Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport

Stofdocument deel A

CAS-nr: 75-44-5 **Fosgeen** $O=CCl_2$ **VN-nr: 1076**
GEVI: 268

Synoniemen: Carbonyl chloride, carbonyldichloride, chloorkooloxide (Engels: Phosgene)

Interventiewaarden		10 min.	30 min.	1 uur	2 uur	4 uur	8 uur
Voorlichtingsrichtwaarden	**VRW (mg/m^3)**	NA	NA	NA	NA	NA	NA
Alarmeringsgrenswaarden	**AGW (mg/m^3)**	2,5	2,5	1,2	0,62	0,31	0,15
Levensbedreigende waarden	**LBW (mg/m^3)**	34	9,4	4,2	1,9	0,82	0,37

Datum vaststelling: November 2015 — 1 mg/m^3 = 0,243 ppm; 1 ppm = 4,11 mg/m^3

Explosiegrens: geen data

Geur: typerende geur vergelijkbaar met vers gemaaid gras

LOA: niet afgeleid

Fysisch-chemische eigenschappen

Uiterlijk: kleurloos tot lichtgeel onder druk tot vloeistof verdicht gas

Brand: niet brandbaar

Relatieve dichtheid van verzadigd damp-lucht mengsel: 3,4

Molecuulmassa: 98,9 g/mol

Zuurgraad: Geen data

LogKow: -0.7 (berekend)

Wateroplosbaarheid: Reacties

Verzadigde dampdruk: 1550 mbar

Overige informatie

Publieke grenswaarde: 0,08 mg/m^3 (8 uur)
MAK: 0,08 mg/m^3
TLV-TWA: 0,411 mg/m^3

Toxicologische eigenschappen

Effecten bij inhalatoire blootstelling

*onder **AGW***: irritatie van ogen en luchtwegen, hoesten, tranenvloed

AGW → LBW: ademnood, pijn of druk op de borst, longoedeem, piepende ademhaling, dyspnoe, pijnlijk hoesten

Boven LBW: anoxie, circulatoire collaps, sterfte

Toxiciteit bij eenmalige, inhalatoire blootstelling

- De toxiciteit van fosgeen is te wijten aan acylatie en hydrolyse, wat zorgt voor eiwit- en vetdenaturatie, membraanschade en irritatie.
- De stof werkt bijtend op de luchtwegen. Inademing van de stof kan kortademigheid/ademnood veroorzaken.
- Blootstelling aan fosgeen kan longoedeem en chemische pneumonitis veroorzaken. De verschijnselen hiervan kunnen vertraagd optreden en versterkt worden door lichamelijke inspanning.
- Door snel verdampen kan de vloeistof bevriezing veroorzaken.
- Overlevende van een ernstige intoxicatie kunnen langdurende klachten (neurotoxische gevolgen, hart- en ademhalingsfunctiestoornissen) ondervinden.

Effecten bij blootstelling aan vloeistof

Huidcontact: bij bevriezing: roodheid, pijn en brandwonden

Oogcontact: bij bevriezing: roodheid, pijn, slecht zien

Carcinogeniteit

IARC classificatie: niet geclassificeerd
CRP: niet afgeleid

Beknopte medische informatie

Ontsmetting damp

algemeen: frisse lucht, rust, halfzittende houding en direct spoedeisende medische hulp inzetten.

ogen: minimaal 15 min. spoelen met water (evt. contactlenzen verwijderen), dan naar oogarts brengen.

Ontsmetting vloeistof

huid: aan de huid vastgevroren kleding NIET lostrekken, eerst spoelen met veel water, dan pas kleding uittrekken, daarna weer spoelen en arts raadplegen.

ogen: minimaal 15 min. spoelen met water (evt. contactlenzen verwijderen), dan naar oogarts brengen, bij bevriezing: blijven spoelen tijdens vervoer.

inslikken: n.v.t. (gas).

***Specifieke behandeling en materialen**:* geen.

Neem contact op met het NVIC (Tel: 030 - 274 8888) voor informatie met betrekking tot medisch handelen

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

Stofdocument deel B

CAS-nr: 75-44-5 **Phosgene** **$O=CCl_2$** **UN-nr: 1076**

Basis for the Dutch Intervention Values

VRW: Not recommended, in accordance with AEGL

AGW: AEGL value is adopted, 2 h value added

LBW: Based on a different point of departure as for AEGL, different uncertainty factors, 2h value added.

Date: November 2015	Final AEGL document, 2002;

Dutch Intervention Values (mg/m^3)

	10 min	30 min	1 h	2 h	4 h	8 h	End point
VRW	NR	NR	NR	NR	NR	NR	Not recommended
AGW	2.5	2.5	1.2	0.62	0.31	0.15	Irritation of respiratory tract
LBW	34	9.4	4.2	1.9	0.82	0.37	Threshold of lethality in rats

Derivation of the Dutch Intervention Values

VRW: Appropriate data were not available for the derivation of VRW values for phosgene. Odour cannot be used as a warning for potential exposure, because the odor threshold is reported to be between 0.5 and 1.5 ppm (2.1-6.2 mg/m^3), a value above or approaching the AGW and LBW values, and tolerance to the pleasant odor occurs rapidly. Furthermore, following odor detection and minor irritation, serious effects may occur after a clinical latency period of 2-24 hours.

AGW: The chemical pneumonia observed in rats exposed to phosgene at 2 ppm (8.2 mg/m^3) for 90 minutes was used as starting point for the derivation of the AGW values. The default total uncertainty factor of 10 (3x3) was considered sufficient to account for inter- and intraspecies differences. Time scaling was performed using the equation $C^n \times t = k$, with n=1. This scaling was supported by time-scaling data derived from rat (n=0.93) and mice (n=1.3) lethality studies. The 30 minute value is also adopted for the 10 minute value, because otherwise, a 10 minute AGW would be determined close to concentrations producing alveolar edema in rats. The values are supported by nonlethal toxicity studies with rats exposed to phosgene at 1 ppm (4.11 mg/m^3) for 4 h (severe pulmonary edema and body weight loss). The 10 minute value is also supported by the observation of pulmonary edema in rats exposed at 5 ppm (20.55 mg/m^3) for 10 minutes. Applying the same uncertainty factors to both potential starting points would yield comparable AGW values.

LBW: LBW values were based on a rat lethality study in which rats were exposed whole-body for 5, 10, 30 and 60 minutes (Zwart et al., 1990). LC_{01} values and the related time scaling factor were calculated using Doseresp, resulting in the following LC_{01} values for a 10 min, 30 min, 1h, 2h, 4h and 8h exposure period, respectively: 202.8 – 56.14 – 24.96 – 11.1 – 4.935 – 2.194 mg/m^3 with an n-value of 0.86. Short exposure durations (i.e. ≤5 min) were excluded for analyses, as these were considered less reliable than longer exposure durations. A second rat lethality study (Pauluhn 2006) was also available in which rats were exposed nose-only to phosgene for 10-30-60-240 min. Analysis of this second study resulted in quite similar results: a similar value for n (0.86) and LC_{01} values approximately a factor 2 lower than those of the study of Zwart et al. (1990). Given that human data of workers with a phosgene indicator badge revealed that an exposure below 50 ppm x min (corresponding to 0.4 mg/m^3 for 8h exposure period) did not result in signs or symptoms of phosgene toxicity in 78 of 88 individuals, the slightly less conservative data of the study of Zwart were selected for the LBW-derivation. An uncertainty factor of 2 for interspecies and the default intraspecies uncertainty factor of 3 is applied. An interspecies factor of 2 is considered sufficient given the following information: 1) rats are considered more sensitive for phosgene-induced pulmonary effects than dogs, 2) dogs are considered more human-like and a better model for humans (associated with the higher ventilation rate of small rodents and with rodent-specific sensory bronchopulmonary defense reflexes (i.e. reflex bradypnoea)) and 3) evaluation of LC_{50} values showed that LC_{50} values of dogs are higher than those of rats.

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

The toxicity of phosgene is due to lipid and protein denaturation, irreversible membrane changes and disruption of enzymatic function. Cellular glycolysis and oxygen uptake are decreased following exposure to phosgene, and it causes an increased permeability of pulmonary vessels and pulmonary oedema. The hydrogen chloride formed by the hydrolysis of phosgene causes initial irritation to the eyes, nasopharynx, and respiratory tract. However, because phosgene's poor water solubility, a minimal amount of hydrogen chloride is formed.

No information is found regarding reproductive or developmental toxicity in rats or humans.

H330 very toxic by inhalation, H314 causes severe burns

Carcinogenicity and derivation of the CRP value

IARC classification: not classified

No carcinogenic risk potency (CRP) was derived.

Epidemiologic studies in humans have shown no increase in cancer in workers.

Odour and derivation of the LOA value

Odour: typical and pleasant odour. Odour threshold supposedly between 0.5 and 1.5 ppm (2.1 and 6.2 mg/m^3).

No LOA was derived due to lack of reliable data.

Other standards and guidelines (1h values in mg/m^3, unless otherwise indicated)

VRW level **NA**	*AEGL-1* NA	*ERPG-1* NA		*IDLH:* 8.22 (30 min.)
AGW level **1.2**	*AEGL-2* 1.2	*ERPG-2* 0.8		
LBW level **4.2**	*AEGL-3* 3.1	*ERPG-3* 4.1		