

Stofdocument deel A

CAS-nr: 7782-50-5

Chloor

CI-CI

VN-nr: 1017

GEVI: 268

Synoniemen: - (Engels: Chlorine)

Interventiewaarden		10 min.	30 min.	1 uur	2 uur	4 uur	8 uur
Voorlichtingsrichtwaarden	VRW (mg/m³)	1,5	1,5	1,5	1,5	1,5	1,5
Alarmeringsgrenswaarden	AGW (mg/m³)	14	8,3	5,9	4,2	3,0	2,1
Levensbedreigende waarden	LBW (mg/m³)	290	110	59	32	18	9,6
Datum vaststelling: 24-09-2009		1 mg/m ³ = 0,339 ppm; 1 ppm = 2,95 mg/m ³					
Explosiegrens: geen data			Geur: stekende geur LOA: 3,6 mg/m ³				
Fysisch-chemische eigenschappen				Overige informatie			
Uiterlijk: geelgroen onder druk tot vloeistof verdicht gas		Molecuulmassa: 70,9 g/mol		Publieke grenswaarde: 1,5 mg/m ³ (15 min)			
Brand: niet brandbaar, bij vele reacties kans op explosie.		Zuurgraad: Geen data		MAK: 1,5 mg/m ³			
Relatieve dichtheid van verzadigd damp-lucht mengsel: 2,5		LogKow: Geen data		TLV-TWA: 1,5 mg/m ³			
		Wateroplosbaarheid: 0,7 g/100 ml (slecht)					
		Verzadigde dampdruk: 6700 mbar					
Toxicologische eigenschappen							
Effecten bij inhalatoire blootstelling				Toxiciteit bij eenmalige, inhalatoire blootstelling			
<i>Onder VRW:</i> geen informatie				<ul style="list-style-type: none"> Chloor werkt irriterend op de slijmvliezen van o.a. ogen en luchtwegen Blootstelling aan chloor kan longoedeem en chemische pneumonitis veroorzaken. De verschijnselen hiervan kunnen vertraagd optreden en versterkt worden door lichamelijke inspanning. Personen met verminderde longfunctie zijn gevoeliger voor de effecten van chloor. 			
<i>VRW → AGW:</i> oog- en luchtwegirritatie, tranenvloed, hoesten							
<i>AGW → LBW:</i> ernstige oog- en luchtwegirritatie, benauwdheid, chemische pneumonitis, longoedeem							
<i>Boven LBW:</i> sterfte							
Effecten bij blootstelling aan vloeistof				Carcinogeniteit			
<i>Huidcontact:</i> roodheid, ernstige bevroeringsverschijnselen zoals pijn, blaren, (bevroerings)wonden.				IARC classificatie: niet geclassificeerd CRP: niet afgeleid			
<i>Oogcontact:</i> bij bevroering: bijtend, roodheid, tranenvloed, hoornvliesbeschadiging, verlies van gezichtsvermogen, ernstige brandwonden.							
Beknopte medische informatie							
Ontsmetting damp							
<i>algemeen:</i> frisse lucht, rust, <i>bij rode ogen, etc.:</i> halfzittende houding en direct spoedeisende medische hulp inzetten.							
Ontsmetting vloeistof							
<i>huid:</i> eerst spoelen met veel water, dan pas kleding uittrekken, daarna weer spoelen, arts raadplegen en direct spoedeisende medische hulp inzetten.							
<i>ogen:</i> minimaal 15 min. spoelen met water (evt. contactlenzen verwijderen), dan naar oogarts brengen, blijven spoelen tijdens vervoer.							
<i>inslikken:</i> n.v.t. (gas)							
Specifieke behandeling en materialen.:							
Neem contact op met het NVIC (tel: +31 (0)30 – 274 8888) voor informatie met betrekking tot medisch handelen.							

Stofdocument deel B

CAS-nr: 7782-50-5

Chlorine

Cl-Cl

UN-nr: 1017

Basis for the Dutch Intervention Values

VRW: AEGL value was adopted, 2h value added

AGW: AEGL value was adopted, 2h value added

LBW: Different point of departure and different n than AEGL values

Date: 24-09-2009

AEGL document: Final, 2004

Dutch Intervention Values (mg/m³)

	10 min	30 min	1 h	2 h	4 h	8 h	End point
VRW	1.5	1.5	1.5	1.5	1.5	1.5	Mild, transient effects on pulmonary function parameters in humans
AGW	14	8.3	5.9	4.2	3.0	2.1	Shortness of breath in sensitive human subject
LBW	290	110	59	32	18	9.6	Calculated threshold for lethality in animals (rats).

Derivation of the Dutch Intervention Values

VRW: The VRW was based on a study with in the first part, 31 male and female human volunteers, including a susceptible individual, which were exposed to 0.0, 0.5, 1.0, 2.0 ppm (0.0, 1.5, 2.9, 5.9 mg/m³) for 4h or 0.5 and 1.0 ppm (1.5 and 2.9 mg/m³) for 8h. The volunteers did not know the test concentration. In the second part of the study eight non-smoking males were exposed to 0.0, 0.5, 1.0 ppm (0.0, 1.5, 2.9 mg/m³) chlorine for 8h. A 15-min exercise period during each hour of exposure was designed to increase the average heart rate to 100 beats per minute. During the exposures, the volunteers filled out subjective questionnaires on sensation (e.g. smell, shortness of breath). A concentration of chlorine at 0.5 ppm (1.5 mg/m³) for 4 h produced no sensory irritation and resulted in only mild transient effects on pulmonary parameters in the healthy individuals. Pulmonary changes in the susceptible individual were greater than those in healthy subjects, but did not result in symptoms above the definition of the VRW. The point of departure is supported by other studies with human volunteers of both genders, including healthy, atopic, and asthmatic subjects and/or periods of exercise to simulate conditions of stress (1-h 0.4 ppm (1.2 mg/m³) no-effect concentration for individuals with airway hyper-reactivity or asthma). Because of this variety of human subjects tested, including the most susceptible groups, no uncertainty factor for differences in human sensitivity was applied. The 0.5-ppm (1.5 mg/m³) exposure was considered a threshold for more severe effects, regardless of exposure duration. No time-scaling was applied. The use of the same value across all exposure durations is supported by the fact that the response to the irritant effects of chlorine appears to be concentration-dependent rather than time-dependent.

AGW: The AGW values were based on the same studies used to derive the VRW value. In those studies healthy human volunteers experienced transient changes in pulmonary function measurements and a susceptible individual experienced an asthma-like attack (shortness of breath and wheezing) following a more than 4-h exposure to chlorine at 1.0 ppm (2.95 mg/m³). The susceptible individual remained in the exposure chamber for the full 4 h before the symptoms occurred. Because both genders were tested, subjects were undergoing light exercise (making them more vulnerable to sensory irritation), and a susceptible individual was tested, no uncertainty factor was applied to account for differences in human sensitivity. If an uncertainty factor for intraspecies differences was applied, then the AGW-values would conflict with the VRW values. Similar effects and symptoms in individuals with airway hyper-reactivity or asthma exposed at 1.0 ppm (2.95 mg/m³) for 1 h in another study supports the application of an intraspecies uncertainty factor of 1 for the 4-h concentration. Time-scaling was performed using the equation $C^n \times t = k$, using n=2. This value was calculated by regression analysis of the percent of subjects reporting a nuisance irritation response to concentrations at 1 ppm (2.95 mg/m³) and 2 ppm (5.90 mg/m³) over exposure durations of 30 min and 120 min. In the AEGL document the 10 minute value was set equal to the 30 minute value so that the highest exposure of 4.0 ppm (11 mg/m³) in the controlled human study was not exceeded. Considering that this highest human exposure level was established after 2 hours of exposure time scaling to 10 minutes seems reasonable.

LBW: The LBW values were based on a lethality study in rats, including three exposure durations of 10, 30 and 60 minutes and four to six concentrations. Probit analysis using DoseResp was performed and yielded and n of 1.1 and LC₀₁ values for the 10 min, 30 min, 1-, 2-,4-, and 8hrs exposure durations of 967, 370, 201, 110, 59.7, and 32.5 ppm (2856, 1090, 594, 324, 176, and 96 mg/m³), respectively, which were used as point of departure for LBW derivation. An uncertainty factor of 3 was used to account for interspecies differences because the data show that interspecies differences were within a factor of approximately 2 for lethality. In addition, chlorine is a contact site, direct-acting toxicant, and there is likely to be little difference between species in the response of biologic tissues to chlorine exposure. Also, for intraspecies differences, corrosive gases acting at the point of contact would predict low variability in a population; thus an uncertainty factor of 3 is applied to protect

susceptible individuals.

In contrast to the derivation of LBW values, the AEGL-3 values were based on an approximate threshold of lethality in animals: Because the experimental data in mice appeared to provide an overly conservative estimate of lethality that was not consistent with the overall preponderance of the data, a value less than the concentration that resulted in no deaths in rats but greater than the value that resulted in no deaths in mice was chosen as the basis for the AEGL-3 values. The 200-ppm (590 mg/m³) value is below the 1-h highest nonlethal concentrations (213 ppm and 322 ppm; 628 and 950 mg/m³) and the LC01 (288 ppm; 849 mg/m³) in two well-conducted studies with rats and above the 1-h highest nonlethal concentration in mice, 150 ppm (442 mg/m³). The 200-ppm (590 mg/m³) concentration is an LC₂₀ for the mouse.

Additional toxicological information (including relevant results of a general literature search, if any)

Chlorine is an eye and respiratory tract irritant and, at high doses, has direct toxic effects on the lungs. Chlorine is extremely reactive and enters into substitution or addition reactions with both inorganic and organic substances. Moist chlorine unites directly with most elements. Reaction with water produces hydrochloric (HCl) and hypochlorous acid (HClO).

No studies on developmental and reproductive effects in humans were located.

H315: Causes skin irritation; H319: Causes serious eye irritation; H331: Toxic if inhaled; H335: May cause respiratory irritation.

Carcinogenicity and derivation of the CRP value

IARC classification: not classified
No carcinogenic risk potency (CRP) was derived.

Odour and derivation of the LOA value

Odour: pungent
Odour threshold: 0.078 ppm (0.23 mg/m³) [U.S. EPA]
 $LOA = 11.8 * OT_{50} * 1.33 = 3.6 \text{ mg/m}^3$
(The concentration Level leading to distinct Odour Awareness (I=3) is calculated using the formula: $I = 2.33 * \log(C/OT_{50}) + 0.5$. A correction factor of 1.33 is applied to this value)
The LOA is below the 10 min-2h AGW values, and below the LBW values.

Other standards and guidelines (1h values in mg/m³, unless otherwise indicated)

VRW level	AEGL-1	ERPG-1	IDLH: 29 (30 minutes)
1.5	1.5	2.9	
AGW level	AEGL-2	ERPG-2	
5.9	5.9	8.8	
LBW level	AEGL-3	ERPG-3	
59	59	59	