MIOSHA CHEMICAL INFORMATION MANUAL
CHAPTER II

SUBSTANCES WITH CURRENTLY AVAILABLE SAMPLING AND ANALYTICAL METHODS FROM LABORATORY AND EQUIPMENT SERVICES

1. General

1.1 Chapter II generally includes substances with sampling and analytical information, which has been reviewed by LESS. Methods listed under LESS1 are MIOSHA compliance and consultation sampling methods. For further explanation of individual fields of information, refer to specific items in Chapter I.

1.2 Secondary sampling methods generally are methods that have also been reviewed by LESS or are available. Methods that are not in general use by LESS have been excluded. Federal OSHA and NIOSH may have additional sampling and analytical methodologies.

1.3 Some substances may only include information listing the availability of detector tubes or direct reading instruments for monitoring. Tubes and instruments listed are not available from LESS unless specifically indicated. LESS does not certify nor endorse products of any manufacturer. Omission of other products does not imply unsatisfactory performance

1.4 For any substance not listed in Chapter II, refer to Chapter III. For substances listed in Chapter III or for a substance not listed in either Chapter II or Chapter III, contact LESS for a recommendation.

1.5 To search for substances by name, IMIS code, CAS number, or synonyms use the ctrl+F function to locate a specific character, word, or phrase in the document.

2. Substances

Acetaldehyde

IMIS	**0010**	CAS	75-07-0
SYN	Ethanal; Acetic Aldehyde; Ethyl aldehyde		
NIOSH	RTECS AB1925000	DOT	1089 129
MIOSHA	FINAL RULE (Table G-1-A):		
		TWA	100 ppm, 180 mg/m3
		STEL	150 ppm, 270 mg/m3
DESC	Colorless liquid or gas (above 69°F) with a pungent, fruity odor. MW: 44.1 BP: 69 F VP: 740 mm MP: -190 F		
INCOM	Strong oxidizers, acids, bases, alcohols, ammonia & amines, phenols, ketones, HCN, H_2S [Note: Prolonged contact with air may cause formation of peroxides that may explode and burst containers; easily undergoes polymerization.]		
HLTH	See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/) Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14) Nervous System Disturbances---Narcosis. (HE8) Respiratory Effects---Acute lung damage/edema or other. (HE11)		
NTP	Suspect Human Carcinogen - [Acetaldehyde]		
IARC	Group 2B - possibly carcinogenic to humans - [Acetaldehyde]		
SYMPT	Irritation eyes, nose, throat; eye, skin burns; dermatitis; conjunctivitis; cough; central nervous system depression; delayed pulmonary edema; In Animals: kidney, reproductive, teratogenic effects; [potential occupational carcinogen]		
ORGAN	Eyes, skin, respiratory system, kidneys, central nervous system, reproductive		

system. [in animals: nasal cancer]
LESS1 MEDIA (52): Silica Gel (300/150 mg) with 2,4-dinitrophenylhydrazine
ANL SOLVENT: Acetonitrile
MAX V: 15 Liters MIN V: 1 Liters REC F: 1.5 L/min
ANL 1: High Performance Liquid Chromatography; HPLC
REF: OHL2002S017 SAE: 0.101 CLASS: Validated In-House
NOTE: Store and ship cold.

Acetic Acid

IMIS **0020** CAS 64-19-7
SYN Acetic acid (aqueous); Ethanoic acid, Glacial acetic acid (pure compound); Methanecarboxylic acid [Note: Can be found in concentrations of 5-8% in vinegar]
NIOSH RTECS AF1225000 DOT 2790 153(10-80%); 2789 132(>80%)
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 25 mg/m3
DESC Colorless liquid or crystals with a sour, vinegar-like odor.
MW: 60.1 BP: 244 F MP: 62 F VP: 11 mm FP: 103 F
INCOM Strong oxidizers (especially chromic acid, sodium peroxide, nitric acid) strong caustics [Note: Corrosive to metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
SYMPT Irritation eyes, skin, nose, throat; eye, skin burns; skin sensitization; dental erosion; black skin, hyperkeratosis; conjunctivitis, lacrimation (discharge of tears); pharyngeal edema, chronic bronchitis.
ORGAN Eyes, skin, respiratory system, teeth
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: 9 mM Carbonate/Bicarbonate
REC V: 48 Liters REC F: 0.2 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2004S025 SAE: 0.159 CLASS: Validated In-House
NOTE: Submit as a separate sample. Butyric and propionic acids are interferences in the acetic acid analysis. Therefore, presence of butyric and propionic acids should be noted on 91s form.
WIPE MEDIA: Whatman smear tab SOLVENT: Deionized Water
SAM2 DET. TUBE: Dräger, 67-22101, 5-80 ppm

Acetone

IMIS **0040** CAS 67-64-1
SYN 2-Propanone; Dimethyl ketone; ketone propane
NIOSH RTECS AL3150000 DOT 1090 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 750 ppm, 1800 mg/m3
STEL 1000 ppm, 2400 mg/m3
DESC Colorless liquid with a fragrant, mint-like odor.
MW: 58.1 BP: 133 F MP: -137 F VP: 180 mm FP: 0 F
INCOM Oxidizers, acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Eyes, nose, throat irritation; headaches, dizziness, central nervous system depression; dermatitis
ORGAN Respiratory system, skin, eyes, central nervous system

LESS1 MEDIA (8): CARBOSIEVE S-III (ORBO 91) (130/65 mg sections, 60/80 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 3 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S016 SAE: 0.091 CLASS: Validated In-House
NOTE: Recommended refrigerated storage. Alternative media is available, contact LESS for more information.
SAM2 DET. TUBE: Dräger, CH 22901, 100-12,000 ppm

Acetyl Methyl Carbinol

IMIS **A624** CAS 513-86-0
SYN Acetoin; 1-hydroxyethyl methyl ketone; γ-hydroxy-β-oxobutane; 3-hydroxy-2-butanone; 2,3-butanolone; dimethylketol
NIOSH RTECS EL8790000* DOT 2621 127(liquid)
DESC A light-yellow colored liquid.
MW: 88.1 BP: 298.4 F MP: 59 F FP: 106 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA: 2 Specially dried silica gel tubes in series; each tube has a single 600 mg section and a GFF, filter faces forward when sampling [SKC 226-183]
ANL SOLVENT: (95/5) Ethyl Alcohol/Deionized Water
REC V: 9 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2012S009 SAE: 0.147 CLASS: Validated In-House

Acrylonitrile (Vinyl Cyanide)

IMIS **0120 (PEL)** CAS 107-13-1
0119 (CEIL)
0121 (AL)
SYN Acrylonitrile inhibited, Acrylonitrile monomer; AN; Cyanoethylene; Propenenitrile; 2-Propenenitrile; VCN; Vinyl cyanide
NIOSH RTECS AT5250000 DOT 1093 131P
MIOSHA FINAL RULE (Table G-1-A) Acrylonitrile (29 CFR 1910.1045):
TWA 2 ppm, 4.34 mg/m3
CEIL 10 ppm, 21.7 mg/m3 (15 min)
AL 1 ppm
DESC Colorless to pale-yellow liquid with an unpleasant odor. [Note: Odor can only be detected above the PEL.]
MW: 53.1 BP: 171 F MP: -116 F VP: 83 mm FP: 30 F
INCOM Strong oxidizers, acids & alkalis; bromine; amines [Note: Unless inhibited (usually with methylhydroquinone), may polymerize spontaneously or when heated or in presence of strong alkali. Attacks copper.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Asphyxiants, Anoxiants. (HE17)
NTP Suspect Human Carcinogen - [Acrylonitrile]
IARC Group 2B - possibly carcinogenic to humans - [Acrylonitrile]
SYMPT Irritation eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]
ORGAN Eyes, skin, cardiovascular system, liver, kidneys, central nervous system; [brain tumors, lung & bowel cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol

REC V: 20 Liters REC F: 0.2 L/min (TWA)
MIN V: 7.5 Liters MIN T: 15 Minutes REC F: 0.5 L/min (CEIL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2007S004 SAE: 0.061 CLASS: Validated In-House

alpha-Alumina (Alundum) (Respirable Fraction)

IMIS **A201** CAS 1344-28-1
SYN Alumina; Aluminum oxide [α-Alumina]; Aluminum trioxide [α-Alumina] [Note: α-Alumina is the main component of technical grade alumina. Corundum is natural Al2O3. Emery is an impure crystalline variety of Al2O3.]
NIOSH RTECS BD1200000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White, odorless, crystalline powder.
MW: 101.9 BP: 5396 F MP: 3632 F VP: 0 mm (approx.)
INCOM Chlorine trifluoride, hot chlorinated rubber, acids, oxidizers [Note: Hydrogen gas may be formed when finely divided iron contacts moisture during crushing & milling operations.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

alpha-Alumina (Alundum) (Total Dust)

IMIS **0160** CAS 1344-28-1
SYN Alumina; Aluminum Oxide [α-Alumina]; Aluminum trioxide [α-Alumina] [Note: α-Alumina is the main component of technical grade alumina. Corundum is natural Al2O3. Emery is an impure crystalline variety of Al2O3.]
NIOSH RTECS BD1200000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White, odorless, crystalline powder.
MW: 101.9 BP: 5396 F MP: 3632 F VP: 0 mm (approx.)
INCOM Chlorine trifluoride, hot chlorinated rubber, acids, oxidizers [Note: Hydrogen gas may be formed when finely divided iron contacts moisture during crushing & milling operations.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

Aluminum, Metal (as Al) (Respirable Fraction)

IMIS **A110** CAS 7429-90-5
SYN Aluminum; aluminum metal; aluminum powder; elemental aluminum
NIOSH RTECS BD0330000 DOT 1309 170; 1396 138; 9260 169
MIOSHA FINAL RULE (Table G-1-A):

TWA 5 mg/m3

DESC Silvery-white, malleable, ductile, odorless metal.
MW: 27.0 BP: 4221 F MP: 1220 F VP: 0 mm

INCOM Strong oxidizers & acids, halogenated hydrocarbons [Note: Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)

SYMPT Irritation eyes, skin, respiratory system

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.102 CLASS: Validated In-House

Aluminum, Metal (as Al) (Total Dust)

IMIS **A100** CAS 7429-90-5

SYN Aluminum; aluminum metal; aluminum powder; elemental aluminum

NIOSH RTECS BD0330000 DOT 1309 170; 1396 138; 9260 169

MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3

DESC Silvery-white, malleable, ductile, odorless metal.
MW: 27.0 BP: 4221 F VP: 0 mm MP: 1220 F

INCOM Strong oxidizers & acids, halogenated hydrocarbons [Note: Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)

SYMPT Irritation eyes, skin, respiratory system

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.102 CLASS: Validated In-House

Aluminum, Pyro Powders (as Al)

IMIS **A101** CAS 7429-90-5

SYN Aluminum; aluminum metal; aluminum powder; elemental aluminum
DOT 1383 135 (powder pyrophoric)

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3

DESC Appearance and odor vary depending upon the specific aluminum compound.

Properties vary depending upon the specific aluminum compound.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation skin, respiratory system; pulmonary fibrosis
ORGAN Skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

Aluminum, Soluble Salts (as Al)
IMIS **A103** CAS 7429-90-5
SYN Aluminum; aluminum metal; aluminum powder; elemental aluminum
DOT 3051 135(aluminum alkyls)
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 mg/m3
DESC Solid; Appearance and odor vary depending upon the specific aluminum compound.
Properties vary depending upon the specific aluminum compound.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation skin, respiratory system; skin burns
ORGAN Skin, respiratory system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.102 CLASS: Validated In-House

Aluminum, Welding Fumes (as Al)
IMIS **A102** CAS 7429-90-5
SYN Aluminum; aluminum metal; aluminum powder; elemental aluminum
NIOSH RTECS ZC2550000 DOT 1383 135
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Fumes generated by the process of joining or cutting pieces of metal by heat, pressure, or both.
Properties vary depending upon the specific aluminum compound.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Symptoms vary depending upon the specific component of the welding fumes; metal fume fever: flu-like symptoms, dyspnea (breathing difficulty), cough, muscle pain, fever, chills; interstitial pneumonitis; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, central nervous system; [lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.102 CLASS: Validated In-House

Ammonia

IMIS **0170** CAS 7664-41-7
SYN Anhydrous ammonia, Aqua ammonia, Aqueous ammonia
NIOSH RTECS BO0875000 DOT 1005 125; 2672 154; 2073 125; 1005 125
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 35 mg/m3
STEL 35 ppm, 24 mg/m3
DESC Colorless gas with a pungent, suffocating odor [Note: Shipped as a liquefied compressed gas. Easily liquefied under pressure.] Mixtures of air-ammonia may explode. UEL=25
MW: 17.0 BP: -28 F MP: -108 F VP: 8.5 atm
INCOM Strong oxidizers, acids, halogens, salts of silver & zinc [Note: Corrosive to copper & galvanized surfaces.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation; liquid: frostbite
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (50): Sulfuric acid treated silica gel sorbent tube (200/100 mg)
ANL SOLVENT: Deionized Water
REC V: 24 Liters REC F: 0.1 L/min (TWA)
MIN V: 7.5 Liters REC F: 0.5 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2003S009 SAE: 0.151 CLASS: Validated In-House
NOTE: Store and ship cold. Submit as a separate sample.
SAM2 DET. TUBE: Dräger, CH 20501, 5-600 ppm

Ammonium Chloride Fume

IMIS **0175** CAS 12125-02-9
SYN Ammonium chloride, Ammonium muriate fume, Sal ammoniac fume
NIOSH RTECS BP4550000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
STEL 20 mg/m3
DESC Finely divided, odorless, white particulate dispersed in air.
MW: 53.5 BP: Sublimes MP: 662 F (Sublimes) VP: 1 mm (321 F)
INCOM Alkalis & their carbonates, lead & silver salts, strong oxidizers, ammonium nitrate, potassium chlorate, bromine trifluoride [Note: Corrodes most metals at high (i.e., fire) temperatures.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), pulmonary sensitization
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Sample analyzed chromatographically only if the gross weight of the sample yields an air concentration greater than the PEL. When the analysis of the compound is requested, an analysis is performed for total ammonia and reported as the compound. The analytical method does not distinguish between dust and fume.

ANL 2: Ion Chromatography; IC
ANL SOLVENT: Deionized Water
REF: OHL2003S009 SAE: 0.151 CLASS: Validated In-House

Ammonium Nitrate

IMIS **A613** CAS 6484-52-2
SYN Ammonium nitrate, ammonium saltpeter, herco prills, Nitric Acid ammonium salt, varioform I
NIOSH RTECS BR9050000* DOT 1942 140
DESC May explode under high temperatures or confinement; however, not readily detonated.
MW: 80.06 BP: 410 F MP: 337 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Ammonium Sulfamate (Respirable Fraction)

IMIS **A111** CAS 7773-06-0
SYN Ammate herbicide; Ammonium amidosulfonate, AMS [Ammonium sulfamate], Monoammonium salt of sulfamic acid, Sulfamate
NIOSH RTECS WO6125000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless to white crystalline, odorless solid. [herbicide]
MW: 114.1 BP: 320 F (Decomposes) VP: 0 mm (approx.) MP: 268 F
INCOM Acids, hot water [Note: Elevated temperatures cause a highly exothermic reaction with water.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, nose, throat; cough, dyspnea (breathing difficulty)
ORGAN Eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An analysis of an ammonium compound is performed only if the gross weight of the sample yields an air concentration greater than the PEL. When the analysis of a compound is requested, an analysis for total ammonia is performed and reported as the compound. The analytical method does not distinguish between dust and fume.

Ammonium Sulfamate (Total Dust)

IMIS **0185** CAS 7773-06-0
SYN Ammate herbicide; Ammate herbicide; Ammonium amidosulfonate, AMS [Ammonium sulfamate], Monoammonium salt of sulfamic acid, Sulfamate
NIOSH RTECS WO6125000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3

DESC Colorless to white crystalline, odorless solid. [herbicide]
MW: 114.1 BP: 320 F VP: 0 mm (approx.) MP: 268 F
INCOM Acids, hot water [Note: Elevated temperatures cause a highly exothermic reaction with water.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, nose, throat; cough, dyspnea (breathing difficulty)
ORGAN Eyes, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An analysis of an ammonium compound is performed only if the gross weight of the sample yields an air concentration greater than the PEL. When the analysis of a compound is requested, an analysis for total ammonia is performed and reported as the compound. The analytical method does not distinguish between dust and fume.

n-Amyl Acetate (Pentyl Acetate)
IMIS **0190** CAS 628-63-7
SYN Amyl acetic ester, Amyl acetic ether, 1-Pentanol acetate, Pentyl ester of acetic acid, Primary amyl acetate
NIOSH RTECS AJ1925000 DOT 1104 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 525 mg/m3
DESC Colorless liquid with a persistent banana-like odor.
MW: 130.2 BP: 301 F VP: 4 mm MP: -95 F FP: 77 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation eyes, nose; dermatitis; possible central nervous system depression, narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 24 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.077 CLASS: Validated In-House
SAM2 DET. TUBE: Gastec 147

Antimony & Compounds (as Sb)
IMIS **0230** CAS 7440-36-0
SYN Antimony metal, Antimony powder, Stibium
NIOSH RTECS CC4025000 DOT 1549 157; 2871 170; 3141 157
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 mg/m3
DESC Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder.
MW: 121.8 BP: 2975 F MP: 1166 F VP: 0 mm (approx.)
INCOM Oxidizers, acids, halogenated acids [Note: Stibine is formed when antimony is exposed to nascent (freshly formed) hydrogen.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
SYMPT Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly

ORGAN Eyes, skin, respiratory system, cardiovascular system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Hydrochloric Acid/Nitric Acid
REF: OHL2018S001 SAE: 0.112 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

Arsenic, Inorganic Compounds (as As)
IMIS **0260 (PEL)** CAS 7440-38-2
0261 (AL)
SYN Arsenia, Arsenic metal [Note: OSHA considers “Inorganic Arsenic” to mean copper acetoarsenite and all inorganic compounds containing arsenic except ARSINE]
NIOSH RTECS CG0525000 DOT 1558 152; 1562 152
MIOSHA FINAL RULE (Table G-1-A) Inorganic Arsenic (29 CFR 1910.1018):
TWA 10 µg/m3
AL 5 µg/m3
This section applies to all occupational exposures to inorganic arsenic except employee exposures in agriculture or treatment of wood with preservatives or the utilization of arsenically preserved wood.
DESC Metal: Silver-gray or tin-white, brittle, odorless solid.
MW: 74.9 BP: Sublimes MP: 1135 F (Sublimes) VP: Approx. 0 mm
INCOM Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Human Carcinogen - [Arsenic and Inorganic Arsenic Compounds]
IARC Group 1 - carcinogenic to humans - [Arsenic and inorganic arsenic compounds]
SYMPT Ulceration of nasal septum; dermatitis; gastrointestinal disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin; [potential occupational carcinogen]
ORGAN Liver, kidneys, skin, lungs, lymphatic system [lung and lymphatic cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.217 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

WIPE MEDIA: Whatman smear tab SOLVENT: Deionized water

Asbestos, All Forms

IMIS **9020** CAS 1332-21-4; 17068-78-9; 12172-73-5; 12001-29-5; 12001-28-4; 14567-73-8

SYN Actinolite, Actinolite asbestos, Amosite (cummingtonite-grunerite), Anthophyllite, Anthophyllite asbestos, Chrysotile, Crocidolite (Riebeckite), Tremolite, Tremolite asbestos

NIOSH RTECS CI6475000 DOT 2212 171, 2590 171

MIOSHA FINAL RULE (Table G-1-A) Asbestos in General Industry (29 CFR 1910.1001):
FINAL RULE (Table G-1-A) Asbestos in Construction (29 CFR 1926.1101):
FINAL RULE (Table G-1-A) Asbestos in Ship Repairing, Shipbuilding and Shipbreaking (29 CFR 1915.1001):
TWA 0.1 fiber/cc
EL 1 fiber/cc (30 min)

DESC White or greenish (chrysotile), blue (crocidolite), or gray green (amosite) fibrous, odorless solids
MW: Varies BP: Varies MP: 1112 F (Decomposes)

INCOM None reported

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)

NTP Human Carcinogen - [Asbestos]

IARC Group 1 - carcinogenic to humans - [Asbestos (all forms, including actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite)]

SYMPT Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen]

ORGAN Respiratory system, eyes; [lung cancer]

LESS1 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (EL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House
NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.

LESS2 MEDIA: Bulk Samples
ANL 1: Polarized Light Microscopy; PLM
REF: OHL2004M9020m_OPL CLASS: Validated In-House
NOTE: Collect sample in a 50 mm x 9 mm style polystyrene petri dish. Do not ship bulk samples with air samples. Seal securely to prevent escape of asbestos.

WIPE Bulk preferred. Do not use Whatman or other paper filters.

Asphalt Fumes (Petroleum)

IMIS **0290** CAS 8052-42-4

SYN Asphaltum, Bitumen, Petroleum asphalt, Petroleum bitumen, Road asphalt, Roofing asphalt

NIOSH RTECS CI9900000 DOT 1999 130(asphalt)

DESC Fumes generated during the production or application of asphalt (a dark brown to black cement-like substance manufactured by the vacuum distillation of crude petroleum oil).

Properties vary depending upon the specific compound.
INCOM None reported [Note: Asphalt becomes molten at about 200°F.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 2B - possibly carcinogenic to humans - [Bitumens, extracts of steam-refined and air-refined; steam-refined, cracking-residue and air-refined bitumens (see Bitumens, occupational exposures)]
SYMPT Irritation eyes, respiratory system; [potential occupational carcinogen]
ORGAN Eyes, respiratory system. [in animals: skin tumors]
LESS1 MEDIA: Pre-Weighed PTFE Filter
MAX V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: High Performance Liquid Chromatography; HPLC
MEDIA: Pre-Weighed PTFE Filter
ANL SOLVENT: Benzene
REF: OHL2009S001 CLASS: Validated In-House
NOTE: The sample will be weighed, and the concentration of the collected material determined. If the concentration is over 0.40 mg/m3, the filter will be extracted with benzene to determine the concentration of the soluble material.

Barium, Soluble Compounds (Except Barium Sulfate)
IMIS **0310** CAS 7440-39-3
SYN Varies depending upon the specific soluble barium compound.
DOT 1564 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 mg/m3
DESC A silver to white metallic, odorless solid; Appearance and odor vary depending upon specific compound.
Properties vary depending upon the specific compound.
INCOM Acids, oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia
ORGAN Eyes, skin, respiratory system, heart, central nervous system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.130 CLASS: Partially Validated by NIOSH and OSHA
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. Solubility of the Barium compounds, if known, should be transmitted to LESS. Soluble means water-soluble.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Barium Sulfate (Respirable Fraction)
IMIS **B104** CAS 7727-43-7
SYN Artificial barite, Barite, Barium salt of sulfuric acid, Barytes (natural)
NIOSH RTECS CR0600000 DOT 1564 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White or yellowish, odorless powder.
MW: 233.4 BP: 2912 F MP: 2876 F VP: 0 mm (approx.)

INCOM Phosphorus, aluminum [Note: Aluminum in the presence of heat can cause an explosion.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, nose, upper respiratory system; benign pneumoconiosis (baritosis)
ORGAN Eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Hydrochloric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: Submit as a separate sample. An elemental analysis for Barium is performed and reported as the compound.

Barium Sulfate (Total Dust)

IMIS **B101** CAS 7727-43-7
SYN Artificial barite, Barite, Barium salt of sulfuric acid, Barytes (natural)
NIOSH RTECS CR0600000 DOT 1564 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White or yellowish, odorless powder.
MW: 233.4 BP: 2912 F MP: 2876 F VP: 0 mm (approx.)
INCOM Phosphorus, aluminum [Note: Aluminum in the presence of heat can cause an explosion.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, nose, upper respiratory system; benign pneumoconiosis (baritosis)
ORGAN Eyes, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Hydrochloric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: Submit as a separate sample. An elemental analysis for Barium is performed and reported as the compound.

Benzaldehyde

IMIS **B105** CAS 100-52-7
SYN Benzoic Aldehyde; Benzenecarbonal; Benzene Carbaldehyde
NIOSH RTECS CU4375000* DOT 1990 171
DESC Clear colorless to yellow liquid with a bitter almond odor.
MW: 106.1 BP: 354 F MP: -15 F FP: 148 F
INCOM Strong oxidizing agents, strong reducing agents, strong bases, alkali metals, aluminum, iron, phenols, oxygen, reacts violently with peroxyformic acid.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Convulsions, Cough, Dizziness, Headache, Nausea, Sore throat, Vomiting,

Redness, Pain.
ORGAN Irritation, eyes, skin, lungs
LESS1 MEDIA (52): Silica Gel (300/150 mg) with 2,4-dinitrophenylhydrazine
ANL SOLVENT: Acetonitrile
MAX V: 15 Liters MIN V: 1 Liters REC F: 1.5 L/min
ANL 1: High Performance Liquid Chromatography; HPLC
REF: OHL2002S017 SAE: 0.062 CLASS: Validated In-House
NOTE: Store and ship cold.

Benzene

IMIS **0320** CAS 71-43-2
SYN Benzol; Phenyl hydride; Cyclohexatriene
NIOSH RTECS CY1400000 DOT 1114 130
MIOSHA FINAL RULE (Table G-1-A) Benzene (29 CFR 1910.1028):
TWA 1 ppm, 3.19 mg/m3
STEL 5 ppm, 15.97 mg/m3 (15 mins)
AL 0.5 ppm
NOTE: The benzene standard in R325.77101-115 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers, and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table G-2 apply.
(Table G-2):
TWA 10 ppm
CEIL 25 ppm
PEAK 50 ppm (max 10 min)
NOTE: This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard 1910.1028. This applies to any industry for which R325.77101-115 is stated or otherwise not in effect.
DESC Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]
MW: 78.1 BP: 176 F VP: 75 mm MP: 41.9 F FP: 12 F
INCOM Strong oxidizers; many fluorides & perchlorates, Nitric Acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Benzene]
IARC Group 1 - carcinogenic to humans - [Benzene]
SYMPT Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, blood, central nervous system, bone marrow [leukemia]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 0.75 Liters REC F: 0.05 L/min TIME: 15 minutes (STEL)
REC V: 0.75 Liters MAX F: 0.05 L/min MIN T: 15 Minutes (CEIL)
REC V: 0.25 Liters MAX F: 0.05 L/min MIN T: 5 Minutes (PEAK)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.114 CLASS: Validated In-House
SAM2 DET. TUBE: Dräger, 8103691, 0.25-10 ppm

Benzo[a]Pyrene

IMIS **0726** CAS 50-32-8
SYN BaP; Benzo alpha Pyrene; Benzo (a) Pyrene; 3,4-Benzophrene; 6,7-Benzopyrene; Diesel Exhaust Component
NIOSH RTECS GF8655000 DOT 2713 153(acridine)
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.2 mg/m3
DESC Odorless, silver-gray to black solid
MW: 252.32 BP: 5612 F MP: 3497 to 3515 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
NTP Suspect Human Carcinogen - [Benzo[a]pyrene (see Polycyclic Aromatic Hydrocarbons: 15 Listings)]
IARC Group 1 - carcinogenic to humans - [Benzo[a]pyrene]
SYMPT Dermatitis, bronchitis, [potential occupational carcinogen]
ORGAN Respiratory system, skin, bladder, kidneys [lung, kidney & skin cancer]
LESS1 MEDIA (G): Glass Fiber Filter (GFF) 37 mm
ANL SOLVENT: Acetonitrile
REC V: 960 Liters REC F: 2.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC
REF: OHL2006S019 SAE: 0.111 CLASS: Validated In-House
(In conjunction with Coal Tar Pitch Volatiles and Coke Oven Emissions.)
NOTE: After sampling, filter must be transferred to a vial with a Teflon-lined cap. Sample must be protected from direct sunlight.

Benzyl Alcohol

IMIS **0337** CAS 100-51-6
SYN Benzenecarbinol; Benzenemethanol; Benzoyl Alcohol; Phenylcarbinol; alpha-Hydroxytoluene; Phenylmethanol
NIOSH RTECS DN3150000*
DESC A clear colorless liquid with a pleasant odor.
MW: 108.13 BP: 401 F MP: 4.5 F FP: 213 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, lungs, cough, dizziness, headache, drowsiness
ORGAN Eyes, skin, kidney, lungs
LESS1 MEDIA (91): XAD-7 Tube (100/50 mg)
ANL SOLVENT: Methanol
REC V: 24 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2008S004 CLASS: Validated In-House
NOTE: Store and ship cold.

Beryllium and Compounds (as Be)

IMIS **0365** CAS 7440-41-7
SYN Beryllium metal
NIOSH RTECS DS1750000 DOT 1566 154; 1567 134
MIOSHA FINAL RULE (Table G-1-A) Beryllium (29 CFR 1910.1024):
TWA 0.2 µg/m3
STEL 2 µg/m3, (15 min)
AL 0.1 µg/m3
OSHA FINAL RULE (TABLE Z-2):
CEIL 5 µg/m3

PEAK 25 µg/m3, (max duration 30 min)

DESC Metal: A hard, brittle, gray-white solid.
MW: 9.0 BP: 4532 F MP: 2349 F VP: 0 mm (approx.)

INCOM Acids, caustics, chlorinated hydrocarbons, oxidizers, molten lithium

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)

NTP Human Carcinogen - [Beryllium (see Beryllium and Beryllium Compounds)]

IARC Group 1 - carcinogenic to humans - [Beryllium and beryllium compounds]

SYMPT Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]

ORGAN Eyes, skin, respiratory system [lung cancer]

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters TIME: 15 minutes REC F: 2.0 L/min (STEL)
MIN V: 30 Liters MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
MIN V: 30 Liters MIN T: 15 Minutes REC F: 2.0 L/min (PEAK)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.150 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Bismuth

IMIS **B100** CAS 7440-69-9

SYN Bismuth elemental, bismuth powder

DESC Solid silvery-grey metal.
MW: 208.98

INCOM Aluminum and the following oxidants: ammonium nitrate, bromine pentafluoride, chloric acid, iodine pentafluoride, Nitric Acid, nitrosyl fluoride, and perchloric acid.

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House

Bismuth Telluride (Se Doped, as Bi_2Te_3)

IMIS **0371** CAS 1304-82-1

SYN Doped bismuth sesquitelluride, Doped bismuth telluride, Doped bismuth tritelluride, Doped tellurobismuthite [Note: Doped with selenium sulfide. Commercial mix may contain 80% Bi2Te3, 20% stannous telluride, plus some tellurium.]
DOT 3284 151

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3

DESC Gray, crystalline solid that has been enhanced (doped) with a small amount of selenium sulfide (SeS). [Note: Doping alters the conductivity of a semiconductor.]

MW: 800.8 MP: 1063 F VP: 0 mm (approx.)
INCOM Strong oxidizers, moisture
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, upper respiratory system; garlic breath; In Animals: pulmonary lesions (nonfibrotic)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: Submit as a separate sample. An elemental analysis for Bismuth is performed and reported as the compound.

Bismuth Telluride (Undoped, as Bi_2Te_3) (Respirable Fraction)
IMIS **B110** CAS 1304-82-1
SYN Bismuth sesquitelluride, Bismuth telluride, Bismuth tritelluride, Tellurobismuthite
NIOSH RTECS EB3110000 DOT 3284 151
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Gray, crystalline solid.
MW: 800.8 MP: 1063 F VP: 0 mm (approx.)
INCOM Strong oxidizers (e.g., bromine, chlorine, or fluorine), moisture, Nitric Acid (decomposes)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, upper respiratory system; garlic breath
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: Submit as a separate sample. An elemental analysis for Bismuth is performed and reported as the compound.

Bismuth Telluride (Undoped, as Bi_2Te_3) (Total Dust)
IMIS **0370** CAS 1304-82-1
SYN Bismuth sesquitelluride, Bismuth telluride, Bismuth tritelluride, Tellurobismuthite
NIOSH RTECS EB3110000 DOT 3284 151
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Gray, crystalline solid.

MW: 800.8 MP: 1063 F VP: 0 mm (approx.)
INCOM Strong oxidizers (e.g., bromine, chlorine, or fluorine), moisture, Nitric Acid (decomposes)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, upper respiratory system; garlic breath
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: Submit as a separate sample. An elemental analysis for Bismuth is performed and reported as the compound.

Bisphenol A
IMIS **0372** CAS 80-05-7
SYN 4,4'-(1-Methylethylidene) bisphenol; 4,4'Isopropylidenediphenol; 2,2-bis (4-Hydroxyphenyl) propane
DOT 3077 171(international)
DESC White to light brown flakes or powder with a weak medicinal odor. Reacts violently with acid anhydrides, acid chlorides, strong bases, and strong oxidants.
MW: 228.3 BP: 428 F MP: 307 to 313 F VP: 0.2 mm FP: 175 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (G): Glass Fiber Filter (GFF) 37 mm
ANL SOLVENT: Methanol
REC V: 360 Liters REC F: 1.5 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S023 SAE: 0.172 CLASS: Validated In-House

Boron Oxide (Total Dust)
IMIS **0380** CAS 1303-86-2
SYN Boric anhydride; boric oxide, boron trioxide
NIOSH RTECS ED7900000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Colorless, semitransparent lumps or hard, white, odorless crystals.
MW: 69.6 BP: 3380 F VP: 0 mm (approx.) MP: 842 F
INCOM Water [Note: Reacts slowly with water to form boric acid.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, respiratory system; cough; conjunctivitis; skin erythema (skin redness)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid

REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: When the standard is the same as for inert dust, noncompliance can be based on gross weight without analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Bromoform

IMIS **0400** CAS 75-25-2
SYN Tribromomethane, Methyl tribromide
NIOSH RTECS PB5600000 DOT 2515 159
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 ppm, 5 mg/m3 (Skin)
DESC Colorless to yellow liquid with a chloroform-like odor. [Note: A solid below 47 F.]
MW: 252.8 BP: 301 F VP: 5 mm MP: 47 F
INCOM Lithium, sodium, potassium, calcium, aluminum, zinc, magnesium, strong caustics, acetone [Note: Gradually decomposes, acquiring yellow color; air & light accelerate decomposition.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Bromoform]
SYMPT Irritation eyes, skin, respiratory system; central nervous system depression; liver, kidney damage
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: Carbon Disulfide
REC V: 10 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: NIOSH1003 SAE: 0.120 CLASS: Partially Validated by NIOSH
WIPE Wipe with charcoal pad, seal in glass vial for shipment.

1-Bromopropane

IMIS **R290** CAS 106-94-5
SYN Propyl bromide, n-Propyl bromide, nPB
NIOSH RTECS TX4110000* DOT 2344 129
DESC Flammable or combustible colorless liquid.
MW: 123.01 BP: 159.6 F VP: 274.01 mm MP: -166 F FP: 71.6 F
INCOM Strong oxidizing agents, strong bases
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes, skin, respiratory system, central nervous system, cough, sore throat, dizziness, drowsiness
ORGAN Eyes, skin, lungs, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2007S002 SAE: 0.128 CLASS: Validated In-House

2-Bromopropane

IMIS **R289** CAS 75-26-3

SYN Isopropyl bromide
NIOSH RTECS TX4111000*
DESC Clear, colorless to slightly yellow flammable liquid.
MW: 123.0
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation skin, eye, respiratory tract, central nervous system depression, excitement fatigue, headache, dizziness, stupor, unconsciousness and possible coma, kidney, and liver damage
ORGAN Skin, lungs, central nervous system, kidney, liver
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2007S002 CLASS: Partially Validated

Butadiene (1,3-Butadiene)

IMIS **0410** CAS 106-99-0
SYN 1,3-Butadiene; Biethylene, Bivinyl, Butadiene, Divinyl, Erythrene, Vinylethylene
NIOSH RTECS EI9275000 DOT 1010 116P
MIOSHA FINAL RULE (Table G-1-A) 1,3-Butadiene (29 CFR 1910.1051):
TWA 1 ppm, 2.2 mg/m3
STEL 5 ppm, 11.1 mg/m3 (15 min)
AL 0.5 ppm
DESC Colorless gas with a mild aromatic or gasoline-like odor. [Note: A liquid below 24°F. Shipped as a liquefied compressed gas.]
MW: 54.1 BP: 24 F VP: 2.4 atm MP: -164 F FP: -105 F (liquid)
INCOM Phenol, chlorine dioxide, copper, crotonaldehyde [Note: May contain inhibitors (such as tributylcatechol) to prevent self-polymerization. May form explosive peroxides upon exposure to air.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
NTP Human Carcinogen - [1,3-Butadiene]
IARC Group 1 - carcinogenic to humans - [1,3-Butadiene]
SYMPT Irritation eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]
ORGAN Eyes, respiratory system, central nervous system, reproductive system. [hemato cancer]
LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Carbon Disulfide
REC V: 3 Liters REC F: 0.05 L/min (TWA & STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2007S003 SAE: 0.110 CLASS: Validated In-House
NOTE: Store and ship cold.

Butane

IMIS **0420** CAS 106-97-8
SYN Normal-Butane, Butyl hydride, Diethyl, Methylethylmethane [Note: Also see specific listing for Isobutane.]
NIOSH RTECS EJ4200000 DOT 1011 115; 1075 115
MIOSHA FINAL RULE (Table G-1-A):
TWA 800 ppm, 1900 mg/m3
DESC Colorless gas with a gasoline-like or natural gas odor. [Note: Shipped as a liquefied compressed gas. A liquid below 31°F.]
MW: 58.1 BP: 31 F FP: -217 F VP: 2.05 atm
INCOM Strong oxidizers (e.g., nitrates & perchlorates), chlorine, fluorine, (nickel carbonyl + oxygen)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Asphyxiants, Anoxiants. (HE17)
Nervous System Disturbances---Narcosis. (HE8)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Drowsiness, narcosis, asphyxia; liquid: frostbite
ORGAN Central nervous system
LESS1 MEDIA (8+8): Two Carbosieve S-III Tubes (130/65 mg, 60/80 mesh) in series
ANL SOLVENT: Carbon Disulfide
REC V: 3 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2017S001 SAE: 0.141 CLASS: Validated In-House

2-Butanone (Methyl Ethyl Ketone; MEK)

IMIS **0430** CAS 78-93-3
SYN Methyl Ethyl Ketone; MEK; Ethyl Methyl Ketone; Methyl Acetone
NIOSH RTECS EL6475000 DOT 1193 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 590 mg/m3
STEL 300 ppm, 885 mg/m3
DESC Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.
MW: 72.1 BP: 175 F VP: 78 mm MP: -123 F FP: 16 F
INCOM Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (8): CARBOSIEVE S-III (ORBO 91) (130/65 mg sections, 60/80 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 12 Liters MIN V: 0.25 Liters REC F: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S016 SAE: 0.126 CLASS: Validated In-House
NOTE: Recommended refrigerated storage. Alternative media is available, contact LESS for more information.

2-Butoxyethanol

IMIS **0435** CAS 111-76-2
SYN Butyl Cellosolve®, Butyl oxitol, Dowanol® EB, EGBE, Ektasolve EB®, Ethylene glycol monobutyl ether, Jeffersol EB
NIOSH RTECS KJ8575000 DOT 2369 152
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 120 mg/m3 (Skin)

DESC Colorless liquid with a mild, ether-like odor.
MW: 118.2 BP: 339 F VP: 0.8 mm MP: -107 F FP: 143 F
INCOM Strong oxidizers and caustics
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Hematologic (Blood) Disturbances---Anemias. (HE12)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [2-Butoxyethanol]
SYMPT Irritation eyes, skin, nose, throat; hemolysis, hematuria (blood in the urine); central nervous system depression, headache; vomiting
ORGAN Eyes, skin, respiratory system, central nervous system, hematopoietic system, blood, kidneys, liver, lymphoid system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
MAX V: 10 Liters MIN V: 2 Liters REC F: 0.01 to 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.118 CLASS: Validated In-House
NOTE: Recommended refrigerated storage
WIPE Wipe with charcoal pad, seal in glass vial for shipment.

2-Butoxyethyl Acetate (Butyl Cellosolve Acetate)
IMIS **0472** CAS 112-07-2
SYN 2-Butoxyethyl acetate, Butyl Cellosolve® acetate, Butyl glycol acetate, EGBEA, Ektasolve EB® acetate, Ethylene glycol monobutyl ether acetate
NIOSH RTECS KJ8925000
DESC Colorless liquid with a pleasant, sweet, fruity odor.
MW: 160.2 BP: 378 F MP: -82 F VP: 0.3 mm FP: 160 F
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, nose, throat; hemolysis, hematuria (blood in the urine); central nervous system depression, headache; vomiting
ORGAN Eyes, skin, respiratory system, central nervous system, hematopoietic system, blood, kidneys, liver, lymphoid system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 48 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.081 CLASS: Validated In-House

n-Butyl Acetate
IMIS **0440** CAS 123-86-4
SYN Butyl Acetate; Butyl ethanoate; n-Butyl ester of Acetic acid
NIOSH RTECS AF7350000 DOT 1123 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 150 ppm, 710 mg/m3
STEL 200 ppm, 950 mg/m3 (15 mins)
DESC Colorless liquid with a fruity odor.
MW: 116.2 BP: 258 F VP: 10 mm MP: -107 F FP: 72 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, skin, upper respiratory system; headache, drowsiness, narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)

ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.111 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.

sec-Butyl Acetate

IMIS **0441** CAS 105-46-4
SYN 1-Methylpropylacetate, sec-Butyl ester of acetic acid
NIOSH RTECS AF7380000 DOT 1123 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 950 mg/m3
DESC Colorless liquid with a pleasant odor.
MW: 116.2 BP: 234 F VP: 10 mm MP: -100 F FP: 62 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes; headache; drowsiness; dryness upper respiratory system, skin; narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 24 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.120 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.

tert-Butyl Acetate

IMIS **0442** CAS 540-88-5
SYN Tert-Butyl ester of acetic acid
NIOSH RTECS AF7400000 DOT 1123 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 950 mg/m3
DESC Colorless liquid with a fruity odor.
MW: 116.2 BP: 208 F FP: 72 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Itch, inflammation eyes; irritation upper respiratory tract; headache; narcosis; dermatitis
ORGAN Respiratory system, eyes, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.077 CLASS: Validated In-House

Butyl Acrylate

IMIS **0450** CAS 141-32-2
SYN n-Butyl acrylate, Butyl ester of acrylic acid, Butyl-2-propenoate
NIOSH RTECS UD3150000 DOT 2348 129P
MIOSHA FINAL RULE (Table G-1-A):

TWA 10 ppm; 55 mg/m3

DESC Clear, colorless liquid with a strong, fruity odor
MW: 128.2 BP: 293 F FP: -83 F VP: 4 mm FP: 103 F

INCOM Strong acids & alkalis, amines, halogens, hydrogen compounds, oxidizers, heat, flame, sunlight [Note: Polymerizes readily on heating.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

IARC Group 3 - not classifiable as to its carcinogenicity to humans - [n-Butyl acrylate]

SYMPT Irritation eyes, skin, upper respiratory system; sensitization dermatitis; dyspnea (breathing difficulty)

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Toluene
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.066 CLASS: Validated In-House
NOTE: Store and ship cold.

SAM2 DET. TUBE: Kitagawa, 211U, 5-60 ppm
Century Organic Vapor Analyzer

n-Butyl Alcohol (n-Butanol)

IMIS **0460** CAS 71-36-3

SYN Butyl alcohol; 1-Butanol; n-Butanol; BA; 1-hydroxybutane; n-propyl carbinol

NIOSH RTECS EO1400000 DOT 1120 129

MIOSHA FINAL RULE (Table G-1-A):
CEIL 50 ppm, 150 mg/m3 (Skin)

DESC Colorless liquid with a strong, characteristic, mildly alcoholic odor.
MW: 74.1 BP: 243 F VP: 15.51 mm MP: -129 F FP: 84 F

INCOM Strong oxidizers, strong mineral acids, alkali metals, halogens

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)

SYMPT Irritation eyes, nose, throat; headache, dizziness, drowsiness; corneal inflammation, blurred vision, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light); dermatitis; possible auditory nerve damage, hearing loss; central nervous system depression

ORGAN Eyes, skin, respiratory system, central nervous system

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 2 Liters REC F: 0.01 to 0.2 L/min (TWA)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.100 CLASS: Validated In-House

LESS2 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (60/40) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.093 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

sec-Butyl Alcohol (sec-Butanol)

IMIS **0461** CAS 78-92-2

SYN 2-Butanol; Methyl ethyl carbinol; Butylene hydrate; 2-Hydroxybutane

NIOSH RTECS EO1750000 DOT 1120 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 305 mg/m3
DESC Colorless liquid with a strong, pleasant odor.
MW: 74.1 BP: 211 F VP: 12 mm MP: -175 F FP: 75 F
INCOM Strong oxidizers, organic peroxides, perchloric and permonosulfuric acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation eyes, skin, nose, throat; narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 2 Liters REC F: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.087 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
LESS2 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (40/60) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.130 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

tert-Butyl Alcohol (tert-Butanol)
IMIS **0462** CAS 75-65-0
SYN 2-Methyl-2-propanol; TBA; Trimethyl carbinol
NIOSH RTECS EO1925000 DOT 1120 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 300 mg/m3
STEL 150 ppm, 450 mg/m3
DESC Colorless solid or liquid (above 77F) with a camphor-like odor. [Note: Often used in aqueous solutions.]
MW: 74.1 BP: 180 F VP: 42 mm MP: 78 F FP: 52 F
INCOM Strong mineral acids, strong hydrochloric acid, oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation eyes, skin, nose, throat; drowsiness, narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters REC F: 0.01 to 0.2 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.120 CLASS: Validated In-House
NOTE: Store and ship cold.

tert-Butyl Chromate (as CrO3)

IMIS Use Chromic Acid & Chromates (as CrO3), (**0689)**
CAS 1189-85-1
SYN Di-tert-Butyl ester of chromic acid
NIOSH RTECS GB2900000
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3 (Skin)
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.
DESC Liquid. [Note: Solidifies at 32-23°F.]
MW: 230.3 MP: 23 to 32 F
INCOM Reducing agents, moisture, acids, alcohols, hydrazine, combustible materials
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Chromium Hexavalent Compounds]
IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]
SYMPT Irritation eyes, skin, respiratory system; eye, skin burns; drowsiness, muscle weak; skin ulcers; lung changes; [potential occupational carcinogen]
ORGAN Respiratory system, skin, eyes, central nervous system, [lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Submit as a separate sample.
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6).
WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: None (dry wipe)

n-Butyl Glycidyl Ether (BGE)

IMIS **0477** CAS 2426-08-6
SYN BGE; 1,2-Epoxy-3-butoxypropane
NIOSH RTECS TX4200000 DOT 1993 128
MIOSHA FINAL RULE (Table G-1-A):

TWA 25 ppm, 135 mg/m3

DESC Colorless liquid with an irritating odor.
MW: 130.2 BP: 327 F VP: 3 mm FP: 130 F
INCOM Strong oxidizers and caustics
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 2B - possibly carcinogenic to humans - [1-Butyl glycidyl ether]
SYMPT Irritation eyes, skin, nose; skin sensitization; narcosis; possible hematopoietic effects; central nervous system depression

ORGAN Eyes, skin, respiratory system, central nervous system, blood
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 30 Liters MIN V: 15 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.100 CLASS: Validated In-House

tert-Butyl Methyl Ether

IMIS **B146** CAS 1634-04-4
SYN Methyl-tert-Butyl Ether; Methoxy-2-Methyl Propane; MTBE
NIOSH RTECS KN5250000* DOT 2398 127
DESC A colorless liquid with a distinctive anesthetic-like color.
MW: 88.17 BP: 131.4 F MP: -164.2 F FP: -14 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Methyl tert-butyl ether]
LESS1 MEDIA: Contact LESS.
ANL SOLVENT: Carbon Disulfide
MAX V: 96 Liters MIN V: 2 Liters FLOW: 0.1 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S016 SAE: 0.076 CLASS: Validated In-House
NOTE: Store and ship cold.

Cadmium (as Cd)

IMIS **C141** CAS 7440-43-9
SYN Cadmium metal; synonyms vary depending upon the specific cadmium compound.
NIOSH RTECS EU9800000 DOT 2570 154
MIOSHA FINAL RULE (Table G-1-A) Cadmium in General Industry (29 CFR 1910.1027):
TWA 0.005 mg/m3
AL 2.5 µg/m3
DESC Metal: Silver-white, blue-tinged lustrous, odorless solid.
MW: 112.4 BP: 1409 F MP: 610 F VP: 0 mm (approx.)
INCOM Strong oxidizers, elemental sulfur, selenium and tellurium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Asphyxiants, Anoxiants. (HE17)
NTP Human Carcinogen - [Cadmium (see Cadmium and Cadmium Compounds)]
IARC Group 1 - carcinogenic to humans - [Cadmium and cadmium compounds]
SYMPT Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
ORGAN Respiratory system, kidneys, prostate, blood [prostatic and lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.076 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume.

WIPE MEDIA: Ghost Wipe

Calcium Arsenate (as As)

IMIS **0500** CAS 7778-44-1
SYN Calcium salt (2:3) of arsenic acid, Cucumber dust, Tricalcium arsenate, Tricalcium ortho-arsenate [Note: Also see specific listing for Arsenic (inorganic compounds, as As).]
NIOSH RTECS CG0830000 DOT 1573 151
DESC Colorless to white, odorless solid [insecticide/herbicide]
MW: 398.1 BP: Decomposes VP: 0 mm (approx.)
INCOM None reported [Note: Produces toxic fumes of arsenic when heated to decomposition.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Human Carcinogen - [Calcium Arsenate (see Arsenic and Inorganic Arsenic Compounds)]
IARC Group 1 - carcinogenic to humans - [Arsenic and inorganic arsenic compounds]
SYMPT Lassitude (weakness, exhaustion); gastrointestinal disturbance; peripheral neuropathy; skin hyperpigmentation, palmar planter hyperkeratosis; dermatitis; In Animals: liver damage [potential occupational carcinogen]
ORGAN Eyes, respiratory system, liver, skin, lymphatic system, central nervous system [lymphatic and lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.217 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized water

Calcium Carbonate (Respirable Fraction)

IMIS **C130** CAS 1317-65-3; 471-34-1
SYN Calcium salt of carbonic acid [Note: Occurs in nature as limestone, chalk, marble, dolomite, aragonite, calcite, and oyster shells.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White, odorless powder or colorless crystals. Calcium carbonate is soluble in concentrated mineral acids.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Acids, alum, ammonium salts, mercury and hydrogen, fluorine, magnesium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system, cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: An elemental analysis is performed for total calcium and reported as the compound.

Calcium Carbonate (Total Dust)
IMIS **0505** CAS 1317-65-3; 471-34-1
SYN Calcium salt of carbonic acid [Note: Occurs in nature as limestone, chalk, marble, dolomite, aragonite, calcite and oyster shells.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC White, odorless powder or colorless crystals. Calcium carbonate is soluble in concentrated mineral acids.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Acids, alum, ammonium salts, mercury and hydrogen, fluorine, magnesium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system, cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: An elemental analysis is performed for total calcium and reported as the compound.

Calcium Cyanamide
IMIS **0510** CAS 156-62-7
SYN Calcium carbamide; cyanamide [calcium cyanamide]; lime nitrogen; nitrogen lime
NIOSH RTECS GS6000000 DOT 1403 138
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 mg/m3
DESC Colorless, gray, or black crystals or powder.
MW: 80.1 BP: Sublimes MP: 2372 F VP: 0 mm (approx.)
INCOM Water [Note: May polymerize in water or alkaline solutions to dicyanamide. Decomposes in water to form acetylene & ammonia.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)

SYMPT Irritation eyes, skin, respiratory system; headache, dizziness, rapid breath, low blood pressure, nausea, vomiting; skin burns, sensitization; cough; Antabuse-like effects
ORGAN Eyes, skin, respiratory system, vasomotor system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Calcium Hydroxide (Respirable Fraction)
IMIS **C330** CAS 1305-62-0
SYN Calcium hydrate; caustic lime; hydrated lime; slaked lime
NIOSH RTECS EW2800000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White, odorless powder. [Note: Readily absorbs CO2 from the air to form calcium carbonate.]
MW: 74.1 MP: 1076 F VP: 0 mm (approx.)
INCOM Maleic anhydride, phosphorus, nitroethane, nitromethane, nitroparaffins, nitropropane [Note: Attacks some metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Inhalation eyes, skin, upper respiratory system; eye, skin burns, skin vesiculation, cough, bronchitis, pneumonitis
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Deionized Water
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound. The stoichiometric factor for calcium hydroxide from calcium is 1.849.

Calcium Hydroxide (Total Dust)
IMIS **0515** CAS 1305-62-0
SYN Calcium hydrate; caustic lime; hydrated lime; slaked lime
NIOSH RTECS EW2800000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC White, odorless powder. [Note: Readily absorbs CO2 from the air to form calcium carbonate.]
MW: 74.1 MP: 1076 F VP: 0 mm (approx.)
INCOM Maleic anhydride, phosphorus, nitroethane, nitromethane, nitroparaffins,

nitropropane [Note: Attacks some metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Inhalation eyes, skin, upper respiratory system; eye, skin burns, skin vesiculation, cough, bronchitis, pneumonitis
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Deionized Water
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound. The stoichiometric factor for calcium hydroxide from calcium is 1.849.

Calcium Oxide

IMIS **0520** CAS 1305-78-8
SYN Burned lime, Burnt lime, Lime, Pebble lime, Quick lime, Unslaked lime
NIOSH RTECS EW3100000 DOT 1910 157
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White or gray, odorless lumps or granular powder.
MW: 56.1 BP: 5162 F VP: 0 mm (approx.) MP: 4662 F
INCOM Water (liberates heat), fluorine, ethanol [Note: Reacts with water to form calcium hydroxide.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritates eyes, skin, upper respiratory tract; ulcer, perforated nasal septum; pneumonia; dermatitis
ORGAN Respiratory system, skin, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not perform an elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Calcium Silicate (Respirable Fraction)

IMIS **C122** CAS 1344-95-2
SYN Calcium hydrosilicate, Calcium metasilicate, Calcium monosilicate, Calcium salt of silicic acid
NIOSH RTECS VV9150000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White or cream-colored, free-flowing powder. [Note: The commercial product is prepared from diatomaceous earth & lime.]

MW: 116.2 MP: 2804 F VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Calcium Silicate (Total Dust)
IMIS **C112** CAS 1344-95-2
SYN Calcium hydrosilicate, Calcium metasilicate, Calcium monosilicate, Calcium salt of silicic acid
NIOSH RTECS VV9150000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC White or cream-colored, free-flowing powder.
MW: 116.2 MP: 2804 F VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Calcium Sulfate (Respirable Fraction)
IMIS **C123** CAS 7778-18-9
SYN Anhydrous calcium sulfate, Anhydrous gypsum, Anhydrous sulfate of lime, Calcium salt of sulfuric acid [Note: Gypsum is the dihydrate form and Plaster of Paris is the hemihydrate form.]
NIOSH RTECS WS6920000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Odorless, white powder or colorless, crystalline solid. [Note: May have blue, gray, or reddish tinge.]
MW: 136.1 MP: 2840 F VP: 0 mm (approx.)
INCOM Diazomethane, aluminum, phosphorus, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum & Plaster of Paris.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, upper respiratory system; conjunctivitis; rhinitis, epistaxis (nosebleed)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min

ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Calcium Sulfate (Total Dust)

IMIS **C104** CAS 7778-18-9
SYN Anhydrous calcium sulfate, Anhydrous gypsum, Anhydrous sulfate of lime, Calcium salt of sulfuric acid [Note: Gypsum is the dihydrate form and Plaster of Paris is the hemihydrate form.]
NIOSH RTECS WS6920000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Odorless, white powder or colorless, crystalline solid. [Note: May have blue, gray, or reddish tinge.]
MW: 136.1 MP: 2840 F VP: 0 mm (approx.)
INCOM Diazomethane, aluminum, phosphorus, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum & Plaster of Paris.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, upper respiratory system; conjunctivitis; rhinitis, epistaxis (nosebleed)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Caprolactam (Dust)

IMIS **0523** CAS 105-60-2
SYN Aminocaproic lactam, epsilon-Caprolactam, Hexahydro-2H-azepin-2-one, 2-Oxohexamethyleneimine
NIOSH RTECS CM3675000
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 3 mg/m3
DESC White, crystalline solid or flakes with an unpleasant odor. [Note: Significant vapor concentrations would be expected only at elevated temperatures.]
MW: 113.2 BP: 515 F MP: 156 F VP: 0.00000008 mm FP: 282 F
INCOM Strong oxidizers, (acetic acid + dinitrogen trioxide)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Caprolactam]
SYMPT Irritation skin, eyes, respiratory system; epistaxis (nosebleed); dermatitis, skin sensitization; asthma; irritability, confusion, dizziness, headache; abdominal cramps, diarrhea, nausea, vomiting; liver, kidney injury
ORGAN Eyes, skin, respiratory system, central nervous system, cardiovascular system, liver, kidneys
LESS1 MEDIA (44): OVS-7 - 13 mm XAD-7 tube (200/100 mg, 20/60 mesh) with glass fiber filter enclosed
ANL SOLVENT: Methanol

REC V: 100 Liters REC F: 1.0 L/min (TWA)
REC V: 15 Liters REC F: 1.0 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OSHAPV2012 SAE: 0.142 CLASS: Partially Validated by OSHA
NOTE: Store and ship cold.

Caprolactam (Vapor)

IMIS **0524** CAS 105-60-2
SYN 2-0xohexamethylene imine; Aminocaproic lactam
NIOSH RTECS CM3675000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 20 mg/m3
STEL 10 ppm, 40 mg/m3
DESC White, crystalline solid or flakes with an unpleasant odor
MW: 113.2 BP: 515 F MP: 156 F VP: 0.00000008 mm FP: 282 F
INCOM Strong oxidizers, (acetic acid + dinitrogen trioxide)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Caprolactam]
SYMPT Irritation skin, eyes, respiratory system; epistaxis (nosebleed); dermatitis, skin sensitization; asthma; irritability, confusion, dizziness, headache; abdominal cramps, diarrhea, nausea, vomiting; liver, kidney injury
ORGAN Eyes, skin, respiratory system, central nervous system, cardiovascular system, liver, kidneys
LESS1 MEDIA (44): OVS-7 - 13 mm XAD-7 tube (200/100 mg, 20/60 mesh) with glass fiber filter enclosed
ANL SOLVENT: Methanol
REC V: 100 Liters REC F: 1.0 L/min (TWA)
REC V: 15 Liters REC F: 1.0 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OSHAPV2012 SAE: 0.142 CLASS: Partially Validated by OSHA
NOTE: Store and ship cold.

Carbon Black

IMIS **0527** CAS 1333-86-4
SYN Channel black; Lamp black; Furnace black; Thermal black; Acetylene black
NIOSH RTECS FF5800000
MIOSHA FINAL RULE (Table G-1-A):
TWA 3.5 mg/m3
DESC Black, odorless solid.
MW: 12.0 BP: Sublimes MP: Sublimes VP: 0 mm (approx.)
INCOM Strong oxidizers, such as chlorates, bromates, and nitrates
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
IARC Group 2B - possibly carcinogenic to humans - [Carbon black]
SYMPT Cough; irritation eyes; in presence of polycrylic aromatic hydrocarbons; [potential occupational carcinogen]
ORGAN Respiratory system, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. If polyaromatic hydrocarbons (PAHs) are suspected to be present, take and submit separate samples on Glass Fiber Filters. See individual PAHs.

Carbon Dioxide

IMIS **0530** CAS 124-38-9
SYN Carbonic acid gas; Dry Ice; CO2
NIOSH RTECS FF6400000 DOT 1013 120; 1845 120; 2187 120
MIOSHA FINAL RULE (Table G-1-A):
TWA 5000 ppm, 9000 mg/m3
STEL 30,000 ppm, 54,000 mg/m3
DESC Colorless, odorless gas; can be liquid or solid.
MW: 44.0 BP: -109 F (Sublimes) MP: -109 F VP: 56.5 atm
INCOM Dusts of various metals, such as magnesium, zirconium, titanium, aluminum, chromium & manganese are ignitable and explosive when suspended in carbon dioxide. Forms carbonic acid in water.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Asphyxiants, Anoxiants. (HE17)
SYMPT Headache, dizziness, restlessness, paresthesia; dyspnea (breathing difficulty); sweating, malaise (vague feeling of discomfort); increased heart rate, cardiac output, blood pressure; coma; asphyxia; convulsions; frostbite (liquid, dry ice)
ORGAN Respiratory system, cardiovascular system
LESS1 See secondary sampling methods (SAM2)
SAM2 DET. TUBE: Dräger, CH 23501, 0.1-6% Vol.; Dräger 8101811, 100-3000ppm

Carbon Monoxide

IMIS **0560** CAS 630-08-0
SYN Carbon oxide, flue gas, monoxide, carboxylhemoglobin/COHb
NIOSH RTECS FG3500000 DOT 1016 119; 9202 168
MIOSHA FINAL RULE (Table G-1-A):
TWA 35 ppm, 40 mg/m3
CEIL 200 ppm, 229 mg/m3 (max 15 min)
DESC Colorless, odorless gas.
MW: 28.0 BP: -313 F VP: >35 atm MP: -337 F
INCOM Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Asphyxiants, Anoxiants. (HE17)
SYMPT Headaches; tachypnea; nausea; lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed ST of electrocardiogram; angina; syncope
ORGAN Cardiovascular system, lungs, blood, central nervous system
LESS1 Direct Reading: Quest Datalogger or Metrosonics Datalogger
SAM2 DET. TUBE: Dräger, CH 25601, 5-700 ppm Dräger, CH 29901, 0.3-7%, CH 20601, 10-3000ppm

Carbon Tetrachloride (Tetrachloromethane)

IMIS **0570** CAS 56-23-5
SYN Tetrachloromethane, carbon chloride, carbon tet, Freon® 10, Halon® 104
NIOSH RTECS FG4900000 DOT 1846 151
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 12.6 mg/m3 (Skin)
OSHA FINAL RULE (TABLE Z-2):

PEAK 200 ppm, 5 mins (in any 4 hrs)

DESC Colorless liquid with a characteristic ether-like odor.
MW: 153.8 BP: 170 F VP: 91 mm MP: -9 F

INCOM Chemically active metals, such as sodium, potassium, magnesium; fluorine; aluminum

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)

NTP Suspect Human Carcinogen - [Carbon Tetrachloride]

IARC Group 2B - possibly carcinogenic to humans - [Carbon tetrachloride]

SYMPT Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]

ORGAN Central nervous system, eyes, lungs, liver, kidneys, skin

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 150 Liters MIN V: 3 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.130 CLASS: Validated In-House

Cellulose (Respirable Fraction)

IMIS **C124** CAS 9004-34-6

SYN Hydroxycellulose, pyrocellulose

NIOSH RTECS FJ5691460

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3

DESC Odorless, white substance. [Note: The principal fiber cell wall material of vegetable tissues (wood, cotton, flax, grass, etc.).]
MW: 160,000-560,000 MP: 500 to 518 F VP: 0 mm (approx.)

INCOM Water, bromine pentafluoride, sodium nitrate, fluorine, strong oxidizers

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)

SYMPT Irritation eyes, skin, mucous membrane

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Cellulose (Total Dust)

IMIS **0575** CAS 9004-34-6

SYN Hydroxycellulose, pyrocellulose

NIOSH RTECS FJ5691460

MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3

DESC Odorless, white substance. [Note: The principal fiber cell wall material of vegetable tissues (wood, cotton, flax, grass, etc.).]
MW: 160,000-560,000 MP: 500 to 518 F VP: 0 mm (approx.)

INCOM Water, bromine pentafluoride, sodium nitrate, fluorine, strong oxidizers

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

SYMPT Irritation eyes, skin, mucous membrane
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Chlorine

IMIS **0640** CAS 7782-50-5
SYN Molecular chlorine; trichloroisocyanuric acid; sodium dichloroisocyanurate; hypochlorites; N-chloro compounds; calcium hypochlorite
NIOSH RTECS FO2100000 DOT 1017 124
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 ppm, 1.5 mg/m3
STEL 1 ppm, 3 mg/m3
DESC Greenish-yellow gas with a pungent, irritating odor.
MW: 70.9 BP: -29 F VP: 6.8 atm MP: -150 F
INCOM Reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, turpentine, ammonia, fuel gas, hydrogen & finely divided metals.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Burning of eyes, nose, mouth; lacrimation (discharge of tears), rhinorrhea (discharge of thin nasal mucus); cough, choking, substernal (occurring beneath the sternum) pain; nausea, vomiting; headache, dizziness; syncope; pulmonary edema; pneumonitis; hypoxemia (reduced O2 in the blood); dermatitis; liquid: frostbite
ORGAN Eyes, skin, respiratory system
LESS1 See secondary sampling methods (SAM2)
SAM2 DET. TUBE: Dräger, 6728411, 0.3-5 ppm

Chlorobenzene

IMIS **0620** CAS 108-90-7
SYN Monochlorobenzene; chlorobenzol; phenyl chloride; MCB; benzene chloride
NIOSH RTECS CZ0175000 DOT 1134 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 75 ppm, 350 mg/m3
DESC Colorless liquid with an almond-like odor.
MW: 112.6 BP: 270 F VP: 9 mm MP: -50 F FP: 82 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; In Animals: liver, lung, kidney injury
ORGAN Respiratory system, eyes, skin, central nervous system, liver
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min

ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.080 CLASS: Validated In-House

Chlorobromomethane

IMIS **0627** CAS 74-97-5
SYN Bromochloromethane; methylene chlorobromide; CB; CBM; Halon® 1011; Fluorocarbon 1011
NIOSH RTECS PA5250000 DOT 1887 160
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 1050 mg/m3
DESC Colorless to pale yellow liquid with a chloroform-like odor.
MW: 129.4 BP: 155 F VP: 115 mm MP: -124 F
INCOM Chemically active metals such as calcium, powdered aluminum, zinc, and magnesium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema
ORGAN Skin, liver, kidneys, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 60 Liters MIN V: 0.5 LITERS FLOW: 0.1 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.100 CLASS: Validated In-House

Chloroform (Trichloromethane)

IMIS **0670** CAS 67-66-3
SYN Trichloromethane, methane trichloride
NIOSH RTECS FS9100000 DOT 1888 151
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 9.78 mg/m3
DESC Colorless liquid with a pleasant odor.
MW: 119.4 BP: 143 F VP: 160 mm MP: -82 F
INCOM Strong caustics, chemically active metals, such as aluminum, magnesium powder, sodium, potassium; strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Nervous System Disturbances---Narcosis. (HE8)
NTP Suspect Human Carcinogen - [Chloroform]
IARC Group 2B - possibly carcinogenic to humans - [Chloroform]
SYMPT Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]
ORGAN Liver, kidneys, heart, eyes, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 50 Liters MIN V: 3.0 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.106 CLASS: Validated In-House

Chromic Acid & Chromates (as CrO3)

IMIS **0689** CAS 7738-94-5; 1333-82-0

SYN Chromic acid (CrO3), Chromic anhydride, Chromic oxide, Chromium(VI) oxide (1:3), Chromium trioxide, Zinc chromate
NIOSH RTECS GB6650000 DOT 1463 141; 1755 154
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.
DESC Appearance and odor vary depending upon specific compound; CrO_3 Dark-red, odorless flakes or powder.
MW: 100.0 BP: 482 F (Decomposes) MP: 387 F (Decomposes)
INCOM Combustible, organic, or other readily oxidizable materials: paper, wood, sulfur, aluminum, plastics, etc. corrosive to metals
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Human Carcinogen - [Chromium Hexavalent Compounds]
IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]
SYMPT Irritation respiratory system; nasal septum perforation; liver, kidney damage; leukocytosis (increased blood leukocytes), leukopenia (reduced blood leukocytes), eosinophilia; eye injury, conjunctivitis; skin ulcer, sensitization dermatitis; [potential occupational carcinogen]
ORGAN Blood, respiratory system, liver, kidneys, eyes, skin [lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 100 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6).
WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: None (Dry wipe)

Chromium(II) Compounds (as Cr)
IMIS **C121** CAS 7440-47-3
SYN Chrome, Chromium, Synonyms vary depending upon the specific Chromium(II compound. [Note: Chromium(II) compounds include soluble chromous salts.]
NIOSH RTECS GB4200000 DOT 1759 154
MIOSHA FINAL RULE (Table G-1-A):

TWA 0.5 mg/m3

DESC Blue white to steel-gray, lustrous, brittle, hard, odorless solid.
MW: 52.0 BP: 4788 F MP: 3452 F VP: 0 mm (approx.)
INCOM Strong oxidizers (such as hydrogen peroxide), alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Chromium, metallic]
SYMPT Irritation eyes, skin; lung fibrosis (histologic)

ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Deionized Water
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: Analytical methodology does not distinguish between valence states. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis for Chromium is performed and reported as the compound.

Chromium(III) Compounds (as Cr)

IMIS **C113** CAS 7440-47-3
SYN Synonyms vary depending upon the specific Chromium(III) compound. [Note: Chromium(III) compounds include soluble salts.]
NIOSH RTECS GB4200000 DOT 1759 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.5 mg/m3
DESC Appearance and odor vary depending upon the specific compound.
MW: 52.0 BP: 4788 F MP: 3452 F VP: 0 mm (approx.)
INCOM Varies; Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Chromium (III) compounds]
SYMPT Irritation eyes; sensitization dermatitis
ORGAN Eyes, skin
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: Analytical methodology does not distinguish between valence states. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis for Chromium is performed and reported as the compound.

Chromium Metal and Insoluble Salts (as Cr)

IMIS **0685** CAS 7440-47-3
SYN Chromium; chrome
NIOSH RTECS GB4200000 DOT 1759 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1.0 mg/m3
DESC Blue white to steel-gray, lustrous, brittle, hard, odorless solid
MW: 52.0 BP: 4788 F MP: 3452 F VP: 0 mm (approx.)
INCOM Strong oxidizers (such as hydrogen peroxide), alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Chromium, metallic]
SYMPT Irritation eyes, skin; lung fibrosis (histologic)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as total chromium.

WIPE MEDIA: Ghost Wipe

Chromium, Soluble Chromic, Chromous Salts (as Cr)

IMIS **0690** CAS 7440-47-3
SYN Chromium Phosphate (7789-04-0); Chromium Carbonate (29689-14-3); Chromium Acetate (1066-30-4)
NIOSH RTECS GB4200000 DOT 1759 154
DESC Appearance and odor vary depending upon specific compound.
Properties vary depending upon the specific compound.
INCOM Water
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Chromium, metallic]
SYMPT Sensitization dermatitis
ORGAN Skin
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis for Chromium is performed and reported as the compound.

Chrysene

IMIS **0692** CAS 218-01-9
SYN Acridine, Anthracene, Benzo(a)pyrene, Chrysene, Coal tar, Phenanthrene, pyrene
[Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]
NIOSH RTECS GF8655000 DOT 3077 171
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.2 mg/m3
DESC Crystalline solid.
MW: 228.29 BP: 838 F MP: 489 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
IARC Group 2B - possibly carcinogenic to humans - [Chrysene]
SYMPT Dermatitis, bronchitis, [potential occupational carcinogen]
ORGAN Respiratory system, skin, bladder, kidneys [lung, kidney, & skin cancer]
LESS1 MEDIA (G): Glass Fiber Filter (GFF) 37 mm
ANL SOLVENT: Acetonitrile
REC V: 960 Liters REC F: 2.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV-FLU
REF: OHL2006S019 SAE: 0.101 CLASS: Validated In-House
(In conjunction with Coal Tar Pitch Volatiles and Coke Oven Emissions.)
NOTE: After sampling, filter must be transferred to a vial with a Teflon-lined cap. Sample must be protected from direct sunlight.

Coal Dust (<5% SiO2), Respirable Fraction

IMIS **9040**
SYN Athracite coal dust, bituminous coal dust, coal mine dust, lignite coal dust
NIOSH RTECS GF8281000 DOT 1361 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 mg/m3
DESC Dark brown to black solid dispersed in air.
Properties vary depending upon the specific coal type.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Coal dust]
SYMPT Chronic bronchitis, decreased pulmonary function, emphysema
ORGAN Respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight sample yields a concentration below the standard for the air contaminant, LESS performs no additional analysis. If a gravimetric analysis is not sufficient, LESS will perform an XRD analysis for quartz. If the filter is not overloaded, samples may be collected up to an 8-hour period.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).
BULK Submit bulk sample in separate package when quartz analysis is requested.

Coal Dust (≥5% SiO2), Respirable Fraction

IMIS **C120**
SYN Athracite coal dust, bituminous coal dust, coal mine dust, lignite coal dust
NIOSH RTECS GF8281000 DOT 1361 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.1 mg/m3
DESC Dark brown to black solid dispersed in air.
Properties vary depending upon the specific coal type.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Coal dust]
SYMPT Chronic bronchitis, decreased pulmonary function, emphysema
ORGAN Respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight sample yields a concentration below the standard for the air contaminant, LESS performs no additional analysis. If a gravimetric analysis is not sufficient, LESS will perform an XRD analysis for quartz. If the filter is not overloaded, samples may be collected up to an 8-hour period.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House

NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

BULK Submit bulk sample in separate package when quartz analysis is requested.

Coal Tar Pitch Volatiles (Benzene Soluble Fraction)
(Pyrene, Phenanthrene, Acridine, Chrysene, Anthracene, and Benzo[a]Pyrene)

IMIS **0700** CAS 65996-93-2
SYN Coal tar pitch high temperature; oil pitch; pitch; CTPHT; coal tar distillates; other synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene and benzo(a)pyrene).
NIOSH RTECS GF8655000 DOT 2713 153(acridine)
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.2 mg/m3
DESC Black or dark-brown amorphous residue.
Properties vary depending upon the specific compound.
INCOM Strong oxidizers.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
NTP Human Carcinogen - [Coal-Tar Pitch (see Coal Tar and Coal-Tar Pitches)]
IARC Group 1 - carcinogenic to humans - [Coal-tar pitch]
SYMPT Dermatitis; bronchitis; (potential occupational carcinogen)
ORGAN Respiratory system, bladder, kidneys, skin [lung, kidney, & skin cancer]
LESS1 MEDIA: THF washed Glass Fiber Filters (GFF) 37 mm
ANL SOLVENT: Benzene
REC V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric/Extraction
REF: OHL2009S001 SAE: 0.178 CLASS: Validated In-House
NOTE: These media are prepared by LESS as needed and are not available for immediate shipment. Please allow time for LESS to prepare these media prior to sampling. After sampling, filter must be transferred to a vial with a Teflon-lined cap. Sample must be protected from direct sunlight.

Cobalt Metal, Dust & Fume (as Co)

IMIS **0720** CAS 7440-48-4
SYN Cobalt metal dust, cobalt metal fume
NIOSH RTECS GF8750000 DOT 3178 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.05 mg/m3
DESC Odorless, silver-gray to black solid.
MW: 58.9 BP: 5612 F MP: 2719 F VP: 0 mm (approx.)
INCOM Strong oxidizers, ammonium nitrate
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Suspect Human Carcinogen - [Cobalt (see Cobalt-Related Exposures)]
IARC Group 2A - probably carcinogenic to humans - [Cobalt metal (without tungsten carbide or other metal alloys)]
SYMPT Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma
ORGAN Respiratory system, skin
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min

ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.080 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

WIPE MEDIA: Ghost Wipe

Copper Dusts & Mists (as Cu)

IMIS **0730** CAS 7440-50-8
SYN Copper metal dusts; copper metal fumes
NIOSH RTECS GL5325000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
DESC Reddish, lustrous, malleable, odorless solids.
MW: 63.5 BP: 4703 F MP: 1981 F VP: 0 mm (approx.)
INCOM Oxidizers, alkalis, sodium azide, acetylene
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia
ORGAN Respiratory system, skin, eyes, liver, increased risk of Wilson's disease, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.092 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume.

WIPE MEDIA: Ghost Wipe

Copper Fume (as Cu)

IMIS **0731** CAS 1317-38-0
SYN Black copper oxide fume, Copper monoxide fume, Copper(II) oxide fume, Cupric oxide fume [Note: Also see specific listing for Copper (dusts and mists).]
NIOSH RTECS GL7900000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.1 mg/m3
DESC Finely divided black particulate dispersed in air.
MW: 79.5 BP: Decomposes MP: 1879 F VP: 0 mm (approx.)
INCOM Acetylene, zirconium [Note: See Copper (dusts and mists) for properties of Copper metal.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, upper respiratory system; metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough, lassitude (weakness, exhaustion); metallic or sweet taste; discoloration skin, hair
ORGAN Respiratory system, skin, eyes, increased risk of Wilson's disease

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.092 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume.

WIPE MEDIA: Ghost Wipe

Cresol (All Isomers)

IMIS **0760** CAS 1319-77-3
95-48-7 [o-]; 108-39-4 [m-]; 106-44-5 [p-]

SYN ortho(meta or para)-cresol; 2(3 or 4)-cresol, o(m or p)-cresylic acid; 1-hydroxy-2(3 or 4)-methylbenzene; 2(3 or 4)-hydroxytoluene; 2(3 or 4) -methyl phenol

NIOSH RTECS GO6300000 [o-]; GO6125000 [m-]; GO6475000 [p-]
DOT 2076 153

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 22 mg/m3 (Skin)

DESC White crystals with a sweet, tarry odor.
MW: 108.2
BP: 376 F [o-]; 397 F [m-]; 396 F [p-]
MP: 88 F [o-];54 F [m-]; 95 F [p-]
VP: 0.29 mm (77 F) [o-]; 0.14 mm (77 F) [m-]; 0.11 mm (77 F)
FP: 178 F [o-]; 187 F [m-]; 187 F [p-]

INCOM Strong oxidizers, acids

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Acute Toxicity---Short-term high-risk effects. (HE4)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)

SYMPT Irritation eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irregular rapid respiratory, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage

ORGAN Central nervous system, respiratory system, liver, kidneys, skin, eyes, pancreas, cardiovascular system

LESS1 MEDIA (91): XAD-7 Tube (100/50 mg)
ANL SOLVENT: Methanol
REC V: 24 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S020 SAE: 0.207 CLASS: Validated In-House
NOTE: Store and ship cold.

Cumene

IMIS **0780** CAS 98-82-8

SYN Isopropyl benzene; 2-Phenyl propane; Cumol

NIOSH RTECS GR8575000 DOT 1918 130

MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 245 mg/m3 (Skin)

DESC Colorless liquid with a sharp, penetrating, aromatic odor.
MW: 120.2 BP: 306 F VP: 8 mm MP: -141 F FP: 96 F

INCOM Oxidizers, Nitric Acid, sulfur acid

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)

Nervous System Disturbances---Narcosis. (HE8)
NTP Suspect Human Carcinogen - [Cumene]
IARC Group 2B - possibly carcinogenic to humans - [Cumene]
SYMPT Eye, skin, mucous membrane irritation; headache; dermatitis; narcosis; coma
ORGAN Eyes, respiratory system, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 24 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.136 CLASS: Validated In-House
WIPE Wipe with charcoal pad, seal in glass vial for shipment.

Cyclohexane
IMIS **0810** CAS 110-82-7
SYN Hexahydrobenzene; Hexamethylene; Benzene hexahydride, hexanaphthene
NIOSH RTECS GU6300000 DOT 1145 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 300 ppm, 1050 mg/m3
DESC Colorless liquid with a sweet, chloroform-like odor.
MW: 84.2 BP: 177 F MP: 44 F VP: 78 mm FP: 0 F
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Eyes, skin, respiratory system irritation; drowsiness; dermatitis; narcosis, coma
ORGAN Eyes, respiratory system, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 9.5 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.101 CLASS: Validated In-House
NOTE: Sample on separate media from other organics.

Cyclohexanone
IMIS **0830** CAS 108-94-1
SYN Pimelic ketone; Cyclohexyl ketone; Anone
NIOSH RTECS GW1050000 DOT 1915 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 100 mg/m3 (Skin)
DESC Water-white to pale-yellow liquid with a peppermint- or acetone-like odor.
MW: 98.2 BP: 312 F MP: -49 F VP: 5 mm FP: 111 F
INCOM Oxidizers, Nitric Acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Cyclohexanone]
SYMPT Eye, skin, mucous membrane irritation; narcosis; headache; coma; dermatitis; In Animals: liver, kidney damage
ORGAN Respiratory system, eyes, skin, central nervous system, liver, kidneys
LESS1 MEDIA (31): Chromosorb 106 Tube (100/50 mg sections, 60/80 mesh)
ANL SOLVENT: Carbon Disulfide
REC V: 10 Liters FLOW: 0.05 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID

REF: OHL2006S011 SAE: 0.165 CLASS: Validated In-House

Cyclohexene

IMIS **0840** CAS 110-83-8
SYN Benzene tetrahydride; Tetrahydrobenzene
NIOSH RTECS GW2500000 DOT 2256 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 300 ppm, 1015 mg/m3
DESC Colorless liquid with a sweet odor.
MW: 82.2 BP: 181 F MP: -154 F VP: 67 mm FP: 11 F
INCOM Strong oxidizers [Note: Forms explosive peroxides with oxygen storage.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Skin, eyes, respiratory system irritation; drowsiness
ORGAN Skin, eyes, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 7 Liters MIN V: 5 Liters FLOW: 0.1 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.080 CLASS: Validated In-House

Cyclohexylamine

IMIS **0842** CAS 108-91-8
SYN Hexahydroaniline; Aminocyclohexane;Hexahydrobenzenamine, Aminohexahydrobenzene
NIOSH RTECS GX0700000 DOT 2375 132
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 40 mg/m3
DESC Colorless or yellow liquid with a strong, fishy, amine-like odor.
MW: 99.2 BP: 274 F MP: 0 F VP: 11 mm FP: 88 F
INCOM Oxidizers, organic compounds, acid anhydrides, acid chlorides, acids, lead [Note: Corrosive to copper, aluminum, zinc & galvanized steel.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Irritation eyes, skin, mucous membrane, respiratory system; eye, skin burns; skin sensitization; cough, pulmonary edema; drowsiness, dizziness; diarrhea, nausea, vomiting
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: Deionized Water
MAX V: 20 Liters REC F: 0.2 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2004S028 SAE: 0.113 CLASS: Validated In-House
NOTE: Store and ship cold.

Diacetone Alcohol (4-Hydroxy-4-Methyl-2-Pentanone)

IMIS **0860** CAS 123-42-2
SYN 4-Hydroxy-4-methyl-2-pentanone; 2-Methyl-2-pentanol-4-one; Diacetone
NIOSH RTECS SA9100000 DOT 1148 129

MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 240 mg/m3
DESC Colorless liquid with a faint, minty odor.
MW: 116 BP: 324 F MP: -47 F VP: 1 mm FP: 125 F
INCOM Strong oxidizers and alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Eye, nose, throat, skin irritation; corneal damage; In Animals: narcosis, liver damage
ORGAN Eyes, skin, respiratory system, central nervous system, liver
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.146 CLASS: Validated In-House

Diallyl Phthalate

IMIS **D117** CAS 131-17-9
NIOSH RTECS CZ4200000* DOT 3082 171
DESC Clear pale-yellow liquid. Odorless.
MW: 246.28 BP: 554 F MP: -94 F FP: 230 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 CLASS: Validated In-House
NOTE: Store and ship cold.

Dibutyl Phthalate

IMIS **0864** CAS 84-74-2
SYN DBP; Dibutyl-1,2-benzene-dicarbovylate; Di-n-Butyl Phthalate; n-butyl phthalate
NIOSH RTECS TI0875000 DOT 3082 171
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless, oily liquid with a very weak, aromatic odor.
MW: 278.3 BP: 644 F MP: -31 F VP: 0.00007 mm FP: 315 F
INCOM Nitrates; strong oxidizers, alkalis, and acids; liquid chlorine
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, upper respiratory system, stomach
ORGAN Eyes, respiratory system, gastrointestinal tract
LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 SAE: 0.093 CLASS: Validated In-House
NOTE: Store and ship cold.

1,1-Dichloroethane (Ethylidene Chloride)

IMIS **1160** CAS 75-34-3
SYN Ethylidene chloride; 1,1-Ethylidene dichloride; Asymmetrical dichlotoethane
NIOSH RTECS KI075000 DOT 2362 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 400 mg/m3
DESC Colorless, oily liquid with a chloroform-like odor.
MW: 99.0 BP: 135 F MP: -143 F VP: 182 mm FP: 2 F
INCOM Strong oxidizers and caustics
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation skin; central nervous system depression; liver, kidney, lung damage
ORGAN Skin, liver, kidneys, lungs, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 15 Liters MIN V: 0.5 Liters FLOW: 0.1 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.076 CLASS: Validated In-House

1,2-Dichloroethylene, Mixed Isomers (Acetylene Dichloride)

IMIS **0870** CAS 540-59-0
SYN Acetylene dichloride; cis-Acetylene dichloride; trans-Acetylene dichloride; sym-Dichloroethylene
NIOSH RTECS KV9360000 DOT 1150 130P
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 790 mg/m3
DESC Colorless liquid (usually a mixture of the cis and trans isomers) with a slightly acrid, chloroform-like odor
MW: 97.0 BP: 118 to 140 F MP: -57 to -115 F VP: 180 to 265 mm
FP: 36 to 39 F
INCOM Strong oxidizers, strong alkalis, potassium hydroxide, copper
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Eyes, respiratory system irritation; central nervous system depression
ORGAN Respiratory system, eyes, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 5 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.064 CLASS: Validated In-House

Dicyclopentadiene

IMIS **0903** CAS 77-73-6
SYN Bicyclopentadiene; 1,3-Cyclopentadiene, dimer; DCPD; 3a,4,7,7a-Tetrahydro-4,7-methanoindene
NIOSH RTECS PC1050000 DOT 2048 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 30 mg/m3

DESC Colorless, crystalline solid with a disagreeable, camphor-like odor. [Note: a liquid above 90 F.]
MW: 132.2 BP: 342 F FP: 90 F VP: 1.4 mm FP: (oc) 90 F
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, nose, throat, incoordination, headache; sneezing, cough; skin blisters; In Animals: kidney, lung damage
ORGAN Eyes, skin, respiratory system, central nervous system, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.080 CLASS: Validated In-House

Dicyclopentadienyl Iron (Respirable Fraction)
IMIS **D100** CAS 102-54-5
SYN bis(Cyclopentadienyl) iron, Ferrocene, Iron dicyclopentadienyl
NIOSH RTECS LK0700000 DOT 1325 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Orange, crystalline solid with a camphor-like odor.
MW: 186.1 BP: 480 F MP: 343 F
INCOM Ammonium perchlorate, tetranitromethane, mercury(II) nitrate
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Possible irritation eyes, skin, respiratory system; In Animals: liver, red blook cell, testicular changes
ORGAN Eyes, skin, respiratory system, liver, blood, reproductive system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Dicyclopentadienyl Iron (Total Dust)
IMIS **0904** CAS 102-54-5
SYN bis(Cyclopentadienyl) iron, ferrocene, iron dicyclopentadienyl
NIOSH RTECS LK0700000 DOT 1325 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Orange, crystalline solid with a camphor-like odor.

MW: 186.1 BP: 480 F MP: 343 F
INCOM Ammonium perchlorate, tetranitromethane, mercury(II) nitrate
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Possible irritation eyes, skin, respiratory system; In Animals: liver, red blook cell, testicular changes
ORGAN Eyes, skin, respiratory system, liver, blood, reproductive system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Diethanolamine
IMIS **D129** CAS 111-42-2
SYN 2,2'-Iminodiethanol; Diethylolamine; Bis(2-hydroxyethyl)amine; 2,2'-Dihyroxydiethylamine; DEA, Di(2-hydroxyethyl)amine, Diolamine
NIOSH RTECS KL2975000 DOT 3082 171
MIOSHA FINAL RULE (Table G-1-A):
TWA 3 ppm, 15 mg/m3
DESC Colorless crystals or a syrupy, white liquid (above 82 F) with a mild, ammonia-like odor.
MW: 105.2 BP: 516 F MP: 82 F VP: <0.01 mm FP: 279 F
INCOM Oxidizers, strong acids, acid anhydrides, halides
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
IARC Group 2B - possibly carcinogenic to humans - [Diethanolamine]
SYMPT Irritation eyes, skin, nose, throat; eye burns, corneal necrosis; skin burns, lacrimation (discharge of tears), cough, sneezing
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (71): Coated XAD-2 Tube (80/40 mg, 20/60 mesh); coating is 10% (w/w) 1-Naphthylisothiocyanate (NITC)
ANL SOLVENT: Dimethylformamide
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S022 SAE: 0.085 CLASS: Validated In-House
NOTE: Store and ship cold.

Diethylene Glycol
IMIS **D609** CAS 111-46-6
NIOSH RTECS ID5950000*
DESC A colorless liquid.
MW: 106.12 BP: 473 F MP: 14 F FP: 290 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

LESS1 MEDIA (44): OVS-7 - 13 mm XAD-7 tube (200/100 mg, 20/60 mesh) with glass fiber filter enclosed
ANL SOLVENT: Methanol
MAX V: 60 Liters MIN V: 5 Liters FLOW: 0.5 to 2.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S009 SAE: 0.360 CLASS: Validated In-House
NOTE: Store and ship cold.

Diethylene Glycol Monoethyl Ether (Carbitol)

IMIS **D615** CAS 111-90-0
SYN Carbitol; Carbitol Cellosolve; DEGEE; Poly-Solv; Solvosol 2-(2-Ethoxyethoxy)-Ethanol
DESC A colorless, slightly viscous liquid with a mildly sweet odor.
MW: 134.2 BP: 396 F MP: -108 F VP: 0.13 mm FP: 205 F
INCOM Oxidizing materials
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
SYMPT Skin, eye and respiratory irritation
ORGAN Skin, eye, and respiratory system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.106 CLASS: Validated In-House

Diethylene Glycol Monomethyl Ether (2-Methoxyethoxy)ethanol

IMIS **M328** CAS 111-77-3
SYN Methyl Carbitol; Diethylene glycol monomethyl ether; Dowanol DM;; Poly-Solv DM; DGMME; DEGME
NIOSH RTECS KL6125000 DOT 2810 153
DESC Colorless liquid with a sweet odor.
MW: 120.2 BP: 381 F MP: -94 F FP: 200 F
INCOM Solid hypochlorite, glycol ethers, glycols, ketones, alcohols, strong oxidizing agents
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.131 CLASS: Not Validated

Diethylenetriamine

IMIS **0921** CAS 111-40-0
SYN N-(2-aminoethyl)1,2-ethanediamine; bis(2-aminoethyl)amine; DETA; 2,2'-diaminodiethylamine
NIOSH RTECS IE1225000 DOT 2079 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 ppm, 4 mg/m3
DESC Colorless to yellow liquid with a strong, ammonia-like odor.
MW: 103.2 BP: 405 F MP: -38 F FP: 208 F
INCOM Oxidizers, strong acids, cellulose nitrate [Note: May form explosive complexes with silver, cobalt, or chromium compounds. Corrosive to aluminum copper, brass & zinc.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
SYMPT Irritation eyes, skin, mucous membrane, upper respiratory system; dermatitis, skin sensitization; eye, skin necrosis; cough, dyspnea (breathing difficulty), pulmonary sensitization
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (71): Coated XAD-2 Tube (80/40 mg, 20/60 mesh); coating is 10% (w/w) 1-Naphthylisothiocyanate (NITC)
ANL SOLVENT: Dimethylformamide
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2006S007 SAE: 0.100 CLASS: Validated In-House
NOTE: Store and ship cold.

Diethyl Phthalate

IMIS **0933** CAS 84-66-2
SYN Diethyl ester of phthalic acid; Ethyl phthalate; DEP
NIOSH RTECS TI1050000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless to water-white, oily liquid with a very slight, aromatic odor.
MW: 222.3 BP: 563 F MP: -41 F VP: 0.002 mm FP: (oc) 322 F
INCOM Strong oxidizers, strong acids, Nitric Acid, permanganates, water
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, nose, throat; headache, dizziness, nausea; lacrimation (discharge of tears); possible polyneuropathy, vestibular dysfunction; pain, numb, lassitude (weakness, exhaustion), spasms in arms & legs; In Animals: reproductive effects
ORGAN Eyes, skin, respiratory system, central nervous system, peripheral nervous system, reproductive system
LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 SAE: 0.090 CLASS: Validated In-House
NOTE: Store and ship cold.

Diisobutyl Ketone (2,6-Dimethyl-4-Heptanone)

IMIS **0924** CAS 108-83-8
SYN 2,6-Dimethyl-4-heptanone; sym-Diisopropyl-acetone; Isovalerone; Valerone, DIBK
NIOSH RTECS MJ5775000 DOT 1157 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 150 mg/m3
DESC Colorless liquid with a mild, sweet odor.
MW: 142.3 BP: 334 F MP: -43 F VP: 2 mm FP: 120 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Eyes, skin, nose, throat irritation; headaches; dizziness; dermatitis; liver, kidney damage

ORGAN Respiratory system, skin, eyes, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.126 CLASS: Validated In-House

n,n-Dimethylaniline

IMIS **0931** CAS 121-69-7
SYN Dimethylaniline [N,N-Dimethylaniline], N,N-Dimethylbenzeneamine, N,N-Dimethylphenylamine [Note: Also known as Dimethylaniline which is a correct synonym for Xylidine.]
NIOSH RTECS BX4725000 DOT 2253 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 25 mg/m3 (Skin)
STEL 10 ppm, 50 mg/m3 (Skin)
DESC Pale yellow, oily liquid with an amine-like odor. [Note: A solid below 36°F.]
MW: 121.2 BP: 378 F VP: <1 mm MP: 36 F FP: 142 F
INCOM Strong oxidizers, strong acids, benzoyl peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Hematologic (Blood) Disturbances---Methemoglobinemia. (HE13)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Anoxia symptoms: cyanosis, lassitude (weakness, exhaustion), dizziness, ataxia; methemoglobinemia
ORGAN Blood, kidneys, liver, cardiovascular system
LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: 0.6 N Methanol/Ammonium Hydroxide
REC V: 30 Liters REC F: 0.2 L/min (TWA)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2009S005 CLASS: Validated In-House
NOTE: Store and ship cold.
SAM2 MIRAN 1A: MIN. Det. Con. 0.7 ppm at 8.6 µm

n,n-Dimethylethanolamine

IMIS **D629** CAS 108-01-0
SYN 2-Dimethylethanolamine; Dimethylaminoethanol; beta-Dimethylaminoethyl alcohol; Deanol; N, N-Dimethyl-2-Hydroxyethylamine
NIOSH RTECS KK6125000* DOT 2051 132
DESC Colorless liquid with a nauseating, ammonia-like odor.
MW: 89.2 BP: 275 F (758 mm) MP: -74 F VP: 7.8 mm (72 F) FP: 105 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [N,N-Dimethylaniline]
SYMPT Irritation eyes, skin, respiratory system; nausea, vomiting
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (91): XAD-7 Tube (100/50 mg)
ANL SOLVENT: MSA
REC V: 24 Liters REC F: 0.2 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2005S023 CLASS: Validated In-House
NOTE: Store and ship cold.

Dimethylphthalate

IMIS **0950** CAS 131-11-3
SYN Dimethyl ester of 1,2-benzenecarboxylic acid, DMP
NIOSH RTECS TI1575000 DOT 3082 171

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless, oily liquid with a slight, aromatic odor.
MW: 194.2 BP: 543 F MP: 42 F VP: 0.01 mm FP: 295 F
INCOM Nitrates, strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, upper respiratory system; stomach pain
ORGAN Eyes, respiratory system, gastrointestinal tract
LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min (TWA)
REC V: 15 Liters REC F: 1.0 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 SAE: 0.090 CLASS: Validated In-House
NOTE: Store and ship cold.

Di-n-Octyl Phthalate
IMIS **1000** CAS 117-84-0
SYN di-n-octyl ester benzenedicarboxylic acid; DNOP; n-dioctyl phthalate
DOT 3082 171
DESC A clear liquid with a mild odor.
MW: 390.62 BP: 428 F MP: -13 F VP: <0.2 mm (302 F) FP: 219 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Skin, eye, and respiratory irritation
ORGAN Skin, eyes, respiratory system
LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 SAE: 0.090 CLASS: Validated In-House
NOTE: Store and ship cold.

Di-sec Octyl Phthalate (Di(2-Ethylhexyl) Phthalate)
IMIS **1015** CAS 117-81-7
SYN DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate

NIOSH RTECS TI0350000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
STEL 10 mg/m3
DESC Colorless, oily liquid with a slight odor.
MW: 390.5 BP: 727 F MP: -58 F VP: <0.01 mm FP: (oc) 420 F
INCOM Nitrates; strong oxidizers, acids, and alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Suspect Human Carcinogen - [Di(2-ethylhexyl) Phthalate]
IARC Group 2B - possibly carcinogenic to humans - [Bis(2-ethylhexyl) phthalate (see Di(2-ethylhexyl) phthalate)]
SYMPT Irritation eyes, mucous membrane; In Animals: liver damage; teratogenic effects; [potential occupational carcinogen]
ORGAN Eyes, upper respiratory system, central nervous system, liver, reproductive system, gastrointestinal tract [in animals: liver tumors]

LESS1 MEDIA (45): OSHA Versatile Sampler (OVS-Tenax) - 13 mm tube (140/70 mg sections) with Glass Fiber Filter enclosed
ANL SOLVENT: Toluene
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S006 SAE: 0.092 CLASS: Validated In-House
NOTE: Store and ship cold.

Dioxane (Diethylene Dioxide) (1,4-Dioxane)

IMIS **1010** CAS 123-91-1
SYN Diethylene dioxide, Diethylene ether, Dioxan, 1,4-Dioxane, p-Dioxane
NIOSH RTECS JG8225000 DOT 1165 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 90 mg/m3 (Skin)
DESC Colorless liquid or solid (below 53°F) with a mild, ether-like odor.
MW: 88.1 BP: 214 F VP: 29 mm MP: 53 F FP: 55 F
INCOM Strong oxidizers, decaborane, triethynyl aluminum
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
NTP Suspect Human Carcinogen - [1,4-Dioxane]
IARC Group 2B - possibly carcinogenic to humans - [1,4-Dioxane]
SYMPT Irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, liver, kidneys [in animals: lung, liver & nasal cavity tumors]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 15 Liters REC F: 0.5 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.078 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.

Dipropylene Glycol Methyl Ether ((2-Methoxymethylethoxy)Propanol)

IMIS **1014** CAS 34590-94-8
SYN Dipropylene glycol monomethyl ether; Dowanol® 50B
NIOSH RTECS JM1575000
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 600 mg/m3 (Skin)
STEL 150 ppm, 900 mg/m3 (Skin)
DESC Colorless liquid with a mild, ether-like odor.
MW: 148.2 BP: 408 F MP: -112 F VP: 0.5 mm FP: 180 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Eyes, nose, throat irritation; lassitude (weakness, exhaustion), dizziness, headache

ORGAN Respiratory system, eyes, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min (TWA)
REC V: 1.5 Liters REC F: 0.1 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.156 CLASS: Validated In-House

Emery (Corundum) (Respirable Fraction)
IMIS **E102** CAS 12415-34-8
SYN Aluminum oxide, Aluminum trioxide, corundum, impure corundum, natural aluminum oxide
NIOSH RTECS GN0231000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Odorless, white, crystalline powder.
MW: 406.9 VP: 0 mm (approx.)
INCOM None listed
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Emery (Corundum) (Total Dust)
IMIS **1016** CAS 12415-34-8
SYN Aluminum oxide, Aluminum trioxide, corundum, impure corundum, natural aluminum oxide
NIOSH RTECS GN0231000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Odorless, white, crystalline powder.
MW: 406.9 VP: 0 mm (approx.)
INCOM None listed
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Epichlorohydrin (1-Chloro-2,3-Epoxypropane)
IMIS **0645** CAS 106-89-8

SYN 1-Chloro-2, 3-epoxy-propane; 2-Chloropropylene oxide; ã-Chloropropylene oxide
NIOSH RTECS TX4900000 DOT 2023 131P
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 8 mg/m3 (Skin)
DESC Colorless liquid with a slightly irritating, chloroform-like odor.
MW: 92.5 BP: 242 F MP: -54 F VP: 13 mm FP: 93 F
INCOM Strong oxidizers, strong acids, certain salts, caustics, zinc, aluminum, water
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
NTP Suspect Human Carcinogen - [Epichlorohydrin]
IARC Group 2A - probably carcinogenic to humans - [Epichlorohydrin]
SYMPT Irritation eyes, skin with deep pain; nausea, vomiting; abdominal pain; resp distress, cough; cyanosis; reproductive effects; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, kidneys, liver, reproductive system [in animals: nasal cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 30 Liters MIN V: 2 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.260 CLASS: Validated In-House

Ethanolamine (2-Aminoethanol)
IMIS **1030** CAS 141-43-5
SYN Ethylolamine; Monoethanolamine; β-Aminoethyl alcohol; 2-Aminoethanol; 2-Hydroxyethylamine
NIOSH RTECS KJ5775000 DOT 2491 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 3 ppm, 8 mg/m3
STEL 6 ppm, 15 mg/m3
DESC Colorless, viscous liquid or solid (below 51 F) with an unpleasant, ammonia-like odor.
MW: 61.1 BP: 339 F MP: 51 F VP: 0.4 mm FP: 186 F
INCOM Strong oxidizers and acids, iron
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Respiratory system, skin, and eye irritation; drowsiness
ORGAN Skin, eyes, respiratory system, central nervous system
LESS1 MEDIA (71): Coated XAD-2 Tube (80/40 mg, 20/60 mesh); coating is 10% (w/w) 1-Naphthylisothiocyanate (NITC)
ANL SOLVENT: Dimethylformamide
REC V: 10 Liters REC F: 0.1 L/min (TWA)
REC V: 1.5 Liters REC F: 0.1 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S022 SAE: 0.132 CLASS: Validated In-House
NOTE: Store and ship cold.

2-Ethoxyethanol (Cellosolve; Glycol Monoethyl Ether)

IMIS **1033** CAS 110-80-5
SYN Ethylene glycol monoethyl ether; Cellosolve®; EGEE
NIOSH RTECS KK8050000 DOT 1171 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 740 mg/m3 (Skin)
DESC Colorless liquid with a sweet, pleasant, ether-like odor.
MW: 90.1 BP: 275 F MP: -130 F VP: 4 mm FP: 110 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
SYMPT In animals: irritation eyes, respiratory system; blood changes; liver, kidney, lung damage; reproductive, teratogenic effects
ORGAN Eyes, respiratory system, blood, kidneys, liver, reproductive system, hematopoietic system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.100 CLASS: Validated In-House

2-Ethoxyethyl Acetate (Cellosolve Acetate)

IMIS **1037** CAS 111-15-9
SYN Cellosolve® acetate; EGEEA, Glycol monoethyl ether acetate; Ethylene glycol monoethyl ether acetate
NIOSH RTECS KK8225000 DOT 1172 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 540 mg/m3 (Skin)
DESC Colorless liquid with a mild odor.
MW: 132.2 BP: 313 F MP: -79 F VP: 2 mm FP: 124 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
SYMPT Irritation eyes, nose; vomiting; kidney damage; paralysis; In Animals: reproductive, teratogenic effects
ORGAN Eyes, respiratory system, gastrointestinal tract, reproductive system, hematopoietic system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.170 CLASS: Validated In-House
NOTE: Keep samples refrigerated when not in transit. Ship samples overnight with cold-packs as soon as possible.
WIPE Wipe with charcoal pad, seal in glass vial for shipment.

Ethyl Acetate

IMIS **1040** CAS 141-78-6
SYN Acetic ester; Acetic ether; Ethyl ethanoate, Ethyl ester if acetic acid
NIOSH RTECS AH5425000 DOT 1173 129
MIOSHA FINAL RULE (Table G-1-A):

TWA 400 ppm, 1400 mg/m3

DESC Colorless liquid with an ether-like, fruity odor.
MW: 88.1 BP: 171 F FP: -117 F VP: 73 mm FP: 24 F

INCOM Nitrates; strong oxidizers, alkalis, and acids

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Generally Low Risk Health Effects---Odor. (HE20)

SYMPT Eyes, skin, nose, throat irritation; narcosis; dermatitis

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 6 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.101 CLASS: Validated In-House
NOTE: Samples must be refrigerated for shipment and sent to the laboratory overnight. Analyze within 6 days of collection if possible.

Ethyl Acrylate

IMIS **1050** CAS 140-88-5

SYN Ethyl acrylate (inhibited), Ethyl ester of acrylic acid, Ethyl propenoate

NIOSH RTECS AT0700000 DOT 1917 129P

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 20 mg/m3 (Skin)
STEL 25 ppm, 100 mg/m3 (Skin)

DESC Colorless liquid with an acrid odor.
MW: 100.1 BP: 211 F MP: -96 F VP: 29 mm FP: 48 F

INCOM Oxidizers, peroxides, polymerizers, strong alkalis, moisture, chlorosulfonic acid

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects---Acute lung damage/edema or other. (HE11)

IARC Group 2B - possibly carcinogenic to humans - [Ethyl acrylate]

SYMPT Eyes, respiratory system, and skin irritation

ORGAN Respiratory system, eyes, skin [in animals: tumors of the forestomach]

LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Carbon Disulfide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.131 CLASS: Validated In-House
NOTE: Store and ship cold.

Ethyl Alcohol (Ethanol)

IMIS 1060 CAS 64-17-5

SYN Alcohol, Cologne spirit, Ethanol, EtOH, Grain alcohol

NIOSH RTECS KQ6300000 DOT 1170 127

MIOSHA FINAL RULE (Table G-1-A):
TWA 1000 ppm, 1900 mg/m3

DESC Clear, colorless, liquid with a weak, ethereal, vinous odor.
MW: 46.1 BP: 173 F FP: -173 F VP: 44 mm FP: 55 F

INCOM Strong oxidizers, potassium dioxide, bromine pentafluoride, acetyl bromide, acetyl chloride, platinum, sodium

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)

Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Human Carcinogen - [Alcoholic Beverage Consumption]
IARC Group 1 - carcinogenic to humans - [Ethanol in alcoholic beverages]
SYMPT Irritation eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects
ORGAN Eyes, skin, respiratory system, central nervous system, liver, blood, reproductive system
LESS1 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (40/60) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.136 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

Ethyl Benzene

IMIS **1080** CAS 100-41-4
SYN Phenylethane; Ethylbenzol
NIOSH RTECS DA0700000 DOT 1175 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 435 mg/m3
STEL 125 ppm, 545 mg/m3
DESC Colorless liquid with an aromatic odor.
MW: 106.2 BP: 277 F MP: -139 F VP: 7 mm FP: 55 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
IARC Group 2B - possibly carcinogenic to humans - [Ethylbenzene]
SYMPT Eyes, skin, mucous membrane irritation; headaches; dermatitis; narcosis; coma
ORGAN Eyes, respiratory system, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.084 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
LESS2 MEDIA: Diffusive Sampler (SKC 575-002 Passive Sampler)
Rec Sampling Time: 5 to 240 Minutes (TWA)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
ANL 1: Gas Chromatography; GC-FID
REF: OHL2021S002 SAE: 0.084 CLASS: Validated In-House

Ethyl 2-Cyanoacrylate

IMIS **E108** CAS 7085-85-0
SYN 2-Cyanoacrylate acid, Ethyl ester; ECA; Ethyl α-cyanoacrylate; 2-Propenoic acid, 2-cyano, ethyl ester
NIOSH RTECS UD3330050*
DESC Clear colorless liquid with irritating, sweet, ester-like odor.
MW: 125.1
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)

LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: 0.2% (v/v) Phosphoric Acid in Acetonitrile
REC V: 12 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S024 SAE: 0.096 CLASS: Validated In-House
NOTE: Store and ship cold.

Ethylene Dichloride (1,2-Dichloroethane)

IMIS **0874** CAS 107-06-2
SYN 1,2-Dichloroethane, Ethylene chloride, Glycol dichloride
NIOSH RTECS KI0525000 DOT 1184 131
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 ppm, 4 mg/m3
STEL 2 ppm, 8 mg/m3
DESC Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]
MW: 99.0 BP: 182 F VP: 64 mm MP: -32 F FP: 56 F
INCOM Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112°F.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Suspect Human Carcinogen - [1,2-Dichloroethane]
IARC Group 2B - possibly carcinogenic to humans - [1,2-Dichloroethane]
SYMPT Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]
ORGAN Eyes, skin, kidneys, liver, central nervous system, cardiovascular system [in animals: forestomach, mammary gland & circulatory sys cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 50 Liters MIN V: 1 Liters REC F: 0.2 L/min (TWA)
MAX V: 3 Liters MIN V: 1 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.069 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.

Ethylene Glycol

IMIS **1911** CAS 107-21-1
SYN 1,2-Dihydroxyethane, 1,2-Ethanediol, Glycol, Glycol alcohol, Monoethylene glycol
NIOSH RTECS KW2975000
MIOSHA FINAL RULE (Table G-1-A):
CEIL 50 ppm, 125 mg/m3
DESC Clear, colorless, syrupy, odorless liquid.
MW: 62.1 BP: 388 F MP: 9 F VP: 0.06 mm FP: 232 F
INCOM Strong oxidizers, chromium trioxide, potassium permanganate, sodium peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Irritation eyes, skin, nose, throat; nausea, vomiting, abdominal pain, lassitude (weakness, exhaustion); dizziness, stupor, convulsions, central nervous system depression; skin sensitization

ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (44): OVS-7 - 13 mm XAD-7 tube (200/100 mg, 20/60 mesh) with glass fiber filter enclosed
ANL SOLVENT: Methanol
MAX V: 60 Liters MIN V: 5 Liters FLOW: 0.5 to 2.0 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S009 SAE: 0.136 CLASS: Validated In-House
NOTE: Store and ship cold.

Ethylene Oxide

IMIS **1190 (PEL); 1191 (ACTION LEVEL); 1192 (EL)**
CAS 75-21-8
SYN Dimethylene oxide, 1,2-Epoxy ethane, Oxirane
NIOSH RTECS KX2450000 DOT 1040 119P
MIOSHA FINAL RULE (Table G-1-A) Ethylene Oxide (29 CFR 1910.1047):
TWA 1 ppm, 1.8 mg/m3
EL 5 ppm, 9 mg/m3 (15 min)
AL 0.5 ppm, 0.9 mg/m3
DESC Colorless gas or liquid (below 51°F) with an ether-like odor.
MW: 44.1 BP: 51 F VP: 1.46 atm MP: -171 F FP: NA (Gas) -20 F (Liq)
INCOM Strong acids, alkalis & oxidizers; chlorides of iron, aluminum & tin; oxides of iron & aluminum; water
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Human Carcinogen - [Ethylene Oxide]
IARC Group 1 - carcinogenic to humans - [Ethylene oxide]
SYMPT Irritation eyes, skin, nose, throat; peculiar taste; headache; nausea, vomiting, diarrhea; dyspnea (breathing difficulty), cyanosis, pulmonary edema; drowsiness, lassitude (weakness, exhaustion), incoordination; EKG abnormal; eye, skin burns (liquid or high vapor concentration); liquid: frostbite; reproductive effects; ; In Animals: convulsions; liver, kidney damage [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, liver, central nervous system, blood, kidneys, reproductive system [peritoneal cancer, leukemia]
LESS1 MEDIA: HBr coated Anasorb 747 (100/50 mg) [SKC 226-178]
ANL SOLVENT: (v/v) (1/1) Acetonitrile/Toluene
REC V: 12 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (EL)
ANL 1: Gas Chromatography; GC-ECD
REF: OHL2008S007 SAE: 0.22 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
SAM2 DET. TUBE: Draeger, 67 28241, 25-500 ppm

Ethyl Ether (Diethyl Ether)

IMIS **1210** CAS 60-29-7
SYN Diethyl ether; Ethyl oxide; Ether; Diethyl oxide; Solvent ether
NIOSH RTECS KI5775000 DOT 1155 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 400 ppm, 1200 mg/m3
STEL 500 ppm, 1500 mg/m3
DESC Colorless liquid with a pungent, sweetish, odor.
MW: 74.1 BP: 94 F MP: -177 F VP: 440 mm FP: -49 F
INCOM Strong oxidizers, halogens, sulfur, sulfur compounds

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation eyes, skin, upper respiratory system; dizziness, drowsiness, headache, excited, narcosis; nausea, vomiting
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 3 Liters MIN V: 0.25 Liters FLOW: 0.01 to 0.2 L/min
MAX V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.072 CLASS: Validated In-House

Ferric Chloride

IMIS **1265** CAS 7705-08-0
SYN Iron(III) chloride; Iron trichloride; trichloroiron
NIOSH RTECS LJ9100000 DOT 1773 157; 2582 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
DESC Orange to brown-black solid.
MW: 162.2 MP: 583 F BP: 599 F (760 mm)
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage
ORGAN Eyes, skin, respiratory system, liver, gastrointestinal tract
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume.

Ferrovanadium (Dust)

IMIS **1267** CAS 12604-58-9
SYN Ferrovanadium
NIOSH RTECS LK2900000
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 3 mg/m3
DESC Dark, odorless particulate dispersed in air. [Note: Ferrovanadium metal is an alloy usually containing 50-80% vanadium.]
MW: 106.8 MP: 2696 to 2768 F VP: 0 mm (approx.)
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Eye, respiratory system irritation; in animals: bronchitis, pneumonitis
ORGAN Respiratory system, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
REC V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Gravimetric

REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Fibrous Glass Dust

IMIS **1300** CAS 65997-17-3
SYN Fiber glas®, Fiberglass, Glass fibers, Glass wool [Note: Usually produced from borosilicate & low alkali silicate glasses.]
NIOSH RTECS LK3651000
MIOSHA FINAL RULE (Table G-1-A) "PNOR":
TWA 5 mg/m3 (respirable fraction)
TWA 15 mg/m3 (total dust)
DESC Typically, glass filaments >3 µm in diameter or glass "wool" with diameters down to 0.05 µm & >1 µm in length.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
IARC Group 3 - not classifiable as to its carcinogenicity to humans – [Insulation Glass Wool]
SYMPT Irritation eyes, skin, nose, throat, dyspnea (breathing difficulty)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
LESS2 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (EL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House
NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.

Fluorides (as F)

IMIS **1280** CAS 16984-48-8
SYN Perfluoride, many different F compounds
NIOSH RTECS LM6290000*
MIOSHA FINAL RULE (Table G-1-A):
TWA 2.5 mg/m3
DESC Appearance and odor vary depending upon specific compounds.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous,

respiratory, hematologic or reproductive. (HE3)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Fluorides (inorganic, used in drinking-water)]
LESS1 MEDIA (F): HF 37 mm (treated/untreated MCE filters) 3-piece cassette
ANL SOLVENT: Carbonate/Bicarbonate
REC V: 10 Liters REC F: 0.2 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2022S001 SAE: 0.114 CLASS: Validated In-House
NOTE: Sample results represent soluble Fluoride only
NOTE: Field desorption, a lab analyst must be present. Coordinate with the lab prior to sampling.

Formaldehyde
IMIS **1290 (TWA); 1291 (AL); 1293 (STEL)** CAS 50-00-0
SYN Methanal, Methyl aldehyde, Methylene oxide
NIOSH RTECS LP8925000 DOT 3077 171
MIOSHA FINAL RULE (Table G-1-A) Formaldehyde (29 CFR 1910.1048):
TWA 0.75 ppm, 0.9 mg/m3
STEL 2 ppm, 2.5 mg/m3 (15 mins)
AL 0.5 ppm, 0.625 mg/m3
DESC Nearly colorless gas with a pungent, suffocating odor.
MW: 30.0 BP: -6 F MP: -134 F VP: >1 atm
INCOM Strong oxidizers, alkalis, and acids; phenols; urea
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Formaldehyde]
IARC Group 1 - carcinogenic to humans - [Formaldehyde]
SYMPT Irritation eyes, nose, throat, respiratory system; lacrimation (discharge of tears); cough; wheezing; [potential occupational carcinogen]
ORGAN Respiratory system, eyes [nasal cancer]
LESS1 MEDIA (52): Silica Gel (300/150 mg) with 2,4-dinitrophenylhydrazine
ANL SOLVENT: Acetonitrile
*REC V: 15 Liters FLOW: 0.1 to 1.5 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2002S017 SAE: 0.118 CLASS: Validated In-House
NOTE: Store and ship cold. NOTE: *When formaldehyde and acrolein are sampled together, their sample volume must be 24 Liters.
SAM2 DET. TUBE: Dräger, 67-33081, 0.2-5 ppm
Screening device: Airscan formaldehyde exposure monitor, Crystal Diagnostics, 0-20 ppm.

Formic Acid
IMIS **1310** CAS 64-18-6
SYN Formic acid 85-95%; Hydrogen carboxylic acid; Methanoic acid
NIOSH RTECS LQ4900000 DOT 1779 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 9 mg/m3
DESC Colorless liquid with a pungent, penetrating odor.
MW: 46.0 BP: 224 F (90% solution) MP: 20 F (90% solution)

VP: 35 mm FP: (oc) 122 F (90% solution)
INCOM Strong oxidizers, strong caustics, concentrated sulfuric acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
SYMPT Irritation eyes; skin, throat; skin burns, dermatitis; lacrimation (discharge of tears); rhinorrhea (discharge of thin nasal mucus); cough, dyspnea (breathing difficulty); nausea
ORGAN Respiratory system, skin, eyes
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: Deionized Water
MAX V: 24 Liters REC F: 0.2 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2004S025 SAE: 0.206 CLASS: Validated In-House

Furfural

IMIS **1325** CAS 98-01-1
SYN 2-Furfuraldehyde; Furfuraldehyde; Fural; 2-Furancarboxaldehyde
NIOSH RTECS LT7000000 DOT 1199 132P
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 8 mg/m3 (Skin)
DESC Colorless to amber liquid with an almond-like odor.
MW: 96.1 BP: 323 F MP: -34 F VP: 2 mm FP: 140 F
INCOM Strong acids, oxidizers, strong alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Furfural]
SYMPT Eye, skin, upper respiratory system irritation; headache; dermatitis
ORGAN Eyes, respiratory system, skin
LESS1 MEDIA (21): Anasorb 747 (140/70 mg, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 180 Liters REC F: 1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2008S003 SAE: 0.090 CLASS: Validated In-House
NOTE: Store and ship cold.

Furfuryl Alcohol

IMIS **1330** CAS 98-00-0
SYN 2-Hydroxymethylfuran; 2-Furylmethanol
NIOSH RTECS LU9100000 DOT 2874 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 40 mg/m3 (Skin)
STEL 15 ppm, 60 mg/m3 (Skin)
DESC Colorless to amber liquid with a faint, burning odor.
MW: 98.1 BP: 338 F MP: 6 F VP: 0.6 mm (77 F) FP: 149 F
INCOM Strong oxidizers, strong acids, organic acids may lead to polymerization
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
IARC Group 2B - possibly carcinogenic to humans - [Furfuryl alcohol]
SYMPT Irritation eyes, mucous membrane; dizziness; nausea, diarrhea; diuresis; resp, body temperature depression; vomiting; dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system

LESS1 MEDIA (47): Porapak Q Tube (150/75 mg)
ANL SOLVENT: Acetone
MAX V: 25 Liters MIN V: 3 Liters REC F: 0.05 L/min (TWA)
MAX V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2007S013 SAE: 0.089 CLASS: Validated In-House

Gallium

IMIS **G104** CAS 7440-55-3
SYN Gallium Metal
NIOSH RTECS LW8600000* DOT 2803 172
DESC Grayish metal, possess a greenish-blue reflection of silver-like when molten
MW: 69.72 BP: Approx. 2400 C MP: 29.78 C
INCOM Hydrogen peroxide and hydrochloric acid, halogens, forms an amalgam with aluminum alloys
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Gasoline

IMIS **1340** CAS 8006-61-9
SYN Motor fuel, Motor spirits, natural gasoline, petrol
NIOSH RTECS LX3300000 DOT 1203 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 300 ppm, 900 mg/m3
STEL 500 ppm, 1500 mg/m3
DESC Clear liquid with a characteristic odor.
MW: approx. 110 BP: 102 F VP: 38 to 300 mm FP: -45 F
INCOM Strong oxidizers such as peroxides, Nitric Acid and perchlorates.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
NTP Suspect Human Carcinogen - [Diesel Exhaust Particulates]
IARC Group 2A - probably carcinogenic to humans - [Petroleum refining (occupational exposures in)]
Group 2B - possibly carcinogenic to humans - [Engine exhaust, gasoline]
SYMPT Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 10 Liters REC F: 0.1 L/min (TWA)
MIN V: 3 Liters REC F: 0.1 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID

REF: OHL2004S014 SAE: 0.110 CLASS: Validated In-House
NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

Glutaraldehyde

IMIS **1361** CAS 111-30-8
SYN Glutaric dialdehyde, 1,5-Pentanedial
NIOSH RTECS MA2450000 DOT 2810 153
MIOSHA FINAL RULE (Table G-1-A):
CEIL 0.2 ppm, 0.8 mg/m3
DESC Colorless liquid with a pungent odor.
MW: 100.1 BP: 212 F MP: 7 F VP: 17 mm
INCOM Strong oxidizers, strong bases.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
SYMPT Irritation eyes, skin, respiratory system, dermatitis, sensitization, skin; cough, asthma; nausea, vomiting.
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (52): Silica Gel (300/150 mg) with 2,4-dinitrophenylhydrazine
ANL SOLVENT: Acetonitrile
REC V: 15 Liters REC F: 1.0 L/min (CEIL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2003S011 SAE: 0.120 CLASS: Validated In-House
NOTE: Store and ship cold.

Glycerine Mist (Respirable Fraction)

IMIS **G115** CAS 56-81-5
SYN Glycerin (anhydrous), Glycerol, Glycyl alcohol, 1,2,3-Propanetriol, Trihydroxypropane
NIOSH RTECS MA8050000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Clear, colorless, odorless, syrupy liquid or solid (below 64 F).
MW: 92.1 BP: 554 F MP: 64 F VP: 0.003 mm (122 F) FP: 320 F
INCOM Strong oxidizers (e.g., chromium trioxide, potassium chlorate, potassium permanganate) [Note: Hygroscopic (i.e., absorbs moisture from the air).]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system; headache, nausea, vomiting; kidney injury
ORGAN Eyes, skin, respiratory system, kidneys
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Glycerine Mist (Total Dust)

IMIS **1363** CAS 56-81-5
SYN Glycerin (anhydrous), Glycerol, Glycyl alcohol, 1,2,3-Propanetriol, Trihydroxypropane

NIOSH RTECS MA8050000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Clear, colorless, odorless, syrupy liquid or solid (below 64 F).
INCOM Strong oxidizers (e.g., chromium trioxide, potassium chlorate, potassium permanganate) [Note: Hygroscopic (i.e., absorbs moisture from the air).]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system; headache, nausea, vomiting; kidney injury
ORGAN Eyes, skin, respiratory system, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Grain Dust (Oat, Wheat & Barley)
IMIS **G109**
SYN Grain Dust
NIOSH RTECS MD7900000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Mixture of grain and all the other substances associated with its cultivation and harvesting.
Properties depend upon the specific compound of the grain dust.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, upper respiratory system; cough, dyspnea (breathing difficulty), wheezing, asthma, bronchitis, chronic obstructive pulmonary disease; conjunctivitis, dermatitis, rhinitis, grain fever
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Noncompliance can be based on gross weight. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Graphite (Natural), Respirable Dust
IMIS **9090** CAS 7782-42-5
SYN Black lead; mineral carbon; plumbago; silver graphite; stove black [Note: Also see specific listing for Graphite (synthetic).]
NIOSH RTECS MD9659600
MIOSHA FINAL RULE (Table G-1-A):
TWA 2.5 mg/m3
DESC Steel gray to black, greasy feeling, odorless solid.
MW: 12.0 BP: Sublimes VP: 0 mm (approx.) MP: 6602 F
INCOM Very strong oxidizers, such as fluorine, chlorine trifluoride, and potassium peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Coughing, dyspnea, black sputum, decreased pulmonary function, lung fibrosis
ORGAN Respiratory system, cardiovascular system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns

preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: If the free silica exceeds 1%, apply the Free Silica standard. If the free silica is <1%, apply the Natural Graphite standard. If filter is not overloaded, samples may be collected up to an 8-hour period. Submit bulk sample in separate mailing container when request for silica analysis is made (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Graphite (Synthetic) (Respirable Fraction)

IMIS **G100** CAS 7440-44-0
SYN Acheson graphite, artificial graphite
NIOSH RTECS FF5250100 DOT 1362 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Steel gray to black, greasy feeling, odorless solid.
MW: 12.0 MP: 6602 F VP: 0 mm (approx.)
INCOM Very strong oxidizers such as fluorine, chlorine trifluoride and potassium peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Coughing, dyspnea, black sputum, decreased pulmonary function, lung fibrosis
ORGAN Respiratory system, cardiovascular system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: When standard is the same as for inert dust, noncompliance can be based on gross weight without analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Graphite (Synthetic) (Total Dust)

IMIS **1366** CAS 7440-44-0
SYN Acheson graphite, artificial graphite
NIOSH RTECS FF5250100 DOT 1362 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Steel gray to black, greasy feeling, odorless solid.
MW: 12.0 MP: 6602 F VP: 0 mm (approx.)
INCOM Very strong oxidizers such as fluorine, chlorine trifluoride and potassium peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Coughing, dyspnea, black sputum, decreased pulmonary function, lung fibrosis
ORGAN Respiratory system, cardiovascular system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric

REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: When standard is the same as for inert dust, noncompliance can be based on gross weight without analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Gypsum (Respirable Fraction)

IMIS **G101** CAS 13397-24-5
SYN Calcium(II) sulfate dihydrate, gypsum stone, hydrated calcium sulfate, mineral white
NIOSH RTECS MG2360000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White or nearly white, odorless, crystalline sold.
MW: 172.2 MP: 262 to 325 F VP: 0 mm (approx.)
INCOM Aluminum (at high temperatures), diazomethane
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Gypsum (Total Dust)

IMIS **1367** CAS 13397-24-5
SYN Calcium(II) sulfate dihydrate, gypsum stone, hydrated calcium sulfate, mineral white
NIOSH RTECS MG2360000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC White or nearly white, odorless, crystalline sold.
MW: 172.2 MP: 262 to 325 F VP: 0 mm (approx.)
INCOM Aluminum (at high temperatures), diazomethane
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Helium

IMIS **1400** CAS 7440-59-7
SYN Atomic helium
DOT 1046 120
DESC Colorless, odorless, noncombustible gas.

MW: 4.0
INCOM Strong oxidizing agents
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 Field Analysis. Measure % oxygen present with oxygen meter.

Heptane
IMIS **1371** CAS 142-82-5
SYN Normal heptane, dipropyl methane
NIOSH RTECS MI7700000 DOT 1206 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 400 ppm, 1600 mg/m3
STEL 500 ppm, 2000 mg/m3
DESC Colorless liquid with a gasoline-like odor.
MW: 100.2 BP: 209 F MP: -131 F VP: 40 mm (72 F) FP: 25 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness
ORGAN Skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 4 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.113 CLASS: Validated In-House

Hexachloroethane
IMIS **1372** CAS 67-72-1
SYN carbon hexachloride; ethane hexachloride; perchloroethane
NIOSH RTECS KI4025000 DOT 2811 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 ppm, 10 mg/m3 (Skin)
DESC Colorless crystals with a camphor-like odor.
MW: 236.7 BP: Sublimes VP: 0.2 mm MP: 368 F Sublimes
INCOM Alkalis; metals such as zinc, cadmium, aluminum, hot iron & mercury
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
NTP Suspect Human Carcinogen - [Hexachloroethane]
IARC Group 2B - possibly carcinogenic to humans - [Hexachloroethane]
SYMPT Irritation eyes, skin, mucous membrane; In Animals: kidney damage; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, kidneys. [in animals: liver cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 3 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.200 CLASS: Validated In-House

Hexamethylene Diisocyanate

IMIS **1377** CAS 822-06-0
SYN HDI; 1,6-Hexamethylene Diisocyanate; 1,6-diisocyanatohexane; hexamethylene-1,6-diisocyanate; HMDI
NIOSH RTECS MO1740000 DOT 2281 156
DESC Clear, colorless to slightly yellow liquid with a sharp, pungent odor.
MW: 168.2 BP: 415 F MP: -89 F VP: 0.05 mm (77 F) FP: 284 F
INCOM Water, alcohols, strong bases, amines, carboxylic acids, organotin catalysts [Note: Reacts slowly with water to form carbon dioxide. Avoid heating above 392°F (polymerizes).]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), bronchitis, wheezing, pulmonary edema, asthma; corneal damage, skin blisters
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min
NOTE: To comply with the 1989 PEL changes, the air volume can be increased to 240 L to sample for the OSHA TWA-PEL.
ANL 1: High Performance Liquid Chromatography; HPLC-UV-FLU
REF: OHL2004S011 SAE: 0.099 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

1,6-Hexamethylene Diisocyanate Homopolymer

IMIS **H130** CAS 28182-81-2
SYN hexamethylene diisocyanate homopolymer; HDIH; 1,6-diisocyanato-hexane homopolymer; poly(hexamethylene diisocyanate)
DESC Colorless to yellow liquid with a mild odor.
MW: 500 (approx.) BP: Decomposes MP: -59.8 F FP: 442.4 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), bronchitis, wheezing, pulmonary edema, asthma; corneal damage, skin blisters
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2009S003 SAE: 0.109 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

Hexane (n-Hexane)

IMIS **1380** CAS 110-54-3
SYN n-Hexane; Hexyl hydride; Normal hexane
NIOSH RTECS MN9275000 DOT 1208 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 180 mg/m3
DESC Colorless liquid with a gasoline-like odor.
MW: 86.2 BP: 156 F MP: -139 F VP: 124 mm FP: -7 F
INCOM Strong oxidizers

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)
ORGAN Skin, eyes, respiratory system, central nervous system, peripheral nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 4.9 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.085 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
SAM2 DET. TUBE: Dräger, 67-28391, 100-3,000 ppm

Hexane Isomers, Excluding n-Hexane

IMIS **H146**
SYN Diethylmethylmethane, Diisopropyl, 2,2-Dimethylbutane, 2,3-Dimethylbutane, Isohexane, 2-Methylpentane, 3-Methylpentane [Note: Also see specific listing for n-Hexane.]
DOT 1208 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 500 ppm, 1800 mg/m3
STEL 1000 ppm, 3600 mg/m3
DESC Clear liquids with mild, gasoline-like odors. [Note: Includes all the isomers of hexane except n-hexane.]
MW: 86.2 BP: 122 to 145 F MP: -245 to -148 F FP: -54 to 19 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, respiratory system; headache, dizziness; nausea; chemical pneumonitis (aspiration liquid); dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 5 Liters MIN V: 2.5 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: NIOSH1500 CLASS: Partially Validated by NIOSH

2-Hexanone (Methyl N-Butyl Ketone; Methyl Butyl Ketone)

IMIS **1690** CAS 591-78-6
SYN Methyl butyl ketone; Butyl methyl ketone; methyl n-butyl ketone; MBK
NIOSH RTECS MP1400000 DOT 1224 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 20 mg/m3
DESC Colorless liquid with an acetone-like odor.
MW: 100.2 BP: 262 F MP: -71 F VP: 11 mm FP: 77 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)

SYMPT Eye, nose irritation; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache; drowsiness
ORGAN Eyes, skin, respiratory system, central nervous system, peripheral nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 20 Liters REC F: 0.2 L/min (TWA)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.084 CLASS: Validated In-House

Hexone (Methyl Isobutyl Ketone; MIBK)

IMIS **1385** CAS 108-10-1
SYN 4-Methyl-2-pentanone; methyl isobutyl ketone; isobutyl methyl ketone; MIBK
NIOSH RTECS SA9275000 DOT 1245 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 205 mg/m3
STEL 75 ppm, 300 mg/m3
DESC Colorless liquid with a pleasant odor.
MW: 100.2 BP: 242 F MP: -120 F VP: 16 mm FP: 64 F
INCOM Strong oxidizers, potassium tert-butoxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 2B - possibly carcinogenic to humans - [Methyl isobutyl ketone]
SYMPT Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; In Animals: liver, kidney damage
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 3 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.120 CLASS: Validated In-House
NOTE: Store and ship cold.

Hydrogen

IMIS **1410** CAS 1333-74-0
SYN Dihydrogen, molecular hydrogen
NIOSH RTECS MW8900000* DOT 1966 115 (refrigerated liquid)
DESC Colorless odorless gas.
MW: 2.02
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Dizziness, headache, lethargy, suffocation; frostbite.
ORGAN Skin, eye, respiratory system
LESS1 Field analysis.
1) Measure % oxygen present with oxygen meter.
2) Measure combustibility with combustible gas meter.
SAM2 DET. TUBE: Dräger, 8101511, 0.2-2%

Hydrogen Bromide

IMIS **1420** CAS 10035-10-6
SYN Anhydrous hydrogen bromide; HBr, Aqueous hydrogen bromide
NIOSH RTECS MW3850000 DOT 1048 125; 1788 154
MIOSHA FINAL RULE (Table G-1-A):
CEIL 3 ppm, 10 mg/m3

DESC Colorless gas with a sharp, irritating odor. [Note: Shipped as a liquefied compressed gas. Often used in an aqueous solution.]
MW: 80.9 BP: -88 F MP: -124 F VP: 20 atm
INCOM Strong oxidizers, strong caustics, moisture, copper, brass, zinc [Note: Hydrobromic acid is highly corrosive to most metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Eye, nose, throat irritation; solution: skin, eye burns; liquid: frostbite
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (59): Silica Gel Tube (400/200 mg, ORBO-53 or equiv.)
ANL SOLVENT: Carbonate/Bicarbonate
REC V: 96 Liters REC F: 0.2 L/min (TWA)
MIN V: 2.5 Liters REC F: 0.5 L/min (CEIL)
ANL 1: Ion Chromatography; IC
REF: OHL2002S012 SAE: 0.106 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric, and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for Bromide is performed and reported as the compound.

Hydrogen Chloride
IMIS **1430** CAS 7647-01-0
SYN Anhydrous hydrogen chloride; Aqueous hydrogen chloride, Hydrochloric acid
NIOSH RTECS MW4025000 DOT 1050 125; 1789 157
MIOSHA FINAL RULE (Table G-1-A):
CEIL 5 ppm, 7 mg/m3
DESC Colorless to slightly yellow gas with an irritating, pungent odor.
MW: 36.5 BP: -121 F MP: -174 F VP: 40.5 atm
INCOM Hydroxides, amines, alkalis, copper, brass, zinc [Note: Hydrochloric acid is highly corrosive to most metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Acute Toxicity---Short-term high-risk effects. (HE4)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Hydrochloric acid]
SYMPT Irritation nose, throat, larynx; cough, choking; dermatitis; solution: eye, skin burns; liquid: frostbite; In Animals: laryngeal spasm; pulmonary edema
ORGAN Respiratory system, skin, eyes
LESS1 MEDIA (59): Silica Gel Tube (400/200 mg, ORBO-53 or equiv.)
ANL SOLVENT: Carbonate/Bicarbonate
REC V: 7.5 liters REC F: 0.5 L/min
ANL 1: Ion chromatography; IC
REF: OHL2002S012 SAE: 0.100 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for Chloride is performed and reported as the compound.
SAM2 DET. TUBE: Dräger, 810-14L, 0.2-76 ppm

Hydrogen Fluoride
IMIS **1460** CAS 7664-39-3

SYN Anhydrous hydrogen fluoride, hydrofluoric acid; HF-A; aqueous hydrogen fluoride
NIOSH RTECS MW7875000 DOT 1052 125(anhydrous)
1790 157(solution)
MIOSHA FINAL RULE (Table G-1-A):
TWA 3 ppm
STEL 6 ppm
DESC Colorless gas or fuming liquid (below 67 F) with a strong, irritating odor.
MW: 20.0 BP: 67 F MP: -118 F VP: 783 mm
INCOM Metals, water or steam [Note: corrosive to metals. Will attack concrete, glass, ceramics.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Eye, nose, throat irritation; pulmonary edema; skin, eye burns; rhinitis; bronchitis; bone changes
ORGAN Eyes, respiratory system, skin, bones
LESS1 MEDIA (F): HF 37 mm (treated/untreated MCE filters) 3-piece cassette
ANL SOLVENT: Carbonate/Bicarbonate
REC V: 90 Liters REC F: 1.5 L/min (TWA)
MIN V: 22.5 Liters REC F: 1.5 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2022S001 SAE: 0.114 CLASS: Validated In-House
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric, and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for Fluoride is performed and reported as the compound.

Hydrogen Sulfide
IMIS **1480** CAS 7783-06-4
SYN Sulfuretted hydrogen; hydrosulfuric acid; sewer gas
NIOSH RTECS MX1225000 DOT 1053 117
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 14 mg/m3
STEL 15 ppm, 21 mg/m3
DESC Colorless gas with a strong odor of rotten eggs. [Note: Sense of smell becomes rapidly fatigued & can NOT be relied upon to warn of the continuous presence of H2S. Shipped as a liquefied compressed gas.]
MW: 34.1 BP: -77 F MP: -122 F VP: 17.6 atm
INCOM Strong oxidizers, strong Nitric Acid, metals
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite
ORGAN Respiratory system, eyes, central nervous system
LESS1 See secondary sampling methods (SAM2)
SAM2 DET. TUBE: Dräger, 8101831, 1-200 ppm

Hydroquinone (Dihydroxybenzene)
IMIS **1490** CAS 123-31-9
SYN Quinol; 1,4-Dihydroxybenzene; 1,4-Benzenediol; p-benzenediol, dihydroxybenzene
NIOSH RTECS MX3500000 DOT 2662 153

MIOSHA FINAL RULE (Table G-1-A):
TWA 2.0 mg/m3
DESC Light tan, light gray, or colorless crystals.
MW: 110.1 BP: 545 F MP: 338 F VP: <0.001 mm FP: 329 F
INCOM Strong oxidizers, alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Hydroquinone]
SYMPT Irritation eyes: conjunctivitis; keratitis (inflammation of the cornea); central nervous system excitement; colored urine, nausea, dizziness, suffocation, rapid breath; muscle twitching, delirium; collapse; skin irritation, sensitization, dermatitis
ORGAN Eyes, respiratory system, skin, central nervous system
LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: Methanol
REC V: 20 Liters REC F: 0.2 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S019 SAE: 0.115 CLASS: Validated In-House
NOTE: Store and ship cold.

Iron (Bulk)
IMIS **I200** CAS 7439-89-6
SYN Iron elemental, ferrum
DOT 3178 133
DESC Appearance and odor vary depending upon the specific soluble iron salt; powdered appears as a silver-white or gray lustrous powder.
MW: 55.8 BP: 288 F
INCOM Oxidizing agents
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 1 - carcinogenic to humans - [Iron and steel founding (occupational exposure during)]
SYMPT Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage
ORGAN Eyes, skin, respiratory system, liver, gastrointestinal tract
LESS1 MEDIA: Bulk Samples
ANL SOLVENT: Nitric Acid
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House

Iron Oxide Fume
IMIS **1520** CAS 1309-37-1
SYN Ferric oxide; Iron(III) Oxide
NIOSH RTECS NO7400000; NO7525000 DOT 1376 135
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Reddish-brown solid.
MW: 159.7 MP: 2664 F VP: 0 mm (approx.)
INCOM Calcium hypochlorite
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)

IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Ferric oxide]
SYMPT Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis
ORGAN Respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

Iron Salts, Soluble (as Fe)

IMIS **1522** CAS 7439-89-6
SYN $FeSO_4$: ferrous sulfate; iron(II) sulfate $FeCl_2$: ferrous chloride; iron(II) chloride $Fe(NO_3)_3$: ferric nitrate; iron(III) nitrate $Fe(SO_4)_3$: ferric sulfate; iron(III) sulfate $FeCl_3$: ferric chloride; iron(III) chloride
DOT 3178 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
DESC Appearance and odor vary depending upon the specific soluble iron salt.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage
ORGAN Eyes, skin, respiratory system, liver, gastrointestinal tract
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.095 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume.

Isobutyl Acetate

IMIS **1534** CAS 110-19-0
SYN Isobutyl ester of acetic acid, 2-Methylpropyl acetate, 2-Methylpropyl ester of acetic acid, β-Methylpropyl ethanoate
NIOSH RTECS AI4025000 DOT 1213 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 150 ppm, 700 mg/m3
DESC Colorless liquid with a fruity, floral odor.
MW: 116.2 BP: 243 F MP: -145 F VP: 13 mm FP: 64 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, skin, upper respiratory system; headache, drowsiness, anesthesia; In Animals: narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide

MAX V: 10 Liters MIN V: 3 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.079 CLASS: Validated In-House

Isobutyl Alcohol (Isobutanol)

IMIS **1536** CAS 78-83-1
SYN Isobutanol; IBA; 2-Methyl-1-propanol; Isopropylcarbinol
NIOSH RTECS NP9625000 DOT 1212 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 150 mg/m3
DESC Colorless, oily liquid with a sweet, musty odor.
MW: 74.1 BP: 227 F MP: -162 F VP: 9 mm FP: 82 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, skin, throat; headache, drowsiness; skin cracking; In Animals: narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 2 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.073 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
LESS2 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (40/60) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
REF: OHL2006S012 SAE: 0.095 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

Isophorone Diisocyanate

IMIS **1539** CAS 4098-71-9
SYN IPDI, 3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl-isocyanate, Isophorone diamine diisocyanate
NIOSH RTECS NQ9370000 DOT 2290 156
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.005 ppm (Skin)
STEL 0.02 ppm (Skin)
DESC Colorless to slightly yellow liquid with a pungent odor.
MW: 222.3 MP: -76 F VP: 0.0003 mm FP: 311 F
INCOM Water, alcohols, phenols, amines, mercaptans, amides, urethanes, ureas [Note: Reacts with water to form carbon dioxide.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, skin, respiratory system; chest tightness, dyspnea (breathing difficulty), cough, sore throat; bronchitis, wheezing, pulmonary edema; possible resp sensitization, asthma
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide

REC V: 15 Liters REC F: 1.0 L/min (TWA)
MIN V: 15 Liters REC F: 1.0 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S011 SAE: 0.110 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate coated filters until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

Isopropyl Acetate

IMIS **1540** CAS 108-21-4
SYN Isopropyl ester of acetic acid; 1-Methylethyl ester of acetic acid, 2-Propyl acetate
NIOSH RTECS AI4930000 DOT 1220 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 250 ppm, 950 mg/m3
STEL 310 ppm, 1185 mg/m3
DESC Colorless liquid with a fruity odor.
MW: 102.2 BP: 194 F MP: -92 F VP: 42 mm FP: 36 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes, skin, nose; dermatitis; In Animals: narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 9 Liters MIN V: 0.1 Liters FLOW: 0.02 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.078 CLASS: Validated In-House

Isopropyl Alcohol (2-Propanol)

IMIS **1560** CAS 67-63-0
SYN Isopropanol; IPA; 2-Propanol; sec-Propyl alcohol; Dimethyl carbinol; rubbing alcohol
NIOSH RTECS NT8050000 DOT 1219 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 400 ppm, 980 mg/m3
STEL 500 ppm, 1225 mg/m3
DESC Colorless liquid with an odor of rubbing alcohol.
MW: 60.1 BP: 181 F MP: -127 F VP: 33 mm FP: 53 F
INCOM Strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Isopropyl alcohol]
SYMPT Mild eye, nose, throat irritation; drowsiness; dizziness; headaches; dry cracking skin; gastrointestinal cramps; nausea, diarrhea
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 3 Liters MIN V: 0.3 Liters FLOW: 0.01 to 0.2 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.110 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
LESS2 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)

ANL SOLVENT: (60/40) Dimethylformamide/Carbon Disulfide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.110 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

Kaolin (Respirable Fraction)

IMIS **K100** CAS 1332-58-7
SYN China clay, Clay, Hydrated aluminum silicate, Hydrite, Porcelain clay [Note: Main constituent of Kaolin is Kaolinite (Al2Si2O5(OH)4).]
NIOSH RTECS GF1670500
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White to yellowish or grayish powder. [Note: When moistened, darkens & develops a clay-like odor.]
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Chronic pulmonary fibrosis, stomach granuloma
ORGAN Respiratory system, stomach
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Kaolin (Total Dust)

IMIS **1568** CAS 1332-58-7
SYN China clay, Clay, Hydrated aluminum silicate, Hydrite, Porcelain clay [Note: Main constituent of Kaolin is Kaolinite (Al2Si2O5(OH)4).]
NIOSH RTECS GF1670500
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White to yellowish or grayish powder. [Note: When moistened, darkens & develops a clay-like odor.]
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Chronic pulmonary fibrosis, stomach granuloma
ORGAN Respiratory system, stomach
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Kerosene (Jet Fuels)

IMIS **K107** CAS 8008-20-6
SYN Fuel oil No. 1; range oil; coal oil; [Note: A refined petroleum solvent (predominantly C9-C16), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics & 5% dinuclear aromatics.]
NIOSH RTECS OA5500000 DOT 1223 128
DESC Colorless to yellowish, oily liquid with a strong, characteristic odor.
MW: approx. 170 BP: 347 to 617 F MP: -50 F VP: 5 mm (100 F)
FP: 100 to 162 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Jet fuel]
SYMPT Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 20 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S014 SAE: 0.080 CLASS: Validated In-House
NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

Lead Arsenate (as As)

IMIS Use Arsenic, Inorganic (**0260**) CAS 13464-43-2; 3687-31-8; 7645-25-2
SYN Arsenic metal; Arsenia; Lead metaarsenate; Lead orthoarsenate; Lead diorthoarsenate; Lead mono-orthoarsenate; Lead pyroarsenate; hydrogen arsorate
NIOSH RTECS CG0990000 DOT 1617 151
MIOSHA FINAL RULE (Table G-1-A) Inorganic Arsenic (29 CFR 1910.1018):
TWA 10 µg/m3
AL 5 µg/m3
DESC Metal: silver-gray or tin-white, brittle, odorless solid.
INCOM Strong oxidizers, bromine azide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Human Carcinogen - [Arsenic and Inorganic Arsenic Compounds]
Suspect Human Carcinogen - [Lead and Lead Compounds]
IARC Group 1 - carcinogenic to humans - [Arsenic and inorganic arsenic compounds]
Group 2A - probably carcinogenic to humans - [Lead compounds, inorganic]
SYMPT Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]

ORGAN Liver, kidneys, skin, lungs, lymphatic system, [lung and lymphatic cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.217 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Lead Chromate (as CrO3)
IMIS Use Chromic Acid & Chromates (as CrO3), (**0689**)
CAS 7758-97-6; 18454-12-1
SYN Plumbous chromate; lead chromate (VI)
NIOSH RTECS GB6650000 DOT 1755 154; 1463 141
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.
DESC Yellow or orange-yellow crystals or powder.
MW: 323.2 BP: 482 F MP: 1551 F
INCOM Combustible, organic, or other readily oxidizable materials (paper, wood, sulfur, aluminum, plastics, etc.); corrosive to metals
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Chromium Hexavalent Compounds]
Suspect Human Carcinogen - [Lead and Lead Compounds]
IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]
Group 2A - probably carcinogenic to humans - [Lead compounds, inorganic]
SYMPT Irritation respiratory system; nasal septum perforation; liver, kidney damage; leukocytosis (increased blood leukocytes), leukopenia (reduced blood leukocytes), eosinophilia; eye injury, conjunctivitis; skin ulcer, sensitization dermatitis; [potential occupational carcinogen]
ORGAN Blood, respiratory system, liver, kidneys, eyes, skin
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Submit as a separate sample.
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6).

WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: None (dry wipe)

Lead, Inorganic (as Pb)

IMIS **1591 (PEL); 1592 (AL)** CAS 7439-92-1
SYN Lead metal, plumbum; other synonyms vary depending upon specific compounds
NIOSH RTECS OF7525000 DOT 3077 171(powder)
MIOSHA FINAL RULE (Table G-1-A) Lead in General Industry (29 CFR 1910.1025):
TWA 50 µg/m3
AL 30 µg/m3
NOTE: This applies to all occupational exposure to lead, except the construction industry or to agricultural operations.
DESC A heavy, ductile, soft, gray solid.
MW: 207.2 BP: 3164 F MP: 621 F VP: 0 mm (approx.)
INCOM Strong oxidizers, hydrogen peroxide; acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Suspect Human Carcinogen - [Lead (see Lead and Lead Compounds)]
IARC Group 2A - probably carcinogenic to humans - [Lead compounds, inorganic]
SYMPT Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension
ORGAN Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.071 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Limestone (Naturally Occurring) (Respirable Fraction)

IMIS **L100** CAS 1317-65-3
SYN Calcium carbonate [Limestone], Natural calcium carbonate [Limestone] [Note: Calcite & aragonite are commercially important natural calcium carbonates.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Odorless, white to tan powder.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Fluorine, magnesium, acids, alum, ammonium salts
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane; cough, sneezing, rhinorrhea (discharge of thin nasal mucus); lacrimation (discharge of tears)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminant, the more specific analysis for Calcium will not be performed.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Not Validated
NOTE: An elemental analysis is performed for total Calcium and reported as the compound.

Limestone (Naturally Occurring) (Total Dust)

IMIS **1593** CAS 1317-65-3
SYN Calcium carbonate [Limestone], Natural calcium carbonate [Limestone] [Note: Calcite & aragonite are commercially important natural calcium carbonates.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Odorless, white to tan powder.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Fluorine, magnesium, acids, alum, ammonium salts
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane; cough, sneezing, rhinorrhea (discharge of thin nasal mucus); lacrimation (discharge of tears)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, the more specific analysis for Calcium will not be performed.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Not Validated
NOTE: An elemental analysis is performed for total Calcium and reported as the compound.

Liquified Petroleum Gas (L.P.G.)

IMIS **1803** CAS 68476-85-7
SYN LPG; Bottled gas, Compressed petroleum gas, Liquefied hydrocarbon gas, Liquefied petroleum gas [Note: A fuel mixture of propane, propylene, butanes, and butylenes.]
NIOSH RTECS SE7545000 DOT 1075 115
MIOSHA FINAL RULE (Table G-1-A):
TWA 1000 ppm, 1800 mg/m3
DESC Colorless, noncorrosive, odorless gas when pure. [Note: A foul-smelling odorant is usually added).
MW: 42 to 58 BP: >-44 F VP: >1 atm
INCOM Strong oxidizers, chlorine dioxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
Asphyxiants, Anoxiants. (HE17)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Dizziness, drowsiness, asphyxia; liquid: frostbite
ORGAN Respiratory system, central nervous system
LESS1 Combustible Gas Meter

Magnesite (Respirable Fraction)

IMIS **M113** CAS 546-93-0; 13717-00-5
SYN Carbonate magnesium, Hydromagnesite, Magnesium carbonate, Magnesium(II) carbonate [Note: Magnesite is a naturally occurring form of magnesium carbonate.]
NIOSH RTECS OM2470000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White, odorless, crystalline powder.
MW: 84.3 MP: 662 F VP: 0 mm (approx.)
INCOM Acids, formaldehyde
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Magnesite (Total Dust)

IMIS **1615** CAS 546-93-0; 13717-00-5
SYN Carbonate magnesium, Hydromagnesite, Magnesium carbonate, Magnesium(II) carbonate [Note: Magnesite is a naturally occurring form of magnesium carbonate.]
NIOSH RTECS OM2470000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White, odorless, crystalline powder.
MW: 84.3 MP: 662 F VP: 0 mm (approx.)
INCOM Acids, formaldehyde
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Magnesium

IMIS **M100** CAS 7439-95-4
NIOSH RTECS OM2100000* DOT 1869 138
DESC Appears as a light silvery metal.
MW: 24.3 BP: 2012 F MP: 1202 F
INCOM Ethylene oxide, metal oxosalts, oxidants, potassium carbonate
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric

REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.093 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

Magnesium Oxide Fume (Total Particulate)

IMIS **1610** CAS 1309-48-4
SYN Magnesia fume; maglite; magox
NIOSH RTECS OM3850000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Finely divided white particulate dispersed in air. [Note: Exposure may occur when magnesium is burned, thermally cut, or welded upon.]
MW: 40.3 BP: 6512 F MP: 5072 F VP: 0 mm (approx.)
INCOM Chlorine trifluoride, phosphorus pentachloride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
SYMPT Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever
ORGAN Respiratory system, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.093 CLASS: Validated In-House
NOTE: Samples may be collected up to an 8-hour period, if the filter is not overloaded. Analytical method does not distinguish between dust & fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.
WIPE MEDIA: Ghost Wipe

Manganese Compounds (as Mn)

IMIS **M112** CAS 7439-96-5
SYN Manganese metal: Colloidal manganese; Manganese-55 Synonyms of other compounds vary depending upon the specific manganese compound.
NIOSH RTECS OO9275000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
CEIL 5 mg/m3
DESC A lustrous, brittle, silvery solid.
MW: 54.9 BP: 3564 F MP: 2271 F VP: 0 mm (approx.)
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage
ORGAN Respiratory system, central nervous system, blood, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)

ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.076 CLASS: Validated In-House
NOTE: Samples may be collected up to an 8-hour period, if the filter is not overloaded. When analysis of a compound is requested, an elemental analysis is performed and reported as the element.

Manganese Fume (as Mn)

IMIS **1620** CAS 7439-96-5
SYN Colloidal manganese, Manganese-55, Manganese metal
NIOSH RTECS OO9275000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 3 mg/m3
DESC A lustrous, brittle, silvery solid.
MW: 54.9 BP: 3564 F MP: 2271 F VP: 0 mm (approx.)
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage
ORGAN Respiratory system, central nervous system, blood, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 Liters (STEL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.076 CLASS: Validated In-House
NOTE: Samples may be collected up to an 8-hour period, if the filter is not overloaded. Analytical method does not distinguish between dust & fume.
WIPE MEDIA: Ghost Wipe

Manganese Tetroxide (as Mn)

IMIS **M101** CAS 1317-35-7
SYN Manganese Oxide; Trimanganese Tetroxide; Manganomanganic oxide; Trimanganese tetraoxide
NIOSH RTECS OP0895000
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
DESC Brownish-black powder.
MW: 228.8 MP: 2847 F VP: 0 mm (approx.)
INCOM Soluble in hydrochloric acid (liberates chlorine gas)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Asthenia, insomnia, mental confusion; low-back pain, vomiting; malaise (vague feeling of discomfort), lassitude (weakness, exhaustion), kidney damage,

pneumonitis
ORGAN Respiratory system, central nervous system, blood, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
NOTE: If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.076 CLASS: Validated In-House
NOTE: Analytical method does not distinguish between dust and fume. When an analysis of a compound is requested, an elemental analysis is performed and reported as the compound.
WIPE MEDIA: Ghost Wipe

Marble (Respirable Fraction)
IMIS **M114** CAS 1317-65-3
SYN Calcium Carbonate [Marble], Natural calcium carbonate [Marble] [Note: Marble is a metamorphic form of calcium carbonate.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Odorless, white powder.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Fluorine, magnesium, acids, alum, ammonium salts
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea (discharge of thin nasal mucus); lacrimation (discharge of tears)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Marble (Total Dust)
IMIS **1626** CAS 1317-65-3
SYN Calcium Carbonate [Marble], Natural calcium carbonate [Marble] [Note: Marble is a metamorphic form of calcium carbonate.]
NIOSH RTECS EV9580000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Odorless, white powder.
MW: 100.1 MP: 1517 to 2442 F VP: 0 mm (approx.)
INCOM Fluorine, magnesium, acids, alum, ammonium salts
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea (discharge of thin nasal mucus); lacrimation (discharge of tears)
ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Mercury (Vapor) (as Hg)

IMIS **1631** CAS 7439-97-6
SYN Quicksilver; Mercury metal, Colloidal mercury; Metallic mercury
NIOSH RTECS OV4550000 DOT 2809 172
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.05 mg/m3 (Skin)
NOTE: Vapor only.
DESC Metal: Silver-white, heavy, odorless liquid.
MW: 200.6 BP: 674 F MP: -38 F VP: 0.0012 mm
INCOM Acetylenes, ammonia, chlorine dioxide, azides, calcium (amalgam formation, sodium carbide, lithium, rubidium, copper
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Mercury and inorganic mercury compounds]
SYMPT Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
ORGAN Eyes, skin, respiratory system, central nervous system, kidneys
LESS1 Currently unavailable. See Secondary sampling method (SAM2).
SAM2 Jerome Mercury Vapor Analyzer - Model 411, 0.001-0.5 mg/m3
Jerome Mercury Dosimeter - Model 412 (for use with Model 411)
All the above are available from LESS.

Mesityl Oxide

IMIS **1635** CAS 141-79-7
SYN 4-Methyl-3-penten-2-one; Isobutenyl methyl ketone; Methyl isobutenyl ketone; Isopropylideneacetone
NIOSH RTECS SB4200000 DOT 1229 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 ppm, 60 mg/m3
STEL 25 ppm, 100 mg/m3
DESC Oily, colorless to light yellow liquid with a peppermint- or honey-like odor.
MW: 98.2 BP: 266 F MP: -52 F VP: 9 mm
INCOM Oxidizers, acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, and mucous membrane; narcosis, coma; In animals: liver, kidney damage; central nervous system effects
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide

MAX V: 25 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.206 CLASS: Validated In-House

Methacrylic Acid

IMIS **M339** CAS 79-41-4
SYN α-Methacrylic acid, Methacrylic acid (glacial), Methacrylic acid (inhibited), 2-Methylacrylic acid, 2-Methylpropenoic acid
NIOSH RTECS OZ2975000 DOT 2531 153P
MIOSHA FINAL RULE (Table G-1-A):
TWA 20 ppm, 70 mg/m3 (Skin)
DESC Colorless liquid or solid (below 61 F) with an acrid, repulsive odor.
MW: 86.1 BP: 325 F MP: 61 F VP: 0.7 mm FP: (oc) 171 F
INCOM Oxidizers, elevated temperatures, hydrochloric acid [Note: Typically contains 100 ppm of the monomethyl ether of hydroquinone to prevent polymerization.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
SYMPT Irritation eyes, skin, mucous membrane; eye, skin burns
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (99): Two Anasorb 708 Tubes in series (100 mg sections)
ANL SOLVENT: Methanol
REC V: 24 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S021 CLASS: Validated In-House

Methane

IMIS **1640** CAS 74-82-8
SYN Fire damp, marsh gas, methane, methyl hydride
NIOSH RTECS PA1490000* DOT 1971 115
DESC Colorless, odorless gas.
MW: 16.05 BP: -258.7 F MP: -296.5 F FP: -306 F
INCOM Chlorine and bromine in light, nitrogen trifluoride, liquid oxygen
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

Methyl Acetate

IMIS **1650** CAS 79-20-9
SYN Methyl ester of acetic acid; Methyl ethanoate
NIOSH RTECS AI9100000 DOT 1231 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 610 mg/m3
STEL 250 ppm, 760 mg/m3
DESC Colorless liquid with a fruity odor.
MW: 74.1 BP: 135 F VP: 173 mm MP: -145 F FP: 14 F
INCOM Nitrates; strong oxidizers, alkalis, and acids; water [Note: Reacts slowly with water to form acetic acid & methanol.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Irritation eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; In Animals: narcosis
ORGAN Eyes, skin, respiratory system, central nervous system

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 0.2 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.161 CLASS: Validated In-House
NOTE: Store and ship cold.

Methyl Acrylate

IMIS **1653** CAS 96-33-3
SYN Methoxycarbonylethylene, Methyl propenoate; Methyl ester of acrylic acid
NIOSH RTECS AT2800000 DOT 1919 129P
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 35 mg/m3 (Skin)
DESC Clear, colorless liquid with an acrid odor.
MW: 86.1 BP: 176 F MP: -106 F VP: 65 mm FP: 27 F
INCOM Nitrates, oxidizers such as peroxides, strong alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Acute Toxicity---Short-term high-risk effects. (HE4)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
IARC Group 2B - possibly carcinogenic to humans - [Methyl acrylate]
SYMPT Irritation eyes, upper respiratory, and skin
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Toluene
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.090 CLASS: Validated In-House
NOTE: Store and ship cold.

Methyl Alcohol (Methanol)

IMIS **1660** CAS 67-56-1
SYN Methanol; Wood alcohol; Columbian spirits; Carbinol; Pyroligneous spirit; Wood alcohol; Wood naphta; Wood spirit
NIOSH RTECS PC1400000 DOT 1230 131
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 260 mg/m3 (Skin)
STEL 250 ppm, 325 mg/m3 (Skin)
DESC Colorless liquid with a characteristic, pungent odor.
MW: 32.1 BP: 147 F MP: -144 F VP: 96 mm FP: 52 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
SYMPT Irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system, gastrointestinal tract
LESS1 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (40/60) Carbon Disulfide/Dimethylformamide
REC V: 3 Liters REC F: 0.05 L/min
*REC V: 5 Liters REC F: 0.05 L/min (When Relative Humidity is >50%)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)

ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.124 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.
*When relative humidity is greater than 50%, recommended volume is 5 Liters.
SAM2 DET. TUBE: Dräger, 810-111L, 20-1000 ppm

Methyl (n-Amyl) Ketone
IMIS **1675** CAS 110-43-0
SYN n-Amyl methyl ketone; 2-Heptanone; Amyl methyl ketone
NIOSH RTECS MJ5075000 DOT 1110 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 465 mg/m3
DESC Colorless to white liquid with a banana like, fruity odor.
MW: 114.2 BP: 305 F MP: -32 F VP: 3 mm FP: 102 F
INCOM Strong acids, alkalis, oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, skin, mucous membrane; headache; narcosis, coma; dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system, peripheral nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 25 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.102 CLASS: Validated In-House

2-Methoxyethanol (Methyl Cellosolve)
IMIS **0590** CAS 109-86-4
SYN 2-Methoxyethanol; Glycol monomethyl ether; Ethylene glycol monomethyl ether; EGME
NIOSH RTECS KL5775000 DOT 1188 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 80 mg/m3 (Skin)
DESC Colorless liquid with a mild, ether-like odor.
MW: 76.1 BP: 256 F MP: -121 F VP: 6 mm FP: 102 F
INCOM Strong oxidizers and caustics
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
SYMPT Irritation eyes, nose, throat, headache; drowsiness; lassitude (weakness, exhaustion); ataxia, tremor; anemic pallor; In Animals: reproductive, teratogenic effects
ORGAN Eyes, respiratory system, central nervous system, blood, kidneys, reproductive system, hematopoietic system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.100 CLASS: Validated In-House

2-Methoxyethyl Acetate (Methyl Cellosolve Acetate; Ethylene Glycol Methyl Acetate)
IMIS **1170** CAS 110-49-6

SYN 2-Methoxyethyl acetate; Glycol monomethyl ether acetate; Ethylene glycol monomethyl ether acetate; EGMEA
NIOSH RTECS KL5950000 DOT 1189 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 120 mg/m3 (Skin)
DESC Colorless liquid with a mild, ether-like odor.
MW: 118.1 BP: 293 F MP: -85 F VP: 2 mm FP: 120 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
SYMPT Irritation eyes, nose, throat; kidney, brain damage; In animals: narcosis; reproductive, teratogenic effects
ORGAN Eyes, respiratory system, kidneys, brain, central nervous system, peripheral nervous system, reproductive system, hematopoietic system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.110 CLASS: Validated In-House
NOTE: Samples should be shipped and stored cold to minimize hydrolysis. Ship samples overnight with cold-packs as soon as possible.

Methyl Chloroform (1,1,1-Trichloroethane)
IMIS **1720** CAS 71-55-6
SYN 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized); Chlorothene
NIOSH RTECS KJ2975000 DOT 2831 160
MIOSHA FINAL RULE (Table G-1-A):
TWA 350 ppm, 1900 mg/m3
STEL 450 ppm, 2450 mg/m3
DESC Colorless liquid with mild, chloroform-like odor.
MW: 133.4 BP: 165 F MP: -23 F VP: 100 mm
INCOM Strong caustics, strong oxidizers; chemically active metals, such as aluminum, magnesium powders, sodium, potassium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
IARC Group 2A - probably carcinogenic to humans - [1,1,1-Trichloroethane]
SYMPT Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage
ORGAN Eyes, skin, central nervous system, cardiovascular system, liver
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 8 Liters MIN V: 3 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.086 CLASS: Validated by In-House

Methylene Bisphenyl Isocyanate (MDI; 4,4-Diphenylmethane Diisocyanate)

IMIS **1073** CAS 101-68-8
SYN 4,4-Diphenylmethane diisocyanate; Methylene bis(4-phenyl isocyanate); MDI; Methylenedi-p-phenylene ester of isocyanic acid
NIOSH RTECS NQ9350000 DOT 2206 156
MIOSHA FINAL RULE (Table G-1-A):
CEIL 0.02 ppm, 0.2 mg/m3
DESC White to light-yellow, odorless flakes [Note: A liquid above 99 F.].
MW: 250.3 BP: 597 F MP: 99 F VP: 0.000005 mm (77 F) FP: 390 F
INCOM Strong alkalis, acids, alcohol
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [4,4'-Methylenediphenyl diisocyanate]
SYMPT Irritation eyes, nose, throat; resp sensitization; cough, pulmonary secretions, chest pain, dyspnea (breathing difficulty); asthma
ORGAN Respiratory system, eyes
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min (CEIL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S011 SAE: 0.120 CLASS: Validated In-House
NOTE: Obtain treated filter from LESS and refrigerate until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

Methylene Chloride (Dichloromethane)

IMIS **1730** CAS 75-09-2
SYN Methylene dichloride; Dichloromethane
NIOSH RTECS PA8050000 DOT 1593 160
MIOSHA FINAL RULE (Table G-1-A) Methylene Chloride (29 CFR 1910.1052):
TWA 25 ppm, 87 mg/m3
STEL 125 ppm, 434 mg/m3 (15 min)
AL 12.5 ppm
DESC Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]
MW: 84.9 BP: 104 F MP: -139 F VP: 350 mm
INCOM Strong oxidizers; caustics; chemically active metals such as aluminum, magnesium powders, sodium, potassium; concentrated nitric acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Asphyxiants, Anoxiants. (HE17)
NTP Suspect Human Carcinogen - [Dichloromethane]
IARC Group 2A - probably carcinogenic to humans - [Dichloromethane (Methylene chloride)]
SYMPT Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]
ORGAN Eyes, skin, cardiovascular system, central nervous system [in animals: lung, liver, salivary & mammary gland tumors]
LESS1 MEDIA (8): CARBOSIEVE S-III (ORBO 91) (130/65 mg sections, 60/80 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide

MAX V: 3 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S016 SAE: 0.125 CLASS: Validated In-House
NOTE: Recommended refrigerated storage. Alternative media is available, contact LESS for more information.

Methylene-bis (4-Cyclohexylisocyanate)

IMIS **2651** CAS 5124-30-1
SYN Dicyclohexylmethane 4,4'-diisocyanate, DMDI, HMDI, Hydrogenated MDI, bis(4-Isocyanatocyclohexyl)methane, Reduced MDI, Saturated MDI
NIOSH RTECS NQ9250000 DOT 2206 156
MIOSHA FINAL RULE (Table G-1-A):
CEIL 0.01 ppm, 0.11 mg/m3
DESC Clear, colorless to light-yellow liquid
MW: 262.4 MP: <14 F FP: >395 F
INCOM Water, ethanol, alcohols, amines, bases, acids, organotin catalysts [Note: May slowly polymerize if heated above 122°F.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, respiratory system; skin, resp sensitization; chest tightness, dyspnea (breathing difficulty), cough, dry throat, wheezing, pulmonary edema; skin blisters
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2009S003 SAE: 0.117 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

Methyl Isoamyl Ketone

IMIS **1776** CAS 110-12-3
SYN 5-Methyl-2-hexanone; MIAK; 2-Methyl-5-hexanone; isopentyl methyl ketone; isoamyl methyl ketone
NIOSH RTECS MP3850000 DOT 2302 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 240 mg/m3
DESC Colorless, clear liquid with a pleasant, fruity odor.
MW: 114.2 BP: 291 F MP: -101 F VP: 5 mm FP: 97 F
INCOM Oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; In Animals: liver, kidney damage
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 10 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.099 CLASS: Validated In-House
NOTE: Ship immediately after sampling. Delay-store at reduced temperature. Refrigerate samples upon receipt at the laboratory.

Methyl Methacrylate

IMIS **1774** CAS 80-62-6
SYN Methacrylic monomer; methyl ester of methacrylic acid; methyl methacrylate monomer; uninhibited; methyl-2-methyl-2-propenoate
NIOSH RTECS OZ5075000 DOT 1247 129P
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 410 mg/m3
DESC Colorless liquid with an acrid, fruity odor.
MW: 100.1 BP: 214 F MP: -54 F VP: 29 mm FP: (oc) 50 F
INCOM Nitrates, oxidizers, peroxides, polymerizers, strong alkalis, moisture
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Methyl methacrylate]
SYMPT Eye, nose, skin, throat irritation; dermatitis
ORGAN Eyes, respiratory system, skin
LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Toluene
REC V: 3 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.112 CLASS: Validated In-House
NOTE: Store and ship cold.

2-Methylpentane

IMIS **M127** CAS 107-83-5
SYN Diethylmethylmethane, Diisopropyl, 2,2-Dimethylbutane, 2,3-Dimethylbutane, Isohexane, 2-Methylpentane, 3-Methylpentane [Note: Also see specific listing for n-Hexane.]
NIOSH RTECS SA2995000 DOT 1208 128
DESC Clear liquids with mild, gasoline-like odors. [Note: Includes all the isomers of hexane except n-hexane.]
MW: 86.2 BP: 122 to 145 F MP: -245 to -148 F FP: -54 to 19 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, respiratory system; headache, dizziness; nausea; chemical pneumonitis (aspiration liquid); dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.068 CLASS: Validated In-House
NOTE: Recommended store and ship cold.

n-Methyl-2-Pyrrolidinone

IMIS **M139** CAS 872-50-4
SYN NMP; N-Methylpyrrolidinone; N-Methyl-2 Pyrrolinone; 1-Methyl-5-Pyrrolidinone; Methylpyrrolidone; N-Methylpyrrolidone; Composite Constituent
NIOSH RTECS UY5790000* DOT 1993 128
DESC A clear colorless liquid with a fish-like odor
MW: 99.1 BP: 396 F MP: -9 F FP: 204 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)

ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.143 CLASS: Validated In-House

alpha-Methyl Styrene

IMIS **1782** CAS 98-83-9
SYN 1-Methyl-1-phenylethylene; AMS; isopropenyl benzene; 2-phenyl propylene
NIOSH RTECS WL5075300 DOT 2303 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 240 mg/m3
STEL 100 ppm, 485 mg/m3
DESC Colorless liquid with a characteristic odor.
MW: 118.2 BP: 330 F MP: -10 F VP: 2 mm
INCOM Oxidizers, peroxides, halogens, catalysts for vinyl or ionic polymers; aluminum, iron chloride, copper
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Nervous System Disturbances---Narcosis. (HE8)
IARC Group 2B - possibly carcinogenic to humans - [α-Methylstyrene]
SYMPT Eye, skin, nose, throat irritation; drowsiness; dermatitis
ORGAN Eyes, respiratory system, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 30 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2001S001 SAE: 0.118 CLASS: Validated In-House

Mica

IMIS **9075** CAS 12001-26-2
SYN Muscovite; Roscoelite; Lepidolite; Phlogopite; Biotite; Zimmwaldite; Margarite
NIOSH RTECS VV8760000
MIOSHA FINAL RULE (Table G-1-A):
TWA 3 mg/m3
DESC Colorless, odorless flakes or sheets of hydrous silicates.
MW: approx. 797 VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes; pneumoconiosis, cough, dyspnea (breathing difficulty); lassitude (weakness, exhaustion); weight loss
ORGAN Respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, the XRD analysis will not be performed.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
BULK Submit bulk sample in separate mailing container when request for silica analysis is

made (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Mineral Wool Fiber

IMIS **1781**
SYN Manmade mineral fibers; rock wool; slag wool; synthetic vitreous fibers
NIOSH RTECS PY8070000
DESC Produced by blowing steam or air through molten rock (rock wool) or various furnace slags that are by-products of metal smelting or refining processes (slag wool).
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eye, skin, respiratory system; dyspnea (breathing difficulty)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
LESS2 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (EL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House
NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.

Molybdenum, Dust & Insoluble Compounds (as Mo)

IMIS **1790** CAS 7439-98-7
SYN Molybdenum metal
NIOSH RTECS QA4680000 DOT 3089 170
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Dark gray or black powder with a metallic luster.
MW: 95.9 BP: 8717 F MP: 4752 F VP: 0 mm (approx.)
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT In Animals: irritation eyes, nose, throat; anorexia, diarrhea, weight loss; listlessness; liver, kidney damage
ORGAN Eyes, respiratory system, liver, kidneys
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, LESS will not analyze for the specific metal.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.068 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour

period.
WIPE MEDIA: Ghost Wipe

Molybdenum, Soluble Compounds (as Mo)
IMIS **1791** CAS 7439-98-7
SYN Molybdenum metal
NIOSH RTECS QA4680000 DOT 3089 170
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Dark gray or black powder with a metallic luster.
MW: 95.9 BP: 8717 F MP: 4752 F VP: 0 mm (approx.)
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT In Animals: irritation eyes, nose, throat; anorexia; incoordination; dyspnea (breathing difficulty); anemia
ORGAN Eyes, respiratory system, kidneys, blood
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.068 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Morpholine
IMIS **1797** CAS 110-91-8
SYN Diethylene imidoxide; diethylene oxamide; tetrahydro-1,4-oxazine; tetrahydro-p-oxazine
NIOSH RTECS QD6475000 DOT 2054 132
MIOSHA FINAL RULE (Table G-1-A):
TWA 20 ppm, 70 mg/m3 (Skin)
STEL 30 ppm, 105 mg/m3 (Skin)
DESC Colorless liquid with a weak, ammonia- or fish-like odor.
MW: 87.1 BP: 264 F MP: 23 F VP: 6 mm FP: (oc) 98 F
INCOM Strong acids, strong oxidizers, metals, nitro compounds
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Morpholine]
SYMPT Irritation eyes, skin, nose, respiratory system; visual disturbance; cough; In Animals: liver, kidney damage
ORGAN Respiratory system, eyes, skin, liver, kidneys
LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: (80/20) Methanol/Deionized Water
REC V: 10 Liters REC F: 0.1 L/min (TWA)
REC V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OSHAPV2123 SAE: 0.164 CLASS: Partially Validated by OSHA
NOTE: Store and ship cold.

Naphthalene

IMIS **1810** CAS 91-20-3
SYN Naphthalin, Tar camphor, White tar
NIOSH RTECS QJ0525000 DOT 1334 133; 2304 133
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 50 mg/m3
STEL 15 ppm, 75 mg/m3
DESC Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]
MW: 128.2 BP: 424 F VP: 0.08 mm MP: 176 F FP: 174 F
INCOM Strong oxidizers, chromic anhydride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Suspect Human Carcinogen - [Naphthalene]
IARC Group 2B - possibly carcinogenic to humans - [Naphthalene]
SYMPT Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage
ORGAN Eyes, skin, blood, liver, kidneys, central nervous system
LESS1 MEDIA (31): Chromosorb 106 Tube (100/50 mg sections, 60/80 mesh)
ANL SOLVENT: Carbon Disulfide
REC V: 10 Liters REC F: 0.2 L/min (TWA)
MIN V: 3 Liters MAX F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S011 SAE: 0.070 CLASS: Validated In-House
NOTE: Submit as a separate sample.

Naphtha (VM&P)

IMIS **V109** CAS 8032-32-4
SYN Ligroin; Varnish Makers' & Painters' Naphtha; Petroleum Ether; Petroleum spirit; refined solvent naphtha
NIOSH RTECS OI6180000 DOT 1268 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 300 ppm, 1350 mg/m3
STEL 400 ppm, 1800 mg/m3
DESC Clear to yellowish liquid with a pleasant, aromatic odor.
MW: approx. 87 to 114 BP: 203 to 320 F VP: 2 to 20 mm
FP: 20 to 55 F
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, upper respiratory system; dermatitis; central nervous system depression; chemical pneumonitis (aspiration liquid)
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 20 Liters MIN V: 1.3 Liters FLOW: 0.01 to 0.2 L/min
MIN T: 15 minutes MAX F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S014 SAE: 0.132 CLASS: Validated In-House

NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

Neon

IMIS **1850** CAS 7440-01-9
DOT 1065 120; 1913 120(cryogenic liquid)
DESC Gas
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 Field analysis. Measure % oxygen present with oxygen meter.

Nickel, Metal and Insoluble compounds (as Ni)

IMIS **1840** CAS 7440-02-0
SYN Elemental nickel; nickel catalyst
NIOSH RTECS QR5950000
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
DESC Metal: lustrous, silvery, odorless solid.
MW: 58.7 BP: 5139 F MP: 2831 F VP: 0 mm (approx.)
INCOM Strong acids, sulfur, selenium, wood and other combustibles, nickel nitrate
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Suspect Human Carcinogen - [Metallic Nickel (see Nickel Compounds and Metallic Nickel)]
IARC Group 2B - possibly carcinogenic to humans - [Nickel, metallic]
SYMPT Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
ORGAN Lungs, nasal cavities, skin [lung and nasal cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Ghost Wipe

Nickel, Soluble Compounds (as Ni)

IMIS **1842** CAS 7440-02-0
SYN Elemental nickel; nickel catalyst
NIOSH RTECS QR5950000
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.1 mg/m3
DESC Lustrous, silvery odorless metal
MW: 58.7 BP: 5139 F MP: 2831 F VP: 0 mm (approx.)
INCOM Strong acids, sulfur, selenium, nickel nitrate; wood and other combustibles
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Suspect Human Carcinogen - [Metallic Nickel (see Nickel Compounds and Metallic Nickel)]

IARC Group 1 - carcinogenic to humans - [Nickel compounds]
Group 2B - possibly carcinogenic to humans - [Nickel, metallic]
SYMPT Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
ORGAN Lungs, nasal cavities, skin [lung and nasal cancer]
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.081 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.

Nitric Acid

IMIS **1860** CAS 7697-37-2
SYN Aqua fortes; spirits of niter; engravers acid; white fuming Nitric Acid (WFNA); red fuming Nitric Acid (RFNA); hydrogen nitrate
NIOSH RTECS QU5775000 DOT 2031 157; 2032 157
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 5 mg/m3
STEL 4 ppm, 10 mg/m3
DESC Colorless, yellow, or red fuming liquid with an acrid, suffocating odor.
MW: 63 BP: 181 F MP: -44 F VP: 48 mm
INCOM Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Eye, mucous membrane, skin irritation; delayed pulmonary edema; pneumonitis; bronchitis; dental erosion
ORGAN Eyes, respiratory system, skin, teeth
LESS1 MEDIA (59): Silica Gel Tube (400/200 mg, ORBO-53 or equiv.)
ANL SOLVENT: Carbonate/Bicarbonate
REC V: 96 Liters REC F: 0.2 L/min (TWA)
MIN V: 7.5 Liters REC F: 0.5 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2002S012 SAE: 0.124 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric, and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for nitrate is performed and reported as the compound. For STEL samples, submit as a separate sample.

Nitric Oxide

IMIS **1890** CAS 10102-43-9
SYN Nitrogen monoxide; mononitrogen monoxide
NIOSH RTECS QX0525000 DOT 1660 124
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 30 mg/m3
DESC Colorless gas.
MW: 30.0 BP: -241 F MP: -263 F VP: 34.2 atm
INCOM Fluorine, combustible materials, ozone, NH3, chlorinated hydrocarbons, metals, carbon disulfide [Note: Reacts with water to form Nitric Acid. Rapidly converted in air

to nitrogen dioxide.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Hematologic (Blood) Disturbances---Methemoglobinemia. (HE13)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Eye, nose, throat irritation; wet skin; drowsiness; unconsciousness; methemoglobinemia
ORGAN Eyes, skin, respiratory system, blood, central nervous system
LESS1 MEDIA (41): Two Glass Tubes each containing 400 mg Triethanolamine-impregnated Molecular Sieve separated by an Oxidizer tube containing 1g of a chromate compound
ANL SOLVENT: Triethanolamine (1.5%)
NOTE: If sampling for both NO2 and NO is necessary, two separate pumps and sampling devices should be used. The differences in OSHA Final Rule PELs (NO2 is a STEL and NO is a TWA PEL) and flow rates dictates a need for a singular assessment of NO2. Nitric oxide is collected at a flow rate not to exceed 0.025 L/min and a three-tube device must be used. Nitrogen dioxide can be collected at this flow rate; however, a longer sampling time will be necessary to collect a detectable amount of NO2. Also, NO2 concentrations may vary widely during sampling periods as long as 4 hours for NO. The three-tube sampling device will not reflect the varying concentration. Therefore, it is recommended to sample at 0.2 L/min for 15-min intervals using a single or two-section tube.
MEDIA (40): Molecular Sieve (400/200 mg) - For NO2.
A separate three-tube device and pump is then used for NO sampling. The front tube of the device can be submitted for NO2 analysis; however, results from this front section may not represent short-term exposures.
MAX V: 6.0 Liters REC F: 0.025 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2002S018 SAE: 0.121 CLASS: Validated In-House
NOTE: Submit as a separate sample. Store and ship cold.
NOTE: First TEA tube collects nitrogen dioxide (NO2), second TEA tube collects nitric oxide (NO). Carefully label tubes before shipping to LESS. Do not submit oxidizer tube to LESS.
SAM2 DET. TUBE: Dräger, CH 31001, 2-100 ppm

Nitrogen
IMIS **1900** CAS 7727-37-9
DOT 1066 120; 1977 120(cryogenic liquid)
DESC Gas
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 Field analysis. Measure % oxygen with oxygen meter.

Nitrogen Dioxide
IMIS **1903** CAS 10102-44-0
SYN Nitrogen tetroxide; NO2; Dinitrogen tetroxide; Nitrogen peroxide; Diesel Exhaust Component
NIOSH RTECS QW9800000 DOT 1067 124
MIOSHA FINAL RULE (Table G-1-A):
STEL 1 ppm, 1.8 mg/m3
DESC Yellowish-brown or reddish-brown gas with a pungent, acrid odor.
MW: 46.0 BP: 70 F MP: 15 F VP: 720 mm
INCOM Combustible material, water, chlorinated hydrocarbons, ammonia, carbon disulfide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)

Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)

SYMPT Irritation eyes, nose, throat; cough, mucoid frothy sputum, decreased pulmonary function, chronic bronchitis, dyspnea (breathing difficulty); chest pain; pulmonary edema, cyanosis, tachypnea, tachycardia

ORGAN Eyes, respiratory system, cardiovascular system

LESS1 MEDIA (40 or 41): One glass tube with 400 mg Triethanolamine- impregnated Molecular Sieve for NO2 only or two glass tubes each containing 400 mg Triethanolamine-impregnated Molecular Sieve separated by an Oxidizer tube containing 1 g of a Chromate compound if collecting Nitric Oxide also.
ANL SOLVENT: Triethanolamine (1.5%)
NOTE: If sampling for both NO2 and NO is necessary, two separate pumps and sampling devices should be used. The differences in OSHA Final Rule PELs (NO2 is a STEL and NO is a TWA PEL) and flow rates dictates a need for a singular assessment of NO2. Nitric oxide is collected at a flow rate not to exceed 0.025 L/min and a three-tube device must be used. Nitrogen dioxide can be collected at this flow rate; however, a longer sampling time will be necessary to collect a detectable amount of NO2 than for a short-term measurement. Also, NO2 concentrations may vary widely during sampling periods as long as 4 hours for NO. The three-tube sampling device will not reflect the varying concentration. Therefore, it is recommended to sample at 0.2 L/min for 15-min intervals using a single or two-section tube for NO2. A separate three-tube device and pump is then used for NO sampling. The front tube of the device can be submitted for NO2 analysis; however, results from this front section may not represent short-term exposures.
MAX V: 6.0 Liters REC F: 0.2 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2002S018 SAE: 0.121 CLASS: Validated In-House
NOTE: Submit as a separate sample. Sample for 30 minutes if possible. First TEA tube collects NO2, second TEA tube collects NO. Carefully label tubes before shipping to LESS. Reduce flow to 0.025 L/min if also collecting Nitric Oxide. Use MEDIA #40 for NO2 only, sampling train MEDIA #41 for NO and NO2. Do not submit oxidizer tube to LESS.

SAM2 DET. TUBE: Dräger, 8103631, 0.1-30 ppm

Nonane

IMIS **N807** CAS 111-84-2

SYN n-Nonane, nonyl hydride

NIOSH RTECS RA6115000 DOT 1920 128

MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 1050 mg/m3

DESC Colorless liquid with a gasoline-like odor.
MW: 128.3 BP: 303 F MP: -60 F VP: 3 mm FP: 88 F

INCOM Strong oxidizers

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Nervous System Disturbances---Narcosis. (HE8)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)

SYMPT Irritation eyes, skin, nose, throat; headache, drowsiness, dizziness, confusion, nausea, tremor, incoordination; chemical pneumonitis (aspiration liquid)

ORGAN Eyes, skin, respiratory system, central nervous system

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 4 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.195 CLASS: Validated In-House

Octane

IMIS **1957** CAS 111-65-9
SYN Normal octane, n-Octane
NIOSH RTECS RG8400000 DOT 1262 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 300 ppm, 1450 mg/m3
STEL 375 ppm, 1800 mg/m3
DESC Colorless liquid with a gasoline-like odor.
MW: 114.2 BP: 258 F MP: -70 F VP: 10 mm FP: 56 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, nose; drowsiness; dermatitis; chemical pneumonitis (aspiration liquid); In Animals: narcosis
ORGAN Skin, eyes, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 4 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.071 CLASS: Validated In-House

Oil Mists, Mineral

IMIS **5010** CAS 8012-95-1
SYN Heavy mineral oil mist, Paraffin oil mist, white mineral oil mist
NIOSH RTECS PY8030000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless, oily liquid aerosol dispersed in air. [Has an odor like burned lubricating oil.]
MW: Varies BP: 680 F MP: 0 F VP: <0.5 mm FP: (oc) 380 F
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Human Carcinogen - [Mineral Oils: Untreated and Mildly Treated]
IARC Group 1 - carcinogenic to humans - [Mineral oils, untreated or mildly treated]
Group 3 - not classifiable as to its carcinogenicity to humans - [Mineral oils, highly-refined]
SYMPT Irritation eyes, skin, respiratory system
ORGAN Respiratory system, skin, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 100 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Infrared; FTIR
ANL SOLVENT: Freon 113
REF: OSHA ID-178SG CLASS: Partially Validated by OSHA
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. Collect a sample of the clean, unused, bulk oil substance and send to the lab in a separate mailing container at the time the air

samples are submitted. Indicate on the sample sheet that a bulk sample has been submitted. Cutting oils may contain nitrosamines. Only analyzed for oil if TWA is greater than 2.5 mg/m3.

Oxygen

IMIS **X100** CAS 7782-44-7
DOT 1072 122; 1073 122(refrigerated liquid)
DESC Colorless, odorless, and tasteless gas.
MW: 32 BP: -297.3 F MP: -361 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 Field analysis. Use portable direct-reading oxygen monitor.

Ozone

IMIS **1980** CAS 10028-15-6
SYN Difluorine monoxide, Fluorine monoxide, Oxygen fluoride
NIOSH RTECS RS8225000 DOT 1955 123
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.1 ppm, 0.2 mg/m3
STEL 0.3 ppm, 0.6 mg/m3
DESC Colorless to blue gas with a very pungent odor.
MW: 48.0 BP: -169 F MP: -315 F
INCOM All oxidizable materials, (both organic and inorganic)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, mucous membrane; pulmonary edema; chronic resp disease
ORGAN Eyes, respiratory system
LESS1 MEDIA: 37 mm GFF filter coated with NaNo2/K2CO3 and glycerol
ANL SOLVENT: Deionized Water
MAX V: 120 Liters MIN V: 90 Liters FLOW: 0.25 to 0.5 L/min
MIN V: 22.5 Liters REC F: 1.5 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2013S003 SAE: 0.175 CLASS: Validated In-House
NOTE: If high concentrations of Ozone (>0.2ppm) are expected, use the lower flow rate. Impregnated filters must be used within 30 days of preparation. Sulfur dioxide, if present, will interfere. Please screen with sulfur dioxide detector tubes. Longer sampling times can be used, up to 480 minutes, when using 0.25 LPM flow rate.
SAM2 Field analysis. Use direct reading field instrument.
DET. TUBE: Draeger, 67-33181, 0.05-1.4 ppm
MSA, 93865, 0.05-3.0 ppm

Palladium

IMIS **P116** CAS 7440-05-3
SYN Palladium, element
DESC Steel-white metal that does not tarnish in air
MW: 106.42
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

PAPI

IMIS **P125** CAS 9016-87-9
SYN MDI oligomer; PMDI; polymeric MDI; polymeric isocyanate; polymeric 4,4'-methylenediphenyl diisocyanate; polymethylenepolyphenol isocyanate; polyphenyl isocyanate
DESC Dark-brown liquid with a weak odor
MW: 400 (approx.) BP: 392 F MP: 200 C FP: 200 C
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Polymethylene polyphenyl isocyanate]
LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2009S003 SAE: 0.091 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until use. Collect samples open-face. After sampling protect from light, store, and ship cold.

Particulates Not Otherwise Regulated (Respirable Dust Fraction)

IMIS **9130**
SYN "Inert" dusts, Nuisance dusts, PNOR [Note: Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 1910.1000.]
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Dusts from solid substances without specific occupational exposure standards. Properties vary depending upon the specific solid.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, throat, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Particulates Not Otherwise Regulated (Total Dust)

IMIS **9135**
SYN Dust, (Total) prior to 9/1/89; PNO
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC "Inert" dusts, Nuisance dusts, PNOR [Note: Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 1910.1000.]
Properties vary depending upon the specific solid.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)

SYMPT Irritation eyes, skin, throat, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Pentaerythritol (Respirable Fraction)
IMIS **P157** CAS 115-77-5
SYN 2,2-bis(Hydroxymethyl)-1,3-propanediol, Methane tetramethylol, Monopentaerythritol, PE, Tetrahydroxymethylolmethane, Tetramethylolmethane
NIOSH RTECS RZ2490000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Colorless to white, crystalline, odorless powder. [Note: Technical grade is 88% monopentaerythritol & 12% dipentaerythritol.]
MW: 136.2 BP: Sublimes MP: 500 F (Sublimes)
INCOM Organic acids, oxidizers [Note: Explosive compound is formed when a mixture of PE & thiophosphoryl chloride is heated.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, respiratory system
ORGAN Eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Pentaerythritol (Total Dust)
IMIS **1987** CAS 115-77-5
SYN 2,2-bis(Hydroxymethyl)-1,3-propanediol, Methane tetramethylol, Monopentaerythritol, PE, Tetrahydroxymethylolmethane, Tetramethylolmethane
NIOSH RTECS RZ2490000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Colorless to white, crystalline, odorless powder. [Note: Technical grade is 88% monopentaerythritol & 12% dipentaerythritol.]
MW: 136.2 BP: Sublimes MP: 500 F (Sublimes)
INCOM Organic acids, oxidizers [Note: Explosive compound is formed when a mixture of PE & thiophosphoryl chloride is heated.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, respiratory system
ORGAN Eyes, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Pentane

IMIS **1990** CAS 109-66-0
SYN n-Pentane, pentane
NIOSH RTECS RZ9450000 DOT 1265 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 600 ppm, 1800 mg/m3
STEL 750 ppm, 2250 mg/m3
DESC Colorless liquid with a gasoline-like odor. [Note: A gas above 97°F. May be utilized as a fuel.]
MW: 72.2 BP: 97 F VP: 420 mm MP: -202 F FP: -57 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Asphyxiants, Anoxiants. (HE17)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT Irritation eyes, skin, nose; dermatitis; chemical pneumonitis (aspiration liquid); drowsiness; In Animals: narcosis
ORGAN Skin, eyes, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 2.25 Liters REC F: 0.05 L/min (TWA)
MIN V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.087 CLASS: Validated In-House

2-Pentanone (Methyl Propyl Ketone)

IMIS **2010** CAS 107-87-9
SYN Methyl propyl ketone; Ethyl acetone; MPK
NIOSH RTECS SA7875000 DOT 1249 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 700 mg/m3
STEL 250 ppm, 875 mg/m3
DESC Colorless to water-white liquid with a characteristic acetone-like odor.
MW: 86.1 BP: 215 F VP: 27 mm MP: -108 F FP: 45 F
INCOM Oxidizers, bromine trifluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
SYMPT Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma
ORGAN Respiratory system, eyes, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.128 CLASS: Validated In-House

Perchloroethylene (Tetrachloroethylene)

IMIS **2020** CAS 127-18-4

SYN Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene
NIOSH RTECS KX3850000 DOT 1897 160
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 170 mg/m3
DESC Colorless liquid with a mild chloroform-like odor.
MW: 165.8 BP: 250 F VP: 14 mm MP: -2 F
INCOM Strong oxidizers, chemically active metals, such as barium, lithium, beryllium; caustic soda, sodium hydroxide; potash
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Suspect Human Carcinogen - [Tetrachloroethylene]
IARC Group 2A - probably carcinogenic to humans - [Tetrachloroethylene (Perchloroethylene)]
SYMPT Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, liver, kidneys, central nervous system [in animals: liver tumors]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 0.25 Liters REC F: 0.05 L/min (CEIL)
MIN V: 0.05 Liters REC F: 0.05 L/min (PEAK)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.152 CLASS: Validated In-House
SAM2 DET. TUBE: Dräger, 8101501, 2 to 300 ppm

Perlite (Respirable Fraction)
IMIS **P101** CAS 93763-70-3
SYN Expanded perlite [Note: An amorphous material consisting of fused sodium potassium aluminum silicate.]
NIOSH RTECS SD5254000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Odorless, light gray to glassy-black solid. [Note: Expanded perlite is a fluffy, white particulate.]
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, throat, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Perlite (Total Dust)
IMIS **2035** CAS 93763-70-3
SYN Expanded perlite [Note: An amorphous material consisting of fused sodium

potassium aluminum silicate.]
NIOSH RTECS SD5254000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Odorless, light gray to glassy-black solid. [Note: Expanded perlite is a fluffy, white particulate.]
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, throat, upper respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Petroleum Distillates (Naphtha, Rubber Solvent)
IMIS **2037** CAS 8002-05-9
SYN Aliphatic petroleum naphtha, Petroleum naphtha, Rubber solvent; petroleum ether
NIOSH RTECS SE7449000 DOT 1268 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 400 ppm, 1600 mg/m3
DESC Colorless liquid with a gasoline- or kerosene-like odor. [Note: A mixture of paraffins (C5 to C13) that may contain a small amount of aromatic hydrocarbons.]
MW: 99 (approx.) BP: 86 to 460 F VP: 40 mm (approx.) MP: -99 F
FP: -40 to -86 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Crude oil]
SYMPT Irritation eyes, nose, throat; dizziness, drowsiness, headache, nausea; dry cracked skin; chemical pneumonitis (aspiration liquid)
ORGAN Skin, eyes, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 20 Liters MIN V: 1.3 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S014 SAE: 0.132 CLASS: Validated In-House
NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

pH Determination
IMIS **P200**
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA: Bulk Samples
REF: OHL2003S008 SAE: 0.08 CLASS: Validated In-House
NOTE: Use pH meter or indicator strips. LESS requires about 20 mL of aqueous solution or 10 g of inorganic material to perform an analysis. Organic solutions are inappropriate for pH determination.

Phenol

IMIS **2040** CAS 108-95-2
SYN Carbolic acid; Monohydroxy benzene
NIOSH RTECS SJ3325000 DOT 1671 153; 2312 153; 2821 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 ppm, 19 mg/m3 (Skin)
DESC Colorless to light-pink solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]
MW: 94.1 BP: 359 F VP: 0.4 mm MP: 109 F FP: 175 F
INCOM Strong oxidizers, calcium hypochlorite, aluminum chloride, acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Phenol]
SYMPT Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching
ORGAN Eyes, respiratory system, liver, kidneys, skin
LESS1 MEDIA (91): XAD-7 Tube (100/50 mg)
ANL SOLVENT: Methanol
REC V: 24 Liters REC F: 0.1 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S020 SAE: 0.109 CLASS: Validated In-House
NOTE: Store and ship cold.

Phosphoric Acid

IMIS **2085** CAS 7664-38-2
SYN White phosphoric acid; Orthophosphoric acid; 85% Phosphoric acid; Metaphosphoric acid
NIOSH RTECS TB6300000 DOT 1805 154; 3453 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 3 mg/m3
DESC Thick, colorless, odorless, crystalline solid. [Note: Often used in an aqueous solution.]
MW: 98.0 BP: 415 F VP: 0.03 mm MP: 108 F
INCOM Strong caustics, most metals [Note: Readily reacts with metals to form flammable hydrogen gas. DO NOT MIX WITH SOLUTIONS CONTAINING BLEACH OR AMMONIA.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, skin, upper respiratory system; eye, skin, burns; dermatitis
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (59): Silica Gel Tube (400/200 mg, ORBO-53 or equiv.)
ANL SOLVENT: Carbonate/Bicarbonate
MAX V: 100 Liters REC F: 0.5 L/min (TWA)
MAX V: 7.5 Liters REC F: 0.5 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2002S012 SAE: 0.100 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric, and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for Phosphate is performed and reported as the compound.

alpha-Pinene

IMIS **P127** CAS 80-56-8
SYN Bicyclo [3.1.1.] hept-2-ene, 2,6,6-trimethyl; 2,6,6-Trimethylbicyclo [3.1.1.]-hept-2-ene; Acitene A; 2-Pinene
NIOSH RTECS DT7000000* DOT 2368 128
DESC A clear colorless liquid with a turpentine odor.
MW: 136.24 BP: 313.2 F MP: -67 F VP: 10 mm (99.1 F)
FP: 91 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation skin, mucous membrane, gastrointestinal, burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 30 Liters MIN V: 2 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.082 CLASS: Validated In-House

beta-Pinene

IMIS **P148** CAS 127-91-3
SYN Nopinene; Pseudopinene
NIOSH RTECS DT5077000*
DESC Colorless, transparent liquid.
MW: 136.23 BP: 329 F MP: -78.7 F VP: 2.93 mm
FP: 88 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Eyes, skin, respiratory system irritation, palpitation, dizziness, nervous disturbance, chest pain, bronchitis, and nephritis; large doses: delirium, ataxia, and kidney damage
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.107 CLASS: Validated In-House

Plaster of Paris (Respirable Fraction)

IMIS **P102** CAS 26499-65-0
SYN Calcium sulfate hemihydrate, Dried calcium sulfate, Gypsum hemihydrate, Hemihydrate gypsum [Note: Plaster of Paris is the hemihydrate form of Calcium Sulfate & Gypsum is the dihydrate form.]
NIOSH RTECS TP0700000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White or yellowish, finely divided, odorless powder.
MW: 145.2 VP: 0 mm (approx.) MP: 325 F (loses H2O)
INCOM Moisture, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane, respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min

ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Plaster of Paris (Total Dust)

IMIS **2127** CAS 26499-65-0
SYN Calcium sulfate hemihydrate, Dried calcium sulfate, Gypsum hemihydrate, Hemihydrate gypsum [Note: Plaster of Paris is the hemihydrate form of Calcium Sulfate & Gypsum is the dihydrate form.]
NIOSH RTECS TP0700000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC White or yellowish, finely divided, odorless powder.
MW: 145.2 VP: 0 mm (approx.) MP: 325 F (loses H2O)
INCOM Moisture, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane, respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Portland Cement (Respirable Fraction)

IMIS **P104** CAS 65997-15-1
SYN Hydraulic cement; Cement; Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]
NIOSH RTECS VV8770000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Gray, odorless powder.
VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Gravimetric analysis is used to determine compliance with respirable Portland cement standard. Following this analysis, LESS can perform X-ray diffraction analysis of respirable Quartz. Compliance can then be determined for both

standards. If filter is not overloaded, samples may be collected up to an 8-hour period. Submit bulk sample in separate mailing container at time air samples are submitted.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Portland Cement (Total Dust)

IMIS **0577** CAS 65997-15-1
SYN Hydraulic cement; Cement; Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]
NIOSH RTECS VV8770000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Gray, odorless powder.
VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis
ORGAN Respiratory system, eyes, skin
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Gravimetric analysis is used to determine compliance with the Portland cement standard. Following this analysis, LESS can perform X-ray diffraction analysis. Compliance can then be determined for both standards. If filter is not overloaded, samples may be collected up to an 8-hour period.
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Potassium Dichromate

IMIS Use Chromic Acid & Chromates (as CrO3), (**0689)**
CAS 7778-50-9
SYN Vary depending upon the compound; chromate commonly used; “chrome six.”
NIOSH RTECS GB6650000 DOT 3087 141
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.
DESC Orange red crystals. Denser than water and soluble in water. No distinctive odor.

May severely irritate the eyes and respiratory tract. Avoid contact with organic materials. Noncombustible. Used in pyrotechnic displays with tungsten and iron.
MW: 294.2 MP: 748 F

INCOM Combustible, organic, or other readily oxidizable materials: paper, wood, sulfur, aluminum, plastics, etc. corrosive to metals

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)

NTP Human Carcinogen - [Potassium Dichromate (see Chromium Hexavalent Compounds)]

IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]

SYMPT Irritation respiratory system; nasal septum perforation; liver, kidney damage; leukocytosis (increased blood leukocytes), leukopenia (reduced blood leukocytes), eosinophilia; eye injury, conjunctivitis; skin ulcer, sensitization dermatitis; [potential occupational carcinogen]

ORGAN Blood, respiratory system, liver, kidneys, eyes, skin [lung cancer]

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6).

WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: None (dry wipe)

Potassium Hydroxide

IMIS **2140** CAS 1310-58-3

SYN Caustic potash, Lye [Potassium hydroxide], Potassium hydrate

NIOSH RTECS TT2100000 DOT 1813 154; 1814 154

MIOSHA FINAL RULE (Table G-1-A):
CEIL 2 mg/m3

DESC Odorless, white, or slightly yellow lumps, rods, flakes, sticks, or pellets. [Note: May be used as an aqueous solution.]
MW: 56.1 BP: 2415 F VP: 1 mm (1317 F) MP: 716 F

INCOM Acids, water, metals (when wet), halogenated hydrocarbons, maleic anhydride [Note: Heat is generated if KOH comes in contact with H2O & CO2 from the air.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Acute Toxicity---Short-term high-risk effects. (HE4)

SYMPT Irritation eyes, skin, respiratory system; cough, sneezing; eye, skin burns; vomiting, diarrhea

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MIN V: 30 Liters MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)

ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.102 CLASS: Validated In-House
NOTE: Submit as a separate sample. Sodium hydroxide may be analyzed from the same filter. When analysis of the compound is requested, an elemental analysis is performed and reported as the compound.

Propane

IMIS **2150** CAS 74-98-6
SYN Bottled gas, Dimethyl methane, n-Propane, Propyl hydride
NIOSH RTECS TX2275000 DOT 1075 115; 1978 115
MIOSHA FINAL RULE (Table G-1-A):
TWA 1000 ppm, 1800 mg/m3
DESC Colorless, odorless gas. [Note: A foul-smelling odorant is often added when used for fuel purposes. Shipped as a liquefied compressed gas.]
MW: 44.1 BP: -44 F VP: 8.4 atm (70 F) MP: -306 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Asphyxiants, Anoxiants. (HE17)
SYMPT Dizziness, confusion, excitation, asphyxia; liquid: frostbite
ORGAN Central nervous system
LESS1 MEDIA (8+8): Two Carbosieve S-III Tubes (130/65 mg, 60/80 mesh) in series
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 5 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2017S001 SAE: 0.235 CLASS: Validated In-House
SAM2 Combustible Gas Meter (Quest Multilog 2000)

n-Propyl Acetate

IMIS **2180** CAS 109-60-4
SYN Propylacetate, n-propyl ester of acetic acid
NIOSH RTECS AJ3675000 DOT 1276 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 840 mg/m3
STEL 250 ppm, 1050 mg/m3
DESC Colorless liquid with a mild, fruity odor.
MW: 102.2 BP: 215 F VP: 25 mm MP: -134 F FP: 55 F
INCOM Nitrates; strong oxidizers, alkalis, and acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
SYMPT In Animals: irritation eyes, nose, throat; narcosis; dermatitis
ORGAN Respiratory system, eyes, skin, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.102 CLASS: Validated In-House
NOTE: Store and ship cold.

n-Propyl Alcohol (n-Propanol)

IMIS **2170** CAS 71-23-8
SYN n-Propyl alcohol; 1-Propanol; Ethyl carbinol, n-propanol
NIOSH RTECS UH8225000 DOT 1274 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 500 mg/m3
STEL 250 ppm, 625 mg/m3
DESC Colorless liquid with a mild, alcohol-like odor.
MW: 60.1 BP: 207 F VP: 15 mm MP: -196 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, nose, throat; dry cracking skin; drowsiness, headache; ataxia, gastrointestinal pain; abdominal cramps, nausea, vomiting, diarrhea; In Animals: narcosis
ORGAN Skin, eyes, respiratory system, GI tract, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.1 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.075 CLASS: Validated In-House
NOTE: Submit as a separate sample.
LESS2 MEDIA (7): Anasorb 747 (set of 2) in series (400/200 mg)
ANL SOLVENT: (60/40) Dimethylformamide/Carbon Disulfide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S012 SAE: 0.194 CLASS: Validated In-House
NOTE: Separate tubes and seal each after sampling. Recommend refrigerated storage.

Propylene Glycol Monomethyl Ether

IMIS **2210** CAS 107-98-2; 1320-67-8
SYN PGME; Dowtherm® 209, 1-Methoxy-2-hydroxypropane, 2-Methoxy-1-methylethanol, 1-Methoxy-2-propanol, Propylene glycol methyl ether
NIOSH RTECS UB7700000 DOT 3092 129
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 360 mg/m3
STEL 150 ppm, 540 mg/m3
DESC Clear, colorless liquid with a mild, ethereal odor.
MW: 90.1 BP: 248 F VP: 12 mm (77 F) MP: -139 F FP: 97 F
INCOM Oxidizers, strong acids [Note: Hygroscopic (i.e., absorbs moisture from the air). May slowly form reactive peroxides during prolonged storage.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Irritation eyes, skin, nose, throat; headache, nausea, dizziness, drowsiness, incoordination; vomiting, diarrhea
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 10 Liters REC F: 0.1 L/min (TWA)
MIN V: 1.5 Liters REC F: 0.1 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID

REF: OHL2006S004 SAE: 0.075 CLASS: Validated In-House

Propylene Glycol Monomethyl Ether Acetate

IMIS **P218** CAS 108-65-6
SYN PGMEA; 1-methoxy-2-acetoxypropane; 2-methoxy-1-methylethyl ester acetic acid; 1-methoxy-2-propanol acetate; 1-methoxy-2-propyl acetate; PGMEA; 1,2-propanediol monomethyl ether acetate; propylene glycol methyl ether acetate; propylene glycol monomethyl ether acetate
NIOSH RTECS A18925000* DOT 3271 127
DESC Colorless, flammable liquid with sweet ether-like odor.
MW: 132.2 BP: 302 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Narcosis. (HE8)
Acute Toxicity---Short-term high-risk effects. (HE4)
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
MAX V: 10 Liters REC F: 0.1 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S004 SAE: 0.072 CLASS: Validated In-House
NOTE: Keep samples refrigerated when not in transit. Ship samples overnight with cold packs as soon as possible.

Qualitative Mass-Spec Analysis

IMIS **M125**
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
BULK Limit the amount of bulk submitted to one gram or one mL.

Qualitative Microscopy

IMIS **S325**
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 NOTE: Call lab for specific application. Phase Contrast, Polarized Light, and Dispersion Stain analysis are available.

Rouge (Respirable Fraction)

IMIS **R102** CAS 1309-37-1
SYN Iron(III)oxide [Rouge], Iron oxide red, Red iron oxide, Red oxide
NIOSH RTECS NO7400000 DOT 1376 135
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC A fine, red powder of ferric oxide. [Note: Usually used in cake form or impregnated in paper or cloth.]
MW: 159.7 MP: 2849 F
INCOM Calcium hypochlorite, carbon monoxide, hydrogen peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Ferric oxide]
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight

without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Rouge (Total Dust)

IMIS **2229** CAS 1309-37-1
SYN Iron(III)oxide [Rouge], Iron oxide red, Red iron oxide, Red oxide
NIOSH RTECS NO7400000 DOT 1376 135
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC A fine, red powder of ferric oxide. [Note: Usually used in cake form or impregnated in paper or cloth.]
MW: 159.7 MP: 2849 F
INCOM Calcium hypochlorite, carbon monoxide, hydrogen peroxide
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Ferric oxide]
SYMPT Irritation eyes, skin, respiratory system
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Silica, Amorphous, Diatomaceous Earth (<1% Crystalline Silica)

IMIS **S122** CAS 61790-53-2
SYN Diatomaceous earth, Diatomaceous silica, Diatomite, Precipitated amorphous silica, Silica gel, Silicon dioxide (amorphous)
NIOSH RTECS VV7310000
MIOSHA FINAL RULE (Table G-1-A):
TWA 6 mg/m3
DESC Transparent to gray, odorless powder. [Note: Amorphous silica is the non-crystalline form of SiO_2.]
MW: 60.1 BP: 4046 F VP: 0 mm (approx.) MP: 3110 F
INCOM Fluorine, oxygen difluoride, chlorine trifluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Silica, amorphous]
SYMPT Irritation eyes, pneumoconiosis
ORGAN Eyes, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Silica, Amorphous, Precipitated and Gel

IMIS **9050** CAS 112926-00-8, 7699-41-4, 112945-52-5
SYN Fumed amorphous silica (Aerosil, silica aerogel, silicic anhydride); fused amorphous silica (Cab-o-sil, colloidal silica, xerogel, diatomaceous earth); hydrated amorphous silica (Hi-sil).

NIOSH RTECS VV7310000
MIOSHA FINAL RULE (Table G-1-A):
TWA 6 mg/m3
DESC Transparent to gray, odorless powder. Irritating to the skin and eyes on contact. Inhalation will cause irritation in the respiratory tract. [Note: Amorphous silica is the non-crystalline form of SiO_2.]
MW: 60.1 BP: 4046 F VP: 0 mm (approx.) MP: 3110 F
INCOM Fluorine, oxygen difluoride, chlorine trifluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Silica, amorphous]
SYMPT Pneumoconiosis, irritation eyes
ORGAN Respiratory system, eyes
As Respirable Dust:
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
As Total Dust:
LESS2 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
NOTE: Amorphous Silica does not diffract x-rays; evaluate gravimetrically. If quartz is suspected, submit a respirable sample for quartz (IMIS 9000)

Silica, Crystalline, Mixed Respirable (Quartz, Cristobalite, Tridymite)
IMIS **9000** CAS 14808-60-7; 14464-46-1; 15468-32-3
SYN Silica; crystalline silica; quartz; quartz dust; cristobalite; cristobalite dust; Tripoli
NIOSH RTECS VV7330000
MIOSHA FINAL RULE (Table G-1-A) Silica in General Industry (29 CFR 1910.1053):
TWA 0.05 mg/m3
AL 25 µg/m3
DESC Colorless, odorless solid. [Note: A component of many mineral dusts.]
MW: 60.1 BP: 4046 F VP: 0 mm (approx.) MP: 3110 F
INCOM Powerful oxidizers: fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
NTP Human Carcinogen - [Silica, Crystalline (Respirable Size)]
IARC Group 1 - carcinogenic to humans - [Silica dust, crystalline, in the form of quartz or cristobalite]
SYMPT Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive resp symptoms (silicosis); irritation eyes; [potential occupational carcinogen]

ORGAN Eyes, respiratory system. [in animals: lung cancer]
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: X-Ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Silica, Crystalline Tripoli (as Quartz), Respirable Dust

IMIS **S114** CAS 1317-95-9
SYN Tripoli; Silica, Crystalline-Tripoli
NIOSH RTECS VV7336000
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.05 mg/m3
AL 25 µg/m3
DESC Colorless, odorless solid. [Note: A component of many mineral dusts.]
MW: 60.1 BP: 4046 F VP: 0 mm (approx.) MP: 3110 F
INCOM Powerful oxidizers: fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
NTP Human Carcinogen - [Silica, Crystalline (Respirable Size)]
IARC Group 1 - carcinogenic to humans - [Silica dust, crystalline, in the form of quartz or cristobalite]
SYMPT Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive resp symptoms (silicosis); irritation eyes; [potential occupational carcinogen]
ORGAN Eyes, respiratory system; [in animals: lung cancer]
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: X-ray Diffraction; XRD
ANL SOLVENT: Tetrahydrofuran
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Silica, Fused (Respirable Dust)

IMIS **9013** CAS 60676-86-0
SYN Silica (Fused)
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.1 mg/m3
DESC Colorless, odorless solid. [Note: A component of many mineral dusts.]
INCOM Fluorine, oxygen difluoride, chlorine trifluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
NTP Human Carcinogen - [Silica, Crystalline (Respirable Size)]
SYMPT Irritation eyes, pneumoconiosis

ORGAN Eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
NOTE: Fused silica does not diffract X-rays; evaluate gravimetrically. If quartz is suspected, submit a respirable sample to LESS for silica (IMIS 9000) analysis.

Silica (Quartz, Non-Respirable)
IMIS **S103** CAS 14808-60-7
DESC Solid.
INCOM Powerful oxidizers: fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
NTP Human Carcinogen - [Quartz (see Silica)]
IARC Group 1 - carcinogenic to humans - [Silica dust, crystalline, in the form of quartz or cristobalite]
SYMPT Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive resp symptoms (silicosis); irritation eyes; [potential occupational carcinogen]
ORGAN Eyes, respiratory system [in animals: lung cancer]
LESS1 MEDIA: Bulk Samples
ANL 1: X-Ray Diffraction; XRD
REF: OHL2022S002 SAE: 0.180 CLASS: Validated In-House
ANL SOLVENT: Tetrahydrofuran
NOTE: Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Silicon (Respirable Fraction)
IMIS **S120** CAS 7440-21-3
SYN Elemental silicon [Note: Does not occur freely in nature but is found in silicon dioxide (silica) and in various silicates.]
NIOSH RTECS VW0100000 DOT 1346 170
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Black to gray, lustrous, needle-like crystals. [Note: The amorphous form is a dark-brown powder.]
MW: 28.1 BP: 4271 F VP: 0 mm (approx.) MP: 2570 F
INCOM Chlorine, fluorine, oxidizers, calcium, cesium carbide, alkaline carbonates
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected

up to an 8-hour period.
NOTE: If quartz is suspected, it is suggested that a respirable quartz sample be submitted to the laboratory to determine applicability of quartz standard (IMIS 9000). Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Silicon (Total Dust)

IMIS **2235** CAS 7440-21-3
SYN Elemental silicon [Note: Does not occur freely in nature but is found in silicon dioxide (silica) and in various silicates.]
NIOSH RTECS VW0100000 DOT 1346 170
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Black to gray, lustrous, needle-like crystals. [Note: The amorphous form is a dark-brown powder.]
MW: 28.1 BP: 4271 F VP: 0 mm (approx.) MP: 2570 F
INCOM Chlorine, fluorine, oxidizers, calcium, cesium carbide, alkaline carbonates
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
NOTE: If quartz is suspected, it is suggested that a respirable quartz sample be submitted to the laboratory to determine applicability of quartz standard (IMIS 9000). Submit bulk sample in separate mailing container at time air samples are submitted (IMIS S103). Send the bulk in a petri dish (½ full or more) or 30 ml vial (½ full or more).

Silicon Carbide (Respirable Fraction)

IMIS **S123** CAS 409-21-2
SYN Carbon silicide, Carborundum®, Silicon monocarbide
NIOSH RTECS VW0450000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Yellow to green to bluish-black, iridescent crystals.
MW: 40.1 BP: Sublimes VP: 0 mm (approx.) MP: 4892 F (Sublimes)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
IARC Group 2A - probably carcinogenic to humans - [Silicon carbide whiskers]
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight

without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Silicon Carbide (Total Dust)

IMIS **2236** CAS 409-21-2
SYN Carbon silicide, Carborundum®, Silicon monocarbide
NIOSH RTECS VW0450000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Yellow to green to bluish-black, iridescent crystals.
MW: 40.1 BP: Sublimes VP: 0 mm (approx.) MP: 4892 F (Sublimes)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
IARC Group 2A - probably carcinogenic to humans - [Silicon carbide whiskers]
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Silver, as Metal Compound (as Ag)

IMIS **2240** CAS 7440-22-4
SYN Silver metal, Silver nitrate
NIOSH RTECS VW3500000 DOT 3077 171(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.01 mg/m3
DESC Metal: White, lustrous solid.
MW: 107.9 BP: 3632 F VP: 0 mm (approx.) MP: 1761 F
INCOM Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
SYMPT Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; GI disturbances
ORGAN Nasal septum, skin, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.114 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Silver, Soluble Compound (as Ag)

IMIS **2240** CAS 7440-22-4
SYN Silver metal, Silver nitrate
NIOSH RTECS VW3500000

MIOSHA FINAL RULE (Table G-1-A):
TWA 0.01 mg/m3
DESC Metal: White, lustrous solid.
MW: 107.9 BP: 3632 F VP: 0 mm (approx.) MP: 1761 F
INCOM Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
SYMPT Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; GI disturbances
ORGAN Nasal septum, skin, eyes
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.114 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Soapstone (Respirable Fraction)
IMIS **S121**
SYN Massive talc; Steatite, Soapstone silicate
NIOSH RTECS VV8780000
MIOSHA FINAL RULE (Table G-1-A):
TWA 3 mg/m3
DESC Odorless solid; <10% tremolite, <1% silica, crystalline.
MW: 379.3 VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Pneumoconiosis: cough, dyspnea (breathing difficulty); digital clubbing; cyanosis; basal crackles, cor pulmonale
ORGAN respiratory system, cardiovascular system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Soapstone (Total Dust)
IMIS **9085**
SYN Massive talc; Soapstone silicate, Steatite
NIOSH RTECS VV8780000
MIOSHA FINAL RULE (Table G-1-A):
TWA 6 mg/m3
DESC Odorless, white-gray powder; <10% tremolite, <1% silica, crystalline.
MW: 379.3 VP: 0 mm (approx.)
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Pneumoconiosis: coughing, dyspnea (difficulty breathing); digital clubbing; cyanosis;

basal crackles; acute right heart strain or chronic right ventricular hypertrophy
ORGAN Respiratory system, cardiovascular system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Sodium Bisulfite
IMIS **S050** CAS 7631-90-5
SYN Monosodium salt of sulfurous acid, Sodium acid bisulfite, Sodium bisulphite, Sodium hydrogen sulfite
NIOSH RTECS VZ000000 DOT 2693 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White crystals or powder with a slight odor of sulfur dioxide.
MW: 104.1 BP: Decomposes MP: Decomposes
INCOM Heat (decomposes) [Note: Slowly oxidized to the sulfate on exposure to air.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, mucous membrane
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.085 CLASS: Validated In-House
NOTE: Submit as a separate sample an analysis is performed for total Na and reported as the compound.
WIPE MEDIA: Whatman smear tab SOLVENT: Deionized water

Sodium Carbonate
IMIS **S330** CAS 497-19-8
SYN Disodium Carbonate; Soda Ash; Carbonic Acid Disodium Salt
NIOSH RTECS VZ4050000*
DESC White or grayish-white odorless solid; Hygroscopic.
MW: 105.9
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Skin, eye respiratory system irritation, cough, sore throat.
ORGAN Skin, eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Sodium Chromate (as CrO3)
IMIS Use Chromic Acid & Chromates (as CrO3), (**0689)**
CAS 7775-11-3
SYN Sodium chromate(VI), disodium chromate, rachromate, chromium disodium oxide, chromium sodium oxide, chromic acid disodium salt

NIOSH RTECS VZ4050000 DOT 3082 140
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.

DESC Yellow hygroscopic solid.
MW: 161.9
INCOM Strong acids, strong reducing agents
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Human Carcinogen - [Chromium Hexavalent Compounds]
IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]
SYMPT Irritation of skin, eyes, and respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6). Not currently available.
WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: none (dry wipe)

Sodium & Compounds

IMIS Use Sodium Hydroxide, (**2260)** CAS 7440-23-5
DOT 1428 138
MIOSHA FINAL RULE (Table G-1-A):
CEIL 2 mg/m3
DESC Colorless to white, odorless solid (flakes, beads, granular form).
MW: 40.0 BP: 2534 F VP: Approx. 0 mm MP: 605 F
INCOM Water, acids, flammable liquids, organic halogens, metals such as aluminum, tin, and zinc; nitromethane [Note: Corrosive to metals.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair
ORGAN Eyes, respiratory system, skin
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MIN V: 30 Liters MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.085 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be

collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.

WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized water

Sodium Dichromate (as CrO3)

IMIS Use Chromic Acid & Chromates (as CrO3), (**0689)**
CAS 10588-01-9

SYN Chromic anhydride, Chromic oxide, Chromium(VI) oxide (1:3), Chromium trioxide, Ammonium chromate, Ammonium dichromate, Barium chromate, Basic lead chromate, Calcium chromate, Chromium [VI] chloride, Chromium trioxide, Chromyl chloride, Lead chromate, Potassium chromate, Potassium dichromate, Sodium chromate, Sodium dichromate, Strontium chromate, Molybdenum orange, Zinc chromate, Zinc chromate hydroxides, Zinc potassium chromates (hydroxides)

NIOSH RTECS GB6650000 DOT 3087 141

MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)

NTP Human Carcinogen - [Sodium Dichromate (see Chromium Hexavalent Compounds)]

IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]

LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
ANL SOLVENT: Buffer Extraction/Phosphate Buffer/Magnesium Sulfate
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: All samples taken for CHROMIUM VI COMPOUNDS should be shipped within 24 hours after sampling by overnight delivery for stabilization and analysis. Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6). Not currently available.

WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: None (dry wipe)

Sodium Hydroxide

IMIS **2260** CAS 1310-73-2

SYN Caustic soda; Soda lye; Lye [Sodium hydroxide], Sodium hydrate

NIOSH RTECS WB4900000 DOT 1823 154; 1824 154

MIOSHA FINAL RULE (Table G-1-A):

CEIL 2 mg/m3

DESC Colorless to white, odorless solid (flakes, beads, granular form).
MW: 40.0 BP: 2534 F VP: Approx. 0 mm MP: 605 F

INCOM Water, acids, flammable liquids, organic halogens, metals such as aluminum, tin, and zinc; nitromethane [Note: Corrosive to metals.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)

Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
SYMPT Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair
ORGAN Eyes, respiratory system, skin
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MIN V: 30 Liters MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.085 CLASS: Validated In-House
NOTE: Submit as a separate sample. If the filter is not overloaded, samples may be collected up to an 8-hour period. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Sodium Metabisulfite
IMIS **S112** CAS 7681-57-4
SYN Disodium pyrosulfite, Sodium metabisulphite, Sodium pyrosulfite
NIOSH RTECS UX8225000 DOT 1759 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Very hard gray solid with a metallic luster.
MW: 190.1
INCOM Heat (decomposes) [Note: Slowly oxidized to the sulfate on exposure to air & moisture.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
SYMPT Irritation eyes, skin, mucous membrane
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.085 CLASS: Validated In-House
NOTE: Analysis performed for soluble sodium and reported as the compound. The stoichiometric factor for sodium metabisulfite from sodium is 4.135.
Submit as a separate sample.
WIPE MEDIA: Whatman smear tab SOLVENT: Deionized water

Starch (Respirable Fraction)
IMIS **S124** CAS 9005-25-8
SYN Corn starch, Rice starch, Sorghum gum, α-Starch, Starch gum, Tapioca starch
NIOSH RTECS GM5090000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Fine, white, odorless powder. [Note: A carbohydrate polymer composed of 25% amylose & 75% amylopectin.]
MW: Varies
INCOM Oxidizers, acids, iodine, alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane; cough, chest pain; dermatitis; rhinorrhea (discharge of thin nasal mucus)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min

ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Starch (Total Dust)

IMIS **2263** CAS 9005-25-8
SYN Corn starch, Rice starch, Sorghum gum, α-Starch, Starch gum, Tapioca starch
NIOSH RTECS GM5090000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Fine, white, odorless powder. [Note: A carbohydrate polymer composed of 25% amylose & 75% amylopectin.]
MW: Varies
INCOM Oxidizers, acids, iodine, alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, mucous membrane; cough, chest pain; dermatitis; rhinorrhea (discharge of thin nasal mucus)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Stoddard Solvent

IMIS **2270** CAS 8052-41-3
SYN Dry cleaning safety solvent; Mineral spirits, Petroleum solvent, Spotting naphtha [Note: A refined petroleum solvent with a flash point of 102-110°F, boiling point of 309-396°F, and containing >65% C10 or higher hydrocarbons.]
NIOSH RTECS WJ8925000 DOT 1268 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 525 mg/m3
DESC Colorless liquid with a kerosene-like odor.
MW: varies BP: 309 to 396 F FP: 102 to 110 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Narcosis. (HE8)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
SYMPT Irritation eyes, nose, throat; dizziness; dermatitis; chemical pneumonitis (aspiration liquid); In Animals: kidney damage
ORGAN Skin, eyes, respiratory system, central nervous system, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 20 Liters MIN V: 1.3 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S014 SAE: 0.095 CLASS: Validated In-House
NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

Styrene (Vinyl Benzene; Phenylethylene)

IMIS **2280** CAS 100-42-5
SYN Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene
NIOSH RTECS WL3675000 DOT 2055 128P
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 215 mg/m3
STEL 100 ppm, 425 mg/m3
DESC Colorless to yellow, oily liquid with a sweet, floral odor.
MW: 104.2 BP: 293 F VP: 5 mm MP: -23 F FP: 88 F
INCOM Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
NTP Suspect Human Carcinogen - [Styrene]
IARC Group 2A - probably carcinogenic to humans - [Styrene]
SYMPT Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects
ORGAN Eyes, skin, respiratory system, central nervous system, liver, reproductive system
LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Toluene
REC V: 12 Liters REC F: 0.05 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.117 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: CEIL [15 min at 50 mL/min (0.75 Liters)] PEAK [15 min at 50 mL/min (0.75 Liters)]
SAM2 DET. TUBE: Dräger, 67-23301, 10-200 ppm

Sucrose (Respirable Fraction)

IMIS **S130** CAS 57-50-1
SYN Beet sugar, Cane sugar, Confectioner's sugar, Granulated sugar, Rock candy, Saccharose, Sugar, Table sugar
NIOSH RTECS WN6500000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Hard, white, odorless crystals, lumps, or powder. [Note: May have a characteristic, caramel odor when heated.]
MW: 342.3 BP: Decomposes MP: 320 to 367 F (Decomposes)
INCOM Oxidizers, sulfuric acid, Nitric Acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight

without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Sucrose (Total Dust)

IMIS **2285** CAS 57-50-1
SYN Beet sugar, Cane sugar, Confectioner's sugar, Granulated sugar, Rock candy, Saccharose, Sugar, Table sugar
NIOSH RTECS WN6500000
MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3
DESC Hard, white, odorless crystals, lumps, or powder. [Note: May have a characteristic, caramel odor when heated.]
MW: 342.3 BP: Decomposes MP: 320 to 367 F (Decomposes)
INCOM Oxidizers, sulfuric acid, Nitric Acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Sulfur

IMIS **S101** CAS 7704-34-9
SYN Flowers of Sulfur; Flour sulfur; Brimstone
NIOSH RTECS WS4250000* DOT 1350 133
DESC Pale yellow crystals or powder with faint odor of rotten eggs.
MW: 32.1
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
As Respirable Fraction:
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
As Total Dust:
LESS2 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Sulfur Dioxide

IMIS **2290** CAS 7446-09-5
SYN Sulfur oxide, Sulfurous acid anhydride, Sulfurous oxide
NIOSH RTECS WS4550000 DOT 1079 16

MIOSHA FINAL RULE (Table G-1-A):
TWA 2 ppm, 5 mg/m3
STEL 5 ppm, 10 mg/m3

DESC Colorless gas with a characteristic, irritating, pungent odor. [Note: A liquid below 14°F. Shipped as a liquefied compressed gas.]
MW: 64.1 BP: 14 F VP: 3.2 atm MP: -104 F

INCOM Powdered alkali metals (such as sodium & potassium), water, ammonia, zinc, aluminum, brass, copper [Note: Reacts with water to form sulfurous acid (H2SO3).]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)

IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Sulfur dioxide]

SYMPT Irritation eyes, nose, throat; rhinorrhea (discharge of thin nasal mucus); choking, cough; reflex bronchoconstriction; liquid: frostbite

ORGAN Respiratory system, skin, eyes

LESS1 MEDIA (S): Sulfur Dioxide 37 mm coated with Na2/CO3
ANL SOLVENT: Carbonate/Bicarbonate
MAX V: 12 Liters REC F: 0.1 L/min (TWA)
MAX V: 1.5 Liters REC F: 0.1 L/min (STEL)
ANL 1: Ion Chromatography; IC
REF: OHL2003S005 SAE: 0.122 CLASS: Validated In-House
NOTE: A prefilter is necessary when particulate sulfate is present in the workplace. Use SKC 225-1708 Teflon filters.

SAM2 DET. TUBE: Dräger, 67 27101, 0.1-3 ppm

Sulfuric Acid

IMIS **2310** CAS 7664-93-9

SYN Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous)

NIOSH RTECS WS5600000 DOT 1831 39; 1831 137; 1832 137

MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3

DESC Colorless to dark-brown, oily, odorless liquid. [Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.]
MW: 98.1 BP: 554 F VP: 0.001 mm MP: 51 F

INCOM Organic materials, chlorates, carbides, fulminates, water, powdered metals [Note: Reacts violently with water with evolution of heat. Corrosive to metals.]

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
Respiratory Effects---Acute lung damage/edema or other. (HE11)

NTP Human Carcinogen - [Sulfuric Acid (see Strong Inorganic Acid Mists Containing Sulfuric Acid)]

IARC Group 1 - carcinogenic to humans - [Acid mists, strong inorganic]

SYMPT Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis

ORGAN Respiratory system, eyes, skin, teeth

LESS1 MEDIA (59): Silica Gel Tube (400/200 mg, ORBO-53 or equiv.)
ANL SOLVENT: Carbonate/Bicarbonate
MAX V: 100 Liters REC F: 0.5 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2002S012 SAE: 0.125 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: Phosphoric, nitric, hydrobromic, hydrochloric, and sulfuric acids may be submitted on the same tube. When analysis of a compound is requested, an analysis for Sulfate is performed and reported as the compound.

WIPE MEDIA: Mixed Cellulose Ester (MCE) Filter 0.8 micron SOLVENT: Deionized Water

Talc (Containing Asbestos)

IMIS **9031** CAS 14807-96-6
SYN Hydrous magnesium silicate, Steatite talc
MIOSHA FINAL RULE (Table G-1-A) Asbestos in General Industry (29 CFR 1910.1001):
FINAL RULE (Table G-1-A) Asbestos in Construction (29 CFR 1926.1101):
FINAL RULE (Table G-1-A) Asbestos in Ship Repairing, Shipbuilding and Shipbreaking (29 CFR 1915.1001):

TWA 0.1 fiber/cc
EL 1 fiber/cc (30 min)

DESC Odorless, white powder.
MW: Varies MP: 1652 to 1832 F
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
NTP Human Carcinogen - [Asbestos]
IARC Group 1 - carcinogenic to humans - [Talc containing asbestiform fibres (see Asbestos)]
SYMPT Fibrotic pneumoconiosis, irritation eyes
ORGAN Eyes, respiratory system, cardiovascular system
LESS1 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (EL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House
NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.
LESS2 MEDIA: Bulk Samples
ANL 1: Polarized Light Microscopy; PLM
REF: OHL2004M9020m_OPL CLASS: Validated In-House
NOTE: Collect sample in a 50mm x 9mm style polystyrene petri dish. Do not ship bulk samples with air samples. Seal securely to prevent escape of asbestos.
WIPE Bulk preferred. Do not use Whatman or other paper filters.

Talc (Containing No Asbestos), Respirable Dust

IMIS **9030** CAS 14807-96-6
SYN Hydrous magnesium silicate, Steatite talc
NIOSH RTECS VV7720000
MIOSHA FINAL RULE (Table G-1-A):

TWA 2 mg/m3

DESC Odorless, white powder.
MW: varies VP: 0 mm (approx.) MP: 1652 to 1832 F
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Talc not containing asbestos or asbestiform fibres]
SYMPT Fibrotic pneumoconiosis, irritation eyes
ORGAN Eyes, respiratory system, cardiovascular system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone

MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight. If the filter is not overloaded, samples may be collected up to an 8-hour period. Sample may be submitted to LESS for a Quartz analysis, if the gross weight of the sample yields a concentration above the standard for the air contaminant.

Tantalum, Metal & Oxide

IMIS **2325** CAS 7440-25-7
SYN Tantalum-181, Tantalum metal
NIOSH RTECS WW5505000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Metal: Steel-blue to gray solid or black, odorless powder.
MW: 180.9 BP: 9797 F VP: 0 mm (approx.) MP: 5425 F
INCOM Strong oxidizers, bromine trifluoride, fluorine
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin; In Animals: pulmonary irritation
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

Tetrahydrofuran

IMIS **2390** CAS 109-99-9
SYN Diethylene oxide, 1,4-Epoxybutane, Tetramethylene oxide, THF
NIOSH RTECS LU5950000 DOT 2056 127
MIOSHA FINAL RULE (Table G-1-A):
TWA 200 ppm, 590 mg/m3
STEL 250 ppm, 735 mg/m3
DESC Colorless liquid with an ether-like odor.
MW: 72.1 BP: 151 F VP: 132 mm MP: -163 F
INCOM Strong oxidizers, lithium-aluminum alloys [Note: Peroxides may accumulate upon prolonged storage in presence of air.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
IARC Group 2B - possibly carcinogenic to humans - [Tetrahydrofuran]
SYMPT Irritation eyes, upper respiratory system; nausea, dizziness, headache, central nervous system depression
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 9 Liters MINV V: 1 Liters FLOW: 0.01 to 0.2 L/min
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.081 CLASS: Validated In-House

Tin, Inorganic Compounds (Except Oxides) (as Sn)

IMIS **2430** CAS 7440-31-5
SYN Metallic tin, Tin flake, Tin metal, Tin powder

NIOSH RTECS XP7320000
MIOSHA FINAL RULE (Table G-1-A):
TWA 2 mg/m3
DESC Gray to almost silver-white, ductile, malleable, lustrous solid.
MW: 118.7 BP: 4545 F VP: 0 mm (approx.) MP: 449 F
INCOM Chlorine, turpentine, acids, alkalis
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Cumulative lung damage. (HE10)
SYMPT Irritation eyes, skin, respiratory system; In Animals: vomiting, diarrhea, paralysis with muscle twitching
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Hydrochloric Acid
REF: OHL2018S001 SAE: 0.130 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Tin may be requested with two of the following elements: Antimony; Cadmium; Copper Fume (as Cu), Lead; Silver Metal & Soluble Compounds (as Ag); Zinc Oxide Fume. Otherwise, submit as a separate sample.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Titanium
IMIS **T103** CAS 7440-32-6
SYN Titanium, titanium powder, titanium element, titanium metallicum
DOT 2546 135
DESC Gray lustrous powder
MW: 47.9
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid/Sulfuric Acid with Potassium Ion
REF: OHL2018S001 SAE: 0.128 CLASS: Validated In-House
NOTE: When the standard is the same as for inert dust, noncompliance can be based on gross weight without analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Titanium Dioxide (Total Dust)
IMIS **2440** CAS 13463-67-7
SYN Rutile, Titanium oxide, Titanium peroxide
NIOSH RTECS XR2275000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White, odorless powder.
MW: 79.9 BP: 4532 to 5432 F VP: 0 mm (approx.) MP: 3326 to 3362 F
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
IARC Group 2B - possibly carcinogenic to humans - [Titanium dioxide]
SYMPT Lung fibrosis; [potential occupational carcinogen]

ORGAN Respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid/Sulfuric Acid with Potassium Ion
REF: OHL2018S001 SAE: 0.128 CLASS: Validated In-House
NOTE: When standard is the same as for inert dust, noncompliance can be based on gross weight without analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period. If the gravimetric result indicates an air concentration less than the PEL, the sample will not proceed for elemental analysis.
WIPE MEDIA: Ghost Wipe

Toluene

IMIS **2460** CAS 108-88-3
SYN Toluol; Phenyl methane; Methylbenzene; methyl benzol
NIOSH RTECS XS5250000 DOT 1294 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 375 mg/m3
STEL 150 ppm, 560 mg/m3
DESC Colorless liquid with a sweet, pungent, benzene-like odor.
MW: 92.1 BP: 232 F VP: 21 mm MP: -139 F FP: 40 F
INCOM Strong oxidizers
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Toluene]
SYMPT Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.114 CLASS: Validated In-House
NOTE: STEL [15 min at 50 mL/min (0.75 L)] CEIL [5 min at 50 mL/min (0.25 L)] PEAK [1 min at 50 mL/min (0.05 L)]. Recommend refrigerated storage.
SAM2 DET. TUBE: Dräger, 8101661, 5-300 ppm

2,4-Toluene-Diisocyanate

IMIS **2470** CAS 584-84-9
SYN 2,4-Tolylene diisocyanate; TDI; 2,4-TDI
NIOSH RTECS CZ6300000 DOT 2078 156
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.005 ppm, 0.04 mg/m3
STEL 0.02 ppm, 0.15 mg/m3
DESC Colorless to pale-yellow solid or liquid (above 71 F) with a sharp, pungent odor.
MW: 174.2 BP: 484 F VP: 0.01 mm (77 F) MP: 71 F FP: 260 F
INCOM Strong oxidizers, water, acids, bases, and amines (may cause foam and spatter); alcohols [Note: Reacts slowly with water to form carbon dioxide and polyureas.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or

other). (HE9)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)

NTP Suspect Human Carcinogen - [2,4-Toluene Diisocyanate (see Toluene Diisocyanates)]

IARC Group 2B - possibly carcinogenic to humans - [Toluene diisocyanates]

SYMPT Irritation eyes, skin, nose, throat; choke, paroxysmal cough; chest pain, retrosternal (occurring behind the sternum) soreness; nausea, vomiting, abdominal pain; bronchitis, bronchospasm, pulmonary edema; dyspnea (breathing difficulty), asthma; conjunctivitis, lacrimation (discharge of tears); dermatitis, skin sensitization; [potential occupational carcinogen]

ORGAN Eyes, skin, respiratory system [in animals: pancreas, liver, mammary gland, circulatory sys & skin tumors]

LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 240 Liters REC F: 1.0 L/min (TWA)
MIN V: 15 Liters REC F: 1.0 L/min (STEL)
ANL 1: High Performance Liquid Chromatography; HPLC-UV
REF: OHL2004S011 SAE: 0.126 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until used. Collect samples open-faced. After sampling protect from light. Store and ship cold.

2,6-Toluene-Diisocyanate (TDI)

IMIS **T177** CAS 91-08-7

SYN 2,6-TDI; TDI; Composite Constituent

NIOSH RTECS CZ6310000* DOT 2078 156

DESC Colorless to pale-yellow solid or liquid with a pungent odor.
MW: 174.2 BP: 264 to 271 F VP: 0.5 mm (77 F) MP: 68 to 72 F

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)

NTP Suspect Human Carcinogen - [2,6-Toluene Diisocyanate (see Toluene Diisocyanates)]

IARC Group 2B - possibly carcinogenic to humans - [Toluene diisocyanates]

LESS1 MEDIA (I): Glass Fiber Filter (37 mm) coated with 1.0 mg 1-(2-Pyridyl) piperazine
ANL SOLVENT: (9/1) Acetonitrile/Dimethyl Sulfoxide
REC V: 15 Liters REC F: 1.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC-UV-FLU
REF: OHL2004S011 SAE: 0.180 CLASS: Validated In-House
NOTE: Obtain filters from LESS and refrigerate until used. Collect samples open face. After sampling protect from light; store and ship cold.

Total Fibers

IMIS **T110**

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

LESS1 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (STEL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House

NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.

1,1,2-Trichloroethane

IMIS **2495** CAS 79-00-5
SYN Vinyl trichloride; beta-Trichloroethane
NIOSH RTECS KJ3150000 DOT 2810 153
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 45 mg/m3 (Skin)
DESC Colorless liquid with a sweet, chloroform-like odor.
MW: 133.4 BP: 237 F VP: 19 mm MP: -34 F
INCOM Strong oxidizers and caustics; chemically active metals (such as aluminum, magnesium powders, sodium, and potassium)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Narcosis. (HE8)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [1,1,2-Trichloroethane]
SYMPT Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]
ORGAN Eyes, respiratory system, central nervous system, liver, kidneys [in animals: liver cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 10 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OSHA 1003 SAE: 0.100 CLASS: Fully Validated by OSHA

Trichloroethylene

IMIS **2490** CAS 79-01-6
SYN Ethylene trichloride; Triclene, TCE, Trichloroethane
NIOSH RTECS KX4550000 DOT 1710 160
MIOSHA FINAL RULE (Table G-1-A):
TWA 50 ppm, 270 mg/m3
STEL 200 ppm, 1080 mg/m3
DESC Colorless liquid (unless dyed blue) with a chloroform-like odor.
MW: 131.4 BP: 189 F VP: 58 mm MP: -99 F
INCOM Strong caustics and alkalis; chemically active metals (such as barium, lithium, sodium, magnesium, titanium and beryllium)
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Reproductive Hazards---Teratogenesis or other reproductive impairment. (HE5)
Nervous System Disturbances---Narcosis. (HE8)
NTP Human Carcinogen - [Trichloroethylene]
IARC Group 1 - carcinogenic to humans - [Trichloroethylene]
SYMPT Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system [in animals: liver and kidney cancer]
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)

ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 0.25 Liters REC F: 0.05 L/min (CEIL)
MIN V: 0.05 Liters REC F: 0.05 L/min (PEAK)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.117 CLASS: Validated In-House

SAM2 DET. TUBE: Dräger, 8101881, 50-500ppm

Triethanolamine

IMIS **T185** CAS 102-71-6
SYN tris(2-hydroxyethyl)amine; tri(hydroxyethyl)amine; trolamine; TEA (amino alcohol); nitrilo-2,2',2''-triethanol; triethylolamine; daltogen
DESC Oily liquid with a mild ammonia odor.
MW: 149.2 BP: 636 F (Decomposes) VP: <0.01 mm MP: 70.9 F
FP: 365 F
NIOSH RTECS KL9275000*
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Triethanolamine]
LESS1 MEDIA (G): Glass Fiber Filter (GFF) 37 mm
ANL SOLVENT: Deionized Water
REC V: 100 Liters REC F: 1.0 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2004S026 SAE: 0.203 CLASS: Validated In-House

Triethylamine

IMIS **2480** CAS 121-44-8
SYN TEA
NIOSH RTECS YE0175000 DOT 1296 132
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 40 mg/m3
STEL 15 ppm, 60 mg/m3
DESC Colorless liquid with a strong, ammonia-like odor.
MW: 101.2 BP: 193 F VP: 54 mm MP: -175 F FP: 20 F
INCOM Strong oxidizers , strong acids, chlorine, hypochlorite, halogenate compounds
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
SYMPT Irritation eyes, skin, respiratory system; In Animals: myocardial, kidney, liver damage
ORGAN Eyes, skin, respiratory system, cardiovascular system, liver, kidneys
LESS1 MEDIA (89): Coated XAD-7 Tube (80/40 mg) Coated with 10% Phosphoric Acid
ANL SOLVENT: Deionized Water
REC V: 10 Liters REC F: 0.1 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2004S028 SAE: 0.064 CLASS: Validated In-House
NOTE: Store and ship cold.

1,3,5-Triglycidyl-s-Triazinetrione

IMIS **T405** CAS 2451-62-9

SYN TGIC, triglycidyl isocyanurate, 1,3,5-triglycidyl isocyanurate, TGT, glycidyl isocyanurate, tris(epoxypropyl)isocyanurate, s-triazine-2,4,6(1H,3H,5H)-trione, 1,3,5-tris(2,3-epoxypropyl)-s-triazine-2,4,6(1H,3H,5H)-trione. [1,3,5-triglycidyl isocyanurate (TGIC) has two stereoisomers, α and β]
NIOSH RTECS XZ1996000*
DESC White crystalline solid.
MW: 297.27 MP: 203 to 208 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (G): Glass Fiber Filter (GFF) 37 mm
ANL SOLVENT: Acetonitrile
MIN V: 180 Liters REC F: 1.0 L/min
ANL 1: Ion Chromatography; IC
REF: OHL2006S010 SAE: 0.165 CLASS: Validated In-House
NOTE: Minimum volume of 180 Liters. Samples must be shipped cold overnight and stored in a freezer until analysis.

Trimethylbenzene, Mixed Isomers
IMIS **2505** CAS 25551-13-7
SYN Hemellitol, Hemimellitene [1,2,3-Trimethylbenzene] [Note: Hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]
NIOSH RTECS DC3220000
MIOSHA FINAL RULE (Table G-1-A):
TWA 25 ppm, 125 mg/m3
DESC Clear, colorless liquid with a distinctive, aromatic odor.
MW: 120.2 BP: 349 F MP: - 14 F VP: 1 mm (62 F)
INCOM Oxidizers, nitric acid
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Hematologic (Blood) Disturbances---Anemias. (HE12)
SYMPT Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)
ORGAN Eyes, skin, respiratory system, central nervous system, blood
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.123 CLASS: Validated In-House

Tungsten, Metal and Insoluble Compounds (as W)
IMIS **2536** CAS 7440-33-7
SYN Tungsten metal, Wolfram
NIOSH RTECS YO7175000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
STEL 10 mg/m3
DESC Hard, brittle, steel-gray to tin-white solid.
MW: 183.9 BP: 10,701 F MP: 6,170 F VP: 0 mm (approx.)
INCOM Bromine trifluoride, chlorine trifluoride, fluorine, iodine pentafluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, respiratory system; diffuse pulmonary fibrosis; loss of appetite, nausea, cough; blood changes

ORGAN Eyes, skin, respiratory system, blood
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Ammonia Solution/Hydrochloric Acid/Nitric Acid/Phosphoric Acid
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Tungsten, Soluble Compounds (as W)
IMIS **2537** CAS 7440-33-7
NIOSH RTECS YO7175000 DOT 3089 170(powder)
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 3 mg/m3
DESC Hard, brittle, steel-gray to tin-white solid.
MW: 183.9 BP: 10,701 F MP: 6,170 F VP: 0 mm (approx.)
INCOM Bromine trifluoride, chlorine trifluoride, fluorine, iodine pentafluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Irritation eyes, skin, respiratory system; diffuse pulmonary fibrosis; loss of appetite, nausea, cough; blood changes
ORGAN Eyes, skin, respiratory system, blood
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water/Acidified with Phosphoric Acid
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.123 CLASS: Validated In-House
NOTE: Submit as a separate sample.
WIPE MEDIA: Whatman Smear Tab SOLVENT: Deionized Water

Turpentine
IMIS **2540** CAS 8006-64-2
SYN Gumspirits; Spirits of turpentine; Steam distilled turpentine; Gum turpentine; Sulfate wood turpentine, Turps, Wood turpentine
NIOSH RTECS YO8400000 DOT 1299 128
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 560 mg/m3
DESC Colorless liquid with a characteristic odor
MW: approx. 136 BP: 309 to 338 F VP: 4 mm MP: -58 to -76 F
INCOM Strong oxidizers, chlorine, chromic anhydride, stannic chloride, chromyl chloride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
SYMPT Irritation eyes, skin, nose, throat; headache, dizziness, convulsions; skin sensitization; hematuria (blood in the urine), proteinuria; kidney damage; abdominal pain, nausea, vomiting, diarrhea; chemical pneumonitis (aspiration liquid)
ORGAN Eyes, skin, respiratory system, central nervous system, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)

ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
MAX V: 10 Liters MIN V: 1 Liters FLOW: 0.01 to 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S014 SAE: 0.090 CLASS: Validated In-House
NOTE: Separately submit 5 mL of a clean bulk sample with little or no color to use as a standard. Recommended refrigerated storage.

Vanadium

IMIS **V125** CAS 7440-62-2
NIOSH RTECS YW1355000* DOT 3285 151
DESC Light gray or white lustrous powder.
MW: 50.94
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.075 CLASS: Validated In-House
NOTE: Submit as a separate sample.

Vanadium Fume (as V_2O_5)

IMIS **2571** CAS 1314-62-1
SYN Divanadium pentoxide fume, Vanadic anhydride fume, Vanadium oxide fume, Vanadium pentoxide fume
NIOSH RTECS YW2460000 DOT 2862 151
MIOSHA FINAL RULE (Table G-1-A):
TWA 0.05 mg/m3
DESC Finely divided particulate dispersed in air.
MW: 181.9 BP: 3182 F VP: 0 mm (approx.) MP: 1274 F
INCOM Lithium, chlorine trifluoride
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
IARC Group 2B - possibly carcinogenic to humans - [Vanadium pentoxide]
SYMPT Irritation eyes, throat; green tongue, metallic taste; cough, fine rales, wheezing, bronchitis, dyspnea (breathing difficulty); eczema
ORGAN Respiratory system, skin, eyes
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.075 CLASS: Validated In-House
NOTE: Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound. Submit as a separate sample.
WIPE MEDIA: Ghost Wipe

Vanadium, Respirable Dust (as V_2O_5)

IMIS **2570** CAS 1314-62-1
SYN Vanadium pentoxide dust
NIOSH RTECS YW2450000 DOT 2862 151
MIOSHA FINAL RULE (Table G-1-A):

TWA 0.05 mg/m3

DESC Yellow-orange powder or dark gray, odorless flakes dispersed in air.
MW: 181.9 BP: 3182 F VP: 0 mm (approx.) MP: 1274 F

INCOM Lithium, chlorine trifluoride

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)

IARC Group 2B - possibly carcinogenic to humans - [Vanadium pentoxide]

SYMPT Irritation eyes, throat; green tongue, metallic taste; cough, fine rales, wheezing, bronchitis, dyspnea (breathing difficulty); eczema

ORGAN Respiratory system, skin, eyes

LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.075 CLASS: Validated In-House
NOTE: Analytical method does not distinguish between dust and fume. When analysis of a compound is requested, an elemental analysis is performed and reported as the compound. Submit as a separate sample.

WIPE MEDIA: Ghost Wipe

Vegetable Oil Mists (Respirable Fraction)

IMIS **V127** CAS 68956-68-3

SYN Vegetable Mist

NIOSH RTECS YX1850000

MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3

DESC An oil extracted from the seeds, fruit, or nuts of vegetables or other plant matter.

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)

INCOM None reported

SYMPT Irritation eyes, skin, respiratory system, lacrimation (discharge of tears)

ORGAN Eyes, skin, respiratory system

LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Vegetable Oil Mists (Total Dust)

IMIS **V126** CAS 68956-68-3

SYN Vegetable Mist

NIOSH RTECS YX1850000

MIOSHA FINAL RULE (Table G-1-A):
TWA 15 mg/m3

DESC An oil extracted from the seeds, fruit, or nuts of vegetables or other plant matter.

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)

INCOM None reported

SYMPT Irritation eyes, skin, respiratory system, lacrimation (discharge of tears)
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Vinyl Acetate

IMIS **2572** CAS 108-05-4
SYN 1-Acetoxyethylene, Ethenyl acetate, Ethenyl ethanoate, VAC, Vinyl acetate monomer, Vinyl ethanoate
NIOSH RTECS AK0875000 DOT 1301 129P
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 ppm, 30 mg/m3
STEL 20 ppm, 60 mg/m3
DESC Colorless liquid with a pleasant, fruity odor, [Note: Raw material for many polyvinyl resins.]
MW: 86.1 BP: 162 F VP: 83 mm MP: -136 F FP: 18 F
INCOM Acids, bases, silica gel, alumina, oxidizers, azo compounds, ozone [Note: Usually contains a stabilizer (e.g., hydroquinone or diphenylamine) to prevent polymerization.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)
IARC Group 2B - possibly carcinogenic to humans - [Vinyl acetate]
SYMPT Irritation eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (5): Carboxen 564 (ORBO-92) carbon molecular sieve tubes (160/80 mg)
ANL SOLVENT: (95/5) Methylene Chloride/Methanol
REC V: 24 Liters REC F: 0.1 L/min (TWA)
REC V: 0.75 Liters REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2008S006 SAE: 0.098 CLASS: Validated In-House

Vinyl Chloride (Chloroethylene)

IMIS **2580 (PEL); 2579 (AL)** CAS 75-01-4
SYN Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, VCM, Vinyl chloride monomer
NIOSH RTECS KU9625000 DOT 1086 116P
MIOSHA FINAL RULE (Table G-1-A) Vinyl Chloride (29 CFR 1910.1017):
TWA 1 ppm, 2.5 mg/m3
STEL 5 ppm, 12.8 mg/m3 (15 min)
AL 0.5 ppm
DESC Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]
MW: 62.5 BP: 7 F VP: 3.3 atm MP: -256 F
INCOM Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)

Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)

NTP Human Carcinogen - [Vinyl Chloride (see Vinyl Halides [Selected])]

IARC Group 1 - carcinogenic to humans - [Vinyl chloride]

SYMPT Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged livor; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

ORGAN Liver, central nervous system, blood, respiratory system, lymphatic system [liver cancer]

LESS1 MEDIA (8): CARBOSIEVE S-III (ORBO 91) (130/65 mg sections, 60/80 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 3 Liters REC F: 0.05 L/min (TWA)
MIN T: 15 Min REC F: 0.05 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S016 SAE: 0.081 CLASS: Validated In-House
NOTE: Submit as a separate sample. Refrigerate samples and analyze as soon as possible.
NOTE: Alternative media is available, contact LESS for more information.

Vinylidene Chloride

IMIS **2583** CAS 75-35-4

SYN 1,1-DCE, 1,1-Dichloroethene, 1,1-Dichloroethylene, VDC, Vinylidene chloride monomer, Vinylidene dichloride

NIOSH RTECS KV9275000 DOT 1303 130P

MIOSHA FINAL RULE (Table G-1-A):
TWA 1 ppm, 4 mg/m3

DESC Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.
MW: 96.9 BP: 89 F VP: 500 mm MP: -189 F FP: -2 F

HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive. (HE3)
Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed). (HE18)

IARC Group 2B - possibly carcinogenic to humans - [Vinylidene chloride]

INCOM Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, Nitric Acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]

SYMPT Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen.]

ORGAN Eyes, skin, respiratory system, central nervous system, liver, kidneys [in animals: liver & kidney tumors]

LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: Carbon Disulfide
MAX V: 7 Liters REC F: 0.2 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2004S013 SAE: 0.186 CLASS: Validated In-House
NOTE: Submit as a separate sample.

Vinyl Toluene

IMIS **2582** CAS 25013-15-4

SYN Methylstyrene; Tolylethylene; ortho, meta & para-vinyltoluene (mixed isomers)

NIOSH RTECS WL507500 DOT 2618 130P

MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 480 mg/m3
DESC Colorless liquid with a strong, disagreeable odor.
MW: 118.2 BP: 339 F VP: 1 mm MP: -106 F
INCOM Oxidizers, peroxides, strong acids, iron or aluminum salts [Note: Usually inhibited with tert-butyl catechol to prevent polymerization.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
Nervous System Disturbances---Nervous system affects other than narcosis. (HE7)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Vinyl toluene]
SYMPT Irritation eyes, skin, upper respiratory; drowsiness; In Animals: narcosis
ORGAN Eyes, skin, respiratory system, central nervous system
LESS1 MEDIA (14): Coated Charcoal Tube (100/50 mg, 20/40 mesh); Coating is 10% (w/w) 4-tert-Butylcatechol
ANL SOLVENT: Toluene
REC V: 12 Liters REC F: 0.05 L/min
ANL 1: Gas Chromatography; GC-FID
REF: OHL2006S003 SAE: 0.156 CLASS: Validated In-House
NOTE: Store and ship cold.
NOTE: VM&P Naphtha, See Naphtha, VM&P

Welding Fumes (Total Particulate)
IMIS **2587**
NIOSH RTECS ZC2550000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Fumes generated by the process of joining or cutting pieces of metal by heat, pressure, or both.
INCOM Varies
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 1 - carcinogenic to humans - [Welding fumes]
SYMPT Symptoms vary depending upon the specific component of the welding fumes; metal fume fever: flu-like symptoms, dyspnea (breathing difficulty), cough, muscle pain, fever, chills; interstitial pneumonitis; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system, central nervous system [lung cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns OR (W): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns 25 mm
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 CLASS: Validated In-House

Wollastonite
IMIS **W101** CAS 13983-17-0
DESC White or slightly cream-colored powder.
MW: 118.19 MP: 2804 F
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Wollastonite]
As Respirable Fraction:
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns

preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

As Total Dust:

LESS2 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

As Fiber Count:

LESS3 MEDIA (N): Mixed Cellulose Ester Filter (MCEF), 0.8 microns (open face) 25 mm cassette with 50 mm conductive cowl
MAX V: 1200 Liters MAX F: 16 L/min MIN F: 0.5 L/min (TWA)
MIN V: 48 Liters MAX F: 2.5 L/min MIN F: 1.6 L/min (STEL)
ANL 1: Phase Contrast Microscopy; PCM
REF: OHL2004M9020F0MCE SAE: 0.250 CLASS: Validated In-House
NOTE: Do not request multiple analytes. Do not overload. If dust is high, reduce air volume to avoid overloading. A minimum of 2 blanks or 10% are required for every set. Pack to reduce shock.

Wood Dust, All Soft and Hard Woods, Except Western Red Cedar

IMIS **W103**
SYN Beech; birch; mahogany; maple; oak; sapele; walnut – hardwoods, redwood; teak – softwoods
NIOSH RTECS ZC9850000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
STEL 10 mg/m3
DESC Tan fibrous powder
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or other). (HE9)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Wood Dust]
IARC Group 1 - carcinogenic to humans - [Wood dust]
SYMPT Irritation eyes; epistaxis (nosebleed); dermatitis; resp hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system [nasal cancer].
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Wood Dust, Hardwood

IMIS **9210**
SYN Oak; Beech; Maple; Mahogany; Walnut; Sapele
NIOSH RTECS ZC9850000
DESC Particulates produced by cutting or machining wood having high density and low void volume.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
NTP Human Carcinogen - [Wood Dust]
IARC Group 1 - carcinogenic to humans - [Wood dust]
SYMPT Irritation eyes; epistaxis (nosebleed); dermatitis; resp hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system [nasal cancer].
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Wood Dust, Softwood

IMIS **9211**
SYN Redwood; Teak
NIOSH RTECS ZC9850000
DESC Particulates produced by cutting or machining wood having a low density and high void volume.
INCOM None reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
NTP Human Carcinogen - [Wood Dust]
IARC Group 1 - carcinogenic to humans - [Wood dust]
SYMPT Irritation eyes; epistaxis (nosebleed); dermatitis; resp hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system [nasal cancer].
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Wood Dust, Western Red Cedar

IMIS **W102**
NIOSH RTECS ZC9850000
MIOSHA FINAL RULE (Table G-1-A):
TWA 2.5 mg/m3
DESC Dust from various types of wood.
INCOM None Reported
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Cancer---Currently regulated by OSHA as carcinogen. (HE1)
Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma or

other). (HE9)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
NTP Human Carcinogen - [Wood Dust]
IARC Group 1 - carcinogenic to humans - [Wood dust]
SYMPT Irritation eyes; epistaxis (nosebleed); dermatitis; resp hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]
ORGAN Eyes, skin, respiratory system [nasal cancer]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Xylene, All Isomers (Dimethylbenzene)
IMIS **2590** CAS 1330-20-7
SYN o-, m-, and p-Isomers; Xylol; Dimethylbenzene
NIOSH RTECS ZE2100000 DOT 1307 130
MIOSHA FINAL RULE (Table G-1-A):
TWA 100 ppm, 435 mg/m3
STEL 150 ppm, 655 mg/m3
DESC Colorless liquid with an aromatic odor (pure p-xylene is a solid at <55 F)
MW: 106.2 BP: 292/282/281 F VP: 7/9/9 mm MP: -13/-54/56 F
INCOM Strong oxidizers, strong acids
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
Nervous System Disturbances---Narcosis. (HE8)
Hematologic (Blood) Disturbances---Anemias. (HE12)
Irritation-Eyes, Nose, Throat, Skin---Moderate. (HE15)
IARC Group 3 - not classifiable as to its carcinogenicity to humans - [Xylenes]
SYMPT Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
ORGAN Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys
LESS1 MEDIA (11): Charcoal Tube (100/50 mg sections, 20/40 mesh)
ANL SOLVENT: (99/1) Carbon Disulfide/Dimethylformamide
REC V: 12 Liters REC F: 0.05 L/min (TWA)
MIN V: 3 Liters REC F: 0.2 L/min (STEL)
ANL 1: Gas Chromatography; GC-FID
REF: OHL2002S001 SAE: 0.117 CLASS: Validated In-House
NOTE: Recommended refrigerated storage.
SAM2 DET. TUBE: Dräger, 6733161, 10-400ppm

Zinc
IMIS **Z100** CAS 7440-66-6
NIOSH RTECS ZG8600000* DOT 1436 138 (dust)
DESC Solid.
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House

ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House

Zinc Bromide

IMIS **Z101** CAS 7699-45-8
NIOSH RTECS ZH1150000* DOT 3077 171
DESC A white crystalline noncombustible solid.
MW: 225.18
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
As Respirable Fraction:
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.
As Total Dust:
LESS2 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: Standard is for inert dust; noncompliance can be based on gross weight without additional analysis. If the filter is not overloaded, samples may be collected up to an 8-hour period.

Zinc Chloride Fume

IMIS **2611** CAS 7646-85-7
SYN Zinc dichloride fume
NIOSH RTECS ZH1400000 DOT 2331 154
MIOSHA FINAL RULE (Table G-1-A):
TWA 1 mg/m3
STEL 2 mg/m3
DESC White particulate dispersed in air.
MW: 136.3 BP: 1350 F MP: 554 F
INCOM Potassium
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Respiratory Effects---Acute lung damage/edema or other. (HE11)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
SYMPT Irritation eyes, skin, nose, throat; conjunctivitis; cough, copious sputum; dyspnea (breathing difficulty), chest pain, pulmonary edema, pneumonitis; pulmonary fibrosis, cor pulmonale; fever; cyanosis; tachypnea; skin burns
ORGAN Eyes, skin, respiratory system, cardiovascular system
LESS1 MEDIA (M): Mixed Cellulose Ester Filter (MCEF) 37 mm, 0.8 microns
ANL SOLVENT: Deionized Water
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. Analytical method does not distinguish between dust and fume. When

analysis of a compound is requested, an elemental analysis is performed and reported as the compound. Analysis is for water-soluble compounds and reported as ZnCl2.

Zinc Chromate

IMIS Use Chromic Acid & Chromates (as CrO3), (**0689)**
CAS 13530-65-9; 14018-95-2
SYN Chromic Acid, Zinc Salt
NIOSH RTECS GB6650000 DOT 3288 151
MIOSHA FINAL RULE (Table G-1-A) Chromium (VI) In General Industry (29 CFR 1910.1026):

TWA 5 µg/m3
AL 2.5 µg/m3
CEIL 0.1 mg/m3*

*If the exposure limit in OH Part 315. “Chromium (VI) in General Industry is stayed or otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m3.
DESC Odorless yellow solid.
INCOM Strong oxidizing agents
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Chronic (Cumulative) Toxicity---Known or Suspected animal or human carcinogen, mutagen (except Code HE1 chemicals). (HE2)
Irritation-Eyes, Nose, Throat, Skin---Marked. (HE14)
Irritation-Eyes, Nose, Throat, Skin---Mild. (HE16)
NTP Human Carcinogen - [Chromium Hexavalent Compounds]
IARC Group 1 - carcinogenic to humans - [Chromium (VI) compounds]
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
REC V: 960 Liters REC F: 2.0 L/min (TWA)
MIN T: 15 Minutes REC F: 2.0 L/min (CEIL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
ANL 2: Ion Chromatography Post Column Derivatization UV-Vis Detector; IC-UV
REF: OHL2012S008 SAE: 0.097 CLASS: Validated In-House
NOTE: Submit as a separate sample. The ion chromatography analysis is valence specific for hexavalent chromium (Cr+6). Not currently available.
WIPE MEDIA: Low Ash Polyvinyl Chloride (LAPVC) filter SOLVENT: none (dry wipe)

Zinc Oxide Fume

IMIS **2610** CAS 1314-13-2
SYN Zinc peroxide
NIOSH RTECS ZH4810000 DOT 1516 143
MIOSHA FINAL RULE (Table G-1-A):

TWA 5 mg/m3
STEL 10 mg/m3

DESC White, odorless solid
MW: 81.4 MP: 3587 F
INCOM Chlorinated rubber (at 419 F), water [Note: Slowly decomposed by water.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function
ORGAN Respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns

MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, analysis for metal will not be performed.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House
ANL SOLVENT: Nitric Acid
NOTE: Analytical method does not distinguish between dust and fume. When the analysis of a compound is requested, the elemental analysis is performed and reported as the compound.

Zinc Oxide (Respirable Fraction)

IMIS **Z103** CAS 1314-13-2
SYN Zinc peroxide
NIOSH RTECS ZH4810000 DOT 1516 143
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC White, odorless solid
MW: 81.4 MP: 3587 F
INCOM Chlorinated rubber (at 419 F), water [Note: Slowly decomposed by water.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function
ORGAN Respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, analysis for metal will not be performed.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House
NOTE: Analytical method does not distinguish between dust and fume. When the analysis of a compound is requested, the elemental analysis is performed and reported as the compound.

Zinc Oxide (Total Dust)

IMIS **Z102** CAS 1314-13-2
SYN Zinc peroxide
NIOSH RTECS ZH4810000 DOT 1516 143
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC White, odorless solid
MW: 81.4 MP: 3587 F
INCOM Chlorinated rubber (at 419 F), water [Note: Slowly decomposed by water.]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Acute Toxicity---Short-term high-risk effects. (HE4)
SYMPT Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude

(weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function
ORGAN Respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min (TWA)
MIN V: 30 Liters REC F: 2.0 L/min (STEL)
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the gross weight of the sample yields a concentration below the standard for the air contaminate, analysis for metal will not be performed.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House

Zinc Stearate (Respirable Fraction)
IMIS **Z104** CAS 557-05-1
SYN Dibasic zinc stearate, Zinc distearate, Zinc salt of stearic acid
NIOSH RTECS ZH5200000
MIOSHA FINAL RULE (Table G-1-A):
TWA 5 mg/m3
DESC Soft, white powder with a slight, characteristic odor
MW: 632.4 MP: 266 F VP: 0 mm (approx.)
INCOM Oxidizers, dilute acids [Note: Hydrophobic (i.e., repels water).]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, upper respiratory system; cough
ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (Q): Three-piece tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns preceded by a SKC aluminum cyclone
MAX V: 1200 Liters MIN V: 600 Liters FLOW: 2.5 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant. The analytical method does not distinguish between dust and fume.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House
NOTE: An elemental analysis for total Zinc is performed and reported as the compound.

Zinc Stearate (Total Dust)
IMIS **2616** CAS 557-05-1
SYN Dibasic zinc stearate, Zinc distearate, Zinc salt of stearic acid
NIOSH RTECS ZH5200000
MIOSHA FINAL RULE (Table G-1-A):
TWA 10 mg/m3
DESC Soft, white powder with a slight, characteristic odor
MW: 632.4 MP: 266 F VP: 0 mm (approx.)
INCOM Oxidizers, dilute acids [Note: Hydrophobic (i.e., repels water).]
HLTH See NIH-NLM PubChem (https://pubchem.ncbi.nlm.nih.gov/)
Generally Low Risk Health Effects---Nuisance particulates, vapors or gases. (HE19)
SYMPT Irritation eyes, skin, upper respiratory system; cough

ORGAN Eyes, skin, respiratory system
LESS1 MEDIA (L): Tared Low Ash Polyvinyl Chloride (LAPVC) filter, 5 microns
MAX V: 960 Liters MIN V: 480 Liters REC F: 2.0 L/min
ANL 1: Gravimetric
REF: OHL2004S015 SAE: 0.050 CLASS: Validated In-House
NOTE: If the filter is not overloaded, samples may be collected up to an 8-hour period. An elemental analysis is not performed if the gross weight of the sample yields a concentration below the standard for the air contaminant. The analytical method does not distinguish between dust and fume.
ANL 2: Inductively Coupled Argon Plasma-Mass Spectrometry; ICP-MS
ANL SOLVENT: Nitric Acid
REF: OHL2018S001 SAE: 0.089 CLASS: Validated In-House
NOTE: An elemental analysis for total Zinc is performed and reported as the compound.