on health-protective parameters, they contain too many conservatisms and uncertainties to be considered as anything more than *recommendations*. (Better than nothing.)

HUD Lead Guidelines

The HUD post-abatement clearance standards, adopted from the Maryland Department of the Environment's 1987 post-abatement clearance standards, are the most commonly referenced lead dust standards in the United States. It is important to recognize, however, that the Maryland standards were designed only to determine when residents could move back into a dwelling after lead-based paint abatement was finished (Farfel, 1993). They were not intended to assess the risk of lead in homes or to identify lead-based paint hazards.

Lead-contaminated dust in residential dwellings is defined by Section 401 of Title X as "...surface dust in residential dwellings that contains an area or mass concentration of lead in excess of levels determined by the [EPA] Administrator under this title to pose a threat of adverse health effects in pregnant women or young children."

Some Common Wipe Standard Guidelines

Lead EPA/HUD 40 ug/ft² floor

250ug/ft² sills 400 ppm soil

Beryllium- equipment release level 10CFR850.31DOE

0.2 ug/100cm² non work

3.0 ug/100cm² work areas/dust

PCBs EPA 10 and CT 1ug/100cm²

Hexavalent Cr above DL or 0.05 ug “defined as free as practicable”

World Trade Table - most in ug/m²

Please let lab know area of wipe and what units you would like

Common Use of OEL to Calculate Surface Limit

$$\text{Surface cleanup level} = \frac{\text{OEL} \times \text{BR}}{\text{SA}}$$

OEL = OSHA PEL/ACGIH TLV (0.01 mg/m³ = 10 ug/m³)

BR = standard worker breathing rate (10 m³/work day)

SA = area sampled (100 cm²)

So, Surface cleanup level = 100 ug/100cm²

Total Palm contact and total ingestion of palm and oral toxicity same as inhalation toxicity or assume finger tip and 10% absorption 1/50th

EPA RfD for arsenic is from 7-56 ug/day ie 70 kg

CA As is carcinogen and NSRL of 10 ug/day ingestion

https://www.bnl.gov/esh/shsd/sop/pdf/ih_sops/ih75190.pdf

Risk Based Calculation Approach

Hazard Quotient = Chemical Intake / Reference Dose of concern

Concentration X Absorption/consumption = mg or Dose

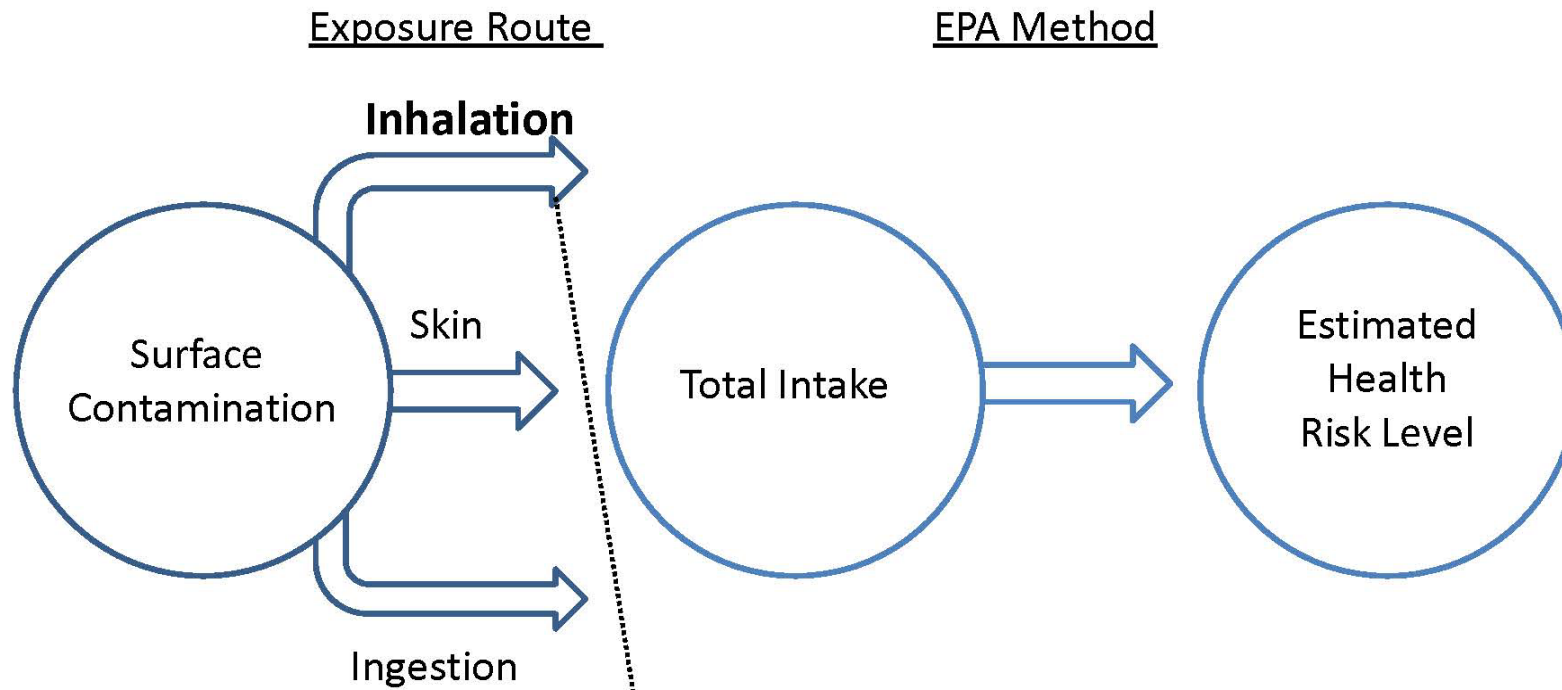
Absorption / Consumption

Dermal contact and skin absorption

Ingestion

Inhalation via resuspension

Exposure Assessment



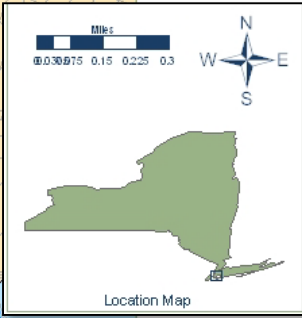
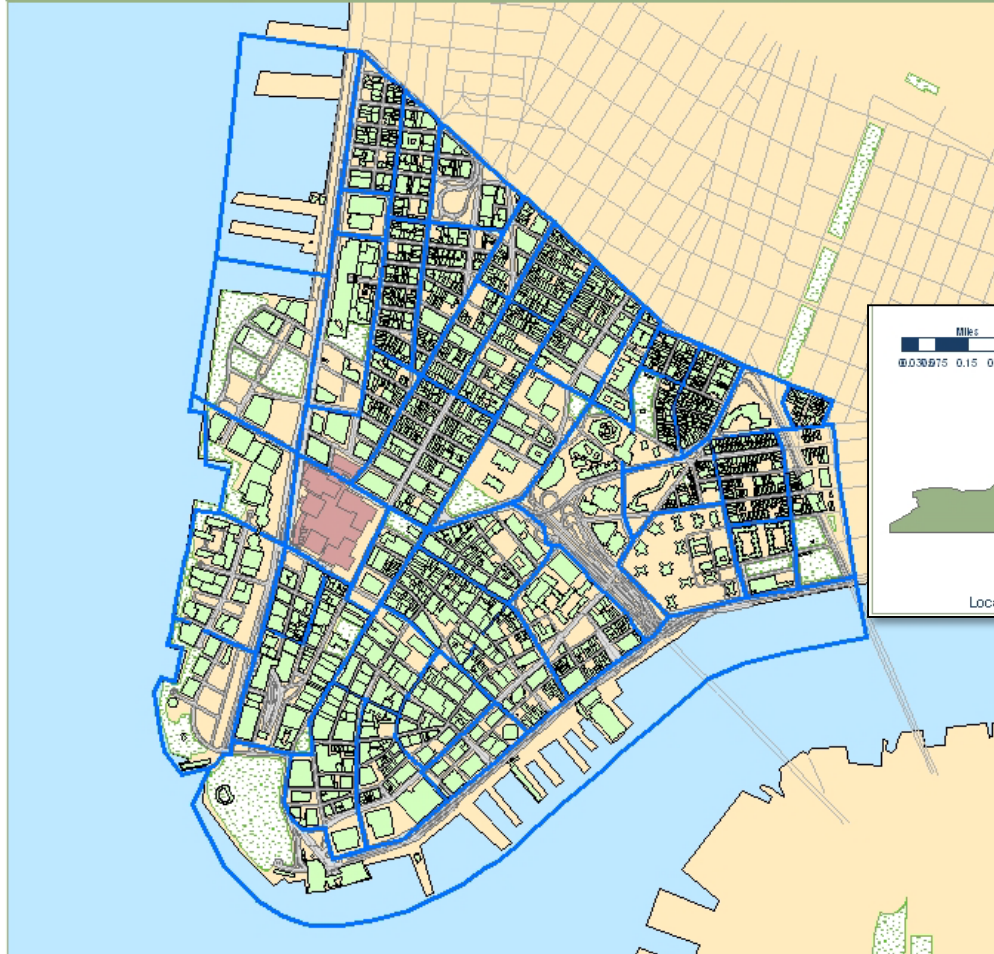
$$ADI_{inh} = \left(\frac{f_{resp} \cdot C_s \cdot 10^4 \cdot A_s \cdot R}{V \cdot (dep \cdot a)} \right) \cdot \frac{I_{Rinh} \cdot ET \cdot EF \cdot ED \cdot 10^{-3}}{BW \cdot AT}$$

Suggested Gastrointestinal Absorption Parameters For Use in Calculating the Intake Factor for Selected Metals

Arsenic	30 %	
Antimony	2.5	Metals default value
Cadmium	2.5	
Cobalt	2.5	
Copper	60	
Iron	50	
Manganese	2.5	
Zinc	25	

World Trade Center

Figure 1-1. Site location map



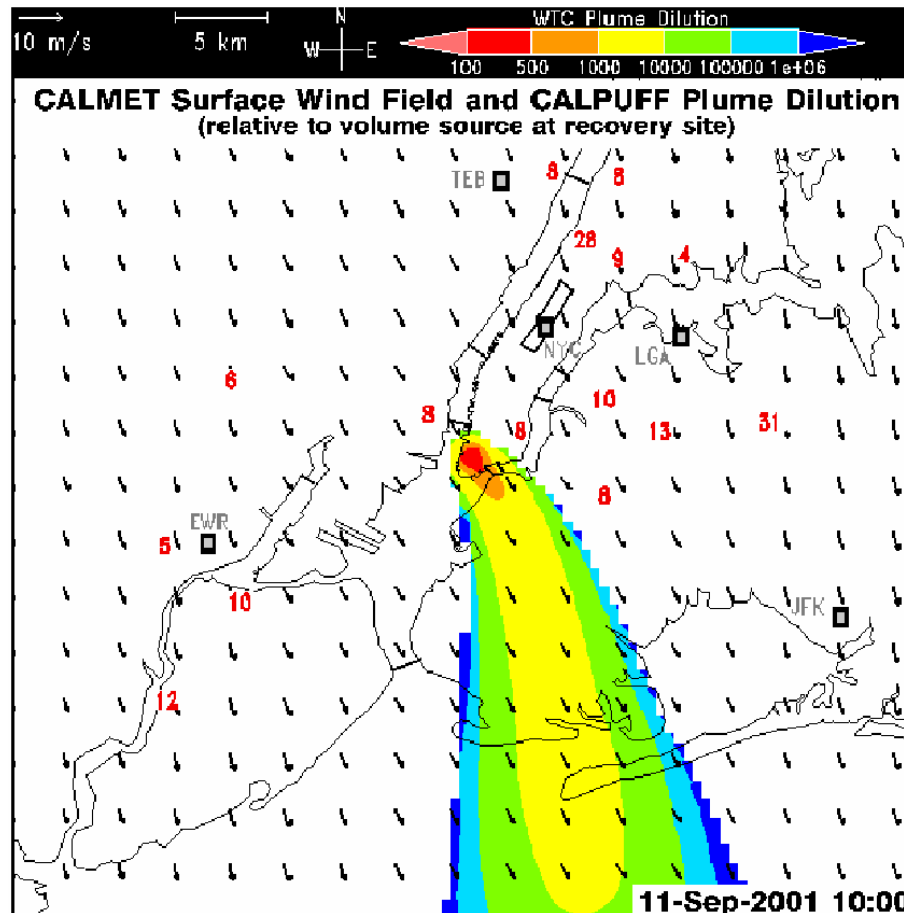
Legend	
■	SSAs
■	WTC buildings
■	open space

The study area consists of Lower Manhattan, south of Canal Street. Statistical summary areas (SSAs) are indicated by heavy blue outline. Cross-hatching indicates areas where data were not collected.

Prepared by: Eyal Ales	Date: 8/17/03
Reviewed by: Bill Thayer	Date: 10/16/03
Project: WTC	

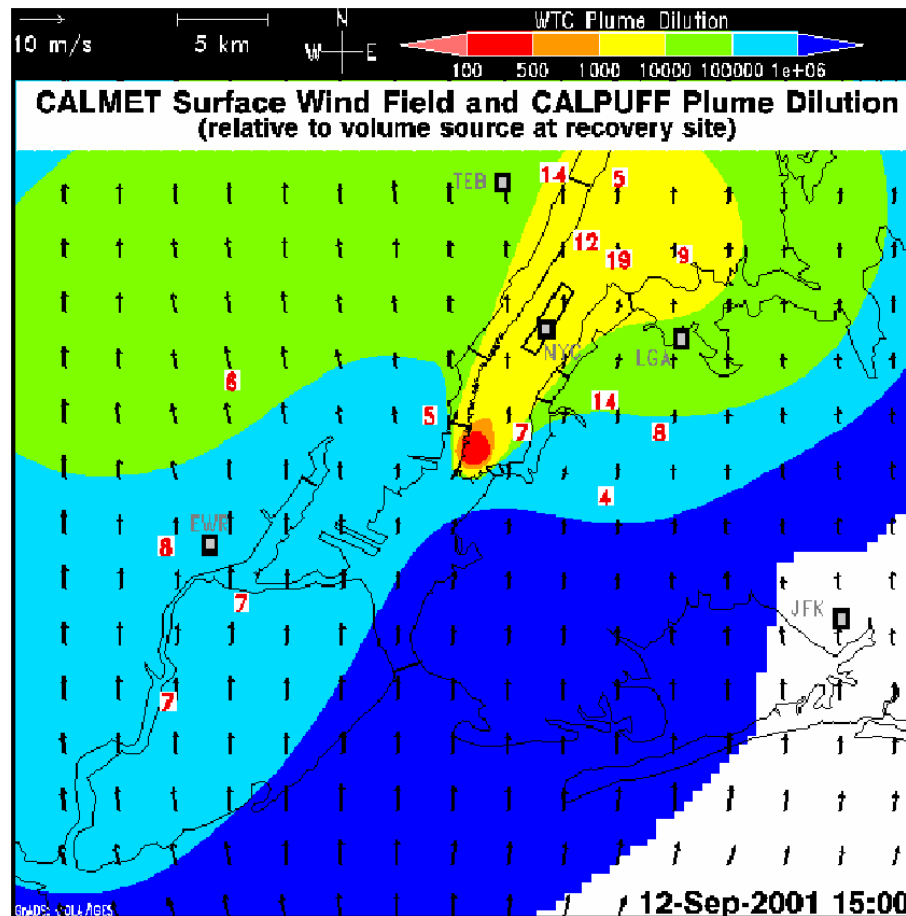
Air Direction morning of Attack

Figure 2-1. Simulation of WTC plume on the morning of the attack. National Oceanic and Atmospheric Administration-Plume direction is towards the south-southeast and dilution of the plume varies



Air direction next day afternoon

Figure 2-2. Simulation of WTC plume in the afternoon the day after the attack. National Oceanic and Atmospheric Administration-Plume direction is primarily towards the northeast



World Trade Center Residential Dust Cleanup Program - Final Report December 2005

- The WTC dust cleanup and testing program allowed residents living south of Canal Street in lower Manhattan to have their homes professionally cleaned and tested or just tested free of charge. In addition to offering this service to residents, EPA conducted three supporting projects, also funded by FEMA under the Stafford Act. The projects were:
 - A Contaminants of Potential Concern (COPC) Report established health-based benchmarks for contaminants in support of cleanup efforts.
 - A Confirmation Cleaning Building Study evaluated the effectiveness of various cleaning techniques on WTC-related dust.
 - A Background Study provided data on contaminants in indoor air and settled dust in residences North of 78th Street
 - Contractors collected wipe samples from 263 apartments in 156 buildings. Approximately 14% of the pre-cleanup samples exceeded the U.S. Housing and Urban Development (HUD) screening level of 25 $\mu\text{g}/\text{ft}^2$ for lead, while only about 3% of the post-cleanup samples exceeded the screening level.

World Trade Center Chemicals of Potential Concern

- Dioxin, PAHs, Lead, Asbestos, Fibrous Glass, and Crystalline Silica.
- The health-based benchmark for asbestos is 0.0009 fibers/cubic centimeters
- At 40 $\mu\text{g}/\text{ft}^2$, a multimedia analysis shows a 5.3% probability that a child's blood lead level would exceed 10 $\mu\text{g}/\text{dL}$. Thus, this standard meets the criteria established by EPA (i.e., 95% probability to be below 10 $\mu\text{g}/\text{dL}$) (EPA, 1994)
- Dust will be considered WTC-related if: pH is 9 or above; fibrous glass content is between 30 and 40 % and crystalline silica content is 5% or greater

Table 3-8. Health-based Benchmarks and Screening Values for Chemicals of Potential Concern (COPCs) in Settled Dust

Chemical of Potential Concern	Health-based Benchmark/ Screening Value
Aluminum	1567888
Antimony	627
Arsenic	387
Barium	109752
Beryllium	3136
Cadmium	1557
Chromium	4704
Cobalt	31358
Copper	62716
Iron	940733
Lead ^a	25
Manganese	31358
Mercury	157
Nickel	31358
Selenium	7839
Silver	7839
Thallium	110
Vanadium	10975
Zinc	470366
Dioxin ^a	2

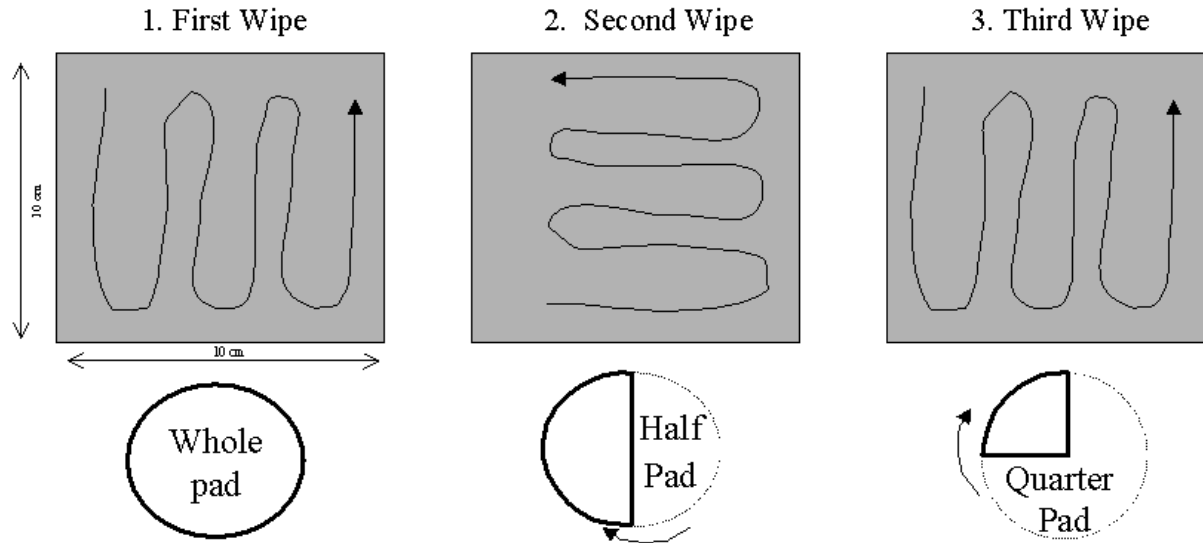
Table is based on EPA, May 2003 COPC report. All benchmarks are $\mu\text{g}/\text{m}^2$, except for lead, which is in $\mu\text{g}/\text{ft}^2$, and dioxin, which is ng/m^2 .

The health-based benchmark for lead is $40 \mu\text{g}/\text{ft}^2$; however, the more stringent screening HUD screening value of $25 \mu\text{g}/\text{ft}^2$ was used (see *Section 3.5.1* for details).

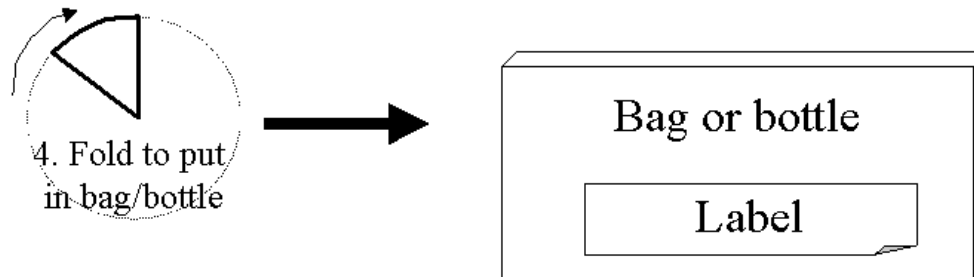
Wipe Materials

- Metals Scan
 - Hg, As, Zn
 - Hex Chrome
 - Aldehydes , acids , oils
 - Ghost wipe
 - Kim wipe/ DI water
 - PVC filter / treated Quartz
 - Treated filters , filters
-
- Use grid or measured with tape ruler etc, powder free gloves
 - Z pattern, Multiple wipes
 - Provide surface area of Wipe
 - Request surface area of results ug/wipe, ug/100cm², ug/ft², ug/m²
 - COLLECT as LARGE a WIPE as POSSIBLE 1 ft² vs 100 cm² – Lower RL !!!!!!!!
-
- Wipes for liquids/ acids can be done via Badge, treated filter into solution or rinse and extract

Wipe Procedure



With each step, fold the exposed surface inward



Standards

- [2] ASTM [2002]. Annual Book of ASTM Standards, Standard Specification for Wipe Sampling Materials for Lead in Surface Dust. West Conshohocken, PA: ASTM International, E 1792-01.
- [3] ASTM [2002]. Annual Book of ASTM Standards, Standard Practice for Field Collection of Settled Dust Samples Using Wipe Sampling Methods for Lead Determination by Atomic Spectrometry Techniques. West Conshohocken, PA: ASTM International, E 1728-99.

http://toxnet.nlm.nih.gov/

TOXNET - Microsoft Internet Explorer

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TOXNET - Databases on toxicology, hazardous chemicals, environmental health, and toxic releases.

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- TOXLINE
- CCRIS
- DART
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- TRI
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Enter term(s) to search all databases.

75-45-6

(e.g. asthma air pollution, ibuprofen fever, vinyl chloride)

Search Clear Help

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- Database description: Click on the [?]

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start | Inbox - Micro... | Main Menu | Login Wizard | Microsoft Pow... | LEED 2009 Ex... | TOXNET - Mic... | Office >> | 11:02 AM

Chemical Toxicity and Limits

The screenshot shows a Microsoft Internet Explorer browser window displaying the HSDB Search Results page. The address bar shows the URL: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~fBK181:1>. The page title is "HSDB Search Results - Frameset".

The navigation menu includes buttons for "Next Item", "Search Results", "Basic Search", "Details", "Other Files", "Modify Search", "Download", "Limits", "Browse Index", and "Help". There are also buttons for "Hazardous Substances Data Bank" and "HSDB".

The left sidebar contains a tree view of categories, including "Toxic Combustion Products", "Explosive Limits & Potential", "Hazardous Reactivities & Incompatibilities", "Hazardous Decomposition", "Protective Equipment & Clothing", "Preventive Measures", "Shipment Methods and Regulations", "Disposal Methods", "Occupational Exposure Standards", "Threshold Limit Values", "NIOSH Recommendations", "Manufacturing/Use Information", "Major Uses", "Manufacturers", "Methods of Manufacturing", "General Manufacturing Information", "Formulations/Preparations", "Impurities", "Consumption Patterns", "U.S. Production", "U.S. Imports", "Laboratory Methods", and "Clinical Laboratory Methods".

The main content area displays the search results for "CHLORODIFLUOROMETHANE". The CASRN is 75-45-6. Below the title, there is a link to "For other data, click on the Table of Contents".

Major Uses:
For **Chlorodifluoromethane** (USEPA/OPP Pesticide Code: 000015) there are 0 labels match. /SRP: Not registered for current use in the U.S., but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses. / Former/
[U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Chlorodifluoromethane (75-45-6). Available from, as of Sept 8, 2000: <http://www.cdpr.ca.gov/docs/epa/epamenu.htm>]*PEER REVIEWED**

Refrigerant; low-temperature solvent; fluorocarbon resins, especially tetrafluoroethylene polymers
[Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 255]*PEER REVIEWED**

The azeotropic mixture (F-502) of **chlorodifluoromethane**/chloropentafluoroethane (F-115) is used as a refrigerant, primarily in food display cases, ice makers, home freezers & heat pumps.
[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume

The taskbar at the bottom shows the Start button and several open applications: "Inbox - Microsoft...", "2 Microsoft Offic...", "LEED 2009 Existing...", "HSDB Search Resu...", and "LEED CT AIHA 200...". The system clock shows "11:08 AM".

