EPA Emergency Response Air Monitoring Guidance Tables



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U.S. EPA Air Monitoring Guidance Tables

Executive Summary



Background

The United States Environmental Protection Agency (EPA) assembled the following 16 tables for use by field responders. The tables cover an array of response types and should be used as guidance only.

These tables are a quick-reference guide to assist field responders during an emergency response or a time-critical site clean-up. Additional guidance and resources may need to be consulted for additional information.

For radiological responses, refer to the site-specific health and safety plan (SSHASP), *Radiation Playbook*, and the EPA memorandum *Turnback Guidance for EPA Personnel Responding to Radiological Emergencies*. Consult with a health physicist for guidance in determining an action level.

User Responsibilities

To verify the data in these tables, refer to the Agency for Toxic Substances and Disease Registry (ATSDR), EPA toxicologists, the National Institute of Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), device manufacturer handbooks (most are available online), equipment operating guides, and other authoritative regulatory guidance. More current data from any source used to compile these tables supersedes the information in these tables. This document does not supersede the SSHASP for any response.

During responses to unknown situations, use the most conservative criterion, approach, and personal protective equipment (PPE) as outlined in the SSHASP. For responses involving metals in a particulate form, a particulate air monitoring instrument (e.g., Personal DataRAM) will be the instrument that can provide real-time data. The instrumentation reading will be in milligram per cubic meter (mg/m³) of particulate and not the metal of interest. Consult with a toxicologist or industrial hygienist for guidance in determining an action level. When monitoring for combustible atmosphere, a combustible gas indicator (e.g., MultiRAE) will need to be used. The action level for a combustible atmosphere is a lower explosive level (LEL) greater than 10%. A normal oxygen level in the ambient air should be between 19.5%-23.5% oxygen (normal 20.8%). An oxygen level below 19.5% or above 23.5% will require a reassessment of the situation.

If you have any changes or revisions please email <u>zintak.leonard@epa.gov</u> or ben.maradkel@westonsolutions.com



Target		Detection	Intringically		Occupational A	ction Levels	J	ΔΕ	GL-1	PPE	
Target	Instruments	Detection	Intrinsically	IP			Conversion	AL	JL-1	(refer to SSHASP and	
Compound ¹		Levels	Safe (Y/N)		TWA	IDLH		4-hour	8-hour	NIOSH Website)	
Acids											
	Dräger Tube	1-10 ppm or higher									
	Dräger Chip	1-25 ppm or higher	No (Yes with option)		PEL = 5 ppm C REL = 5 ppm V TLV = 5 ppm C ACGIH TLV = 2 ppm A4						
Hydrochloric	pH Paper	NA	Yes	12.74 eV		50 ppm	1 ppm = 1.49 mg/m^3	1.8 ppm 1.8 ppm	1.0 nnm	www.cdc.gov/niosh/npg/	
Acid	SPM	0.5-15 ppm	No (Yes with option)	112.740		оо ррш	1 ppm = 1.45 mg/m	т.о ррпп	т.о ррпп	npgd0332.html	
	Dräger Pac III	0-30 ppm	Yes	_							
	GFG Inc. Micro IV	0-30 ppm	Yes						1		
	Dräger Tube	1-50 ppm or higher	Yes	_	PEL = 2 ppm				to the	www.cdc.gov/niosh/npg/	
Nitric Acid	pH Paper	NA	Yes	11.95 eV	REL = 2 ppm	25 ppm	1 ppm = 2.58 mg/m^3	0.53 ppm	0.53 ppm	npgd0447.html	
	SPM	0.2-6 ppm	No (Yes with option)	ļ	TLV = 2 ppm				0.	прдаоччт.пап	
Sulfuric	Dräger Tube	1-5 mg/m ³ (mist)	Yes	<u> </u>	PEL = 1 mg/m ³					www.cdc.gov/niosh/npg/	
Acid	pH Paper	NA	Yes	12.40 eV	$REL = 1 \text{ mg/m}^3$ $TLV = 1 \text{ mg/m}^3$	15 mg/m ³	NA	0.2 mg/m ³	0.2 mg/m ³	npgd0577.html	
7 1010	SPM	26-750 ppb	No (Yes with option)		ACGIH TLV = 0.2 mg/m ³ A2					npguoo77.num	
	Dräger Tube	2-30 ppm	Yes	A.E.					The second	and \	
	Dräger Chip	2-50 ppm	No (Yes with option)					1.3 ppm	1 10		
1 1	pH Paper	NA	Yes		PEL = 10 ppm S						
Hydrocyanic	ToxiRAE II HCN	0-100 ppm	Yes	13.60 eV	REL = ST 4.7 ppm S	50 ppm	1 ppm = 1.10 mg/m^3		1 ppm	www.cdc.gov/niosh/npg/	
Acid	SPM	1.1-30 ppm	No (Yes with option)	-	TLV = 4.7 ppm C S					npgd0333.html	
	Multiwarn II	0-50 ppm	Yes	4							
	Dräger Pac III	0-50 ppm	Yes	_						The state of the s	
	GFG Inc. Micro IV	0-50 ppm	Yes								
Hydrofluoric –	Dräger Tube	0.5-90 ppm	Yes		PEL = 3 ppm						
	pH Paper SPM	NA 0.0.0 mmm	Yes	15.9 <mark>8</mark> eV	REL = 3 ppm	30 ppm	1 ppm = 0.82 mg/m^3	V8/1	1 ppm	www.cdc.gov/niosh/npg/	
Acid		0.6-9 ppm	No (Yes with option)		TLV = 0.5 ppm	30 ррпі	1 ppm = 0.82 mg/m	1 ppm		npgd0334.html	
	Dräger Pac III GFG Inc Micro IV	0-30 ppm	Yes Yes							Hall 1	
Judrobromio	pH Paper	0-10 ppm NA	Yes		PEL = 3 ppm				-	www.cdc.gov/niosh/npg/	
Hydrobromic Acid	SPM	0.3-9 ppm	No (Yes with option)	11.62 eV	REL = 3 ppm C TLV = 2 ppm C	30 ppm	1 ppm = 3.31 mg/m^3	1 ppm	1 ppm	npgd0331.html	
ACIU	Dräger Tube	5-80 ppm	Yes							ripgu0331.html	
	Dräger Chip	2-50 ppm	No (Yes with option)		PEL = 10 ppm					www.cdc.gov/niosh/npg/	
Acetic Acid	pH Paper	NA	Yes	10.66 eV	REL = 10 ppm	50 ppm	1 ppm = 2.46 mg/m^3	NA	NA	npgd0002.html	
	MIRAN SapphIRe	0-100 ppm	Yes		TLV = 10 ppm					npgacocz.nam	
Sases Produc	ced from Acid										
	MultiRAE/AreaRAE		· ·			VXIII III	- J As				
	O ₂ Sensor	0-30% Vol.	Yes								
	Dräger Tube	5-23% Vol.	Yes		40.50/.0				~ /		
Oxygen	Dräger Chip	1-25% Vol.	No (Yes with option)	12.35 eV	< 19.5% O ₂	NA	NA	NA	NA	< 19.5% O ₂ = Level B	
, 0	Multiwarn II	0-25% Vol.	Yes	1.77	(simple asphyxiant)				1 /	2	
	Dräger Pac III	0-100% Vol.	Yes								
	GFG Inc Micro IV	0-25%	Yes								
	Dräger Tube	0.2-2% Vol.	Yes	-				~ /			
Hydrogon	Multiwarn II	0-2,000 ppm	Yes	15.42 eV	< 19.5% O ₂	NA	NA	NA	NA	110 F0/ C Lavial D	
Hydrogen	Dräger Pac III	0-2,000 ppm	Yes	15.42 eV	(simple asphyxiant)		- 5			< 19.5% O ₂ = Level B	
	GFG Micro IV	0-4% Vol.	Yes		District Control	-					
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No		10 micro-R/hr						
Radiation	Ludlum 2241-2 with		1	NA		NA	NA	NA	NA	Level C	
Radiation L	Pancake Probe	999,000 cpm	No	NA	300 cpm					Level O	



Table 1 -- Acid (Spill or Release)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- Does not include all compounds associated with this type of event, only the most common compounds with the lowest action levels.
- 2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

Acronyms:

< -- less than

% -- percent

A2 -- suspect human carcinogen

A4 -- concern that the compound may be carcinogenic, but supporting data are lacking

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

HCN -- hydrogen cyanide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

O₂ -- oxvaen

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound may be absorbed through the skin)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Vol. -- volume



Table 2 -- Ammonia (Spill or Release) -Instrument Guidance -- Regulatory Guidance

Regulatory Guidance

	*				· · · · · · · · · · · · · · · · · · ·						
Target	Instruments	Detection	Intrinsically	ΙΡ	PID CF	Occupational A	Action Levels	Conversion	AEC	GL-1	PPE (refer to SSHASP and
Compound	IIISHUIIICIIIS	Levels	Safe (Y/N)	"	(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	(refer to SSHASP and NIOSH Website)
Gas											
	MultiRAE/AreaRAE with NH ₃ Sensor	1-50 ppm (NH ₃ Sensor)	Yes		NA	PEL = 50 ppm REL = 25 ppm TLV = 25 ppm	300 ppm 1 ppr	1 ppm = 0.70 mg/m ³		30 ppm	www.cdc.gov/niosh/npg/ npgd0028.html
	Dräger Tube	0.25-3 ppm or higher	Yes	1					30 ppm		
	Dräger Chip	0.2-5 ppm or higher	No (Yes with option)								
	Dräger Pac III	0-300 ppm	Yes								
Ammonia	SPM	2.6-75 ppm	No (Yes with option)	10.18 eV							
	ToxiRAE II NH ₃	0-50 ppm	Yes	1							
	Miran SapphIRe*	0-500 ppm	Yes	1							
	Multiwarn II	0-300 ppm	Yes]							
	MultiRAE/AreaRAE PID	1-2,000 ppm (PID)	Yes		9.7 (10.6 lamp)					1	
Radiation ¹											
	Ludlum 192	0-5,000 micro-R/hr	No	NA		10 micro-R/hr		1		No. of London	
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No		NA	300 cpm	NA	NA	NA	NA	Level C

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor.)

ACGIH -- American Conference of Governmental Industrial Hygienists mg/m³ -- milligrams per cubic meter

AEGL -- acute exposure guideline levels

CF -- conversion factor

cpm -- counts per minute EPA -- U.S. Environmental Protection Agency

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NH₃ -- ammonia

NIOSH -- National Institute for Occupational Safety and Health SSHASP -- site-specific health and safety plan

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

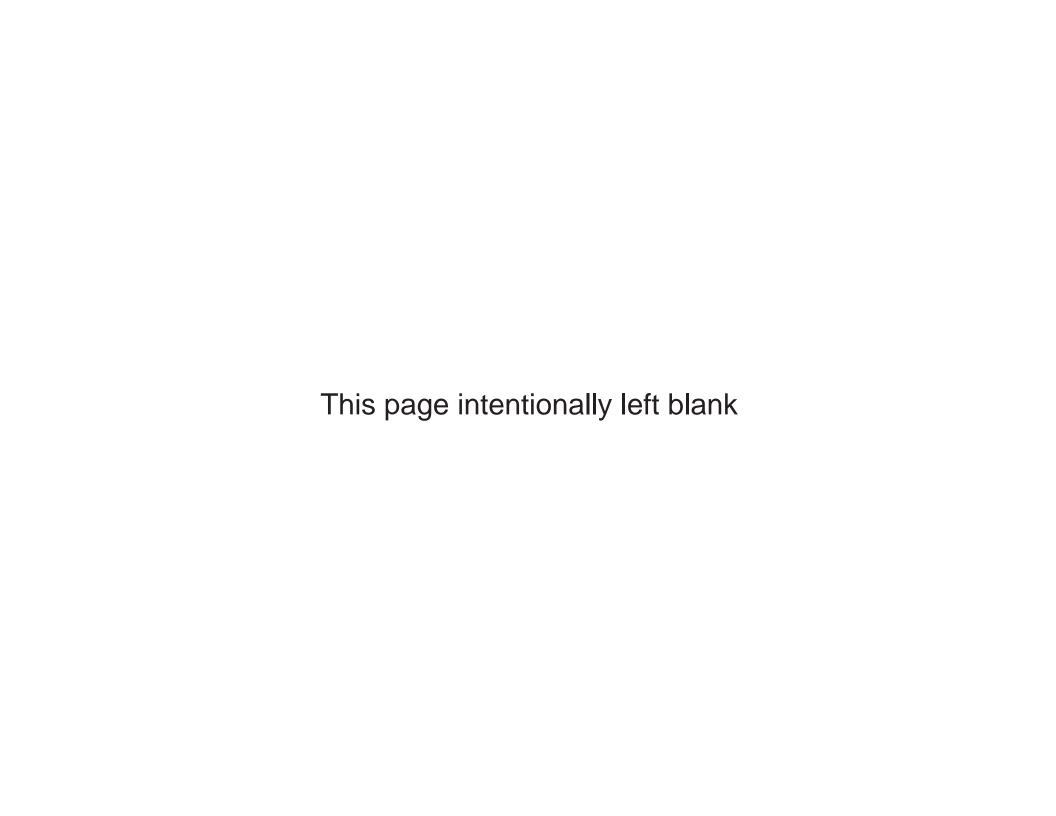




Table 3 -- Chemical Plant Fire

-Instrument Guidance Regulatory Guidance Reference

<u>_</u>	Detection In	Intrincically		DID CE	Occupational Action Levels		J	۸۵۵	N 4	PPE	
Target	Instruments		Intrinsically	ΙP	PID CF			Conversion	AEGL- 1		(refer to SSHASP and
Compound ¹		Levels	Safe (Y/N)		(ISO)	TWA	IDLH		4-hour	8-hour	NIOSH Website)
VOCs and Ga	ses										
	UltraRAE-PID***	0.1-2,000 ppm	Yes								
	Dräger Tube	0.5-10 ppm or higher	Yes								
	Dräger Chip	0.2-10 ppm or higher	No (Yes with option)	1	NA						
	Miran SapphIRe**	10-200 ppm	Yes	1		PEL = 1 ppm					
Benzene	ppbRAE-PID***	1 ppb-200 ppm	Yes	9.24 eV	'	REL = 0.1 ppm TLV = 0.5 ppm	500 ppm	1 ppm = 3.19 mg/m ³	18 ppm	9 ppm	www.cdc.gov/niosh/npg/
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		0.53 (10.6 lamp)					1	npgd0049.html
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		10.6 lamp 0.702 (10 ppm) -					1	
	1	1-50,000 ppm (FID)			1.781 (2,000 ppm)			/ A 1		1	
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes				- 1	/ A \		\	
	Dräger Tube	2-300 ppm or higher	Yes		NA	PEL = 50 ppm REL = 35 ppm				\ \	
Carbon	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 e\			1,200 ppm	1 nnm 1 15 mg/m3	22 nnm*	27 nnm*	www.cdc.gov/niosh/npg/ npgd0105.html
Monoxide	Multiwarn II	0-2,000 or 0-10,000 ppm	Yes	14.0160	, INA		1,200 ppm	1 ppm = 1.15 mg/m^3	33 ppm*	27 ppm*	
	ToxiRAE II CO	0-500 ppm oh highei	Yes			TLV = 25 ppm					
	GFG Inc. Micro IV	0-2,000 ppm	Yes							6 21	
	MIRAN SapphIRe**	4.5-250 ppm	Yes							100	
	MultiRAE/AreaRAE H ₂ S		Yes							0.33 ppm	www.cdc.gov/niosh/npg/ npgd0337.html
	Dräger Tube	0.2-6 ppm or higher	No (Yes with option)						0.36 ppm		
	Dräger Chip	0.2-5 ppm or higher	No (Yes with option)	10.46 eV	NA						
Hydrogen	SPM	1.1-30 ppm	Yes			PEL = 20 ppm C					
Sulfide	Multiwarn II	0-100 or 0-1,000 ppm	Yes			REL = 10 ppm C	100 ppm	1 ppm = 1.40 mg/m ³			
Camac	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		3.3 (10.6 lamp) NA	TLV = 10 ppm	16 6				
	GFG Inc. Micro IV	0-500 ppm	Yes								
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes	6				_		Per I	
	MultiRAE/AreaRAE SO ₂ sensor***	0- <mark>20 ppm</mark>	Yes		184		1 6			2/	
	Dräger Pac III	0-100 ppm	Yes							- /	
Sulfur	Dräger Tube	0.1-3 ppm or higher	Yes			PEL = 5 ppm					www.cdc.gov/niosh/npg/
Dioxide	Dräger Chip	0.4-10 ppm o <mark>r higher</mark>	No (Yes with option)	12.30 eV	/ NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	npgd0575.html
Dioxide	MIRAN SapphIRe**	6-30 ppm	Yes			TLV = 2 ppm	- A			/	ripguo575.ritini
	Multiwarn II	0-50 ppm	Yes								
	GFG Inc Micro IV	1-10 ppm	Yes								
	SPM	0.2-6 ppm	No (Yes with option)								
	MultiRAE/AreaRAE NO sensor	0-250 ppm	Yes			DEL OF THE					
Nitric Oxide	ToxiRAE II - NO	0-250 ppm	Yes	11.95 eV	/ NA	PEL = 25 ppm	100 ppm	1 nnm = 1 22 mg/==3	NA	NIA	www.cdc.gov/niosh/npg/
I Millio Oxide	Dräger Pac III	0-100 ppm	Yes	11.55 6	14/4	REL = 25 ppm	100 ppm	1 ppm = 1.23 mg/m ³	INA	NA	npgd0448.html
	GFG Inc. Micro IV	0-100 ppm	Yes			TLV = 25 ppm		P 1			
	Multiwarn II	0-100 ppm	Yes								
	Dräger Tube	0.5-30 ppm or higher									
	Dräger Chip	0.3-10 ppm or higher	. ,			PEL = 1 ppm C	С	1 ppm = 2.56 mg/m ³			www.cdc.gov/niosh/nng/
Vinyl Chloride	Multiwarn II	0-100 ppm	Yes	9.99 eV	NA	REL = NL	ND		mg/m³ 140 ppm	70 ppm	www.cdc.gov/niosh/npg/ npgd0658.html
	MIRAN SapphIRe**	2-20 ppm	Yes	9.99 ev	IVA	TLV = 1 ppm	407				
	Dräger Pac III	0-100 ppm	Yes								

⇒ EPA EMERGENCY RESPONSE TECHNICAL GROUP

Table 3 -- Chemical Plant Fire

RESPONSE TECHNICAL GROUP		Instrumer	nt Guidan	ce-				Reference			
Target	la aturus austa	Detection	Intrinsically	IP	DID OF	Occupational A	ction Levels	Commission	AE	GL-1	PPE
Compound ¹	Instruments	Levels	Safe (Y/N)	IP.	PID CF (ISO)	TWA	IDLH	Conversion	4-hour	8-hour	refer to SSHASP and NIOSH Website)
VOCs and Ga	ses (continued	d)									
	MultiRAE/AreaRAE NO ₂ sensor	0-20 ppm	Yes						. /		
	Dräger Tube	0.5-25 ppm or higher	Yes	1				100			
Nitrogen	Dräger Chip		No (Yes with option)	1		PEL = 5 ppm C					www.cdc.gov/niosh/npg/
Dioxide	SPM	0.3-9 ppm	No (Yes with option)	9.75 eV	NA	REL = 1 ppm	20 ppm	1 ppm = 1.88 mg/m^3	0.5 ppm	0.5 ppm	npgd0454.html
Dioxide	ToxiRAE II -NO ₂	0-20 ppm	Yes]		TLV = 3 ppm				\.	ripguo434.ritini
	Dräger Pac III	0-50 ppm	Yes]	The second second					1	
	GFG Inc. Micro IV	0-30 ppm	Yes	_						- N.	
	Multiwarn II	0-50 ppm	Yes					V - \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			
	Dräger Tube	2-50 ppm or higher	Yes	1	NA	551 400 0		/ A 1		Λ.	
-	Dräger Chip	5-100 ppm or higher	No (Yes with option)	4	147.	PEL = 100 ppm C REL = NL TLV = 150 ppm				Α.	www.cdc.gov/niosh/npg/
Trichloroethylene	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes	9.47 eV	0.54 (10.6 lamp) 10.6 lamp		ND	1 ppm = 5.37 mg/m ³	84 ppm	77 ppm	npgd0629.html
	TVA 1000B***	0.5-2,000 ppm	Yes	A	0.605 (10 ppm) 2.129 (2,000 ppm)			\ \tag{\tag{\tag{\tag{\tag{\tag{\tag{		7	
	Dräger Tube	0.02-15 ppm	Yes								
	Dräger Chip	0.05-2 ppm	No (Yes with option)		NA	PEL = 0.1 ppm			NA	NA	1
Phosgene	MIRAN SapphIRe**	0.05 ppm	Yes	11.2 eV	14/ (REL = 0.1 ppm	2 ppm	1 ppm = 4 mg/m^3			www.cdc.gov/niosh/npg/
•	TVA 1000B*** MultiRAE/AreaRAE	0.5-2,000 ppm (PID) 0-200 ppm	Yes Yes		8.5 (11.7 lamp)	TLV = 0.1 ppm					npgd0504.html
Matalata	PID***	0 200 ppiii	163		0.0 (11.1 ld/11p)					100	
Metals (as pa		ı	ı								I
Lead	Personal DataRAM****	0.0 <mark>01-400 mg/m³</mark>	No	NA	NA	$PEL = 0.05 \text{ mg/m}^3$ $REL = 0.05 \text{ mg/m}^3$	100 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0368.html
	DataRAM 4****	0.001-400 mg/m ³	No	4		$TLV = 0.05 \text{ mg/m}^3$					10
	Lumex RA-915	2-50,000 ng/m ³	No			PEL = 0.1 mg/m ³ S					
Mercury	Jerome 431	1,000-999,000 ng/m ³	No	NA	NA	Vapor REL = 0.05 mg/m ³ S	10 mg/m ³	NA	0.67 mg/m ³	0.33 mg/m ³	www.cdc.gov/niosh/npg/
iviol cary	Jerome J405	500-99 <mark>9,000 ng/m³</mark>	No			$TLV = 0.025 \text{ mg/m}^3$			olor mg/m	oloo iligiili	npgd0383.html
	Jerome 471	30-250,000 ng/m ³	No			S and A4					
Arsenic	Personal DataRAM****	0.001-40 <mark>0 mg/m³</mark>	No	9.81 eV	NA	PEL = 0.01 mg/m ³ REL = 0.002 mg/m ³	5 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0038.html
	DataRAM 4****	0.001-400 mg/m ³	No			$TLV = 0.01 \text{ mg/m}^3$				1	1 3
Arsenic (organic components)	Dräger Tube	0-3 mg organic arsenic/m³	Yes	NA	NA	PEL = 0.01 mg/m ³ REL = 0.002 mg/m ³ TLV = 0.01 mg/m ³	5 mg/m³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0039.html
Chromium	Personal DataRAM****	0.001-400 mg/m ³	No	NA	NA	PEL = 0.005 mg/m ³ REL = 0.01 mg/m ³ ACGIH TLV =	15 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
	DataRAM 4****	0.001-400 mg/m ³	No			0.01 mg/m ³	A L	1			npgd0139.html
Particulate***	*										
Particulate	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 5 mg/m ³ (respirable fraction) TLV = 3 mg/m ³	ND	ND	NA	NA	www.cdc.gov/niosh/npg/
	DataRAM 4	0.001-400 mg/m ³	No		The same of	(respirable fraction)	7 6	The state of the s			npgd0480.html
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr					
Radiation	Ludlum 2241-2 with			NA	NA		NA	NA	NA	NA	Level C
	Pancake Probe	999,000 cpm	No		NA	300 cpm	INA				



Table 3 -- Chemical Plant Fire

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with chemical plant fires, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied.

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

A4 -- concern that the compound may be carcinogenic, but supporting data are lacking

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hvdrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

m³ -- cubic meter

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ND -- non-detect

NL -- not listed

ng/m³ -- nanograms per cubic meter

NIOSH -- National Institute for Occupational Safety and Health

NO -- nitrogen oxide

NO₂ -- nitrogen dioxide

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound can be absorbed through the skin)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

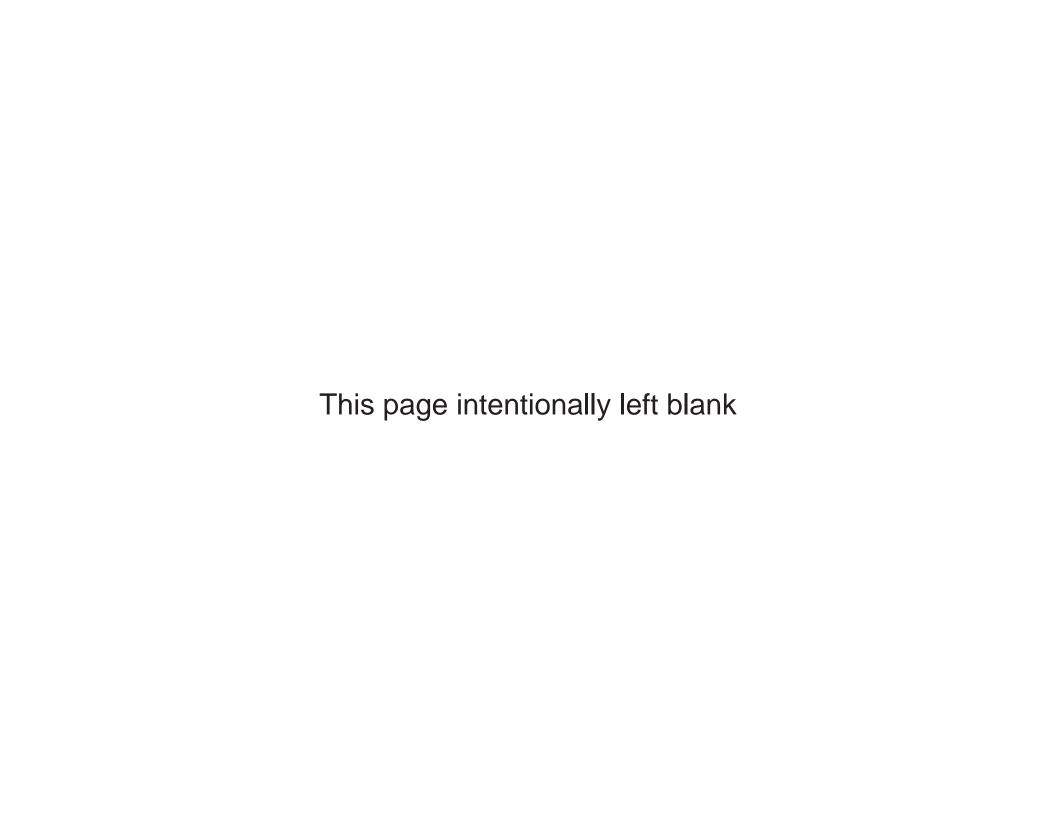




Table 4 -- Chlorine (Spill or Release) Instrument Guidance Regulatory Guidance

Reference

	<u>*</u>					8					
Target	Instruments	Detection	Intrinsically	ΙΡ	Occupational A	Occupational Action Levels		AEGL-1		PPE (refer to SSHASP and	
Compound	Instruments	Levels	Safe (Y/N)	"	TWA	IDLH	Conversion	4-hour	8-hour	(refer to SSHASP and NIOSH Website)	
Chlorine											
Chlorine	MultiRAE/AreaRAE CI sensor	0.1-10 ppm	Yes		PEL = 0.1 ppm C REL = 0.05 ppm C TLV = 0.5 ppm;			1.			
	Dräger Pac III CI Sensor	0.1-20 ppm	Yes	11.48 eV			1 ppm = 2.90 mg/m ³	0.5 ppm	0.5 ppm	www.cdc.gov/niosh/npg/	
Officials	Dräger Tube	0.2-30 ppm or higher	Yes							npgd0115.html	
	Dräger Chip	0.2-10 ppm or higher	No (Yes with option)	1	ST 1 ppm						
	Multiwarn II	0-20 ppm	Yes	1					la l		
	SPM	0.05-1.5 ppm	No (Yes with option)					VIII.	30	1	
Radiation ¹											
	Ludlum 192	0-5,000 micro-R/hr	No		10 micro-R/hr			A 1		1	
rtadiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	300 cpm	NA	NA	NA	NA	Level C	

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers

Acronyms:

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CI -- chlorine

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short-term

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

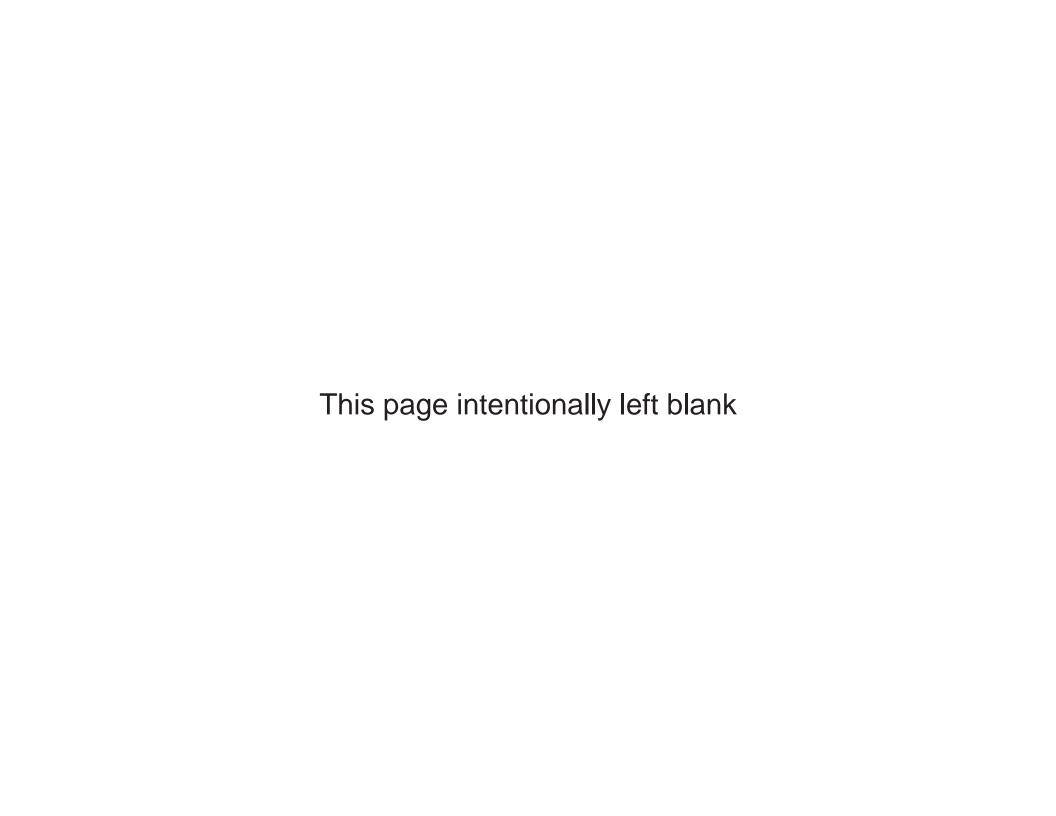




Table 5 -- Electroplating Facility (Spill, Release, or Fire) Instrument Guidance Regulatory Guidance Reference

							1108011	J			
Target	Instruments	Detection	Intrinsically	IP	IP & PID CF	Occupational A	action Levels	Conversion	AEGL-1		PPE (refer to SSHASP and
Compound ¹	motrumento	Levels	Safe (Y/N)		(ISO)	TWA	IDLH	CONVENSION	4-hour	8-hour	NIOSH Website)
VOCs and Ga	ses										
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes					1			
Carbon	Dräger Tube	2-300 ppm or higher	Yes]		PEL = 50 ppm					www.cdc.gov/niosh/npg/
Monoxide	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 e\	/ NA	REL = 35 ppm	1,200 ppm	1 ppm = 1.15 mg/m^3	33 ppm*	27 ppm*	npgd0105.html
	Multiwarn II	0-2,000 ppm or 0-10,000 ppm	Yes			TLV = 25 ppm				\	
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
	MultiRAE/AreaRAE H ₂ S sensor	0-100 ppm	Yes					$I \times I$	_ ^	_ /	
	SPM	1.1-30 ppm or higher	No (Yes with option)		NA	PEL = 20 ppm C REL = 10 ppm C TLV = 10 ppm				A	
Hydrogen	Multiwarn II	0-100 or 0-1,000 ppm	Yes							1	www.cdc.gov/niosh/npg/
Sulfide	Dräger Tube	0.2-6 ppm of higher	Yes	10.46 e\			100 ppm	1 ppm = 1.40 mg/m ³	0.36 ppm	0.33 ppm	npgd0337.html
• • • • • • • • • • • • • • • • • • • •		0.2-5 ppm or higher	No (Yes with option)	1							1 3
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		3.3 (10.6 lamp)						
		0.5-2,000 ppm (PID)	Yes		NA					631	
	MultiRAE/AreaRAE NO sensor	0-2,000 ppm	Yes			PEL = 25 ppm				NA	www.cdc.gov/niosh/npg/ npgd0448.html
Nitric Oxide	Dräger Pac III	0-100 ppm	Yes	12.30 eV	NA	REL = 25 ppm	100 ppm	1 ppm = 1.23 mg/m^3	NA		
_	Dräger Chip	0.5-15 ppm or higher	No (Yes with option)			TLV = 25 ppm					
	Multiwarn II	0-100 ppm	Yes								
Nitrogen	MultiRAE/AreaRAE NO ₂ sensor	0-20 ppm	Yes	1 <mark>2.</mark> 30 eV	/ NA	PEL = 5 ppm C				ш	www.cdc.gov/niosh/npg/ npgd0454.html
Dioxide	Dräger Pac III	0-100 ppm	Yes			REL = 1 ppm STEL	100 ppm	1 ppm = 2.62 mg/m ³	0.5 ppm	0.5 ppm	
		0.4-10 ppm or higher				TLV = 3 ppm					10
	Multiwarn II	0-50 ppm	Yes								
	MultiRAE/AreaRAE SO ₂ sensor	0-250 ppm	Yes		-51					-/	
	Dräger Pac III	0-100 ppm	Yes	7		PEL = 5 ppm				-/	www.cdc.gov/niosh/npg/
Sulfur Dioxide	Dräger Tube Dräger Chip	0.1-3 ppm or higher 0.4-10 ppm or higher		12.30 eV	NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	npgd0575.html
	MIRAN SapphIRe**	6-30 ppm	Yes			TLV = 2 ppm					npgdoo7 5.html
	Multiwarn II	0-50 ppm	Yes							/	
	SPM	0.2-6 ppm	Yes								
	Dräger Tube	2-50 ppm or higher	Yes		NIA			7	~ ~/		
	Dräger Chip	5-100 ppm or higher	No (Yes with option)		NA	PEL = 100 ppm C					www.cdc.gov/niosh/npg/
Trichloroethylene	MultiRAE/AreaRAE PID***	0.5-2,000 ppm (PID)	Yes	9.47 eV	5.2 (1 <mark>0.</mark> 6 lamp)	REL = NL TLV = 150 ppm	ND	1 ppm = 5.37 mg/m ³	0.2 ppm	0.2 ppm	npgd0629.html
	TVA 1000B***	0.5-2,000 ppm	Yes		10.6 lamp 0.605 (10 ppm) 2.129 (2,000 ppm)			c.			
	Dräger Tube	0.02-15 ppm	Yes								
	Dräger Chip	0.05-2 ppm	No (Yes with option)		NA	PEL = 0.1 ppm		The second second			
Phosgene	MIRAN SapphIRe**	0.05 ppm	Yes	11.2 eV		REL = 0.1 ppm	2 ppm	m 1 ppm = 4 mg/m ³	NA	NA	www.cdc.gov/niosh/npg/
9		0.5-2,000 ppm (PID)	Yes		-	TLV = 0.1 ppm					npgd0504.html
М	MultiRAE/AreaRAE PID***	0.02-15 ppm	Yes		5.2 (10.6 lamp)						

⇒ EPA EMERGENCY RESPONSE TECHNICAL GROUP

Table 5 -- Electroplating Facility (Spill, Release, or Fire)

TECHNICAL GROUP		Instrumer	nt Guidan	ce-		Regulatory Guidance					Reference	
Target	Instruments	Detection	Intrinsically	IP	IP & PID CF	Occupational A	ction Levels	Conversion	AE	GL-1	PPE (refer to SSHASP and	
Compound ¹	motraments	Levels	Safe (Y/N)		(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)	
VOCs and Ga	ases (continued	i)										
Sulfuric Acid	Dräger Tube pH Paper SPM	1-5 mg/m³ (mist) NA 26-750 ppb	Yes No (Yes with option) Yes	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³	15 mg/m ³	NA	0.2 mg/m ³	0.2 mg/m ³	www.cdc.gov/niosh/npg npgd0577.html	
Hydrochloric Acid	Dräger Tube Dräger Chip pH Paper SPM	1-10 ppm or higher 1-25 ppm or higher NA 0.5-15 ppm	Yes No (Yes with option) Yes No (Yes with option)	12.74 eV	/ NA	PEL = 5 ppm REL = 5 ppm TLV = 5 ppm	50 ppm	1 ppm = 1.49 mg/m ³	1.8 ppm	1.8 ppm	www.cdc.gov/niosh/npg npgd0332.html	
Nitric Acid	Dräger Tube Ph Paper SPM	1-50 ppm or higher NA 0.2-6 ppm	Yes Yes No (Yes with option)	10.46 eV	' NA	PEL = 2 ppm REL = 2 ppm TLV = 2 ppm	25 ppm	1 ppm = 2.58 mg/m ³	0.53 ppm	0.53 ppm	www.cdc.gov/niosh/npg npgd0447.html	
Hydrocyanic Acid & Hydrogen Cyanide	Dräger Tube Dräger Chip Ph Paper ToxiRAE II HCN SPM Multiwarn II Dräger Pac III GFG Inc. Micro IV	2-30 ppm 2-50 ppm NA 0-100 ppm 1.1-30 ppm 0-50 ppm 0-50 ppm 0-50 ppm	Yes No (Yes with option) Yes Yes No (Yes with option) Yes Yes Yes Yes Yes	-13.60 eV	/ NA	PEL = 10 ppm REL = ST 4.7 ppm TLV = 4.7 ppm C	50 ppm	1 ppm = 1.10 mg/m ³	1.3 ppm	1 ppm	www.cdc.gov/niosh/npg/ npgd0333.html	
Metals (as pa	rticulates)****											
Cadmium	Personal DataRAM DataRAM 4	0.001-400 mg/m ³ 0.001-400 mg/m ³	No No	NA	NA	PEL = 0.005mg/m^3 TLV = $2 \mu \text{g/m}^3$	9 mg/m³	NA	NA	NA	www.cdc.gov/niosh/npg npgd0087.html	
Copper	Personal DataRAM DataRAM 4	0.0 <mark>01-400 mg/m³</mark> 0.00 <mark>1-400 mg/m</mark>	No No	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³	100 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg npgd0150.html	
Hexavalent Chromium	Personal DataRAM DataRAM 4	0.001-400 mg/m ³ 0.001-400 mg/m ³	No No	NA	NA	PEL = 0.005 mg/m ³ A1 REL = 0.001 mg/m ³ A1 TLV = 0.01 mg/m ³ A1	15 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg npgd0138.html	
Lead	Personal DataRAM DataRAM 4	0.001-400 mg/m³ 0.001-400 mg/m³	No No	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg npgd0368.html	
Nickel	Personal DataRAM DataRAM 4	0.001-400 mg/m ³ 0.001-400 mg/m ³	No No	NA	NA	PEL = 1 mg/m ³ REL = 0.015 mg/m ³ TLV = 0.1 mg/m ³	10 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg npgd0445.html	
Particulate***	**											
Particulate	Personal DataRAM DataRAM 4	0.001-400 mg/m ³ 0.001-400 mg/m ³	No No	- NA	NA	PEL = 5 mg/m³ (respirable fraction) TLV = 3 mg/m³ (respirable fraction)	NA	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0480.html	
Radiation ²												
Radiation	Ludlum 192 Ludlum 2241-2 with	0-5,000 micro-R/hr 0-9,999 R/hr or	No No	NA	NA	10 micro-R/hr	NA	NA	NA	NA	Level C	



Table 5 -- Electroplating Facility (Spill, Release, or Fire)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with electroplating facility responses, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs and FIDs are non-specific detectors and can not differentiate one VOC from another, even with CFs applied

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another

Acronyms:

μg/m³ -- micrograms per cubic meter

A1 -- carcinogenic effects

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

 H_2S -- hydrogen sulfide

HCN -- hydrocyanic acid

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ND -- non-detect

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

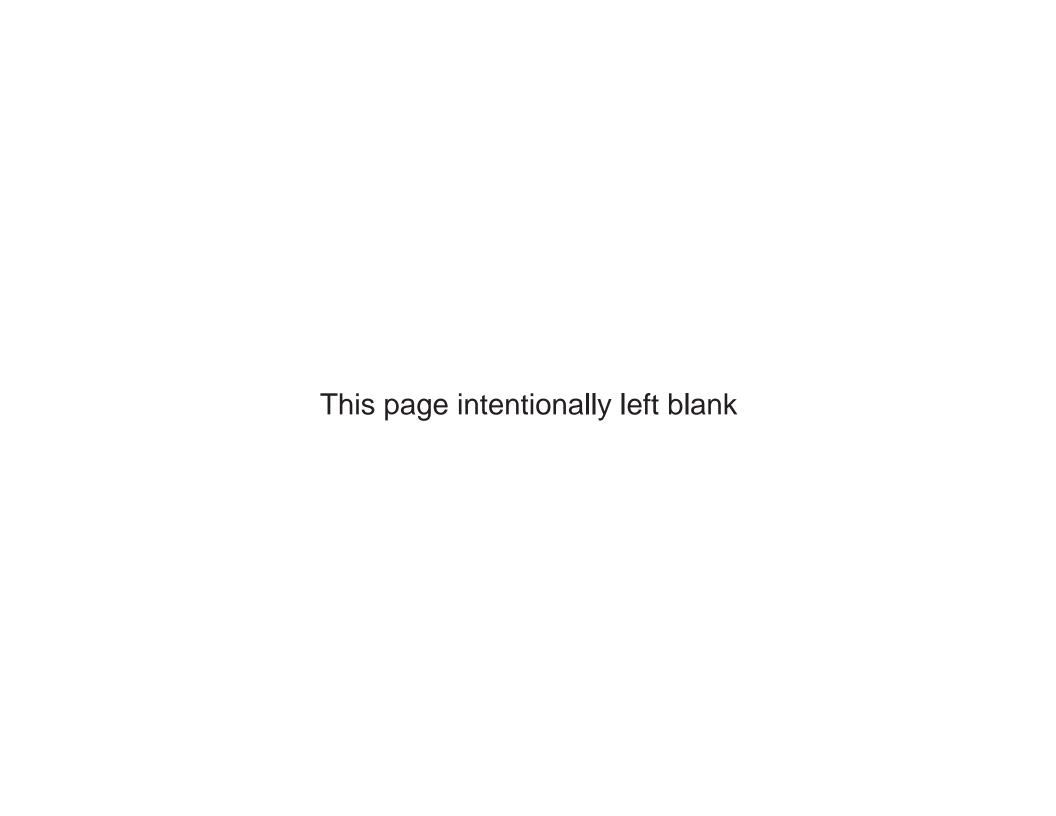
SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

STEL -- short-term exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average



EMERGENCY CRESPONSE TECHNICAL TECHNI

Table 6 -- General Industrial Fire

—Instrument Guidance — Regulatory Guidance — Reference

							0	J			
Target	Instruments	Detection	Intrinsically	ΙP	PID CF	Occupational A	ction Levels	Conversion	AEGL-1		PPE (refer to SSHASP and
Compound ¹	mstruments	Levels	Safe (Y/N)		(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
VOCs and Ga	ises										
	UltraRAE PID***	0.1-2,000 ppm	Yes					1 1 1 1 1			
	Dräger Tube	0.5-10 ppm or higher	Yes	1	NIA	NA					
	Dräger Chip	0.2-10 ppm or higher	No (Yes with option)	1	NA						ununu ada gay/ajaah/ang/
	MIRAN SapphIRe**	10-200 ppm	Yes	1		PEL = 1 ppm					www.cdc.gov/niosh/npg/ npgd0049.html
Benzene	ppbRAE PID***	1 ppb - 200 ppm	Yes	9.24 eV			500 ppm	1 ppm = 3.19 mg/m^3	18 ppm	9 ppm	npgaoo49.nam
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		0.53 (10.6 lamp)					. \	
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Yes		10.6 lamp 0.702 (10 ppm) 1.781 (2,000 ppm)			/ . V			
	MultiRAE/AreaRAE				1.701 (2,000 ppin)					1	
	CO sensor	0-500 ppm	Yes	Level 1		DEL FOrem				\ \	
Carbon	Dräger Tube	2-300 ppm or higher	Yes			PEL = 50 ppm REL = 135 ppm	1,200 ppm	4 45 / 3		07 4	www.cdc.gov/niosh/npg/
Monoxide	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 e\	/ NA	TLV = 25 ppm		1 ppm = 1.15 mg/m ³	33 ppm*	27 ppm*	npgd0105.html
	Multiwarn II	0-2,000 or 0-10,000 ppm	Yes	A		1LV = 25 ppm					
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
	Dräger Tube	1-10 ppm or higher	Yes			PEL = 5 ppm C				0 9	
Hydrochloric	Dräger Chip	1-25 ppm or higher	No (Yes with option)	12.74 eV	/ NA	REL = 35 ppm	F0 nnm	1 nnm 1 10 mg/m³	4.0	1 9 ppm	www.cdc.gov/niosh/npg/
Acid	pH Paper	NA	Yes	12.74 6	INA	TLV = 25 ppm	50 ppm	1 ppm = 1.49 mg/m^3	1.8 ppm	1.8 ppm	npgd0332.html
	SPM	0.5-15 ppm	No (Yes with option)			1LV = 23 ppiii					
	Dräger Tube	2-30 ppm	Yes							1 ppm	www.cdc.gov/niosh/npg/ npgd0333.html
Hydrocyanic Acid	Dräger Chip	2-50 ppm	No (Yes with option)								
	pH Paper	NA	Yes	13.60 eV		PEL = 10 ppm					
&	ToxiRAE II HCN	0-100 ppm	Yes		/ NA	REL = ST 4.7 ppm	50 ppm	1 ppm = 1.10 mg/m^3	1.3 ppm		
Hydrogen	SPM	1.1-30 ppm	No (Yes with option)			TLV = 4.7 ppm C		, pp			
Ćyanide	Multiwarn II	0-50 ppm	Yes								
,	Dräger Pac III	2-50 ppm	Yes	1							
	GFG Inc. Micro IV MultiRAE/AreaRAE	0-100 ppm	Yes								
	H ₂ S sensor	0-100 ppm	Yes								
	Dräger Tube	0.2-6 ppm or higher	Yes							pp /	
Hydrogen	Dräger Chip		No (Yes with option)	-		PEL = 20 ppm				/ /	www.cdc.gov/niosh/npg/
Sulfide	SPM	1.1-30 ppm	No (Yes with option)	12.30 eV	NA	REL = 10 ppm	100 ppm	1 ppm = 1.40 mg/m^3	0.36 ppm	0.33 ppm	npgd0337.html
Camao	Multiwarn II	0-50 ppm	Yes		100	TLV = 10 ppm				/	
	Dräger Pac III	0-50 ppm	Yes	1						f-	
	GFG Inc. Micro IV	0-50 ppm	Yes								
	Dräger Tube	0.02-15 ppm	Yes								
	Dräger Chip		No (Yes with option)								
Dhaagana	MIRAN SapphIRe**	0.05 ppm	Yes	11.2 eV	NA	PEL = 0.1 ppm		4 4 3			www.cdc.gov/niosh/npg/
Phosgene	TVA 1000B***	0.5-2,000 ppm (PID)	Yes	11.2 ev		REL = 0.1 ppm	2 ppm	$1 \text{ ppm} = 4 \text{ mg/m}^3$	NA	NA	npgd0504.html
· L	MultiRAE/AreaRAE PID***		Yes		8.5 (11.7 lamp)	TLV = 0.1 ppm		01			
	Dräger Tube	0.5-3000 ppm	Yes				- 1				
	Dräger Chip	0.3-250 ppm	No (Yes with option)	d /	NA	-					
Vinyl	MIRAN SapphIRe**		Yes		19 - 70	DEL 4	100				www.cdc.gov/niosh/nng/
Chloride	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		10.6 lamp 2.334 (10 ppm) 4.397 (2,000 ppm)	PEL = 1 ppm	NA	1 ppm = 2.56 mg/m ³	ng/m ³ 140 ppm	70 ppm	m www.cdc.gov/niosh/npg/ npgd0658.html
	MultiRAE/AreaRAE										
	PID***	0-2,000 ppm	Yes		2.0 (10.6 lamp)						
	I.	I.								1	1



Table 6 -- General Industrial Fire

—Instrument Guidance — Regulatory Guidance — Reference

						0	J			
Instruments	Detection	Intrinsically	IP	PID CF (ISO)	Occupational Action Levels		Conversion	AEGL-1		PPE
mstruments	Levels	Safe (Y/N)			TWA	IDLH	Conversion	4-hour	8-hour	refer to SSHASP and NIOSH Website)
ises										
MultiRAE/AreaRAE SO ₂ sensor	0-20 ppm	Yes		/ NA			1 ppm = 2.62 mg/m ³	0.2 ppm	0.2 ppm	
Dräger Pac III	0-100 ppm	Yes	1		DEL – 5 ppm	100 ppm				www.cdc.gov/niosh/npg/ npgd0575.html
	0.1-3 ppm or higher		12.30 eV		REL = 2 ppm TLV = 2 ppm					
	0.4-10 ppm or higher	No (Yes with option)								
	6-30 ppm	Yes								
									. \	
9	0.2-6 ppm	No (Yes with option)							1	
rticulates)****										
Personal DataRAM	0.001-400 mg/m ³	No	NA	NA		100 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0368.html
DataRAM 4	0.001-400 mg/m ³	No			$TLV = 0.05 \text{ mg/m}^3$					
Refer to Table	9 Mercury F	Response				J.			7	
**										
Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 5 mg/m ³ (respirable fraction)	NΔ	NA		NA	www.cdc.gov/niosh/npg/ npgd0480.html
DataRAM 4	0.001-400 mg/m ³	No	INA	INA	TLV = 3 mg/m ³ (respirable fraction)	INA	NA	IVA	NA	
Ludlum 192	0-5,000 micro-R/hr	No	,	NA	10 micro-R/hr		NA			Level C
Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA		300 cpm	NA		NA	NA	
	MultiRAE/AreaRAE SO2 sensor Dräger Pac III Dräger Tube Dräger Chip MIRAN SapphIRe** Multiwarn II SPM ** Personal DataRAM DataRAM 4 Refer to Table ** Personal DataRAM Ludlum 192 Ludlum 2241-2 with	MultiRAE/AreaRAE	Levels Safe (Y/N)	MultiRAE/AreaRAE	MultiRAE/AreaRAE	MultiRAE/AreaRAE	National Detection Levels	Instruments	Instruments	Nature Detection Conversion Conversion AEGL-1





Table 6 -- General Industrial Fire

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- Does not include all compounds associated with industrial fires, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.
- 2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied

****Personal Data RAMs and Data RAMs are non-specific detectors and cannot differentiate one particulate from another

Acronyms:

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

HCN -- hydrocyanic acid

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/kg -- milligrams per kilograms

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound can be absorbed through the skin)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short-term

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

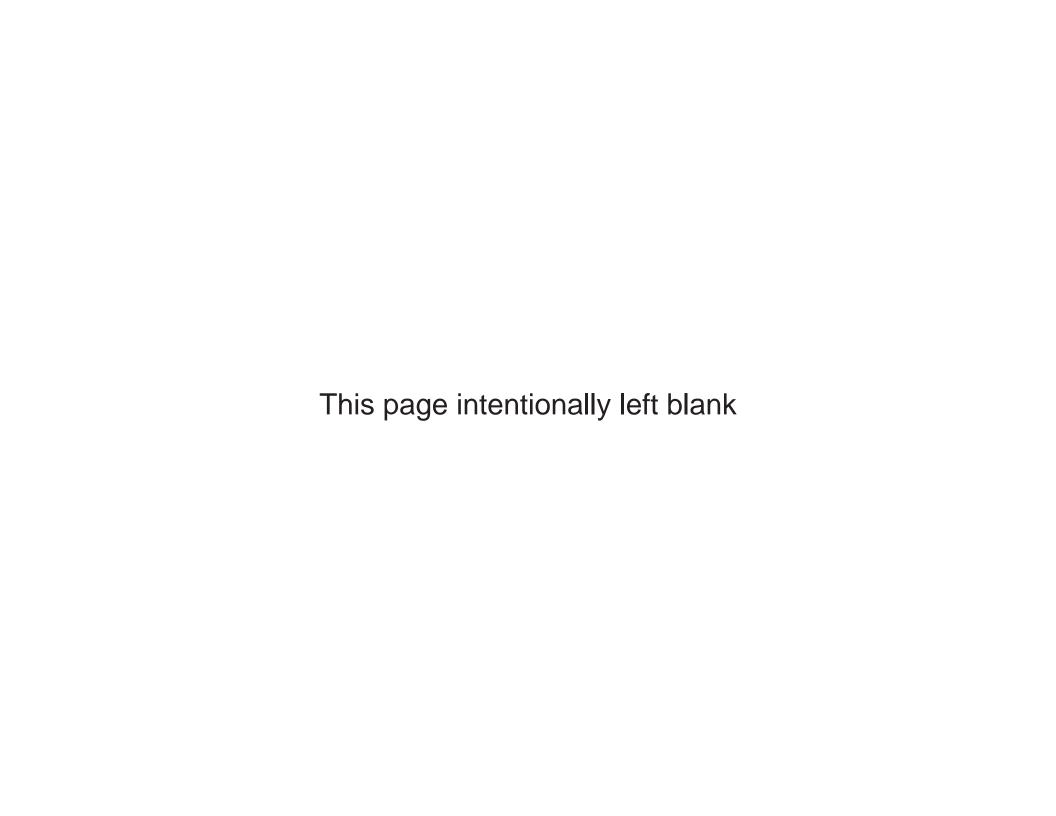




Table 7 -- Landfill (Spill, Release, or Fire) (If the landfill is on fire, also refer to Table 6)

-Instrument Guidance Regulatory Guidance Reference

	•						riogenerally defined to				
Target Compound ¹	Instruments	Detection		ΙP	PID CF (ISO)	Occupational Action Levels		Conversion	AEGL-1		PPE (refer to SSHASP and
	motramento	Levels	Safe (Y/N)	"		TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
Gases											
	Multiwarn II IR-Ex sensor	0-100,000+ ppm	Yes			< 19.5% O ₂ (simple asphyxiant) ³	NA		0,/	30 ppm	< 19.5% O ₂ = Level B
Methane	TVA 1000B***	1-50,000 ppm (FID) no response (PID)	Yes								
	MIRAN SapphIRe**	7.5-100 ppm	Yes	12.98 eV	NA			NA	30 ppm		
	AreaRAE	0-100% LEL, 0-30% O ₂ 1-100% LEL, 0-30\$ O ₂	Yes	12.90 e v	IVA			NA	30 ppm		
	Multiwarn II LEL	2.6-75 ppm	Yes								
	Landtec Gas Extraction Monitor (GEM)-500	0-70% to specification 0-100% reading	Yes								
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes			DEL TWA 50 page		I — 1	33 ppm*	>	
Carbon	Dräger Tube	2-300 ppm or higher		14.01 eV		PEL = TWA 50 ppm REL = TWA 35 ppm	1,200 ppm	1 ppm = 1.15 mg/m ³		27 nnm*	www.cdc.gov/niosh/npg/
Monoxide	Dräger Chip	5-150 ppm	No (Yes with option)		INA	TLV = 25 ppm	1,200 ppm	1 ppm = 1.15 mg/m		27 ppm*	npgd0105.html
		0-2,000 or 0-10,000 ppm	Yes			1EV = 25 ppiii					
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
l	MultiRAE/AreaRAE H ₂ S	0-100 ppm	Yes	1	NA V	PEL = 20 ppm C REL = 10 ppm C TLV = 10 ppm	100 ppm	1 ppm = 1.40 mg/m ³	0.36 ppm	Of the last of the	www.cdc.gov/niosh/npg/ npgd0337.html
	Dräger Tube	0.2-6 ppm or higher	No (Yes with option)								
Lludrogon	Dräger Chip SPM	0.2-5 ppm or higher	No (Yes with option)								
Hydrogen Sulfide	Multiwarn II	1.1-30 ppm 0-100 or 0-1,000 ppm	Yes Yes	10.46 eV						0.33 ppm	
Juliue	MultiRAE/AreaRAE	0-2,000 ppm	Yes		3.3 (10.6 lamp)						
		0.5-2,000 ppm (PID)	Yes								
	MultiRAE/AreaRAE SO ₂ sensor	0-20 ppm	Yes				10		- (5/	
	Dräger Pac III	0-100 ppm	Yes							/	
Sulfur		0.1-3 ppm or higher		40.00 14		PEL = 5 ppm				-/	
Dioxide		0.4-10 ppm or higher		12.30 eV	NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	www.cdc.gov/niosh/npg/
	MIRAN SapphIRe**	6-30 ppm	Yes			TLV = 2 ppm					npgd0575.html
	Multiwarn II	0-50 ppm	Yes						2		
	SPM	0.2-6 ppm	No (Yes with option)								
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No	1		10 micro-R/hr					
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA	Level C



Table 7 -- Landfill (Spill, Release, or Fire) (If the landfill is on fire, also refer to Table 6)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with this type of event, only the most common compounds with the lowest action levels.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table. 3 -ACGIH TLV = 1,000 ppm

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound.

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).

***PIDs and FIDs are non-specific detectors and can not differentiate one VOC from another, even with CFs applied.

Acronyms:

< -- less than

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

LEL -- lower explosive level

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

O₂ -- oxygen

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average



Table 8 -- Magnesium Fire

—Instrument Guidance ———— Regulatory Guidance ———— Reference

	•						1108011	atory care			Treference
Target	Instruments	Detection	Intrinsically	ΙP	PID CF (ISO)	Occupational A	Action Levels	Conversion	AE	GL-1	PPE (refer to SSHASP and NIOSH Website)
Compound ¹	monumento	Levels	Safe (Y/N)			TWA	IDLH	Conversion	4-hour	8-hour	
VOCs and Ga	ses										
	UltraRAE-PID***	0.1-2,000 ppm	Yes								
	Dräger Tube	0.5-10 ppm or higher	Yes	1					A \		
	Dräger Chip	0.2-10 ppm or higher	No (Yes with option)	1	NA						
Benzene	Miran SapphIRe**	10-200 ppm	Yes	1		PEL = 1 ppm					
	ppbRAE-PID***	1 ppb-200 ppm	Yes	9.24 eV		REL = 0.1 ppm	500 ppm	1 ppm = 3.19 mg/m^3	18 ppm	9 ppm	www.cdc.gov/niosh/npg npgd0049.html
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		0.53 (10.6 lamp)	TLV = 0.5 ppm				/	ripgu0049.niinii
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Yes	1	10.6 lamp 0.702 (10 ppm) - 1.781 (2,000 ppm)			/ . \			
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes		1.761 (2,000 ppin)	PEL = 50 ppm REL = 35 ppm				27 ppm*	www.cdc.gov/niosh/npg
Carbon		2-300 ppm or higher	Yes		NA			1 ppm = 1.15 mg/m ³	33 ppm*		
Monoxide	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 eV			1,200 ppm				npgd0105.html
Monoxido	Multiwarn II	0-2,000 or 0-10,000 ppm	Yes	1		TLV = 25 ppm				7	inpguo roomum
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
	MultiRAE/AreaRAE H ₂ S		Yes							0 0	
Hydrogen Sulfide	Dräger Tube	0.2-6 ppm or higher								0	
	Dräger Chip	0.2-5 ppm or higher		10.46 eV	NA						
	SPM	1.1-30 ppm	Yes			PEL = 20 ppm C					www.cdc.gov/niosh/npg
	Multiwarn II	0-100 or 0-1,000 ppm	Yes			REL = 10 ppm C TLV = 10 ppm	100 ppm	1 ppm = 1.40 mg/m^3	0.36 ppm	0.33 ppm	npgd0337.html
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		3.3 (10.6 lamp)	1EV = 10 ppm		V			
	TVA 100B***	0.5-2,000 ppm (PID)	Yes		NA						
	MultiRAE/AreaRAE SO ₂ sensor***	0-20 ppm	Yes	<u>/ </u>	/ NA	PEL = 5 ppm REL = 2 ppm TLV = 2 ppm	1 <mark>00 ppm</mark>	1 ppm = 2.62 mg/m ³	0.2 ppm	0.2 ppm	www.cdc.gov/niosh/npg/ npgd0575.html
	Dräger Pac III	0-100 ppm	Yes								
Sulfur	Dräger Tube	0.1-3 ppm or higher	Yes	12.30 eV							
Dioxide		0.4-10 p <mark>pm or higher</mark>	No (Yes with option)	12.30 ev							
	MIRAN SapphIRe**	6-30 ppm	Yes								
	Multiwarn II	0-50 ppm	Yes								
	SPM	0.2-6 ppm	No (Yes with option)							1.1	
Metals (as pa	rticulates)****										
Magnesium	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 15 mg/m ³ REL = NL	750 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
-	DataRAM 4	0.001-400 mg/m ³	No			$TLV = 10 \text{ mg/m}^3$					npgd0374.html
Particulate***	*										
Particulate	Personal 0.001-400 mg/m ³ No	NA	NA	PEL = 5 mg/m ³ (respirable fraction) TLV = 3 mg/m ³	ND	ND	NA	NA	www.cdc.gov/niosh/npg/		
	DataRAM 4	0.001-400 mg/m ³	No			(respirable fraction)		61			пручочоолип
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr		The state of the s			
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA	Level C



Table 8 -- Magnesium Fire

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with magnesium fires, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

²- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound.

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied.

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ND -- non-detect

NIOSH -- National Institute for Occupational Safety and Health

NL -- not listed

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Table 9 -- Mercury (Spill or Release)

-Inst	Instrument Guidance Regulatory Guidance Regulatory										
Instruments	Detection	Intrinsically	ΙΡ	Health Guida	ance Values ¹	Occupational a	Action Levels	Conversion	PPE (active polymorphism)		
IIISHUIIICHIS	Levels	Safe (Y/N)	=	Residential	Commercial	TWA IDLI		Conversion	(refer to SSHASP and NIOSH Website)		
Mercury											
Lumex RA-915	2-50,000 ng/m ³	No	W.	1,000 ng/m³	3,000 ng/m³	PEL = 0.1 mg/m ³		NA	www.cdc.gov/niosh/npg/npgd0115.html		
Jerome 431	1,000-999,000 ng/m ³	No									
Jerome J405	500-999,000 ng/m ³	No	NA			$REL = 0.05 \text{ mg/m}^3 \text{ S}$					
Jerome 471	30-250,000 ng/m ³	No				$TLV = 0.025 \text{ mg/m}^3 \text{ A4}$					
Dräger Tube	0.05-2 ng/m ³	Yes									
Radiation ²											
Ludlum 192	0-5,000 micro-R/hr	No	107	10 micro-R/hr					h- \		
Ludlum 2241-2 with	0-9,999 R/hr or	No	NA	300 cpm	NA	NA	NA	NA	Level C		

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- EPA and ATSDR Health Guidance Values
- 2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

Acronyms:

A4 -- concern that this is a carcinogen, but sufficient data are lacking

AEGL -- acute exposure guidance levels

ATSDR -- Agency for Toxic Substances and Disease Registry

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

IDLH -- immediately dangerous to life and health

IP -- ionization potential

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ng/m³ -- nanograms per cubic meter

NIOSH -- National Institute for Occupational Safety and Health

PPE -- personal protective equipment

R/hr -- Roentgens per hour

S -- skin notation -- can be absorbed through the skin

SSHASP -- site-specific health and safety plan

TWA -- time-weighted average

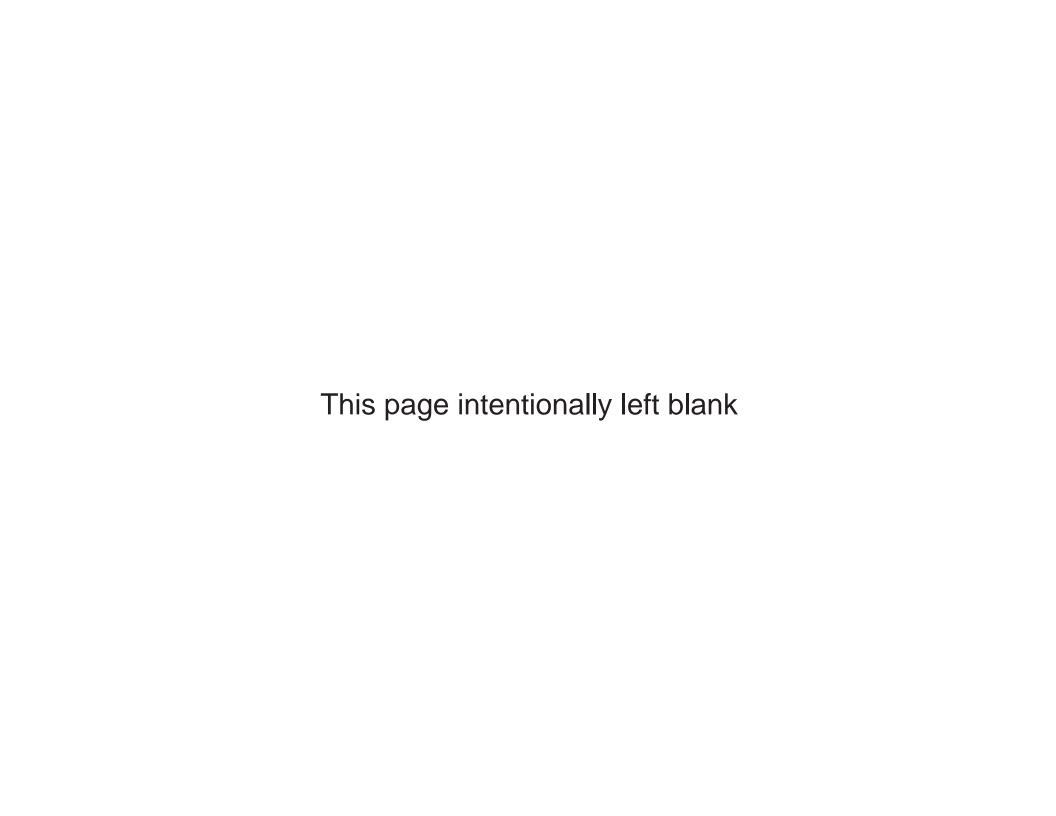




Table 10 -- Oil (Spill, Release, or Fire) Instrument Guidance Regulatory Guidance Reference

		instrainer	it Garaari			regulatory daratice					Treference
Target Compound ¹	Instruments	Detection	Intrinsically Safe (Y/N)	IP	IP & PID CF (ISO)	Occupational Action Levels		Conversion	AE	GL-1	PPE (refer to SSHASP and
	motramonto	Levels		-		TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
VOCs and Ga	ses										
	UltraRAE PID	0.1-2,000 ppm	Yes					1 6 3			
	Dräger Tube	0.5-10 ppm or higher	Yes	1					10		www.cdc.gov/niosh/npg/ npgd0049.html
	Dräger Chip		No (Yes with option))	NA						
_	MIRAN SapphIRe**	10-200 ppm	Yes			PEL = 1 ppm					
Benzene	ppbRAE PID***	1ppb - 200 ppm	Yes	9.24 eV		REL = 0.1 ppm	500 ppm	1 ppm = 3.19 mg/m^3	18 ppm	9 ppm	10
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		0.53 (10.6 lamp)	TLV = 10 ppm	-			1	
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		10.6 lamp 0.702 (10 ppm) 1.781 (2,000 ppm)					1	
	TVA TUUUB	1-50,000 ppm (FID)	163		1.781 (2,000 ppm)					1	
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes				- 1	/ A \	33 ppm*	27 ppm*	www.cdc.gov/niosh/npg/
Carbon	Dräger Tube	2-300 ppm or higher	Yes			PEL = 50 ppm					
Monoxide	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 eV	NA	REL = 35 ppm	1,200 ppm	1 ppm = 1.15 mg/m^3			npgd0105.html
	Multiwarn II	0-2,000 ppm or	Yes			TLV = 25 ppm	7				
		0-10,000 ppm									
	MIRAN SapphIRe**	4.5-250 ppm	Yes		12		1		2.	A 16.	
	MultiRAE/AreaRAE H_2 S sensor	0-100 ppm	Yes						0.36 ppm		www.cdc.gov/niosh/npg/ npgd0337.html
	SPM	1.1-30 ppm or higher	No (Yes with option))	NA	PEL = 20 ppm					
Hydrogen	Multiwarn II	0-100 or 0-1,000 ppm		10.46 eV		REL = 10 ppm	100 ppm	1 ppm = 1.40 mg/m^3		0.33 ppm	
Śulfide	Dräger Tube	0.2-6 ppm of higher	Yes			TLV = 10 ppm	.00 pp	1 ppm = 1.40 mg/m		0.55 ррш	
		0.2-5 ppm or higher	No (Yes with option)								
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		3.3 (10.6 lamp)		1 1/2 1/4			ш	
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		NA						
			163		INA					F 800-1	
	MultiRAE/AreaRAE SO ₂ sensor	0-250 ppm	Yes							5/	
	Dräger Pac III	0-100 ppm	Yes								
0 1/ 0:	Dräger Tube	0.1-3 ppm or higher				PEL = 5 ppm				/	www.cdc.gov/niosh/npg
Sulfur Dioxide	Dräger Chip	0.4-10 ppm or higher		12.30 eV	NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	npgd0575.html
	MIRAN SapphIRe**	6-30 ppm	Yes			TLV = 2 ppm	-	2-3			
	Multiwarn II	0-50 ppm	Yes								
	SPM	0.2-6 ppm	Yes								
PAHs (as part	iculate)****										
PAHs	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 0.2 mg/m ³	750 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg
гипэ	DataRAM 4	0.001-400 mg/m ³	No	INA	147	REL = 0.1 mg/m^3 TLV = 0.2 mg/m^3	. 55	IVA	NA	INA	npgd0374.html
Radiation ²						1 LV = 0.2 mg/m					
Naulaliuli	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr					
Radiation	Ludium 192 Ludlum 2241-2 with	0-9,999 R/hr or	W 7	NA	NA		NA	NA	NΛ	NA	Level C
radiation	Pancake Probe	999,000 cpm	No		14/4	300 cpm	IVA	NA	NA	NA	Level C
	i dilcake i lobe	300,000 opin		1						L	



Table 10 -- Oil (Spill, Release, or Fire)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- Does not include all compounds associated with this type of event, only the most common compounds with the lowest action levels.
- 2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are greater than 100 micro-R/hr or 300 cpm, then further investigation is warranted. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

- *AEGL-2- There are no AEGLs-1 for this compound.
- **MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).
- ***PIDs and FIDs are non-specific detectors and can not differentiate one VOC from another, even with CFs applied.
- ****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PAH -- polyaromatic hydrocarbon

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Table 11 -- Pesticide or Fertilizer Fire

-Instrument Guidance Regulatory Guidance Reference

	-		it Galaali		Acres de la constante de la co		Treference				
Target Compound ¹		Detection	Intrinsically Safe (Y/N)	IP	IP & PID CF (ISO)	Occupational Action Levels		Conversion	AEC	GL-1	PPE (refer to SSHASP and
		Levels				TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
VOCs and Ga	ses										
	UltraRAE Benzene Tube	0.1-2,000 ppm	Yes								
	Dräger Tube	0.5-10 ppm or higher	Yes	1	NA						
	Dräger Chip	0.2-10 ppm or higher	No (Yes with option)	1		PEL = 1 ppm					
Benzene	Miran SapphIRe**	10-200 ppm	Yes	9.24 eV		REL = 0.1 ppm	500 ppm	1 ppm = 3.19 mg/m^3	18 ppm	9 ppm	www.cdc.gov/niosh/npg/
Delizerie	ppbRAE-PID***	1 ppb-200 ppm	Yes	3.24 6 0		• • •	эоо ррпп	1 ppiii = 3.19 mg/m	то ррпп	э ррш	npgd0049.html
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		0.53 (10.6 lamp)	TLV = 0.5 ppm		Λ		1	
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Yes		10.6 lamp 0.702 (10 ppm) - 1.781 (2,000 ppm)					\	
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes					1 ppm = 1.15 mg/m ³	33 ppm*	27 ppm*	www.cdc.gov/niosh/npg/ npgd0105.html
Carbon Monoxide	Dräger Tube	2-300 ppm or higher	Yes	A	NA	PEL = 50 ppm					
	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 eV		REL = 35 ppm	1,200 ppm				
Wiorioxide	Multiwarn II	0-2,000 ppm or 0-10,000 ppm	Yes			TLV = 25 ppm					
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
	MultiRAE/AreaRAE H ₂ S sensor	0-100 ppm	Yes	10.4 <mark>6 e</mark> V					0.36 ppm	2	www.cdc.gov/niosh/npg/ npgd0337.html
	SPM	1.1-30 ppm or higher	No (Yes with option)								
l ly dra a a a	Multiwarn II	0-100 or 0-1,000 ppm	Yes		NA	PEL = 20 ppm C					
Hydrogen Sulfide	Dräger Tube	0.2-6 ppm of higher	Yes		V	REL = 10 ppm C TLV = 10 ppm	100 ppm	1 ppm = 1.40 mg/m ³		0.33 ppm	
Sullide	Dräger Chip	0.2-5 ppm or higher	No (Yes with option)								
	MultiRAE/AreaRAE PID***		Yes		3.3 (10.6 lamp)					R	
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes	ń .	NA						
	MultiRAE/AreaRAE SO ₂ sensor	0-2 <mark>50 ppm</mark>	Yes		2	2(O)h			7	-/	
	Dräger Pac III	0-100 ppm	Yes			PEL = 5 ppm				-/	
Sulfur Dioxide	Dräger Tube	0.1-3 ppm or higher	Yes	12.30 eV	NA NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	www.cdc.gov/niosh/npg/
Sullui Dioxide	Dräger Chip	0.4-10 ppm or <mark>highe</mark> i	No (Yes with option)	12.50 6 V	IVA	TLV = 2 ppm	тоо ррш	1 ppiii = 2.02 iiig/iii	0.2 ppm	0.2 μμπ	npgd0575.html
	MIRAN SapphIRe**	6-30 ppm	Yes			TEV = 2 ppiii				1	
	Multiwarn II	0-50 ppm	Yes								
	SPM	0.2-6 ppm	Yes						~ ~ /		
1	Dräger Tube	0.02-15 ppm	Yes	7.0							
	Dräger Chip	0.05-2 ppm	No (Yes with option)		NA	PEL = 0.1 ppm		/ A. 1			
Phosgene	MIRAN SapphIRe**	0.05 ppm	Yes	11.2 eV	14/	REL = 0.1 ppm	2 ppm	$1 \text{ ppm} = 4 \text{ mg/m}^3$	NA	NA	www.cdc.gov/niosh/npg/
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes			TLV = 0.1 ppm	1 1	11			npgd0504.html
	MultiRAE/AreaRAE PID***	0.02-15 ppm	Yes		5.2 (10.6 lamp)			0			
Methyl Bromide	Dräger Tube	0.5-30 ppm or highei	Yes	10.54 eV	NA	PEL = 20 ppm C REL = NL TLV = 1 ppm	250 ppm	1 ppm = 3.89 mg/m ³	NA	NA	www.cdc.gov/niosh/npg/ npgd0400.html



Table 11 -- Pesticide or Fertilizer Fire Instrument Guidance Regulatory Guidance

¬ Reference

AL PROTECT		instruinci	it Guidaii			regulatory durdance					TRETETETE
Target Compound ¹	Instruments	Detection	Intrinsically	IP	PID CF (ISO)	Occupational Action Levels		Conversion	AEC	GL-1	PPE
		Levels	Safe (Y/N)	"		TWA	IDLH	Conversion	4-hour	8-hour	(refer to SSHASP and NIOSH Website)
Pesticides an	d Fertilizers										
Phosphorus	Personal DataRAM****	0.001-400 mg/m ³	No			$PEL = 0.1 \text{ mg/m}^3$		11/11/11			www.cdc.gov/niosh/npg/
(Yellow) ³	DataRAM 4****	0.5-15 ppm or highe		NA	NA	$REL = 0.1 \text{ mg/m}^3$	5 mg/m ³	NA	NA	NA	npgd0507.html
(1011011)	AP2Ce****	0-100 ppm	Yes			$TLV = 0.1 \text{ mg/m}^3$				k-	ripgaooo7.html
Phosphorus	Personal DataRAM****	0.001-400 mg/m ³	No	NA	NA	$PEL = 1 \text{ mg/m}^3$ $REL = 3 \text{ mg/m}^3$	250 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
Pentoxide	DataRAM 4****	0.001-400 mg/m ³	No]		ACGIH TLV = 1 mg/m ³				V	npgd0510.html
	MultiRae/AreaRAE PH ₃ sensor	0-5 ppm	Yes						N 1/2	6 /	
	ToxiRAE	0-5 ppm	Yes	1				/ A \		A	
	Dräger Pac III	0-10 ppm	Yes	1		PEL = 0.3 ppm				1	. , , , , ,
Phosphine	Dräger Tube	0.1-1 ppm or higher	Yes	9.96 eV	NA	REL = 0.3ppm; ST 1 ppm ACGIH TLV = 0.3 ppm	50 ppm	1 ppm = 1.39 mg/m ³	0.5 ppm*	0.25 ppm*	www.cdc.gov/niosh/npg/
'	Dräger Chip	0.1-2.5 ppm or higher	No (Yes with option))					о.о ррпп	>\	npgd0505.html
	Multiwarn II	0-10 or 0-1,000 ppm	Yes	1							
	GFG Inc. Mico IV PH ₃	0-10 ppm	Yes	4							
	SPM	32-900 ppb	No (yes with option)								
Nitrogen	MultiRAE/AreaRAE NO ₂ sensor	0-20 ppm	Yes			PEL = 5 ppm C		1 ppm = 2.62 mg/m ³	0.5 ppm	0.5 ppm	www.cdc.gov/niosh/npg npgd0454.html
Dioxide	Dräger Pac III	0-100 ppm	Yes	12.30 eV	/ NA	REL = 1 ppm STEL	100 ppm				
Dioxido	Dräger Chip		No (Yes with option))		TLV = 3 ppm					
	Multiwarn II	0-50 ppm	Yes							-0.00	
	MultiRAE/AreaRAE NO sensor	0-2,000 ppm	Yes	12.30 eV		DEL 25 777		1 ppm = 1.23 mg/m ³	NA		www.cdc.gov/niosh/npg/
Nitric Oxide	Dräger Pac III	0-100 ppm	Yes		NA	PEL = 25 ppm REL = 25 ppm	100 ppm			NA	npgd0448.html
	Dräger Chip	0.5-15 ppm or higher	No (Yes with option)			TLV = 25 ppm					
	Multiwarn II	0-100 ppm	Yes								
Metals (as pa	rticulates)										
Lead	Personal DataRAM****	0.001-400 mg/m ³	No	7.41 eV	NIA	PEL = 0.05 mg/m ³	100 mg/m ³	NA	NIA	NA	www.cdc.gov/niosh/npg
Leau	DataRAM 4****	0.001-400 mg/m ³	No	7.41 eV	NA	REL = 0.05 mg/m^3 TLV = 0.05 mg/m^3	100 mg/m²	INA	NA	INA	npgd0368.html
Cadmium	Personal DataRAM****	0.001-400 mg/m ³	No	8.99 eV	NA	PEL = 0.005 mg/m ³ REL = NL	0.727/223	NA	NA.	7/	www.cdc.gov/niosh/npg/ npgd0087.html
Cadillidill	DataRAM 4****	0.001-400 mg/m ³	No	0.99 eV	INA	TLV = 0.002 mg/m ³ (respirable fraction)	9 mg/m³	NA	NA	NA	
Arsenic	Personal DataRAM****	0.001-400 mg/m ³	No	NA	NA	$PEL = 0.01 \text{ mg/m}^3$ $REL = 0.002 \text{ mg/m}^3$	5 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
(inorganic compounds)	DataRAM 4****	0.001-400 mg/m ³	No			$TLV = 0.01 \text{ mg/m}^3$	- 3		~ ~ /		npgd0038.html
Arsenic (organic compounds)	Dräger Tube	0-3 mg organic arsenic/m ³	Yes	NA	NA	PEL = 0.01 mg/m^3 REL = 0.002 mg/m^3 TLV = 0.01 mg/m^3	5 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0039.html
Mercury	Refer to Table	9 Mercury F	Response			1 LV = 0.01 Hig/III					
Particulate***			Соролов								
Particulate	Personal					PEL = 5 mg/m ³				ı	1
Particulate	DataRAM	0.001-400 mg/m ³	No	NA	NA	(respirable fraction) TLV = 3 mg/m ³	ND	ND	NA	NA	www.cdc.gov/niosh/npg/ npgd0480.html
	DataRAM 4	0.001-400 mg/m ³	No			(respirable fraction)					пручотоолип
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr					
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA	Level C



Table 11 -- Pesticide or Fertilizer Fire

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- Does not include all compounds associated with pesticide/fertilizer fire responses, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.
- 2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.
- 3- Emits irritating oxides of phosphorus, may re-ignite upon exposure to air.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to reseatch AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another

*****APD2Ce units are specilized versions of the APD2C that are designed to be used in an explosive environment

Acronyms:

µg/m³ -- micrograms per cubic meter

ACGIH -- American Conference of Industrial Hygienists

AEGL -- Acute Exposure Guideline Levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

IDLH -- Immediately Dangerous to Life and Health

IP -- ionization potential

ISO -- isobutylene

m3 -- cubic meter

mg -- milligram

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ND -- non-detect

NIOSH -- National Institute for Occupational Safety and Health

NL -- not listed

OSHA -- Occupational Safety and Health Administration

PEL -- Permissible Exposure Limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- Recommended Exposure Limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- Single-Point Monitor

SSHASP -- site-specific health and safety plan

ST -- short-term

STEL -- Short-Term Exposure Limit

TLV -- Time-Limited Value (ACGIH)

TWA -- Time-Weighted Average

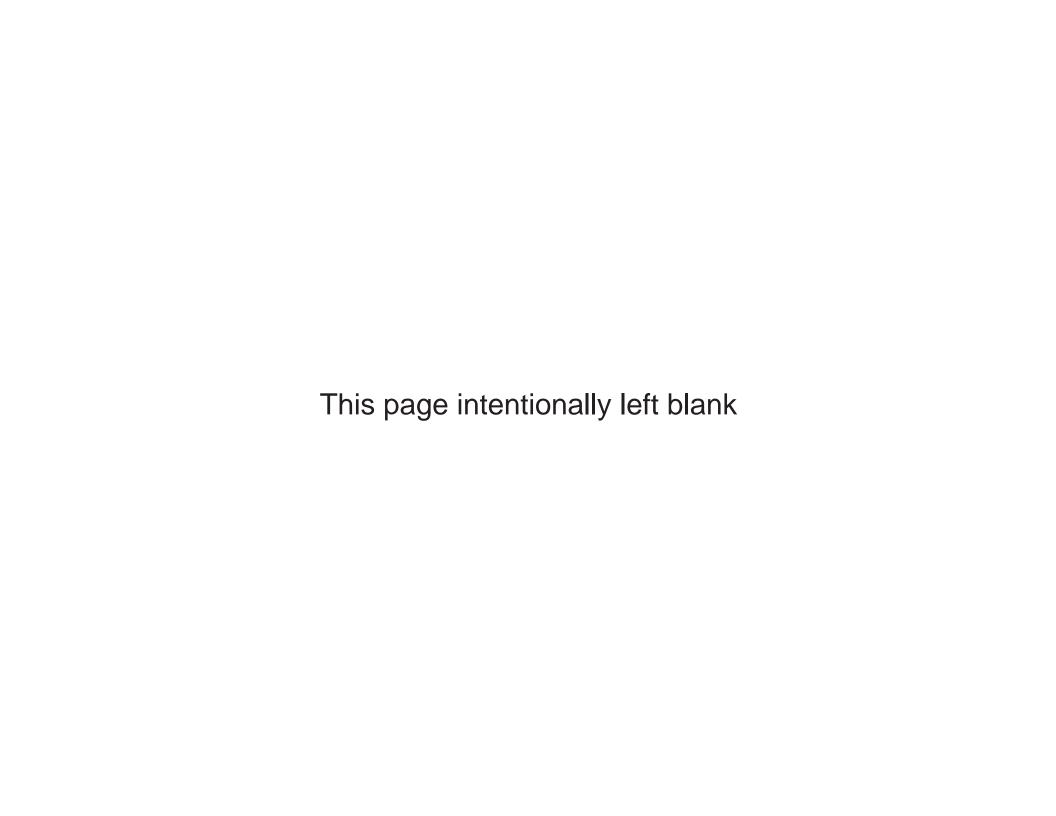




Table 12 -- Phosphorus (Spill, Release, or Fire) Instrument Guidance Regulatory Guidance Reference

				-			0	J			
Target	Instruments	Detection	Intrinsically	IP	PID CF	Occupational A	action Levels	Conversion	AEC	GL-1	PPE
Compound ¹	IIISHUIIIEIKS	Levels	Safe (Y/N)	"	(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	refer to SSHASP and NIOSH Website)
Phosphorus	Compounds an	d Gases									
	Personal DataRAM****	0.001-400 mg/m ³	No					1 6 4			
Phosphorus	DataRAM 4****	0.001-400 mg/m ³	No	1		$PEL = 0.1 \text{ mg/m}^3$					
(Yellow) ³	AP2Ce/AP4C	>1.5 ppb for G agents >60 ppb for HG agents >2µg/cm2 for VX	Yes	NA	NA	REL = 0.1 mg/m ³ TLV = 0.1 mg/m ³	5 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg. npgd0507.html
Phosphorus	Personal DataRAM***	0.001-400 mg/m ³	No	NA	NA	PEL = 1 mg/m ³ REL = 3 mg/m ³	250 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
Pentoxide	DataRAM 4****	0.001-400 mg/m ³	No	1 ''``	101	ACGIH TLV = 1 mg/m ³	200g/	1	- A		npgd0510.html
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes					/ / /			
	Dräger Tube	2-300 ppm or higher								A	
Carbon	Dräger Chip	5-150 ppm	No (Yes with option)			PEL = 50 ppm			07 4	www.cdc.gov/niosh/npg/	
Monoxide	Multiwarn II	0-2,000 ppm or 0-10,000 ppm	Yes	14.01 eV	NA NA	REL = 35 ppm TLV = 25 ppm	1,200 ppm	1 ppm = 1.15 mg/m ³	33 ppm*	27 ppm*	npgd0105.html
	ToxiRAE CO	0-500 ppm or higher	Yes								
	GFG Inc. Micro IV	0-2,000 ppm	Yes	4						0 0 1	
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
	MultiRAE/AreaRAE H ₂ S		Yes								
	Dräger Tube	0.2-6 ppm or higher	Yes	1						0.33 ppm	www.cdc.gov/niosh/npg/
	Dräger Chip		No (Yes with option)		NA						
Hydrogen Sulfide	SPM Multiwarn II	1.1-30 ppm	No (Yes with option)	10.46 eV	,	PEL = 20 ppm C	100 ppm	4 4 40 / 3	0.36 ppm		
Sulfide	MultiRAE/AreaRAE	0-100 or 0-1,000 ppm 0-2,000 ppm	Yes Yes	10.46 eV	3.3 (10.6 lamp)	REL = 10 ppm C TLV = 10 ppm	тоо ррш	1 ppm = 1.40 mg/m ³	о.зо ррпі	0.33 ррш	npgd0337.html
	ToxiRAE II H ₂ S	0-100 ppm	Yes								
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		NA						
	MultiRAE/AreaRAE SO ₂ sensor		Yes	l ji	0		10			5/	
	Dräger Pac III	0-100 ppm	Yes	1						/	
Sulfur	Dräger Tube	0.1-3 ppm or higher	Yes			PEL = 5 ppm				F /	
Dioxide	Dräger Chip	0.4-10 ppm o <mark>r higher</mark>	No (Yes with option)	12.30 eV	NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	www.cdc.gov/niosh/npg/ npgd0575.html
Dioxide	MIRAN SapphIRe **	6-30 ppm	Yes			TLV = 2 ppm					npguo575.html
	ToxiRAE II SO ₂	0-20 ppm	Yes				A			/	
	Multiwarn II	0-50 ppm	Yes								
	SPM	0.2-6 ppm	No (Yes with option)						_ 7/		
Particulate***	~										
Particulate	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 5 mg/m ³ (respirable fraction) TLV = 3 mg/m ³	ND	ND	NA	NA	www.cdc.gov/niosh/npg/ npgd0480.html
	DataRAM 4	0.001-400 mg/m ³	No			(respirable fraction)					пручочнин
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr	- N -	Val. 1			
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA	Level C



Table 12 -- Phosphorus (Spill, Release, or Fire)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with phosphorus responses, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

3- Emits irritating oxides of phosphorus, may re-ignite upon exposure to air.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound.

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied.

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

> -- greater than

µg/cm² -- micrograms per square centimeter

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hvdrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

ND -- non-detect

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Table 13 -- Tire Fire -Instrument Guidance Regulatory Guidance Reference

				440	Daniel Co.		Treference				
Target	Instruments	Detection	Intrinsically	IP	PID CF	Occupational A	Action Levels Conversion		AEGL-1		PPE
Compound ¹	monumento	Levels	Safe (Y/N)	"	(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	(refer to SSHASP and NIOSH Website)
VOCs and Ga	ses										
	UltraRAE with	0.1-2,000 ppm	Yes								
	Benzene Tube			_							
	Dräger Tube	0.5-10 ppm or higher		4	NA					\	
	Dräger Chip		No (Yes with option)	1		PEL = 1 ppm					ununu ada gay/biaah/bbg/
Benzene	MIRAN SapphIRe** ppbRAE PID***	10-200 ppm	Yes	9.24 eV		REL = 0.1 ppm	500 ppm	1 ppm = 3.19 mg/m^3	18 ppm	9 ppm	www.cdc.gov/niosh/npg/ npgd0049.html
	MultiRAE/AreaRAE	1ppb - 200 ppm	Yes		0.53 (10.6 lamp)	TLV = 10 ppm				1	npgu0049.niini
	PID***	0-2,000 ppm	Yes		0.55 (10.5 lamp)					1	
		0.5-2,000 ppm (PID)	V	1	10.6 lamp					\ \	
	/	1-50,000 ppm (FID)	Yes		0.702 (10 ppm) - 1.781 (2,000 ppm)			/ A \		\ \	
	MultiRAE/AreaRAE		Ver								
	CO sensor	0-500 ppm	Yes							_ \	
		2-300 ppm or higher	Yes	A		PEL = 50 ppm					
Carbon	Dräger Chip	5-150 ppm	No (Yes with option)	14.01 eV	NA NA	REL = 135ppm	1,200 ppm	1 nnm - 1 15 mg/m ³	33 ppm*	27 ppm*	www.cdc.gov/niosh/npg/
Monoxide	Multiwarn II	0-2,000 or 0-10,000 ppm	Yes	101 0	1471	TLV = 25 ppm	1,200 ppiii	1 ppm = 1.15 mg/m^3	оо ррш	Zi ppiii	npgd0105.html
	ToxiRAE II CO	0-500 ppm or higher		4		1 LV = 25 ppiii				()	
	GFG Inc. Micro IV	0-2,000 ppm	Yes	-							
	MIRAN SapphIRe**	4.5-250 ppm	Yes								
-	MultiRAE/AreaRAE H ₂ S sensor	0-100 ppm	Yes								
	Dräger Tube	0.2-6 ppm or higher		7-15						0.33 ppm	www.cdc.gov/niosh/npg/ npgd0337.html
	Dräger Chip		No (Yes with option)		NA NA			1 ppm = 1.40 mg/m ³	0.36 ppm		
l	SPM	1.1-30 ppm	No (Yes with option)			PEL = 20 ppm REL = 10 ppm	100 ppm				
Hydrogen Sulfide	Multiwarn II	0-100 ppm or 0-1,000 ppm	Yes								
	ToxiRAE H ₂ S	0-100 ppm	Yes	1		TLV = 10 ppm				187	
	GFG Inc. Micro IV	0-500 ppm	Yes								
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes		3.3 (10.6 lamp)					=/	
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes		NA						
	MultiRAE/AreaRAE SO ₂ sensor	0-20 ppm	Yes						7.	1/	
	Dräger Pac III	0-100 ppm	Yes	- 4							
	Dräger Tube	0.1-3 ppm or higher	Yes			DEL Ennm					
Sulfur	Dräger Chip	0.4-10 ppm or higher	No (Yes with option)	12 30 4	NA	PEL = 5 ppm REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	www.cdc.gov/niosh/npg/
Dioxide	MIRAN SapphIRe**	6-30 ppm	Yes	12.50 6 V	IVA	ACGIH TLV = 2 ppm	тоо ррпп	1 ppm = 2.62 mg/m	0.2 ррпп	0.2 ppiii	npgd0575.html
	ToxiRAE II SO ₂	0-20 ppm	Yes			7.00m TEV = 2 ppm					
	GFG Inc Micro IV	1-10 ppm	Yes								
	Multiwarn II	0-50 ppm	Yes					_ /			
DAIL (SPM	0.2-6 ppm	No (Yes with option)					P 30 7			
PAHs (as part	iculate)****										
PAHs	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 0.2 mg/m ³	750 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
1 / 11 13	DataRAM 4	0.001-400 mg/m ³	No	11/7	14/1	REL = 0.1 mg/m^3 TLV = 0.2 mg/m^3	. 55 mg/m	IVA	INA	INA	npgd0374.html



Table 13 -- Tire Fire

<u>—</u>]	İnstrumer	nt Guidan	ce-		Regula	- Regulatory Guidance			
. 4 -	Detection	Intrinsically	Ē	PID CF	Occupational Action Levels	C	AEGL-1	PPE	

Target	Instruments	Detection	Intrinsically	ΙΡ	PID CF	Occupational A	Conversion	AEC	GL-1	PPE (refer to SSHASP and	
Compound ¹	motrumonto	Levels	Safe (Y/N)		(ISO)	TWA	IDLH	001170131011	4-hour	8-hour	NIOSH Website)
Metals (as pa	Metals (as particulate)****										
Lead	Personal DataRAM DataRAM 4	0.001-400 mg/m ³ 0.001-400 mg/m ³	No No	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/ npgd0368.html
Particulate***	**										
Particulate	Personal DataRAM	0.001-400 mg/m ³	No	NA	NA	PEL = 5 mg/m ³ (respirable fraction)	NA	NIA	NA	NA	www.cdc.gov/niosh/npg/
Tarticulate	DataRAM 4	0.001-400 mg/m ³	No	INA	ĵ	TLV = 3 mg/m ³ (respirable fraction)	IVA	NA	INA	IVA	npgd0480.html
Radiation ²											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr		/ A 1		\ \	
Radiation L	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA	Level C

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with tire fires, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound.

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor).

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied.

Acronyms:

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

^{****}Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.



Table 14 -- Wood-Treating Facility (Spill or Release) Instrument Guidance Regulatory Guidance Reference

instrument datatiee						Reference				
Target	Instruments	Detection	Intrinsically	ΙP	Occupational A	ction Levels	Conversion	AEC	GL-1	PPE (refer to SSHASP and
Compound ¹	motramento	Levels	Safe (Y/N)	"	TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
Acids										
	Dräger Tube	1-10 ppm or higher	Yes					6.3		
ı	Dräger Chip		No (Yes with option)		PEL = 5 ppm C					
Hydrochloric	pH Paper	NA	Yes	12.74.0	REL = 5 ppm	50 nnm	1 222 1 40 22/23	4.0	4.0	www.cdc.gov/niosh/npg/
Acid	SPM	0.5-15 ppm	No (Yes with option)	12.74 eV	TEV = 3 ppin 0	50 ppm	1 ppm = 1.49 mg/m^3	1.8 ppm	1.8 ppm	npgd0332.html
[Drager Pac III	0-30 ppm	Yes		ACGIH TLV = 2 ppm					
	GFG Inc. Micro IV	0-30 ppm	Yes						1	
	Dräger Tube	1-50 ppm or higher	Yes		PEL = 2 ppm				la alla	www.odo.gov/pioch/ppg/
Nitric Acid	pH Paper	NA	Yes	11.95 eV	REL = 2 ppm	25 ppm	1 ppm = 2.58 mg/m^3	0.53 ppm	0.53 ppm	www.cdc.gov/niosh/npg/ npgd0447.html
	SPM	0.2-6 ppm	No (Yes with option)		TLV = 2 ppm			1		npgu0447.ntm
Sulfuric	Dräger Tube	1-5 mg/m ³ (mist)	Yes		PEL = 1 mg/m ³			A. 1		www.cdc.gov/niosh/npg/
Acid	pH Paper	NA	Yes	12.40 eV	$REL = 1 \text{ mg/m}^3$ $TLV = 1 \text{ mg/m}^3$	15 mg/m ³	NA	0.2 mg/m ³	0.2 mg/m ³	npgd0577.html
71010	SPM	26-750 ppb	No (Yes with option)		ACGIH TLV = 0.2 mg/m ³					npgdos77.html
	Dräger Tube	2-30 ppm	Yes	1					The state of the s	
Hydrocyanic	Dräger Chip	2-50 ppm	No (Yes with option)	2						
Acid	pH Paper	NA	Yes		PEL = 10 ppm					
8	ToxiRAE II HCN	0-100 ppm	Yes	13.60 eV	REL = ST 4.7 ppm	50 ppm	1 ppm = 1.10 mg/m^3	1.3 ppm	1 ppm	www.cdc.gov/niosh/npg/
Hydrogen	SPM	1.1-30 ppm	No (Yes with option)	4	TLV = 4.7 ppm C					npgd0333.html
Cyanide -	Multiwarn II	0-50 ppm	Yes	-						
l 'L	Dräger Pac III	0-50 ppm	Yes	4						
	GFG Inc. Micro IV	0-50 ppm	Yes							2
Metals (as part	ticulate)									
Arsenic	Personal	0.001-400 mg/m ³	No	7 / 1	$PEL = 0.01 \text{ mg/m}^3$			V/		www.cdc.gov/niosh/npg/
(inorganic	DataRAM*	e.cor roomg/m	110	9.81 eV	$REL = 0.002 \text{ mg/m}^3$	5 mg/m ³	NA	NA	NA	npgd0038.html
components)	Data RAM 4*	0.001-400 mg/m ³	No		$TLV = 0.01 \text{ mg/m}^3$					правосовини
Arsenic	1 100	0.2 mg organia			$PEL = 0.01 \text{ mg/m}^3$, at 1	www.cdc.gov/niosh/npg/
(organic	Dräger Tube	0-3 mg organic arsenic/m ³	Yes	NA	$REL = 0.002 \text{ mg/m}^3$	5 mg/m ³	NA	NA	NA	npgd0039.html
components)	1.0	arsemo/m			$TLV = 0.01 \text{ mg/m}^3$					npguooss.num
- F	Personal DataRAM*	0.001-400 mg/m ³	No		PEL = 1 mg/m ³				1	www.cdc.gov/niosh/npg/
Copper ⁻	DataRAM 4*	0.001-400 mg/m ³	No	NA	$REL = 1 \frac{\text{mg/m}^3}{\text{TLV}} = 1 \frac{\text{mg/m}^3}{\text{mg/m}^3}$	100 mg/m ³	NA	NA	NA	npgd0150.html
Hexavalent F	Personal DataRAM*	0.001-400 mg/m ³	No	NIA	PEL = 0.005 mg/m ³ A1	4.5 mm m/mm 3				www.cdc.gov/niosh/npg/
Chromium	DataRAM 4*	0.001-400 mg/m ³	No	NA	REL = $0.001 \text{ mg/m}^3 \text{ A1}$ TLV = $0.01 \text{ mg/m}^3 \text{ A1}$	15 mg/m ³	NA	NA	NA	npgd0138.html
	Personal DataRAM*	0.001-400 mg/m ³	No	NIA	$PEL = 0.05 \text{ mg/m}^3$	400/3	/ Ac	214	110	www.cdc.gov/niosh/npg/
Leau	DataRAM 4*	0.001-400 mg/m ³	No	NA	REL = 0.05 mg/m^3 TLV = 0.05 mg/m^3	100 mg/m ³	NA	NA	NA	npgd0368.html
PAHs (as parti	iculate)*				12V = 0.00 mg/m					
TAIIS (as parti	cuiate)				DEL 0.0 / 3					
PAHs ³	Personal DataRAM	0.001-400 mg/m ³	No	NA	$PEL = 0.2 \text{ mg/m}^3$	750 mg/m ³	NA	NA	NA	www.cdc.gov/niosh/npg/
17(13)	DataRAM 4	0.001-400 mg/m ³	No	1 11/1	REL = 0.1 mg/m ³	700 mg/m	INA	INA	INA	npgd0374.html
	Data to tivi 1	0.001 400 mg/m	140		$TLV = 0.2 \text{ mg/m}^3$			-	1	
Particulate*										
	Personal DataRAM	0.001-400 mg/m ³	No	A	PEL = 5 mg/m ³ (respirable fraction)			10		www.cdc.gov/niosh/npg/
Particulate -	DataRAM 4	0.001-400 mg/m ³		NA	(respirable fraction) TLV = 3 mg/m ³	NA	NA	NA	NA	npgd0480.html
	DataKAIVI 4	0.001-400 mg/m°	No		(respirable fraction)					
Radiation ²										
	Ludlum 192	0-5,000 micro-R/hr	No		10 micro-R/hr					
Radiation I	Ludlum 2241-2 with	0-9,999 R/hr or	No	NA		NA	NA	NA	NA	Level C
Nauidillii li	Laalaiii LL III L Willia				300 cpm			1 1/ 1	14/1	



Table 14 -- Wood-Treating Facility (Spill or Release)

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with a wood treating facility response, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

3- PAHs = Coal Tar Pitch Volatiles

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

µg/m³ -- micrograms per cubic meter

A1 -- carginogenic effects

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

m³ -- cubic meter

mg -- milligram

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PAH -- polyaromatic hydrocarbon

PEL -- permissible exposure limit (OSHA)

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Table 15 -- Volcano

Instrument Guidance Regulatory Guidance Reference

	•			-			riegan	atory Gara			Therefore
Target	Instruments	Detection	Intrinsically	IP	PID CF	Occupational A	action Levels	Conversion	AEC	GL-1	PPE
Compound ¹	monuments	Levels	Safe (Y/N)	"	(ISO)	TWA	IDLH	Conversion	4-hour	8-hour	(refer to SSHASP and NIOSH Website)
VOCs and Ga	ases										
	MultiRAE/AreaRAE CO sensor	0-500 ppm	Yes					1			
	Dräger Tube	2-300 ppm or higher	Yes	1					100	33 ppm* 27 ppm*	
Carbon	Dräger Chip	5-150 ppm	No (Yes with option)		NA	PEL = 50 ppm					www.cdc.gov/niosh/npg
Monoxide	Multiwarn II	0-2,000 or 0-10,000 ppm	Yes	14.01 eV		REL = 35 ppm	1,200 ppm	1 ppm = 1.15 mg/m^3	33 ppm*		npgd0105.html
	ToxiRAE II CO	0-500 ppm oh highei	Yes	Yes TLV = 25 ppm			1				
	GFG Inc Micro IV	0-2,000 ppm	Yes]						1	
	MIRAN SapphIRe**	4.5-250 ppm	Yes							1	
	Dräger Pac III	0-5% vol.	Yes	Ì				7 A V		100	
Carbon	Dräger Tube	2-12% vol.	Yes	1		PEL = 5,000 ppm		/ A 1		Α.	
Dioxide	Dräger Chip	200-25,000 ppm	No (Yes with option)	13.77 eV	NA	REL = 5,000 ppm	40,000 ppm	$1 \text{ ppm} = 1.80 \text{ mg/m}^3$	NA	NA	www.cdc.gov/niosh/np
Dioxide	Multiwarn II	0-5% vol.	Yes			TLV = 5,000 ppm					npgd0103.html
	MIRAN SapphIRe**	7.5-2,000 ppm		- N							
	MultiRAE/AreaRAE H ₂ S		Yes	1							
	Dräger Tube		No (Yes with option)								
	Dräger Chip		No (Yes with option)		7				= 1.40 mg/m ³ 0.36 ppm 0.33 ppm	251	
	SPM	1.1-30 ppm	Yes		NA					(D1	
Hydrogen	Multiwarn II	0-100 or 0-1,000 ppm	Yes	10.46 eV		PEL = 20 ppm				0.33 ppm	www.cdc.gov/niosh/npg/ npgd0337.html
Sulfide	ToxiRAE H ₂ S	0-100 ppm	Yes			REL = 10 ppm	100 ppm 1 ppm = 1.40	1 ppm = 1.40 mg/m^3			
(GFG Inc Micro IV	0-500 ppm	Yes			TLV = 10 ppm					
	MultiRAE/AreaRAE PID***	0-2,000 ppm	Yes	/=W	3.3 (10.6 lamp)						
	TVA 1000B***	0.5-2,000 ppm (PID)	Yes	7.7	NA						
	MultiRAE/AreaRAE SO ₂ sensor	0-20 ppm	Yes	A.J.			INK	<i>y</i> []			
	Dräger Pac III	0-100 ppm	Yes							P. Drove /	
	Dräger Tube	0.1-3 ppm or higher	Yes		160					")/	
Sulfur	Dräger Chip		No (Yes with option)			PEL = 5 ppm					www.cdc.gov/niosh/npg
Dioxide	MIRAN SapphIRe**	6-30 ppm	Yes	12.30 eV	NA	REL = 2 ppm	100 ppm	1 ppm = 2.62 mg/m^3	0.2 ppm	0.2 ppm	npgd0575.html
	Multiwarn II	0-50 ppm	Yes			TLV = 2 ppm				-/	13
	ToxiRAE SO ₂	0-20 ppm	Yes							. /	
	GFG Inc Micro IV	1-10 ppm	Yes							1	
	SPM	0.2-6 ppm	No (Yes with option)								
Particulate***	**										
Particulate	Personal DataRAM	0.001-400 mg/m ³	No	NA	NIA	PEL = 5 mg/m ³ (respirable fraction)	NA		37		www.cdc.gov/niosh/npg
raniculate	DataRAM 4	0.001-400 mg/m ³	No	INA	NA	(respirable fraction) TLV = 3 mg/m ³ (respirable fraction)	NA	NA	NA	NA	npgd0480.html
Radiation ²						,					
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr		P 10 1	7		
Radiation	Ludlum 2241-2 with	0-9,999 R/hr or	- AT	NA	NA		NA	NA	NA	NA	Level C
	Pancake Probe	999,000 cpm	No			300 cpm	سيا السي	The same of	14/7	INA	Level C



Table 15 -- Volcano

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

1- Does not include all compounds associated with volcanoes, only the most common compounds with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

2- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*AEGL-2- There are no AEGLs-1 for this compound

**MIRAN SapphIRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied

****Personal DataRAMs and DataRAMs are non-specific detectors and cannot differentiate one particulate from another

Acronyms:

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

H₂S -- hydrogen sulfide

HCN -- hydrocyanic acid

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SO₂ -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

Table 16 -- Chemical Warfare Agents Instrument Guidance Regulatory Guidance Reference

		TIDEI GITTOTI				regulatory Gardanee					rtererenee
Target	Instruments	Detection	Intrinsically	IP ²	IP & PID CF	Occupational A	- Conversion		AEGL-1		PPE (refer to SSHASP and
Compound ¹		Levels	Safe (Y/N)		$(ISO)^2$	TWA	IDLH		4-hour	8-hour	NIOSH Website)
Nerve											
	APD 2000	15 ppb	No								
1	AP2C ³	1.5 ppb	No	1							
	AP4C	10 μg/m ³	No	1		PEL = 0.0001 mg/m ³					
	SAW Mini-CAD	0.17 ppm	No			U-STEL = 0.00001 mg/m ³					
	HAPSITE	0.1 - 10 ppb	No			WPL = 0.00003 mg/m ³	0.02.000		0.00004	0.00045	
Tabun (GA)	M256 A-1	0.001 ppm	Yes			C-STEL = 0.0001 mg/m ³	0.03 ppm U = 0.1 mg/m^3	1 ppm = 6.6 mg/m^3	0.00021 ppm	0.00015 ppm	Level A
\	Dräger CDS Tubes	0.025 ppm	Yes	1		WPL = 0.00003 mg/m ³	0 = 0.1 mg/m ³		(0.0014 mg/m ³)	(0.001 mg/m ³)	
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes		0.8 (10.6 lamp)	GPL = 0.000001 mg/m ³					
		0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	unknown	NA						
	APD 2000	15 ppb	No	İ							
	AP2C ³	1.5 ppb	No	1		PEL = 0.0001 mg/m ³					
	AP4C	10 μg/m ³	No	1		U-STEL - 0.0001 mg/m ³				\	
	SAW Mini-CAD	0.17 ppm	No			WPL = 0.00003 mg/m^3					
	HAPSITE	0.1 - 10 ppb	No	1		C-STEL = 0.0001 mg/m^3	0.00		0.00004	0.00047	
Sarin (GB)	M256 A-1	0.0008 ppm	Yes	1		WPL = 0.00003 mg/m^3	0.03 ppm	1 ppm = 5.7 mg/m^3			Level A
· · ·	Dräger CDS Tubes	0.025 ppm	Yes	1		$GPL = 0.000001 \text{ mg/m}^3$	$U = 0.1 \text{ mg/m}^3$		0.00024 ppm (0.0014 mg/m³)	(0.001 mg/m ³)	
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes	<16 eV	3-6 (10.6 lamp)	A-TWA = 0.00003 mg/m^3					
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	<10.64	NA						
	APD 2000	15 ppb	No								
	AP2C ³	1.5 ppb	No								
	AP4C	10 μg/m ³	No								
	SAW Mini-CAD	0.02 ppm	No			PEL = 0.0003 mg/m ³					
	HAPSITE	0.1 - 10 ppb	No			U-STEL - 0.001 mg/m ³	0.05 mg/m ³		0.000004	0.00005	
Soman (GD)	M256 A-1	0.001 ppm	Yes			WPL = 0.00003 mg/m ³	or	1 ppm = 7.5 mg/m^3			Level A
` '	Dräger CDS Tubes	0.025 ppm	Yes			GPL = 0.000001 mg/m^3 A-TWA = 0.00003 mg/m^3	0.008 ppm		(0.0007 mg/m²)	(0.0005 mg/m²)	
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes	40.00 -1/	~3 (10.6 lamp)	A-1 WA = 0.00003 mg/m²					
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	<10.60 eV	NA						
	APD 2000	15 ppb	No								
	AP2C ³	1.5 ppb	No	1							
	AP4C	10 μg/m ³	No	1							
	SAW Mini-CAD	0.01 ppm	No	1		PEL = 0.003 mg/m ³					
Cycle Serie	HAPSITE	0.1 - 10 ppb	No	1		U-STEL = 0.001 mg/m ³			(0.0014 mg/m³) (0.001 mg/m³) 0.000091 ppm (0.00065 ppm (0.0007 mg/m³) Level A 0.0001 ppm (0.0007 ppm		
Cyclo-Sarin (GF)	M256 A-1	0.002 ppm	Yes	1		WPL = 0.00003 mg/m ³	0.05 mg/m ³	1 ppm = 7.3 mg/m^3			Level A
(GF)	Dräger CDS Tubes	0.025 ppm	Yes	1		GPL = 0.000001 mg/m ³	-		(0.0007 mg/m³)	(0.0005 mg/m³)	
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes	10.60 eV	~3 (10.6 lamp)	A-TWA = 0.00003 mg/m ³					
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	10.00 8	NA						



Table 16 -- Chemical Warfare Agents -Instrument Guidance Regulatory Guidance Reference

	Thistiannent Salaanee					Tregulatory Galdance					rtererence
Target	Instruments	Detection	Intrinsically	IP ²	IP & PID CF	Occupational A	Action Levels	Conversion	AEGL-1		PPE (refer to SSHASP and
Compound ¹	motramonto	Levels	Safe (Y/N)		$(ISO)^2$	TWA	IDLH	Convolcion	4-hour	8-hour	NIOSH Website)
Nerve											
	APD 2000	4 ppb	No								
	AP2C ³	1.5 ppb	No	1							
	AP4C	10 μg/m ³	No	1							
	SAW Mini-CAD	0.01 ppm	No	1		$PEL = 0.0001 \text{ mg/m}^3$					
	HAPSITE	0.1 - 10 ppb	No	1		U-STEL = 0.0001 mg/m ³			0.0000001 ppm	0.0000065 ppm	
VX	M256 A-1	0.002 ppm	Yes			WPL = 0.00001 mg/m ³ GPL = 0.000001 mg/m ³	$U = 0.05 \text{ mg/m}^3$	1 ppm = 7.3 mg/m^3			Level A
	Dräger CDS Tubes	0.025 ppm	Yes						(0.00001 mg/m²)	(0.000071 mg/m²)	
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes		~0.5 (10.6 lamp)	A-TWA = 0.00003 mg/m ³					
	TVA 1000B*	0.5-2000 ppm (PID)	Yes	unknown	NA	1					
	TVA 1000B	1-50,000 ppm (FID)	163		INA						
Blister											
	APD 2000	300 ppb	No				,				
	AP2C ³	1.5 ppb	No	1							
	AP4C	0.5 mg/m ³	No]		PEL = 0.003 mg/m ³	0.0005 ppm				
Mustard (U)	SAW Mini-CAD	0.09 ppm	No	J		U-STEL - 0.003 mg/m ³					
Mustard (H) &	HAPSITE	0.1 - 10 ppb	No]		WPL = 0.004 mg/m ³			0.0030 ppm	0.0010 ppm	
Distilled	M256 A-1	0.31 ppm	Yes			GPL = 0.00002 mg/m ³		1 ppm = 6.5 mg/m^3			Level A
Mustard (HD)	Dräger CDS Tubes	1 mg/m ³	Yes			$A = 0.0004 \text{ mg/m}^3$ C-STEL = 0.003 mg/m ³	0.7 mg/m ³		(re		
	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes	< 11.1 eV	~0.5 (10.6 lamp)	WPL = 0.004 mg/m^3					
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	Z 11.1 ev	NA	GPL = 0.00002 mg/m ³					
	APD 2000	300 ppb	No								
	AP4C	10 μg/m ³	No								
Nitro mon	SAW Mini-CAD	Does not detect	No					4			
Nitrogen Mustard	M256 A-1	0.6 ppm	Yes					1 ppm = HN1 6.9 mg/m ³			
(HN1, HN2,	Dräger CDS Tubes	1 mg/m ³	Yes			NA	0.0008 ppm	HN2 6.4 mg/m ³	NR	NR	Level A
HN3)	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes		~0.5 (10.6 lamp)			HM3 8.3 mg/m ³			
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	<11.1 eV	NA						
	APD 2000	200 ppb	No	 							
	AP4C	1.5 mg/m ³	No	1							
	M256 A-1	1 ppm	Yes	1							
Lourisite (L)	Dräger CDS Tubes	3.0 mg/m ³	Yes	1		PEL = 0.003 mg/m ³			ND	ND	l aval A
Lewisite (L)	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes		1 (10.6 lamp)	U WPL = 0.003 mg/m^3 GPL = 0.003 mg/m^3	0.0004 ppm	1 ppm = 8.4 mg/m^3	NK	NK	Level A
	TVA 1000B*	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	~10.60 eV	NA						
Phosgene	MultiRAE/AreaRAE PID*	0-2,000 ppm	Yes		10 (10.6 lamp)						
Oxime (CX)		0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Yes	~10.60 eV	NA	NA NA	NA	1 ppm = 4.7 mg/m ³	NR	NR	Level A



Table 16 -- Chemical Warfare Agents

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Target	Instruments	Detection	Intrinsically	IP ²	IP & PID CF	Occupational A	Action Levels	Conversion	AEC	GL-1	PPE (refer to SSHASP and
Compound ¹	motramonto	Levels	Safe (Y/N)	"	$(ISO)^2$	TWA	IDLH	Conversion	4-hour	8-hour	NIOSH Website)
Blood											
Hydrogen Cyanide	AP4C M256 A-1 Dräger CDS Tubes	10 mg/m³ or 1.5 ppm 7.13 ppm 1 ppm	No Yes Yes	NA	NA	PEL = 11 mg/m ³ = 1 ppm PEL = 10,000 ppbv	45 ppm NIOSH 50 ppm	1 ppm = 1.1 mg/m ³	1.3 ppm	1 ppm	Level A
	Dräger CDS Chips		Yes			ACGIH = 4.7 ppm C					
Cyanogen	M256 A-1	0.25 ppm	Yes	12.34	NA	REL = 0.6 mg/m3 C REL = 300 ppbv C		1 ppm = 2.52 mg/m ³	NR	NR	Level A
Chloride (CK)	Dräger CDS Tubes	3.13 ppm	Yes	12.34	1471	ACGIH = 0.3 ppm C		1 ppm = 2.02 mg/m	IVIX	, , ,	LeverA
Arsine (SA)	Dräger CDS Tubes	0.1 ppm	Yes	9.89	NA	PEL = 0.002 mg/m3 PEL = 0.05 ppm ACGIH = 0.005 ppm	3 ppm	1 ppm = 3.19 mg/m ³	NR	NR	Level A
Radiation ⁴											
	Ludlum 192	0-5,000 micro-R/hr	No			10 micro-R/hr					
Radiation	Ludlum 2241-2 with Pancake Probe	0-9,999 R/hr or 999,000 cpm	No	NA	NA	300 cpm	NA	NA	NA	NA NA	Level C

Notes:

For guidance only. These tables do not supersede a site-specific health and safety plan at any time or on any response.

- 1- Does not include all chemical warfare agents, only the most common compounds with the lowest action levels.
- 2- Estimated response of warfare agent detection products by PID. Source: RAE TN-159
- 3- AP2Ce is intrinsically safe; however, the AP2Ce may not detect distilled mustard gas (HD) well.
- 4- Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta, and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

http://www.epa.gov/oppt/aegl/pubs/chemist.html

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

*PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied.



Table 16 -- Chemical Warfare Agents

Acronyms:

~ -- approximately

< -- less than

µg/m³ -- micrograms per cubic meter

A -- ATSDR

A-TWA -- ATSDR time-weighted average

A4 -- concern that the compound may be carcinogenic, but supporting data are lacking

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

ATSDR -- Agency for Toxic Substances and Disease Registry

C -- ceiling (concentrations that should not be exceeded during any part of the work exposure)

C-STEL -- CDC short-term exposure limit

CDC -- Centers for Disease Control

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

eV -- electron volt

FID -- flame ionization detector

GPL -- general public limit

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

micro-R/hr -- micro Roentgens per hour

NA -- not available/applicable

NL -- not listed

NIOSH -- National Institute for Occupational Safety and Health

NR -- no response

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

PPE -- personal protective equipment

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TLV -- time-limited value (ACGIH)
TWA -- time-weighted average

U -- USA CHPPM

U-STEL -- USA CHPPM short-term exposure limit

U-WPL -- USA CHPPM worker protection limit

USA CHPPM -- U.S. Army Center for Health Promotion and Preventive Medicine

WPL -- worker protection limit

Glossary

approximately > greater than less than < % percent

 $\mu g/m^3$ micrograms per cubic meter

A1 carcinogenic effects

A4 concern that the compound may be carcinogenic, but supporting data are

lacking

ATSDR Α

A-TWA ATSDR time-weighted average

ACGIH American Conference of Governmental Industrial Hygienists

Acute Exposure Guideline Levels **AEGL**

ATSDR Agency for Toxic Substances and Disease Registry

ceiling (concentrations that should not be exceeded during any part of work

exposure)

C-STEL CDC short-term exposure limit CDC Centers for Disease Control

CF correction factor

Cl chlorine

CO carbon monoxide counts per minute cpm

EPA United States Environmental Protection Agency

eVelectron volt

FID flame ionization detector **GPL** general public limit $H_{9}S$ hydrogen sulfide **HCN** hydrocyanic acid **HGV** Health Guidance Value

IDLH Immediately Dangerous to Life and Health

ΙP ionization potential ISO

isobutylene

LEL lower explosive level

 m^3 cubic meter

milligram per kilogram mg/kg mg/m³ milligram per cubic meter micro-R/hr micro-Roentgens per hour NA not available/applicable

ND non-detect

ng/m³ nanogram per cubic meter

 NH_3 ammonia

NIOSH National Institute for Occupational Safety and Health

NL not listed NR no response O_{2} oxygen

OSHA Occupational Safety and Health Administration

Glossary (continued)

PAH polyaromatic hydrocarbon PID photoionization detector

ppb parts per billion PDR personal dataRAM

PEL Permissible Exposure Limit (OSHA)
PPE personal protective equipment

ppm parts per million R/hr Roentgens per hour

REL Recommended Exposure Limit (NIOSH)

SO₂ sulfur dioxide SPM Single-Point Monitor

SSHASP site-specific health and safety plan

ST short-term

STEL Short-Term Exposure Limit
TLV Time-Limited Value (ACGIH)
TWA Time-Weighted Average

U USA CHPPM

U-STEL USA CHPPM short-term exposure limit U-WPL USA CHPPM worker protection limit

USA CHPPM U.S. Army Center for Health Promotion and Preventive Medicine

VOC volatile organic compound

Vol. volume

WPL worker protection limit

Attachment A — Hazard Evaluation Flowchart for Unknowns

Early Considerations!

Collect intelligence, Document signs and symptoms of victims, Evaluate scene & situation, Potential explosives should be evaluated by the local bomb squad, Cordon off area, Isolate, Evacuate, Disable HVAC, Seal doors and cracks, Delineate hotzone (wind direction and intensity), Turn on radiation meter while preparing entry, Approach uphill/upwind/upstream, Follow H&S plan, Sampling plan, & Decontamination procedures for personnel/sample containers/equipment, consult with Incident Commander and law enforcement

> Calibrate instruments/Collect background readings Team dons Level A or B PPE (consult with H&S Manager) Team enters hot zone (Photo/video documentation) Liquid/Solid

1st Entry: CGI/O₂*; Radiation Meter; FID; AP4Ce/APD2000/AP2Ce; MultiRAE; MultiWARN (CGI/O₂; CN; Phosgene;

Cl₂; NH₃; H₂S; PID) digital or video camera

2nd Entry: Dräger Tubes, Cl. Ps: SAM935/940, or Exploranium; MultiRAE or MultiWARN (CGI/O₂, CN, Phosgene, Cl₂, NH₃, H₂S, PID); SPM; Dräger CMS; Lumex MVA Collect Samples As Appropriate

Additional Monitoring: Portable GCMS; Particulate Monitor (RAM); AreaRAE

1st Entry: CGI/O₂*; Radiation Meter; FID; pH Paper; APD 2000/AP2Ce/AP4Ce; M8/M9 Paper; digital or video camera

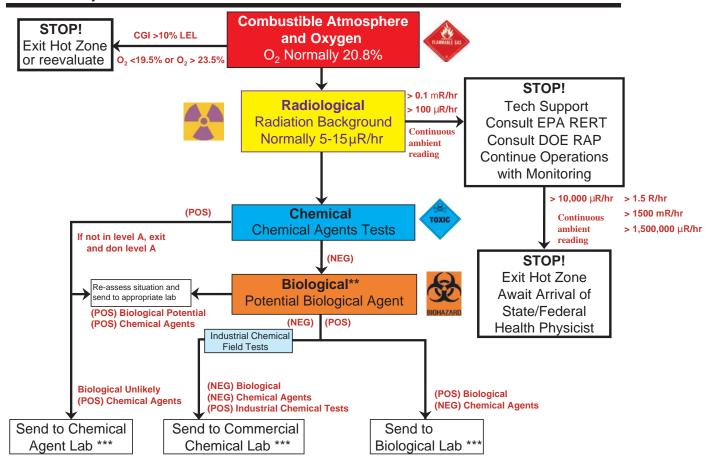
2nd Entry: M256 Kit; Dräger tubes (liquid); SAM935/940, or Exploranium; Ratemeter with Pancake Probe

Collect Samples As Appropriate

Additional Monitoring: Portable GCMS; Industrial Chemical Field Tests; PCR; Hazmat ID FTIR

* intrinsically safe

Air



^{**} If the situation is suspicious send samples to biological lab.

^{***} Send to laboratory if radiation is less than 3 times background. If above, consult with laboratory prior to shipping.

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