Czerczak S., Kupczewska M.: „Harmonisation of Polish regulations according to European legislation – skin notation in the MAC List in Poland".
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Introduction

For many years already (since 1982), the Group of Experts for Chemical Agents have been setting down hygienic standard values for chemicals in workplace atmospheres in Poland. The values represent the limits within which workers may be chronically exposed to a specified chemical without causing any detrimental changes in their, or their progeny's, health condition. The first list of hygienic standards in Poland was published in 1956. The specified standard values did not differ from the MAC values which were at that time in force in the USSR. Since 1982 the MAC values in Poland have been determineed as follows: the Group of Experts for Chemical Agents within the Intersectoral Commission for MAC Value Updating performs a critical evaluation of the documentation for the MACs prepared by individual members of the team and establishes MAC values based solely on health criteria and most recent research data. Those proposals, together with the documentation, are presented during a session of the Intersectoral Commission (the Commission including representatives of the ministries of health and labour, and representatives of industry and of scientific institutions), and are then submitted to the Minister of Labour and Social Policy; the MAC value is then published in the Law Gazette as an Act of the Minister of Labour and Social Policy regulating maximum allowable concentrations and intensities of harmful agents in the environment. This is a hygienic standard valid over the whole territory of Poland.

The use of the Maximum Allowable Concentration (MAC) values is limited to instances where a toxic chemical enters into the organism through the respiratory system. Toxic chemicals, however, can enter into the human organism by routes other than the respiratory system. Biological levels of xenobiotics in the organism may be in some instances significantly increased by dermal absorption. The MAC list substances suspected of the ability to increase their contribution to the overall exposure by dermal absorption, i.e. through mucous membranes, eyes, or as a result of the contact of the skin with vapours or liquids, are denoted by symbol *Sk* in the MAC list. Current Polish MAC list contains 414 chemical compounds, of which 144 (34,8%) are denoted with *Sk*. The *Sk*-noted chemicals are to be handled in a particular way, especially when large surfaces of the skin are subject to prolonged exposures. The symbol *Sk* attached to a chemical's name indicates that, in order to assess the exposure quantitatively, air sampling only is not sufficient and must be accompanied by determination of dermal absorption. Biological monitoring is recommended for the determination of dermal exposure contribution to the overall absorbed dose.

Up to now, no criteria for assigning the *Sk (SKIN)* symbol to Polish MAC-list chemicals have been determined yet. And the dispute over the procedure for *Sk* notation of chemicals continues worldwide. Currently, the symbol has been often placed in MAC lists quite arbitrarily.

According to the type of biological effects, the following categories of MAC values are used:

- NDS – MAC(TWA): MAXIMUM ADMISSIBLE CONCENTRATION: the time-weighted average concentration for a conventional 8-hour workday and a workweek defined in the Labour Code, to which workers may be exposed during their whole working life, without any adverse effects on their health (also when retired) or that of the next generations.
- NDSCh – MAC(STEL): MAXIMUM ADMISSIBLE SHORT-TERM CONCENTRATION: The short-term exposure limit is an average concentration, to which workers may exposed without any adverse health effects if it does not last longer than 15 minutes and does not occur more than twice during a workday, at intervals not shorter than 1 hour.
- NDS – MAC(C): MAXIMUM ADMISSIBLE CEILING CONCENTRATION: Ceiling concentration, which because of the threat to workers' health or life, should not be exceeded even instantaneously.

Out of 414 chemical compounds specified in Polish MAC list, 144 are provided with *Sk* notation, and 140 of these are organic compounds. Documentation of admissible occupational exposure levels, prepared by the Group of Experts for Chemical Agents, Intersectoral Commission for MAC based on health criteria and current research results, has been used as the reason of *Sk* notation for 108 of the chemicals. Out of these chemicals, however, only 5 are not provided with *Skin* notation in the ACGIH 2000 list: ethyl acetate, p-phenylenediamine, picric acid, bis(2,3-epoxypropyl) ether and calcium cyanamide. There are 9 chemicals without *Sk* notation in the Polish list which are *Skin*-marked in the ACGIH list: 1,3,5-trinitro-1,3,5-triazine, dipropylene glycol methyl ether, hexamethyl phosphoramide, hexane, naphthalene, phenothiazine, tallium and compounds, tin and its inorganic compounds, tris(2-tolyl) phosphate.

Criteria used for skin notation

ACCORDING TO SCANSETTI: 2000 mg/kg LD_{50s} – SKIN NOTATION LIMIT VALUE

According to Scansetti, who analyzed the American TLV List, dermal lethal dose LD_{50s} determined in experiments on test animals served as the basis for noting 66 (39%) out of 168 chemical substances with the *Sk (SKIN)* symbol. In this list, 2g/kg LD_{50s} was assumed to be the *Sk*-notation limit value. The following were used as the criterion for *Sk* notation: documented tests on humans for 25 substances (15%); non-documented data both for animals and humans for 24 substances (14.5%); dermatoses in occupationally employed people for 13 substances (8%); similarity to other substances for 7 chemicals (4%). No criteria for including into the *SKIN* category were found for the remaining 33 chemicals (20%).

Many countries adopted the *Sk* notation symbol in their national MAC lists as suggested by US hygienists. According to a study by the International Labour Office (ILO), almost 400 chemical compounds placed in the ILO list specifying MAC values (the list comprises MAC values of 17 countries: Switzerland, U.S.A., Netherlands, Germany, Belgium, Austria, U.K., Finland, Roumania, Yugoslavia, Sweden, Italy, Argentina, Poland, Japan, Hungary) have been considered dangerous for skin contact.

ACCORDING TO KENNEDY: 1000 mg/kg LD_{50s} – SKIN NOTATION LIMIT VALUE

Kennedy et al. suggested that LD_{50s} determined for the dermal absorption should be arbitrarily employed as a rough criterion for *Sk*-notation of a chemical in the MAC list. According to that theory, all chemicals with LD_{50s} value below 1000 mg/kg

should be originally provided with the *Sk* index in the MAC list until some other criteria are found for applying the *Sk* notation, such as: systemic effects of repeated dermal exposure, or extrapolation of dermal effects observed during exposure by route other than dermal. The adoption of the 1000 mg/kg LD_{50s} as the limit value for marking a chemical with the dermal absorption symbol in the MAC list was justified by calculating the probability of *Sk* notation for chemicals depending on LD_{50s} value. To that effect, the authors ranked the chemicals according to their LD_{50s} values and classified them into the dermal toxicity categories.

The authors of the report procured LD_{50s} data for the 195 TLV (ACGIH) List chemicals from the Registry of Toxic Effects of Chemical Substances.

FISEROVA-BERGEROVA: DERMAL PENETRATION RATE, PREDICTED FROM PHYSICAL PROPERTIES, AS THE INDEX OF DERMAL ABSORPTION

Fiserova-Bergerova et al. proposed a mathematical method to determine dermal absorption, designed specifically for the purpose of *Skin* notation. She suggested to adopt the dermal penetration rate (flux - Fl), predicted from physical properties, as the index of dermal absorption of chemicals:

$$Fl = \frac{Csat}{15}(0{,}38 + 0{,}153 \cdot P) \cdot e^{-0{,}016\,MW}$$

where: MW is the molecular weight of the chemical
P s the water/octanol partition coefficient
C_{sat} is the concentration of the chemical in saturated aqueous solution (mg/l)

Two reference values were recommended as the indicators for *Skin* notation of a chemical in the MAC list:

1. dermal absorption potential, which relates to dermal absorption resulting in 30% (1.3-fold) increase of a non-volatile chemical dose, or of the biological level of a volatile chemical (determined by biological monitoring) relative to the biological levels of that compound resulting from the solely inhalational exposure to the compound at concentration equal to the value specified in the current MAC list;
2. dermal toxicity potential, which relates to dermal absorption resulting in 200% (3-fold) increase of the biological levels of the chemical relative to the biological levels of that compound resulting from the solely inhalational exposure to the compound at concentration equal to the value specified in the current MAC list.

Both for volatile and non-volatile chemicals, the values of the critical flows depend on the determined highest admissible concentration of the chemical in ambient air:

$$Fl = \frac{3}{4}\,TLV \qquad Fl^{**} = 5\ TLV$$

where: TLV - prevailing highest admissible concentration value, in mg/l, corresponding to the MAC value.

Fiserova-Bergerova et al. recommend that the following criteria for *Skin* notation of chemicals in the MAC list be adopted, using the specified reference values of Fl^{*} and Fl^{**}:

1. If absorption of a chemical through 2% body surface results in 30% increase of the biological level of the chemical, i.e. when $Fl^{*} < Fl$ ($Fl^{*}/Fl < 1$), then the chemical should be classified as probably absorbable through the skin, and ought to be provided with the suitable notation in the MAC list.
2. If absorption of a chemical through 2% body surface results in 3-fold increase of the biological level of the chemical (increase by 200%), i.e. when $Fl^{**} < Fl$ ($Fl^{**}/Fl < 1$) or $Fl^{*}/Fl = 0.15$, then the chemical should be classified as absorbable through the skin, and ought to be provided with the suitable notation in the MAC list.

Fiserova-Bergerova et al. stress that the critical flow is associated with the systemic action of a chemical and should not be used for those substances for which MAC values have been determined from their irritant effect.

DUTCH EXPERT COMMITTEE ON OCCUPATIONAL STANDARD STRATEGY OF ASSIGNING A SKIN NOTATION

The documentation on a strategy of assigning a skin notation assumes an absorption rate R of:

$$R = \frac{10^{b}(m^{3}) \cdot OEL\,(mg \cdot m^{-3}) \cdot f^{c}}{2000^{a}(cm^{2})10^{d}}$$

Where the area of the hands and the forearms is $^{a}2000\ cm^{2}$, that $^{b}10\ m^{3}$ is inhaled in 8h, that a fraction (f) of $^{c}0{,}5$ of the atmospheric contaminants is absorbed by the lungs, at the $^{d}10\%$ criterion of Dutch Expert Committee on Occupational Standards (DECOS). The provisional approach by the Dutch Expert Committee on Occupational Standards implies that a skin notation should be applied when the amount absorbed by both arms and forearms in 1 h could amount to more than 10 % of the amount absorbed via the lungs on exposure to the occupational exposure limit (OEL) for 8 h[(2)]. Thus, if R >0,25 OEL [µg cm^{-2}], a skin notation may be appropriate. The OEL is set on the basis of data for respiratory exposure. In a situation where the dermal route predominates and respiratory exposure is of minor importance, the OEL is not a valid starting point from which to derive a skin notation.

OPTION OF THE MEMBERS OF THE DFG COMMISSION

In Germany, scientifically based occupational threshold values in air (MAK) are evaluated by the DFG Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area. In the opinion of the members of the DFG Commission, substances are assigned an "H" (the German equivalent of *Sk*) when the observance of the MAK value for the substance is not sufficient to protect dermally exposed persons from adverse effects on their health. A substance is considered to be absorbed through the skin when one of the criteria listed below is fulfilled:

1. Designation with "H" based on workplace studies.

2. Designation with "H" based on animal studies.
3. Designation with "H" based on *in vitro* studies.
4. Designation with "H" based on theoretical models.

THE GROUP OF EXPERTS FOR CHEMICAL AGENTS IN POLAND PROPOSES FOLLOWING CRITERIA FOR ASSIGNING THE *SK* SYMBOL (DANGER OF CUTANEOUS ABSORPTION) TO POLISH MAC DRAFT LIST CHEMICALS:

1. All chemicals with LD_{50s} value below 1000 mg/kg should be provided with the *Sk* index in the MAC list.
2. For other chemicals, a skin notation would be considered when repeated human and dermal application studies have shown significant systemic effects following exposure.
3. When the data quoted above are not available, the physicochemical data required to calculate the flow (solubility, octanol/water partition coefficient, molecular weight) were obtained to consider a skin notation.

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Assignment of skin notation for MAC list in Poland from the viewpoint of the Group of Experts for Chemical Agents

No	Name of chemical and CAS (Chemical Abstracts Service Registry Number)	NDS values in mg/m^3			Skin notation
		MAC	STEL	Ceiling	
1	**acetaldehyde** [75-07-0]	5	-	45	-
2	**acetanilide** - dusts [103-84-4]	6	-	-	-
3	**acetic acid** [64-19-7]	15	30	-	-
4	**acetic anhydride** [108-24-7]	10	-	20	-
5	**acetone** [67-64-1]	200	1600	-	-
6	**acetonitrile** [75-05-8]	70	140	-	Sk
7	**acetophenone** [98-86-2]	50	100	-	-
8	**acid green 16** [12768-78-4]	10	-	-	-
9	**acrylaldehyde** [107-02-8]	0,2	0,5	-	Sk
10	**acrylamide** [79-06-1]	0,1	-	-	Sk
11	**acrylic acid** [79-10-7]	20	50	-	Sk
12	**acrylonitrile** [107-13-1]	2	10	-	Sk
13	**adipic acid** [124-04-9]	5	10	-	-
14	**aldrin** [309-00-2]	0,01	0,08	-	Sk
15	**allyl alcohol** [107-18-6]	2	10	-	Sk
16	**allyl propyl disulfide** [2179-59-1]	12	18	-	-
17	**aluminum trioxide** [1344-28-1]	2	16	-	-
18	**2-aminoethanol** [141-43-5]	3	10	-	Sk
19	***N,N'*-bis(2-aminoethyl)ethylenediamine** [112-24-3]	1	3	-	Sk
20	**4-aminophenol** - dusts [123-30-8]	5	-	-	-
21	**ammonia** [7664-41-7]	20	27	-	-
22	**ammonium chloride** - vapours & fumes [12125-02-9]	10	20	-	-
23	**ammonium sulfamate** - dusts [7773-06-0]	10	-	-	-
24	**aniline** [62-53-3]	5	20	-	Sk
25	**antimony & inorganic compounds** - as Sb [7440-36-0]	0,5	1,5	-	-
26	**arsenic & inorganic compounds** - as As [7440-38-2]	0,01	-	-	-
27	**arsine** [7784-42-1]	0,2	0,6	-	-
28	**asphalt petroleum** - fumes [8052-42-4]	5	10	-	-
29	**atrazine** [1912-24-9]	5	-	-	-
30	**barium & inorganic compounds** - as Ba [7440-39-3]	0,5	1,5	-	-
31	**benzaldehyde** [100-52-7]	10	40	-	-
32	**benzene** [71-43-2]	10	40	-	Sk
33	**benzidine** [92-87-5]	0	0	-	Sk
34	**p-benzoquinone** [106-51-4]	0,1	0,4	-	-
35	**benzoyl peroxide** [94-36-0]	5	10	-	-
36	**benzo[*a*]pyrene** [50-32-8]	0,002	-	-	-
37	**beryllium & inorganic compounds** - as Be [7440-41-7]	0,001	0,003	-	-
38	**bicyclo[4.4.0]decane** [91-17-8]	100	300	-	-
39	**biphenyl** [92-52-4]	1	2	-	Sk
40	**biphenyl-4-amine** [92-67-1]	0,001	-	-	-
41	**bromine** [7726-95-6]	0,7	2	-	-
42	**bromine pentafluoride** [7789-30-2]	0,5	1,0	-	-
43	**bromochloromethane** [74-97-5]	1000	1300	-	-
44	**bromoethane** [74-96-4]	50	400	-	Sk
45	**bromoform** [75-25-2]	5	-	-	Sk
46	**bromomethane** [74-83-9]	5	40	-	Sk
47	**bromphenvinphos** [33399-00-7]	0,01	-	-	Sk
48	**buta-1,3-diene** [106-99-0]	10	40	-	-
49	**butan-1-ol** [71-36-3]	50	150	-	Sk
50	**butan-2-ol** [78-92-2]	300	450	-	-
51	**butane** [106-97-8]	1900	3000	-	-
52	***tert*-butanol** [75-65-0]	300	450	-	-
53	**butanone** [78-93-3]	200	850	-	-
54	**(*E*)-but-2-enal** [4170-30-3]	6	12	-	Sk
55	**1-butoxy-2,3-epoxy propane** [2426-08-6]	30	60	-	-
56	**2-butoxyethanol** [111-76-2]	100	360	-	Sk
57	**2-butoxyethyl acetate** [112-07-2]	100	-	-	Sk
58	***sec*-butyl acetate** [105-46-4]	900	900	-	-
59	***tert*-butyl acetate** [540-88-5]	900	900	-	-
60	**butyl acetate** [123-86-4]	200	950	-	-
61	**butyl acrylate** [141-32-2]	20	70	-	-
62	**butyl mercaptan** [109-79-5]	1	2	-	-
63	**butyl methacrylate** [97-88-1]	100	300	-	-

No	Name of chemical and CAS (Chemical Abstracts Service Registry Number)	NDS values in mg/m^3			Skin notation
		MAC	STEL	Ceiling	
64	**4-*tert*-butyltoluene** [98-51-1]	30	-	-	Sk
65	**cadmium, elemental and inorganic compounds**, as Cd - fumes & dusts [7440-43-9]	0,01	-	-	-
66	**calcium carbonate** – dusts [1317-65-3]	10	-	-	-
67	**calcium cyanamide** [156-62-7]	1	-	-	Sk
68	**calcium hydroxide** [1305-62-0]	2	-	-	-
69	**calcium oxide** [1305-78-8]	2	6	-	-
70	**camphor, synthetic** [76-22-2]	12	18	-	-
71	**captan** [133-06-2]	5	-	-	-
72	**carbaryl** [63-25-22]	1	8	-	-
73	**carbofurane** [1563-66-2]	0,1	-	-	Sk
74	**carbon dioxide** [124-38-9]	9000	27000	-	-
75	**carbon disulfide** [75-15-0]	18	30	-	Sk
76	**carbon oxide** [630-08-0]	30	180	-	-
77	**carbon tetrachloride** [56-23-5]	20	100	-	Sk
78	**chlorine** [7782-50-5]	1,5	9	-	-
79	**chlorine dioxide** [10049-04-4]	0,3	0,9	-	-
80	**chlormequate chloride** [999-81-5]	15	-	-	Sk
81	**1-chloro-2,3-epoxypropane** [106-89-8]	1	-	-	Sk
82	**chloro(phenyl)methane** [100-44-7]	3	-	5	-
83	**1-chloro-1-nitropropane** [600-25-9]	10	-	-	-
84	**chloroacetaldehyde** [107-20-0]	1	3	-	-
85	**chloroacetic acid** [79-11-8]	2	4	-	-
86	**2-chloroaniline** [95-51-2]	3	10	-	Sk
87	**3-chloroaniline** [108-42-9]	3	10	-	Sk
88	**4-chloroaniline** [106-47-8]	3	10	-	Sk
89	**chlorobenzene** [108-90-7]	50	150	-	-
90	**2-chlorobuta-1,3-diene** [126-99-8]	2	16	-	Sk
91	**chlorodifluoromethane** [75-45-6]	3000	-	-	-
92	**chlorodinitrobenzene** - all isomers [25567-67-3]	1	3	-	-
93	**chloroethane** [75-00-3]	200	1600	-	Sk
94	**2-chloroethanol** [107-07-3]	1	3	-	Sk
95	**chloroethene** [75-01-4]	5	30	-	-
96	**bis(2-chloroethyl) ether** [111-44-4]	10	30	-	Sk
97	**chloroform** [67-66-3]	50	225	-	-
98	**chloromethane** [74-87-3]	20	160	-	Sk
99	**chloronitrobenzene** - all isomers [25167-93-5]	1	3	-	-
100	**4-chlorophenol** [106-48-9]	1	3	-	Sk
101	**4-chlorostyrene** [2039-85-2]	50	400	-	-
102	**2-chlorotoluene** [95-49-8]	100	250	-	-
103	**chlorphenvinphos** [470-90-6]	0,01	0,1	-	Sk
104	**chlorpyrifos** [2921-88-2]	0,2	0,6	-	Sk
105	**chromates(VI) and dichromates(VI)** [7440-47-3]	0,1	0,3	-	-
106	**chromium metal & chromium(III) compounds** [7440-47-3]	0,5	-	-	-
107	**chromyl chloride** [149777-61-8]	0,15	-	-	-
108	**cobalt, elemental** – fumes and dusts [7440-48-4]	0,05	0,2	-	-
109	**copper and compounds** - as Cu				
	a) oxides fumes and soluble salts	0,1	0,3	-	-
	b) oxides dusts and insoluble salts [7440-50-8]	1	2	-	-
110	**cresol** - all isomers [1319-77-3]	5	15	-	Sk
111	**cumene** [98-82-8]	100	350	-	Sk
112	**cyanamide** [420-04-2]	2	4	-	Sk
113	**cyclohexane** [110-82-7]	80	640	-	-
114	**cyclohexanol** [108-93-0]	10	-	-	Sk
115	**cyclohexanone** [108-94-1]	40	80	-	Sk
116	**cyclohexene** [110-83-8]	300	900	-	-
117	**cyclohexylamine** [108-91-8]	40	80	-	Sk
118	**cyclopenta-1,3-diene** [542-92-7]	200	-	-	-
119	**2,4-D** [94-75-7]	7	20	-	-
120	**DDT** [50-29-3]	0,1	0,8	-	Sk
121	**decaborane(14)** [17702-41-9]	0,3	0,9	-	Sk
122	**demeton** (O-demeton; S-demeton) [8065-48-3]	0,1	-	-	Sk
123	**demeton-S methyl** [8022-00-2]	0,1	0,8	-	Sk
124	**dibenz-1,4-thiazine** [92-84-2]	4	-	-	-
125	**dibenzo[*a,h*]anthracene** [53-70-3]	0,004	-	-	-
126	**diborane(6)** [19287-54-7]	0,1	0,2	-	-

No	Name of chemical and CAS (Chemical Abstracts Service Registry Number)	NDS values in mg/m^3			Skin notation
		MAC	STEL	Ceiling	
127	**diborium trioxide** - dusts [1303-86-2]	10	-	-	-
128	**dibromodifluoromethane** [75-61-6]	600	1200	-	
129	**1,2-dibromoethane** [106-93-4]	0,5	-	-	Sk
130	**dibutyl phthalate** [84-74-2]	5	10	-	-
131	**1,1-dichloro-1-nitroethane** [594-72-9]	30	60	-	-
132	**1,2-dichloro-1,1,2,2-tetrafluoroethane** [76-14-2]	5000	8750	-	-
133	**2,2'-dichloro-4,4'-methylenedianiline** [101-14-4]	0,02	-	-	Sk
134	**1,2-dichlorobenzene** [95-50-1]	20	-	300	-
135	**1,4-dichlorobenzene** [106-46-7]	20	-	300	-
136	**dichlorodifluoromethane** [75-71-8]	4000	6200	-	-
137	**dichloroethane** - all isomers [1300-21-6]	50	60	-	-
138	**dichloroethene** - all isomers [25323-30-2]	50	80	-	-
139	**dichlorofluoromethane** [75-43-4]	40	200	-	-
140	**dichloromethane** [75-09-2]	20	50	-	-
141	**1,2-dichloropropane** [26638-19-7]	50	400	-	-
142	**2,2-dichloropropionic acid & sodium salt** [75-99-0]	6	12	-	-
143	**(1,2-dichlorovinyl)benzene** [6607-45-0]	50	150	-	-
144	**dichlorvos** [62-73-7]	1	3	-	Sk
145	**dieldrin** [60-57-1]	0,01	0,08	-	Sk
146	**diethyl ether** [60-29-7]	300	1500	-	-
147	**diethyl phthalate** [84-66-2]	5	15	-	-
148	**diethylamine** [109-89-7]	30	75	-	Sk
149	**2-(diethylamino)ethanol** [100-37-8]	50	-	-	Sk
150	**diethylbenzene** - all isomers [25340-17-4]	100	400	-	Sk
151	**diisopropyl ether** [108-20-3]	1000	1300	-	-
152	**dimethoate** [60-51-5]	0,2	0,6	-	Sk
153	**dimethoxymethane** [109-87-5]	1000	3500	-	-
154	**dimethyl sulfate** [77-78-1]	0,5	1	-	Sk
155	**dimethyl phthalate** [131-11-3]	5	10	-	-
156	***N,N*-dimethylacetamide** [127-19-5]	35	-	-	Sk
157	**dimethylamine** [124-40-3]	19	18	-	-
158	***N,N*-dimethylaniline** [121-69-7]	12	40	-	Sk
159	**dimethylaniline** - all isomers [1300-73-8]	10	-	-	Sk
160	**1,3-dimethylbutyl acetate** [108-84-9]	300	-	-	-
161	**dimethylformamide** [68-12-2]	10	-	-	Sk
162	**2,6-dimethylheptan-4-on** [108-83-8]	150	300	-	-
163	**1,1-dimethylhydrazine** [57-14-7]	0,1	-	-	Sk
164	**dinitrobenzene** - all isomers [25154-54-5]	1	3	-	Sk
165	**dinitrophenol** - all isomers [25550-58-7]	0,05	0,15	-	-
166	**dinitrotoluene** - all isomers [25321-14-6]	1	5	-	Sk
167	**dioxane** [123-91-1]	10	80	-	Sk
168	**1,3-dioxolane** [646-06-0]	10	50	-	-
169	**diphenyl ether** [101-84-8]	7	14	-	-
170	**dipropylene glycol methyl ether** [34590-94-8]	240	480	-	-
171	**diquate dibromide** – dusts [85-00-7]	0,1	0,3	-	Sk
172	**disulfur dichloride** [10025-67-9]	5	15	-	-
173	**endosulfan** [115-29-7]	0,1	0,3	-	Sk
174	**endrin** [72-20-8]	0,01	0,08	-	Sk
175	**1,2-epoxy-3-isopropoxypropane** [4016-14-2]	240	360	-	-
176	**1,2-epoxy-3-phenoxypropane** [122-60-1]	0,6	3	-	Sk
177	**1,2-epoxy-4-(epoxyethyl)cyclohexane** [106-87-6]	60	-	-	Sk
178	**epoxypropane** [75-21-8]	1	3	-	-
179	**2,3-epoxypropanol** [556-52-5]	6	-	-	-
180	**bis(2,3-epoxypropyl) ether** [2238-07-5]	0,05	-	-	Sk
181	**ethanedinitrile** [460-19-5]	8	20	-	-
182	**ethanethiol** [75-08-1]	1	2	-	-
183	**ethanol** [64-17-5]	1900	-	-	-
184	**4'-ethoxyacetanilide** - dusts [62-44-2]	5	-	-	-
185	**2-ethoxyethanol** [110-80-5]	20	80	-	Sk
186	**2-ethoxyethyl acetate** [111-15-9]	20	-	-	Sk
187	**ethyl acetate** [141-78-6]	200	600	-	-
188	**ethyl acrylate** [140-88-5]	20	80	-	Sk
189	**ethyl formate** [109-94-4]	250	500	-	-
190	**ethyl silicate** [78-10-4]	80	250	-	-
191	**ethylamine** [75-04-7]	5	15	-	Sk
192	**ethylbenzene** [100-41-4]	100	350	-	Sk

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			MAC	STEL	Ceiling	
193	**ethylene glycol dinitrate**	[628-96-6]	0,3	0,4	-	Sk
194	**ethylene glycol**	[107-21-1]	15	50	-	-
195	**ethylenediamine**	[107-15-3]	20	50	-	Sk
196	**2-ethylhexyl acrylate**	[103-11-7]	35	100	-	Sk
197	**bis(2-ethylhexyl) phthalate**	[117-81-7]	1	5	-	-
198	**ethyltoluene** - all isomers	[25550-14-5]	100	-	-	-
199	**fenitrothion**	[122-14-5]	0,02	0,1	-	-
200	**fenthion**	[55-38-9]	0,2	-	-	Sk
201	**ferrovanadium** – dusts	[12604-58-9]	1	3	-	-
202	**fluorides** - as HF	[16984-48-8]	1	3	-	-
203	**fluorine**	[7782-41-4]	0,05	0,4	-	-
204	**fonofos**	[944-22-9]	0,1	-	-	Sk
205	**formaldehyde**	[50-00-0]	0,5	1	-	Sk
206	**formic acid**	[64-18-6]	5	15	-	-
207	**2-furaldehyde**	[98-01-1]	10	40	-	Sk
208	**2-furylmethanol**	[98-00-0]	30	60	-	-
209	**gasoline**					
	a) extraction naphtha		500	1500	-	-
	b) painters' naphtha	[-]	300	900	-	-
210	**glutaraldehyde**	[111-30-8]	0,4	0,6	-	-
211	**glyphosate**	[1071-83-6]	10	-	-	-
212	**hafnium and compounds** - as Hf	[7440-58-6]	0,5	-	-	-
213	**halothane**	[151-67-7]	40	100	-	-
214	**heptan-2-one**	[110-43-0]	240	480	-	-
215	**heptane**	[142-82-5]	1200	2000	-	-
216	**hexachlorobenzene**	[118-74-1]	0,5	-	-	Sk
217	**1,2,3,4,5,6-hexachlorocyclohexane**	[608-73-1]	0,05	0,4	-	-
218	**hexachloroethane**	[67-72-1]	10	30	-	Sk
219	**hexamethyl phosphoramide**	[680-31-9]	0,05	-	-	-
220	**hexamethylenetetramine**	[100-97-0]	4	-	-	-
221	**hexan-2-one**	[591-78-6]	10	50	-	Sk
222	**hexane**	[110-54-3]	100	400	-	-
223	**hexane-1,6-diisocyanate**	[822-06-0]	0,05	0,15	-	Sk
224	**hexane, other isomers**	[73513-42-5]	400	3200	-	-
225	**hexano-6-lactam**	[105-60-2]	10	-	-	-
226	**hydrazine**	[302-01-2]	0,05	0,1	-	Sk
227	**hydrogen bromide**	[10035-10-6]	7	21	-	-
228	**hydrogen chloride**	[7647-01-0]	5	-	10	-
229	**hydrogen cyanide & cyanides** - as HCN	[74-90-8]	0,3	-	10	Sk
230	**hydrogen fluoride**	[7664-39-3]	0,5	-	2	-
231	**hydrogen peroxide**	[7722-84-1]	1,5	4	-	-
232	**hydrogen sulfide**	[7783-06-4]	10	20	-	-
233	**hydroquinone**	[123-31-9]	2	4	-	-
234	**2,2'-iminobis(ethylamine)**	[111-40-0]	4	12	-	Sk
235	**iodine**	[7553-56-2]	1	-	-	-
236	**iodomethane**	[74-88-4]	10	30	-	Sk
237	**iron oxides** - as Fe - fumes	[1309-37-1]	5	10	-	-
238	**isobutyl alcohol**	[78-83-1]	100	200	-	Sk
239	**isobutyraldehyde**	[78-84-2]	100	-	-	-
240	**isopentyl acetate**	[123-92-2]	250	500	-	-
241	**isophorone**	[78-59-1]	5	10	-	-
242	**isoprene**	[78-79-5]	100	300	-	-
243	**isopropyl acetate**	[108-21-4]	600	1000	-	-
244	**isopropyl alkohol**	[67-63-0]	900	1200	-	Sk
245	**isopropylamine**	[75-31-0]	12	24	-	-
246	**2-isopropyl-4,6-dinitrophenol**	[118-95-6]	0,05	0,15	-	Sk
247	**kerosene**	[8008-20-6]	100	300	-	-
248	**ketene**	[463-51-4]	0,5	1,5	-	-
249	**lead, elemental and inorganic compounds** - as Pb	[7439-92-1]	0,05	-	-	-
250	**lithium hydride**	[7580-67-8]	0,025	-	-	-
251	**magnesium oxide**:					
	a) fumes		5	-	-	-
	b) dusts	[1309-48-4]	10	-	-	-
252	**malathion**	[121-75-5]	1	10	-	Sk
253	**maleic anhydride**	[108-31-6]	0,5	1	-	Sk
254	**manganese, elemental and inorganic compounds** - as Mn	[7439-96-5]	0,3	-	-	-

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		MAC	STEL	Ceiling	
255	**MCPA** [94-74-6]	1	5	-	Sk
256	**mercury and compounds** - as Hg				
	a) organic	0,01	0,03	-	Sk
	b) inorganic	0,05	0,15	-	
	c) vapours [7439-97-6]	0,025	0,2	-	
257	**mesityl oxide** [141-79-7]	20	100	-	-
258	**methanethiol** [74-93-1]	1	2	-	-
259	**methanol** [67-56-1]	100	300	-	Sk
260	**2-methoxy-1-methyethyl acetate** [108-65-6]	260	520	-	-
261	**2-methoxyaniline** [90-04-0]	0,5	1	-	Sk
262	**4-methoxyaniline** [104-94-9]	0,5	1	-	Sk
263	**methoxychlor** - dusts [72-43-5]	10	-	-	-
264	**2-methoxyethanol** [109-86-4]	15	60	-	Sk
265	**2-methoxyethyl acetate** [110-49-6]	25	100	-	Sk
266	**1-methoxypropan-2-ol** [107-98-2]	180	360	-	-
267	**2-methoxypropyl acetate** [70657-70-4]	100	200	-	-
268	**2-methyl-4,6-dinitrophenol** [534-52-1]	0,05	0,4	-	Sk
269	**methyl acetate** [79-20-9]	250	600	-	-
270	**methyl acrylate** [96-33-3]	20	70	-	Sk
271	**methyl isobutyl ketone** [108-10-1]	200	300	-	-
272	**methyl methacrylate** [80-62-6]	50	400	-	-
273	**methyl parathion** [298-00-0]	0,1	0,6	-	Sk
274	**methyl propyl ketone** [107-87-9]	100	800	-	-
275	**5-methyl-heptan-3-one** [541-85-5]	50	100	-	-
276	**methylamine** [74-89-5]	5	15	-	-
277	***N*-methylaniline** [100-61-8]	2	-	-	Sk
278	**3-methylbutan-1-ol** [123-51-3]	200	400	-	-
279	**methylcyclohexane** [108-87-2]	500	2000	-	-
280	**methylcyclohexanol** - all isomers [25639-42-3]	50	350	-	-
281	**2-methylcyclohexanone** [583-60-8]	50	340	-	Sk
282	**4,4'-methylenebis(phenylisocyanate)** [101-68-8]	0,05	-	0,2	-
283	**methylhydrazine** [60-34-4]	0,02	0,1	-	Sk
284	***N*-methylmorfoline** [109-02-4]	15	30	-	-
285	**1-methylnaphthalene** [90-12-0]	30	-	-	-
286	**4-methylpentan-2-ol** [108-11-2]	100	160	-	Sk
287	**molybdenum and compounds** - as Mo [7439-98-7]	4	10	-	-
288	**morpholine** [110-91-8]	70	100	-	Sk
289	**naphthalene** [91-20-3]	20	75	-	-
290	**1-naphthylamine** [134-32-7]	0	0	-	-
291	**2-naphthylamine** [91-59-8]	0	0	-	-
292	**napthalene chlorinated derivates** [-]	0,5	1,5	-	-
293	**nickel and compounds except nickel carbonyl** - as Ni [7440-02-0]	0,25	-	-	-
294	**nicotine** [54-11-5]	0,5	1,5	-	Sk
295	**nitric acid(V)** [7697-37-2]	10	-	-	-
296	**2-nitroaniline** [88-74-4]	3	10	-	Sk
297	**3-nitroaniline** [99-09-2]	3	10	-	Sk
298	**4-nitroaniline** [100-01-6]	3	10	-	Sk
299	**nitrobenzene** [98-95-3]	3	10	-	Sk
300	**nitroethane** [79-24-3]	30	240	-	-
301	**nitroglycerin** [55-63-0]	0,5	1	-	Sk
302	**nitromethane** [75-52-5]	30	240	-	-
303	**nitropropane** - all isomers [25322-01-4]	30	70	-	-
304	**3-nitrotoluene** [99-08-1]	3	9	-	Sk
305	**4-nitrotoluene** [99-99-0]	3	9	-	Sk
306	**nitrous oxides** [10102-43-9; 10102-44-0; 63907-41-5]	5	10	-	-
307	**octane** [111-65-9]	1000	1800	-	-
308	**oil mist, mineral** [8012-95-1]	5	10	-	-
309	**osmium tetroxide as Os** [20816-12-0]	0,002	0,006	-	-
310	**oxalic acid** [144-62-7]	1	2	-	-
311	**2,2'-oxydiethanol** - aerosol [111-46-6]	10	-	-	-
312	**ozone** [10028-15-6]	0,15	-	-	-
313	**pentachlorophenol** [87-86-5]	0,5	1,5	-	Sk
314	**pentan-1-ol** [71-41-0]	100	450	-	-
315	**pentane** [109-66-0]	1800	2300	-	-
316	**2-pentyl acetate** [626-38-0]	250	500	-	-
317	**3-pentyl acetate** [620-11-1]	250	500	-	-

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		MAC	STEL	Ceiling	
318	**pentyl acetate** [628-63-7]	100	800	-	-
319	***tert* pentyl acetate** [625-16-1]	250	500	-	-
320	**perchloric acid** [7601-90-3]	1	3	-	-
321	**phenol** [108-95-2]	10	20	-	Sk
322	**phenyl(2-naphtyl)amine** [135-88-6]	0,02	-	-	-
323	**1,4-phenylendediamine** [106-50-3]	0,1	0,3	-	-
324	**phenylhydrazine** [100-63-0]	20	-	-	Sk
325	**phosgene** [75-44-5]	0,5	1,5	-	-
326	**phosphine** [7803-51-2]	0,1	0,8	-	-
327	**phosphoric acid** [7664-38-2]	1	3	-	-
328	**phosphorus (yellow)** [7723-14-0]	0,03	0,24	-	-
329	**phosphorus pentachloride** [10026-13-8]	0,7	1,4	-	-
330	**phosphorus trichloride** [7719-12-2]	1	2	-	-
331	**phthalic anhydride** - vapours and aerosols [85-44-9]	1	8	-	-
332	**picric acid** [88-89-1]	0,1	0,3	-	-
333	**platinum metal** [7440-06-4]	1	-	-	-
334	**polychlorinated biphenyls** [1336-36-3]	1	-	-	Sk
335	**polycyclic aromatic hydrocarbons** - cyclohexane extractable fraction [-]	0,002	-	-	-
336	**potassium hydroxide** [1310-58-3]	0,5	1	-	-
337	**potassium peroxodisulfate(VI)** - dusts [7727-21-1]	0,1	-	-	-
338	**prop-2-yn-1-ol** [107-19-7]	3	-	-	Sk
339	**propano-3-lactone** [57-57-8]	1	-	-	Sk
340	**propanol** [71-23-8]	200	600	-	Sk
341	**propionic acid** [79-09-4]	30	45	-	-
342	**propoxur** [114-26-1]	0,5	2	-	Sk
343	**propyl acetate** [109-60-4]	200	1000	-	-
344	**propyl nitrate** [627-13-4]	30	100	-	-
345	**propyne** [74-99-7]	1500	2000	-	-
346	**pyrethrins** [8003-34-7]	5	-	-	-
347	**pyridine** [110-86-1]	5	30	-	Sk
348	**2-pyridylamine** [504-29-0]	2	-	-	Sk
349	**resorcinol** [108-46-3]	45	90	-	-
350	**selenium and compounds** - as Se [7782-49-2]	0,1	0,3	-	-
351	**silver** - fumes and dusts [7440-22-4]	0,05	-	-	-
352	**silver insoluble compounds** - as Ag [7440-22-4]	0,05	-	-	-
353	**silver soluble compounds** - as Ag [7440-22-4]	0,01	-	-	-
354	**sodium borate, decahydrate** - dusts [1303-96-4]	0,5	2	-	-
355	**sodium fluoroacetate** [62-74-8]	0,05	0,15	-	Sk
356	**sodium hydroxide** [1310-73-2]	0,5	1	-	-
357	**stibine** [7803-52-3]	0,5	1,5	-	-
358	**strychnine** [57-24-9]	0,15	-	-	-
359	**styrene** [100-42-5]	50	200	-	Sk
360	**sulfur tetrafluoride** [7783-60-0]	0,5	1	-	-
361	**sulfur dioxide** [7446-09-5]	2	5	-	-
362	**sulfur trioxide** [7446-11-9]	1	3	-	-
363	**sulfuric acid** [7664-93-9]	1	3	-	-
364	**tallium and compounds** - as Tl [7440-28-0]	0,1	0,3	-	-
365	**tantalum** [7440-25-7]	5	-	-	-
366	**tellurium and compounds** - as Te [13494-80-9]	0,01	0,03	-	-
367	**1,1,2,2-tetrabromoethane** [79-27-6]	4	-	-	-
368	**1,1,2,2-tetrachloroethane** [79-34-5]	5	35	-	Sk
369	**tetrachloroethene** [127-18-4]	60	480	-	-
370	**tetraethyl lead** [78-00-2]	0,05	0,1	-	Sk
371	**tetrahydrofuran** [109-99-9]	600	750	-	Sk
372	**1,2,3,4-tetrahydronaphthalene** [119-64-2]	100	300	-	-
373	**tetranitromethane** [509-14-8]	0,04	-	-	-
374	**tetraphosphorus decaoxide** [1314-56-3]	1	3	-	-
375	**tetraphosphorus decasulfide** [1314-80-3]	1	3	-	-
376	**thioglycolic acid** [68-11-1]	4	8	-	Sk
377	**thiram** [137-26-8]	0,5	2	-	-
378	**tin & inorganic compounds** - as Sn, except stannan - fumes & dusts [7440-31-5]	2	-	-	-
379	**titanium and compounds** - as Ti [13463-67-7]	10	30	-	-
380	**toluene-2,4-diamine** [95-80-7]	0,04	0,1	-	-
381	**toluene** [108-88-3]	100	350	-	Sk
382	**toluene-2,4-diisocyanate** [584-84-9]	0,035	0,070	-	-
383	**toluene-2,6-diisocyanate** [91-08-7]	0,035	0,070	-	-

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		MAC	STEL	Ceiling	
384	**2-tolylamine** [95-53-4]	3	9	-	Sk
385	**1,3,5-triazinano-2,4,6-trion 1,3,5-triazino-2,4,6-triol** - dusts [108-80-5]	10	-	-	-
386	**2,4,6-trichloro-1,3,5-triazine** - vapours and aerosols [108-77-0]	0,05	0,1	-	-
387	**trichlorobenzene** - all isomers (1,2,3-; 1,2,4-;1,3,5-) [87-61-6; 120-82-1; 108-70-3]	20	40	-	-
388	**1,1,1-trichloroethane** [71-55-6]	300	1400	-	Sk
389	**1,1,2-trichloroethane** [79-00-5]	45	100	-	Sk
390	**trichloroethene** [79-01-6]	50	400	-	-
391	**trichlorofluoromethane** [75-69-4]	500	-	5600	-
392	**trichloronaphthalene** – all isomers [1321-65-9]	5	-	-	Sk
393	**trichloronitromethane** [76-06-2]	0,5	1,5	-	-
394	**trichlorphon** [52-68-6]	0,5	2	-	Sk
395	**trimethylamine** [75-50-3]	12	24	-	-
396	**trimethylbenzene** [25551-13-7] all isomers (1,2,3-; 1,2,4-;1,3,5-) [526-73-8; 95-63-6; 108-67-8]	100	170	-	Sk
397	**1,3,5-trinitro-1,3,5-triazine** [121-82-4]	1	3	-	-
398	**2,4,6-trinitrotoluene** [118-96-7]	1	3	-	Sk
399	**1,3,5-trioxane** [110-88-3]	15	75	-	-
400	**tris(2-tolyl)-phosphate** [78-30-8]	0,1	0,3	-	-
401	**tungsten** - fumes and dusts [7440-33-7]	5	-	-	-
402	**tungsten insoluble compounds** - as W [7440-33-7]	5	-	-	-
403	**tungsten soluble compounds** - as W [7440-33-7]	1	-	-	-
404	**turpentine** [8006-64-2]	300	840	-	-
405	**uranium and compounds** - as U:				
	a) soluble compounds	0,075	0,6	-	-
	b) insoluble compounds [7440-61-1]	0,015	0,12	-	-
406	**vanadium pentoxide**				
	a) fumes	0,05	0,1	-	-
	b) dusts [1314-62-1]	0,05	0,5	-	-
407	**vinyl acetate** [108-05-4]	10	30	-	-
408	**4-vinylcyclohexene** [100-40-3]	10	-	-	-
409	**vinyltoluene** - all isomers [25013-15-4]	100	300	-	-
410	**xylene** - all isomers [1330-20-7]	100	350	-	-
411	**yttrium metal and compounds** - as Y [7440-65-5]	1	-	-	-
412	**zinc oxide** - as Zn - fumes [1314-13-2]	5	10	-	-
413	**zinc dichloride** [7646-85-7]	1	2	-	-
414	**zirkonium & compounds** - as Zr [7440-67-7]	5	10	-	-