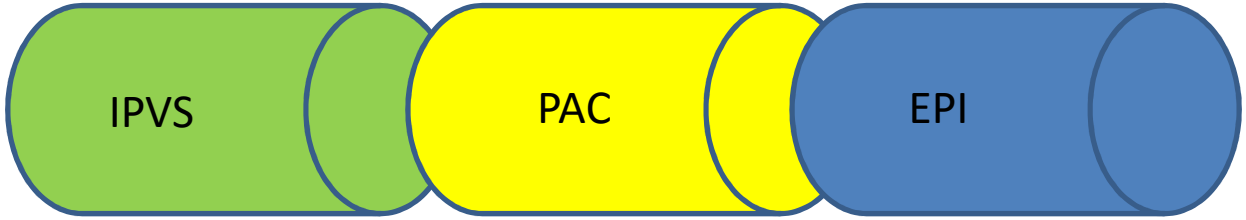
Toxicologia para Emergências

HAZMAT

Atualizado em: Agosto de 2015

Toxicologia para Emergências



1. IPVS

NIOSH (National Institute for Occupational Safety and Health)

IPVS (ou IDLH): imediatamente perigoso para a vida e saúde

1. IPVS

. Concentração Imediatamente Perigosas para a Vida e Saúde

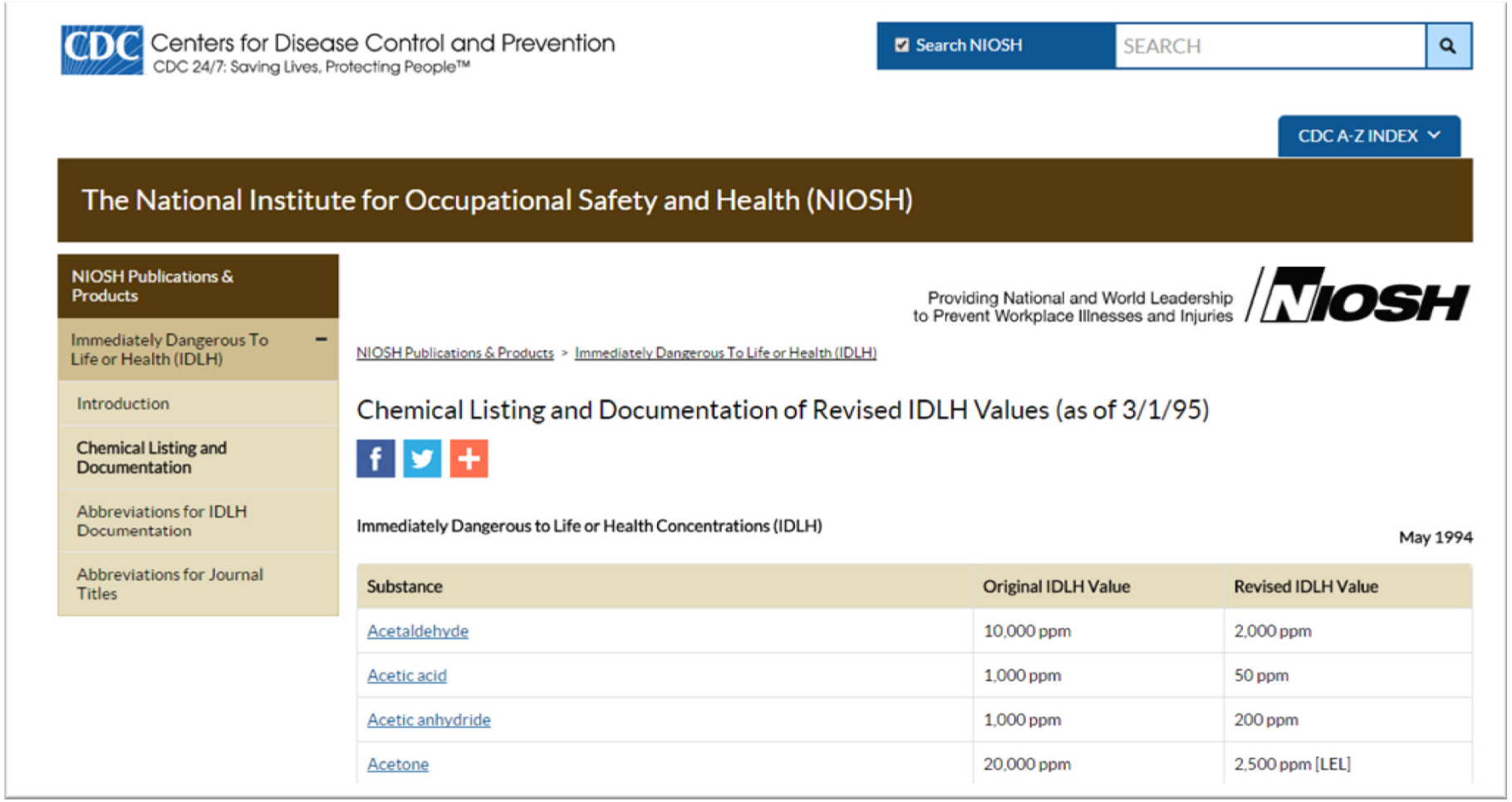
Caracterizada pelas iniciais **IPVS** ou por **IDLH** (Imediatelly Dangerous for Life and Health). Exposição respiratória aguda que pode causar a morte ou consequências irreversíveis a saúde (instantâneas ou retardadas) ou exposição dos olhos que impeça a fuga do local.

É a concentração máxima para a exposição por 30 minutos que permite escapar de um ambiente se houver falha do protetor respiratótiono. (NIOSH)

Acima da concentração IDLH, a presença de pessoas só deve ser permitida em emergências, com proteção respiratória autônoma.

Detalhamento teórico:
http://www.cdc.gov/niosh/idlh/idlhintr.html

1. IPVS



http://www.cdc.gov/niosh/idlh/intridl4.html

Substance	Original IDLH Value	Revised IDLH Value
Acetaldehyde	10,000 ppm	2,000 ppm
Acetic acid	1,000 ppm	50 ppm
Acetic anhydride	1,000 ppm	200 ppm
Acetone	20,000 ppm	2,500 ppm [LEL]
Acetonitrile	4,000 ppm	500 ppm
Acetylene tetrabromide	10 ppm	8 ppm
Acrolein	5 ppm	2 ppm
Acrylamide	Unknown	60 mg/m^3
Acrylonitrile	500 ppm	85 ppm
Aldrin	100 mg/m^3	25 mg/m^3
Allyl alcohol	150 ppm	20 ppm
Allyl chloride	300 ppm	250 ppm
Allyl glycidyl ether	270 ppm	50 ppm
2 Aminopyridine	5 ppm	5 ppm [Unch]
Ammonia	500 ppm	300 ppm
Ammonium sulfamate	5,000 mg/m^3	1,500 mg/m^3

http://www.cdc.gov/niosh/idlh/intridl4.html

2. Métricas para Emergências / ERPG

ERPGL
(AIHA)

Emergency Response Planning Guidelines Levels

Desenvolvido pensando em situações de emergência,
visa a população em geral.

https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2013ERPGValues.pdf

Please refer to the key at the end of the table.

Current ERPG® Values (2013)

Chemical (CAS Number)	ERPG-1	ERPG-2	ERPG-3	LEL***
Acetaldehyde (75-07-0)	10 ppm✪	200 ppm	1000 ppm	
Acetic Acid (64-19-7)	5 ppm✪	35 ppm	250 ppm	
Acetic Anhydride (108-24-7)	0.5 ppm✪	15 ppm	100 ppm	
Acrolein (107-02-8)	0.05 ppm✪	0.15 ppm	1.5 ppm	
Acrylic Acid (79-10-7)	1 ppm✪	50 ppm	250 ppm	
Acrylonitrile (107-13-1)	10 ppm✪	35 ppm	75 ppm	
Allyl Chloride (107-05-1)	3 ppm✪	40 ppm	300 ppm	
Ammonia (7664-41-7)	25 ppm✪	150 ppm	750 ppm	
Arsine (7784-42-1)	NA†	0.5 ppm	1.5 ppm	
Benzene (71-43-2)	50 ppm✪	150 ppm	1000 ppm	
Benzene, ethylenated, by-products from (Dowtherm Q) (68987-42-8)	ID‡	150 mg/m³	ID‡	
Benzoyl Chloride (98-88-4)	0.3 ppm✪	5 ppm	20 ppm	
Benzyl Chloride (100-44-7)	1 ppm✪	10 ppm	50 ppm	
Beryllium (7440-41-7)	NA†	25 µg/m³	100 µg/m³	

Chemical (CAS Number)	ERPG-1	ERPG-2	ERPG-3	LEL***
Hydrogen Sulfide (7783-06-4)	0.1 ppm✪	30 ppm	100 ppm	
Iodine (7553-56-2)	0.1 ppm✪	0.5 ppm	5 ppm	
Isobutyronitrile (78-82-0)	10 ppm	50 ppm	200 ppm	
2-Isocyanatoethyl Methacrylate (30674-80-7)	ID‡	0.1 ppm	1 ppm	
Isoprene (78-79-5)	5 ppm✪	1000 ppm	4000 ppm	15,000 ppm
Isopropyl Chloroformate (108-23-6)	ID‡	5 ppm	20 ppm	
Lithium Hydride (7580-67-8)	0.025 mg/m³	0.1 mg/m³	0.5 mg/m³	
Maleic Anhydride (108-31-6)	0.2 ppm	2 ppm	20 ppm	
MDI (Methylene Diphenyl Diisocyanate) (101-68-8)	NA†	5 mg/m³	55 mg/m³	
Mercury Vapor (7439-97-6)	NA†	0.25 ppm	0.5 ppm	
Methanol (67-56-1)	200 ppm	1000 ppm	5000 ppm	
Methyl Bromide (74-83-9)	NA†	50 ppm	200 ppm	
Methyl Chloride (74-87-3)*	150 ppm✪	1000 ppm	3000 ppm	
Methyl Chloroformate (79-22-1)	NA†	2 ppm	5 ppm	
Methyl Iodide (74-88-4)*	25 ppm	50 ppm	125 ppm	
Methyl Isocyanate (624-83-9)	0.025 ppm	0.25 ppm	1.5 ppm	
Methyl Mercaptan (74-93-1)	0.005 ppm✪	25 ppm	100 ppm	
Methyl tert-Butyl Ether (MTBE) (1634-04-4)*	50 ppm✪	1000 ppm	5000 ppm	16,000 ppm

Lower Explosive Limit (LEL) Notations for ERPG values:

100% or more LEL = ***Bold Red Italics Underlined***

50–99% LEL = ***Bold Red Italics***

10–49% LEL = **Bold Red**

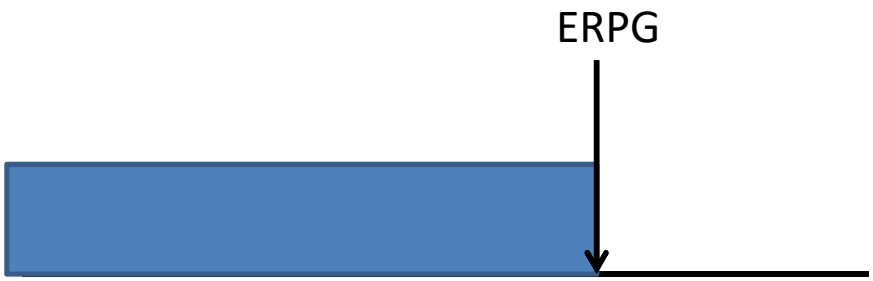
<10% LEL = Regular Font

Definições:

The **ERPG-1** is the **maximum** airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

The **ERPG-2** is the **maximum** airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

The **ERPG-3** is the **maximum** airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.



3. Métricas para Emergências / AEGL

AEGL: Acute Emergency Guideline Levels

U.S. Environmental Protection Agency (EPA)

Represent threshold exposure limits for the general public and are applicable to emergency exposures ranging from 10 minutes to 8 hours. Three levels—AEGL-1, AEGL-2, AEGL-3—are developed for each of five exposure periods (10 minutes, 30 minutes, **1 hour**, 4 hours, and 8 hours) and are distinguished by varying degrees of severity of toxic effects.

DOE guidance is to use the 1 hour AEGL values, which appear in this database.

http://www.epa.gov/oppt/aegl/index.htm

Definições:

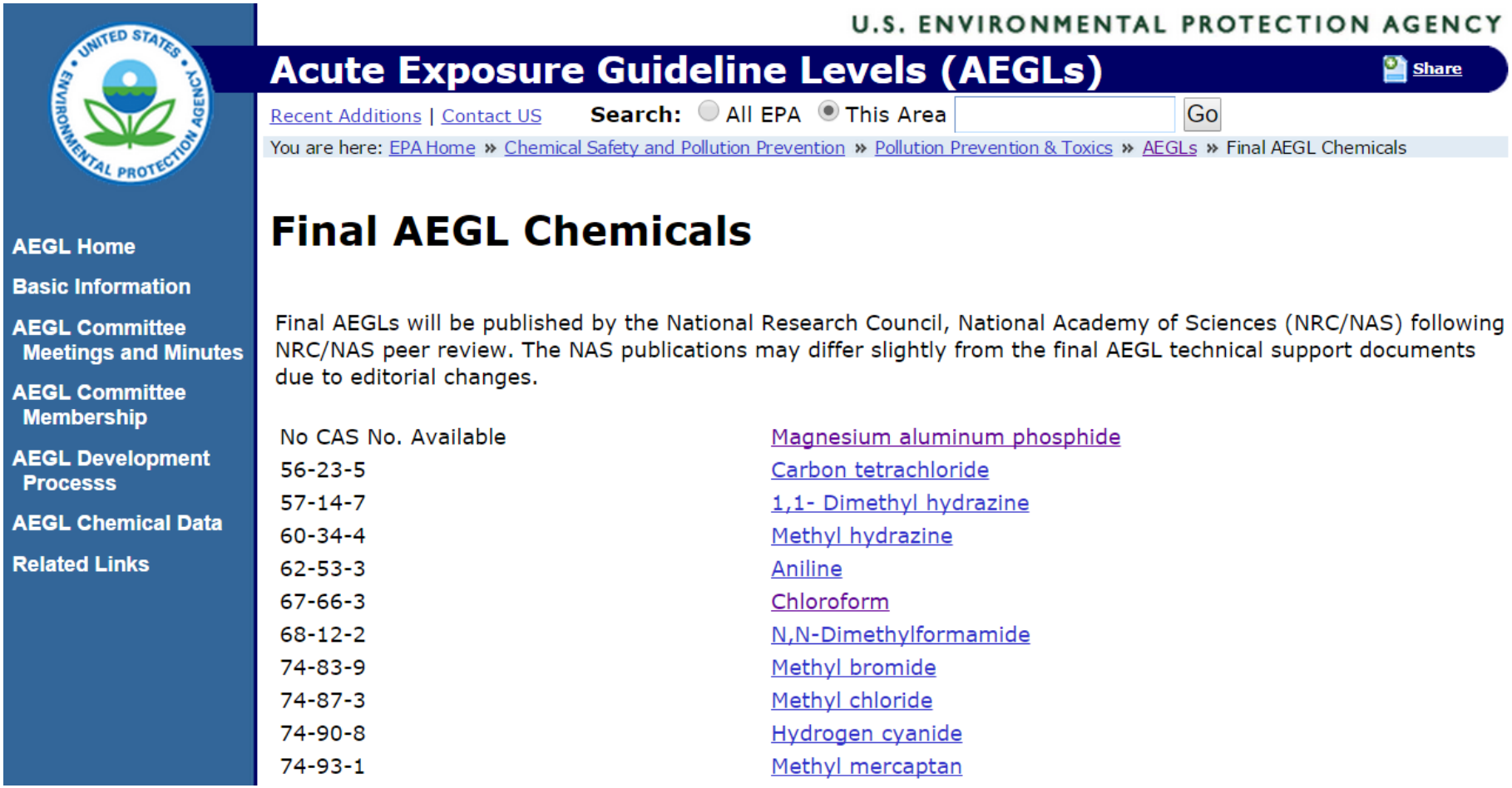
AEGL-1 is the airborne concentration (expressed as ppm [parts per million] or mg/m^3 [milligrams per cubic meter]) of a substance **above** which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, nonsensory effects. However, these effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m^3) 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/m^3) of a substance **above** which it is predicted that the general population, including susceptible individuals, could experience life-threatening adverse health effects or death.

http://www.epa.gov/oppt/aegl/pubs/define.htm

Listagem de Substâncias com AEGL:



U.S. ENVIRONMENTAL PROTECTION AGENCY

Acute Exposure Guideline Levels (AEGLs)

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AEGL Home
Basic Information
AEGL Committee Meetings and Minutes
AEGL Committee Membership
AEGL Development Processs
AEGL Chemical Data
Related Links

Final AEGL Chemicals

Final AEGLs will be published by the National Research Council, National Academy of Sciences (NRC/NAS) following NRC/NAS peer review. The NAS publications may differ slightly from the final AEGL technical support documents due to editorial changes.

No CAS No. Available	Magnesium aluminum phosphide
56-23-5	Carbon tetrachloride
57-14-7	1,1- Dimethyl hydrazine
60-34-4	Methyl hydrazine
62-53-3	Aniline
67-66-3	Chloroform
68-12-2	N,N-Dimethylformamide
74-83-9	Methyl bromide
74-87-3	Methyl chloride
74-90-8	Hydrogen cyanide
74-93-1	Methyl mercaptan

http://www.epa.gov/oppt/aegl/pubs/final.htm

AEGL Home
Basic Information
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AEGL Committee Membership
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AEGL Chemical Data
Related Links

Chloroform Results

Chloroform 67-66-3 (Final)					
ppm					
	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	NR	NR	NR	NR	NR
AEGL 2	120	80	64	40	29
AEGL 3	4,000	4,000	3,200	2,000	1,600

NR = Not recommended due to insufficient data

Technical Support Document

http://www.epa.gov/oppt/aegl/pubs/results70.htm

U.S. ENVIRONMENTAL PROTECTION AGENCY

Acute Exposure Guideline Levels (AEGLs)

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- Basic Information
- AEGL Committee Meetings and Minutes
- AEGL Committee Membership
- AEGL Development Processs
- AEGL Chemical Data
- Related Links

Phosgene Results

Phosgene 75-44-5 (Final)					
ppm					
	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	NR	NR	NR	NR	NR
AEGL 2	0.60	0.60	0.30	0.080	0.040
AEGL 3	3.6	1.5	0.75	0.20	0.090

NR = Not recommended due to insufficient data

http://www.epa.gov/oppt/aegl/pubs/results7.htm

3. Métricas para Emergências / TEEL

TEEL: Temporary Emergency Exposure Limits

(SCAPA)

TEEL-0 is the threshold concentration **below** which most people will experience no adverse health effects.

TEEL-1 is the airborne concentration (expressed as ppm [parts per million] or mg/m^3 [milligrams per cubic meter]) 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, these effects are not disabling and are transient and reversible upon cessation of exposure.

TEEL-2 is the airborne concentration (expressed as ppm or mg/m^3) 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.

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

http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/temporary-emergency-exposure-limits-teels.html

4. Métricas para Emergências / PAC

PAC: Protective Action Criteria for Chemicals

(Chem PAC: Protective Action Criteria for Chemicals)

DOE: Department of Energy

Protective Action Criteria (PACs) are essential components for planning and response to uncontrolled releases of hazardous chemicals.

These criteria, combined with estimates of exposure, provide the information necessary to evaluate chemical release events for the purpose of taking appropriate protective actions. During an emergency response, these criteria may be used to evaluate the severity of the event, to identify potential outcomes, and to decide what protective actions should be taken. These criteria may also be used to estimate the severity of consequences of an uncontrolled release and to plan for an effective emergency response.

http://orise.orau.gov/emi/scapa/chem-pacs-teels/default.htm

4. Métricas para Emergências / PAC

PAC: Protective Action Criteria for Chemicals
(Chem PAC: Protective Action Criteria for Chemicals)

Definição:

PAC values for emergency planning for chemical release events are based on the following exposure limit values:

AEGL: values published by the U.S. Environmental Protection Agency (EPA)

ERPG: values produced by the American Industrial Hygiene Association (AIHA)

TEEL: values developed by SCAPA

4. Métricas para Emergências / PAC

PAC: Protective Action Criteria for Chemicals
(Chem PAC: Protective Action Criteria for Chemicals)

Prioridades:

For any particular chemical, DOE policy for its facilities and activities established the following hierarchy of PAC values:

1. Use AEGLs (including final or interim values) if they are available.

2. If AEGLs are not available, use ERPGs.

3. If neither AEGLs or ERPGs are available, use TEELs. (1 hora)

4. Métricas para Emergências / PAC

February 2012

Table 2: Protective Action Criteria (PAC) Rev 27
Based on applicable 60-minute AEGLs, ERPGs, or TEELs (Chemicals listed in alphabetical order)

PAC Rev 27

No.	Chemical Name	CASRN	PAC based on AEGLs, ERPGs, or TEELs			
			PAC-1	PAC-2	PAC-3	Units
1	Acacia; (Gum arabic)	9000-01-5	37	410	3,200	mg/m^3
2	Acenaphthene	83-32-9	3.6	40	240	mg/m^3
3	Acenaphthylene	208-96-8	10	110	660	mg/m^3
4	**Acetaldehyde**	**75-07-0**	**45**	**270**	**840**	ppm
5	Acetamide	60-35-5	8.7	96	1,400	mg/m^3
6	Acetanilide	103-84-4	0.28	3.1	61	mg/m^3
7	**Acetic acid**	**64-19-7**	**5**	**35**	**250**	ppm
8	Acetic acid ethenyl ester, polymer with 1,1-bis(ethenyloxy) butane and ethenol	27360-07-2	30	330	2,000	mg/m^3
9	Acetic acid, 2-propenyl ester	591-87-7	0.42	4.6	28	ppm
10	Acetic acid, lithium salt	546-89-4	5.1	56	330	mg/m^3
11	Acetic acid, manganese(2+) salt, tetrahydrate	6156-78-1	13	22	740	mg/m^3
12	Acetic acid, manganese(II) salt (2:1)	638-38-0	9.4	16	580	mg/m^3
13	**Acetic anhydride**	**108-24-7**	**0.5**	**15**	**100**	ppm

http://www.atlintl.com/DOE/teels/teel/Table2.pdf

4. Métricas para Emergências / PAC

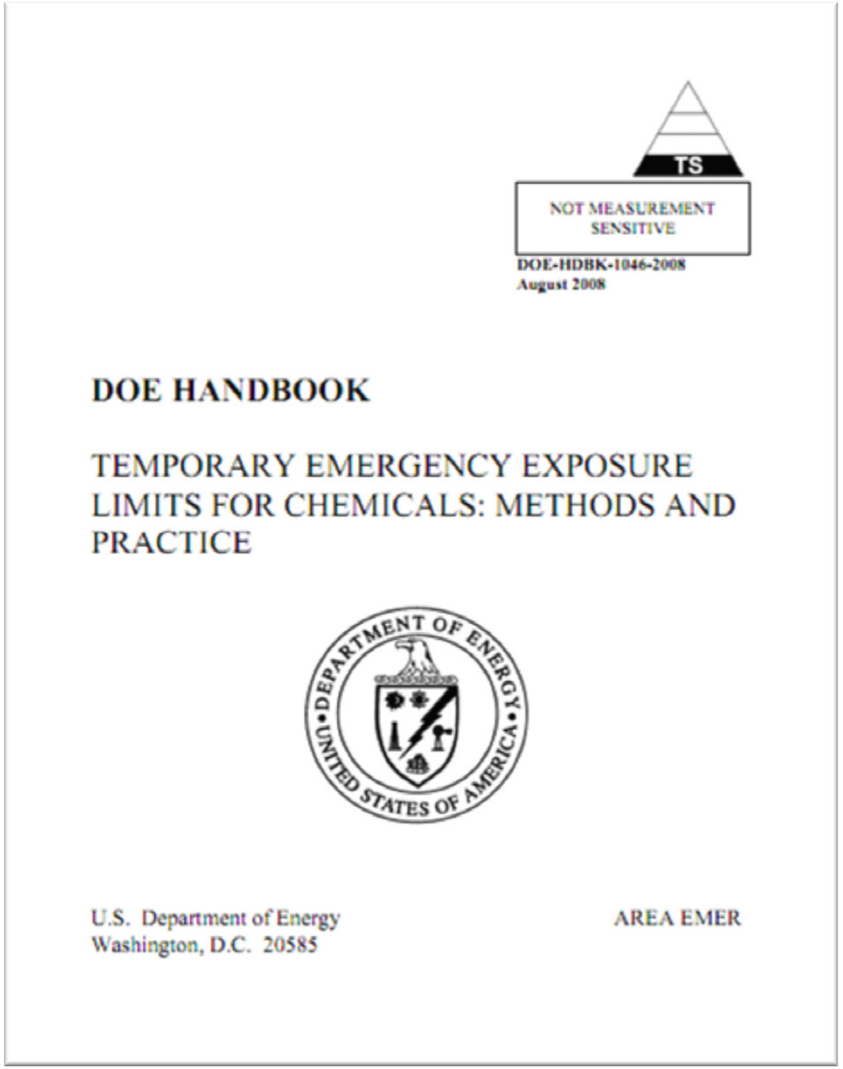
DOE policy for its facilities and activities established irreversible health effects (the “-2” level) as the protective action criterion benchmark for chemical releases.

http://orise.orau.gov/emi/scapa/chem-pacs-teels/default.htm

5. Outras abordagens

ABIQUIM
Associação Brasileira da Indústria Química

5. Outras abordagens


TS

NOT MEASUREMENT SENSITIVE

DOE-HDBK-1046-2008
August 2008

DOE HANDBOOK

TEMPORARY EMERGENCY EXPOSURE LIMITS FOR CHEMICALS: METHODS AND PRACTICE

U.S. Department of Energy
Washington, D.C. 20585

AREA EMER

http://www.hss.doe.gov/nuclearsafety/techstds/docs/handbook/DOE-HDBK-1046-2008.pdf
http://energy.gov/sites/prod/files/2013/06/f1/DOE-HDBK-1046-2008.pdf

5. Outras abordagens

http://www2.epa.gov/cameo

EPI / Bombeiros

EPI / HAZMAT

EPI / HAZMAT

Normas NFPA:

NFPA 1991 - Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing)

NFPA 1992 - Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing)

NFPA 1993 - Standard on Liquid Splash-Protective Suits for Non-emergency, Non-flammable Hazardous Chemical Situations (EPA Level B Protective Clothing)

OSHA

Part A

Personal protective equipment is divided into four categories based on the degree of protection afforded.

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required.

(roupa sem emendas, respirador autônomo)

Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required.

The following constitute Level A equipment; it may be used as appropriate:

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit.
3. Coveralls.(Optional, as applicable.)
4. Long underwear.(Optional, as applicable.)
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).(Optional, as applicable.)
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

(roupa com emendas, respirador autônomo)

Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

The following constitute Level B equipment; it may be used as appropriate:

1. Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.(Optional, as applicable.)
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).(Optional, as applicable.)
8. Hard hat.(Optional, as applicable.)
9. [Reserved]
10. Face shield.(Optional, as applicable.)

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.

(roupa com emendas, respirador por filtro)

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.

The following constitute Level C equipment; it may be used as appropriate:

1. Full-face or half-mask, air purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.(Optional, as applicable.)
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.(Optional, as applicable.)
7. Boot-covers, outer, chemical-resistant (disposable).(Optional, as applicable.)
8. Hard hat.(1)
9. Escape mask.(Optional, as applicable.)
10. Face shield.(Optional, as applicable.)

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level D - A work uniform affording minimal protection: used for nuisance contamination only.

Level D - A work uniform affording minimal protection: used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.
2. Gloves.(Optional, as applicable.)
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).(Optional, as applicable.)
5. Safety glasses or chemical splash goggles.(Optional, as applicable.)
6. Hard hat.(Optional, as applicable.)
7. Escape mask.(Optional, as applicable.)
8. Face shield.(Optional, as applicable.)

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

OSHA

Part B

The types of hazards for which levels A, B, C, and D protection are appropriate.

Level A

Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin,

2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level B

Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.

2. The atmosphere contains less than 19.5 percent oxygen; or

3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level C

Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

3. All criteria for the use of air-purifying respirators are met.

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

Level D

Level D protection should be used when:

1. The atmosphere contains no known hazard; and

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767