

Occupational exposure limits for chemicals in the European Union

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Exposure limits for dangerous substances in working environments have played a major part in the control of occupational disease. Exposure limits are quantitative health standards expressed as mean concentrations over a given period which an environmental pollutant must not exceed if the exposed workers' health is not to be affected. This is true provided the term limit is not accompanied by adjectives such as acceptable or tolerable, which imply the general social acceptability of a particular risk or general biological tolerance of an exposure.

It is obvious that acceptable cannot be applied on the basis of a decision taken by scientists alone; it implies evaluation both of the health effect and any other socioeconomic or political factor implied in a decision of this nature. The term tolerable makes no biological sense in that each subject tends to respond to an exogenous nuisance in a personal way, as a function of numerous individual factors. Thus, a certain level of exposure may well be tolerated (the internal environment remains in equilibrium) by one subject and not by another. For these reasons the current scientific trend is to exclude these two adjectives in the context of exposure limits; in 1977 the International Labour Organisation (ILO) defined an exposure limit as:

"... the concentration in air of a harmful substance which, if the standards are respected, does not generally have harmful effects—including long-term effects on posterity—on the health of workers exposed for 8 to 10 hours a day, 40 hours a week; this exposure is considered acceptable by the competent authority which determines the limits, but it is possible that it may not completely guarantee the protection of the health of all the workers; accordingly, the exposure limit does not constitute an absolute dividing line between harmless and harmful concentrations, but is intended solely as a guide to prevention".

In fact, verification that a specific chemical or physical agent does not exceed the exposure limits laid down for working environments (a fundamental and often decisive aspect in the prevention of occupational diseases) is today only one factor in assessing good practice in industrial hygiene, and does not signify biological compatibility for all exposed people. Thus when the results of environmental monitoring have to be compared with reference values, it is essential also to take account of other factors

which influence exposure and of different biological conditions if we are not to lose sight of the ultimate objective of prevention.

Approach of the European Union

The main role of the exposure limits in the control and prevention of occupational diseases has been recognised by the European Communities since the adoption of the first action programme on the health and safety at work in 1978,¹ with a subsequent inclusion of relevant terminology in the community legislation on the use of chemicals at work.

The first comprehensive framework for Community legislation on chemicals in the workplace was included in Council Directive 80/1107/EEC,² which set out measures for the control of risks related to chemical, physical, and biological agents. It was amended in 1988 by the adoption of Directive 88/642/EEC,³ which emphasised the mechanisms for setting exposure limits for hazardous chemicals. Furthermore Council Directive 90/394/EEC on carcinogens at work⁴ defines carcinogens in relation to the criteria set up under the framework of Council Directive 67/548/EEC,⁵ and contains a particular provision for setting up limit values for carcinogens.

The concept embodied in these Directives of having two different types of exposure limits was agreed by the Council of Ministers: (a) "binding limit value", adopted by the Council under the procedure laid down in Article 118a of the Treaty; reflects scientific data as well as socioeconomic considerations and must be transposed into national legislation as a minimum requirement, and (b) "indicative limit value", adopted by the Commission after obtaining the opinion of a committee consisting of representatives of the Member States and presided over by a representative of the Commission; an indicative limit value reflects expert evaluations based on scientific data; national authorities shall take indicative limit values into account, among other things, when they adopt national measures for the protection of workers.

These limit values are stated as the eight hour time weighted average (8 h TWA) concentration for exposure of a substance in gaseous, vaporous, or suspended form in the air at the workplace, whereas exposure means the presence of a chemical agent in the air within the breathing area of a worker.

Community legislation, which may be

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Table 1 Substances for which binding limit values or prohibition measures exist

Vinyl chloride monomer ⁶	7 ppm
Lead and its ionic compounds ⁷	0.15 mg/m ³
Asbestos ⁸ :	
Chrysotile	0.60 f/ml
Other forms (alone or in mixtures)	0.30 f/ml
2-Naphthylamine and its salts ⁹	Ban of production or use
4-Aminobiphenyl and its salts ⁹	Ban of production or use
Benzidine and its salts ⁹	Ban of production or use
4-Nitrodiphenyl ⁹	Ban of production or use

Table 2 Substances for which indicative limit values exist due to Commission Directive 91/322/EEC¹⁰

Substance	CAS*	Limit values†	
		mg/m ³ ‡	ppm§
Nicotine¶	54-11-5	0.5	—
Formic acid	64-18-6	9	5
Acetic acid	64-19-7	25	10
Methanol	67-56-1	260	200
Acetonitrile	75-05-8	70	40
Picric acid¶	88-89-1	0.1	—
Naphthalene	91-20-3	50	10
Nitrobenzene	98-95-3	5	1
Resorcinol¶	108-46-3	45	10
Diethylamine	109-89-7	30	10
Pyridine¶	110-86-1	15	5
Carbon dioxide	124-38-9	9 000	5 000
Oxalic acid¶	144-62-7	1	—
Cyanamide¶	420-04-2	2	—
Calcium dihydroxide¶	1305-62-0	5	—
Disphosphorus pentoxide¶	1314-56-3	1	—
Disphosphorus pentasulphide¶	1314-80-3	1	—
Cresols (all isomers)¶	1319-77-3	22	5
Platinum (metallic)¶	7440-06-4	1	—
Lithium hydride¶	7580-67-8	0.025	—
Bromine¶	7726-95-6	0.7	0.1
Phosphorus pentachloride¶	10026-13-8	1	—
Nitrogen monoxide	10102-43-9	30	25
Pyrethrum	8003-34-7	5	—
Barium (soluble compounds as Ba)¶	—	0.5	—
Silver (soluble compound as Ag)¶	—	0.01	—
Tin (inorganic compounds as Sn)¶	—	2	—

*CAS = chemical abstract service number.

†Measured or calculated in relation to a reference period of eight hours (8 hTWA).

‡mg/m³ Of air at 20°C and 101.3 KPa (760 mm mercury pressure).§ppm = Parts per million by volume in air (ml/m³).

¶Existing scientific data on health effects seem to be particularly limited.

amended by the Council, requires already that binding limit values be fixed for certain chemicals (appendix 1). After a similar procedure, specific Council Directives⁶⁻⁹ have laid down binding limit values or prohibition measures for the chemicals (table 1). Apart from the groups of chemicals for which binding limit values may be specified, the Commission is empowered to fix "indicative limit values". Table 2 shows the chemicals for which indicative limit values have been adopted in Commission Directive 91/322/EEC.¹⁰

Scientific basis for exposure limits

Despite the different concepts sometimes encountered, there is nowadays a general agreement on the methods and variables to be used in laying down exposure limits at work. Despite the acknowledgement of the need for more standardised toxicological and epidemiological studies to provide the scientific basis for the proposals for health based exposure limits for the working environment, minimum data have been identified on: (a) the physical and chemical properties of the substance under investigation, including the quality and quantity of impurities; (b) the results of studies of acute, subacute, short term, and chronic toxicity (through the airways, stomach, and skin; of animals or humans). Information on

genotoxicity, sensitisation, and reproductive toxicity should be taken into consideration, when available.

The first task in evaluating the available data is the identification of a no observed adverse effect level (NOAEL). However, whenever the only data available are those derived from animal experiments, it is essential, for various reasons, to introduce a factor by which the observed non-effect dose is divided. It should be stressed that in choosing and applying the final figure, the factor should only take human health into consideration. This procedure is a cornerstone of quantitative, environmental, and industrial toxicology. Nevertheless, it is on the basis of the NOAEL that the factors can be applied and thus it is necessary to find this level to suggest an appropriate dose.

As far as carcinogens are concerned, in the light of present knowledge the scientific community does not recognise the existence of a dose for carcinogens below which we can be certain that cancer will not occur. Molecular biology has amply shown the persistent existence of chemical carcinogens which can damage DNA so that it is not possible to postulate a threshold dose that would have no genotoxic effect. Neither does epidemiology provide evidence of a zero risk of tumours. Even if it can be said for a given cohort of workers exposed that there is no significant increase in the incidence of cancer, it is easy to argue that every working situation is specific and concerns specific groups of workers.

A different problem, but one that has identical practical implications, concerns the possibility of proposing exposure limits for substances which cause sensitivity. The observance of the exposure limits is not sufficient to protect people who are sensitised to the specific substance used at work; however, it is known that the lower the exposure to chemicals with sensitising capacity, the smaller the number of workers who will develop allergic syndromes.

Scientific Committee for Occupational Exposure Limits to Chemical Agents (SCOEL)

In 1990, at the request of the Council, the European Commission had set up an informal group of scientists, known as the Scientific Expert Group (SEG), to give advice on setting limit values, after having reviewed the different approaches in the member states. To encourage the work to develop harmonised occupational exposure limits (OELs), the European Commission decided to formalise the SEG and with its Decision of 12 July 1995¹¹ has set up a formal base for the work on the scientific evaluation of the risk at the workplace related to chemical substances. The Committee formed comprises not more than 21 members drawn from all member states and reflects the full range of scientific expertise which is necessary to fulfil its mandate, including, in particular chemistry, toxicology, epidemiology, occupational medicine, industrial hygiene, and gen-

Table 3 Key principles agreed by SCOEL

Strategy for short term exposure
Strategy to apply uncertainty factors
Strategy for assigning a skin notation
Interpretation of neurobehavioural studies
Reproductive toxicity
Assessment of sensitisers
Biological limit values
8 h TWA exposure limits
Role of the SCOEL in the evaluation of chemical carcinogens

eral competence in setting OELs.

Article 2 of the Decision describes the key issues of the major task of the SCOEL:

"The Committee shall in particular give advice on the setting of OELs based on scientific data and where appropriate shall propose values which may include:

the eight-hour time weighted average (TWA);

short-term/excursion limits (STEL);

biological limit values"

To take into account specific problems "the OELs may be supplemented, as appropriate, by further notations" and "the committee shall advise on any other absorption of the substance in question via other routes".

It has already become clear that several key principles concerning the criteria of setting OELs need to be discussed in detail because already existing national scientific committees have applied different approaches to develop their limit values. This was influenced on the one hand by different historically developed legislation and on the other hand by the fact that not only one truth can be interpreted from several scientific data.

The SCOEL has considered these differences and started a fruitful discussion on their principles to fulfil the requirements of the European legislation. They have already agreed on some key principles which will be published in brief documents (table 3).

It is well understood that not all aspects of debate can be discussed at once, furthermore, the development in science underlies rapid changes. This means that also in future the SCOEL will consider this dynamic process and will further go on discussing other key principles of the procedure to set OELs.

Procedure for the establishment of limit values in the European Union

The scientific reliability of the SCOEL recommendations is the cornerstone for any of the Commission's legislative proposals to set limit values for chemicals. It was soon recognised that a procedure for the adoption of OELs generally acceptable to all interested groups would be of great importance, it will facilitate the work of the Commission and it will minimise or even eliminate the negative scientific criticism of the figures decided by the SCOEL.

For this reason in 1994, after an extensive consultation of the tripartite Advisory Committee for Safety, Hygiene, and Health Protection at Work (ACSHH), the Commission approved a Guidance note (as an internal working document) on procedures to set limit values, which is to be updated in the

light of experience. This Guidance note sets out the arrangements for the scientific review and evaluation for establishing OELs in the European Union. It includes the procedure to be followed and how, and at what stage, the interested parties (government, industry, workers, the scientific community, and other relevant organisations) can make their contribution to this procedure.

Table 4 summarises the main stages of the process. Whereas the first three stages are mainly related to the scientific evaluation which concerns the work of the SCOEL, the subsequent stages are more related to the work carried out by the European Commission, and non-scientific matters have also to be considered. The SCOEL starts its work by evaluating criteria documents from different sources. These criteria documents should contain all available information and should fit with a format described in the guidelines for the preparation of criteria documents.¹² The identified base document is announced by the Commission through publication in the Official Journal with the request for further data, especially unpublished, to be provided to the Commission, to guarantee the completeness of the data for the chemical agent concerned.

The SCOEL evaluates the scientific dossier and the supplementary data for the identification of the critical health effects. The detailed evaluation of the key studies describing them, leads to a short document which describes the recommended OELs and the recommendation is supported and explained by information on the basic data, a description of the critical effect, the extrapolation techniques used, and any data on possible risks to human health. The technical feasibility of monitoring exposure is also noted. Furthermore the SCOEL decided to identify important gaps in the data and need for more research.

Once the summary document is agreed by the Committee the Commission makes it public to interested parties with the request for health based scientific comments and eventually further data. After a comments period of about six months the SCOEL rediscusses the document in the light of the comments received and adopts the final version which is then published by the Commission.

By applying this procedure, recommendations of more than 50 OELs have been made to the Commission (appendix 2). The experience on this work has shown that a process clear to the member states of the European Union and the social partners is a good way forward, although not all recommendations

Table 4 Stages leading to the establishment of OELs

Stage 1	Preparation of a scientific dossier for review
Stage 2	Evaluation of scientific dossier
Stage 3	Development of recommendation from the SCOEL to the Commission services for a scientifically based OEL
Stage 4	Development of proposal for an OEL by the Commission services
Stage 5	Consultation of the Advisory Committee for Safety, Hygiene, and Health Protection at Work
Stage 6	Adoption of the implementing Directive

are welcomed unanimously by all interested parties. In this context it should be stressed that the primary task of the SCOEL is the recommendation of a health based OEL.

Once the Commission services have received recommendations from the SCOEL they are in a position to develop legal proposals for OELs. At this stage and according to the type of the OEL, the Commission services will seek relevant technical and socioeconomic data. If any of the interested parties is aware that there are such data which can be shown to be pertinent to the development of a Commission's proposal then these should be made known to the Commission services.

The Commission's proposal for a legislative text is submitted to the ACSHH. At this stage all the interested parties have a further opportunity, through the ACSHH structure, to contribute to the opinion adopted by the Committee. The opinion delivered by the ACSHH is available through its minutes, and is also published in the ACSHH's annual report. Once these consultations have been completed the Commission services will finalise their preparation of a proposal to be agreed by the Commission. According to the type of OEL and the legal procedure selected, further consultation on the Commission's proposal, within the appropriate European Union institutions, will take place, before the final adoption and publication in the Official Journal of an OEL.

Future work

In 1995 the Commission adopted a Communication on a programme concerning safety, hygiene, and health at work (1996–2000).¹³ The programme underlines the need for further action in setting limit values, through the formalisation of SCOEL and the continuation of the efforts for adoption by the Council of the Commission's proposal for a Directive on chemical agents.¹⁴

As far as the legislative action is concerned, the Commission intends to carry out the following procedures.

(1) To push for progress on the proposal for chemical agents pending now at Council level. This proposal has been developed to provide an opportunity for consolidating and simplifying old legislation on chemicals, and to bring the existing measures up to date in respect of the social aspects of the internal market and relations with the Community's trading partners and to fulfil international obligations, especially after the conclusions of the United Nations concerns on environment and development (UNCED).

The new Directive will be an individual Directive under the Framework Directive 89/391/EEC¹⁵ and intends to amplify the Framework Directive's general provisions by: (a) establishing minimum requirements specifically identified for the protection of workers against risks to their health and safety arising from any chemical agent at work; (b) consolidating, clarifying, updating, and adapting existing provisions on chemical agents in

the workplace in the light of current knowledge and aligning them with Directive 89/391/EEC; (c) ensuring that all precautionary measures at work are based on a proper assessment of risks arising from the way workers are exposed to chemical agents and that by taking account of the features of the workplace, the activity and likely exposure protection measures properly reflect the scale of risk without imposing unnecessary burdens on employers.

The concept of having two different types of occupational exposure levels, of different status, is retained from Directive 80/1107/EEC.²

(2) To make proposals for legislation concerning indicative limit values for chemicals, based on the existing recommendations of SCOEL (appendix 2).

(3) To push for progress to the Commission's proposal amending the carcinogens Directive 90/394/EEC,¹⁶ where a binding limit value of 1 ppm for benzene is proposed.

The Commission, in cooperation with the ACSHH, has already developed an agreed open list (appendix 3) of chemical agents where there is major concern at the workplace. The SCOEL new recommendations for OELs of many chemicals are expected.

The advantages of a common European approach to the process for setting limit values are obvious. The enormous effort necessary to evaluate toxicological data should not be duplicated. The Commission has access to the results of several data reporting programmes—for example, risk assessment for existing substances and risk assessment for pesticides—which are carried out under European legislation, unpublished data from all European industries can be considered, and cost sharing for the development of urgently needed data on a European level is promoted.

Appendix 1 Substances for which binding limit values may be established

PART 1

Acrylonitrile
Asbestos
Arsenic and compounds
Benzene
Cadmium and compounds
Mercury and compounds
Nickel and compounds
Lead and compounds
Chlorinated hydrocarbons:
Chloroform
Paradichlorobenzene
Carbon tetrachloride

PART 2

Carcinogens

- (a) Substance to which, in Annex I to Directive 67/548/EEC³ the risk-phrase R 45 "may cause cancer" is applied
- (b) Preparation which, under Article 3(5)(j) of Directive 88/379/EEC¹⁷ must be labelled as R 45 "may cause cancer"
- (c) Substance, preparation, or a process referred to in Annex I to Directive 90/394/EEC⁴ as well as a substance or preparation released by a process referred to in Annex I to Directive 90/394/EEC.⁴ The list of this Annex includes:
 - 1 Manufacture of auramine
 - 2 Work involving exposure to aromatic polycyclic hydrocarbons present in coal soots, pitch, fumes, or dust
 - 3 Work involving exposure to dusts, fumes, and sprays produced during the roasting and electrorefining of cupronickel mattes
 - 4 Strong acid process in the manufacture of isopropyl alcohol

Appendix 2 Substances for which SCOEL has made recommendations

Substance	CAS	8 h TWA		STEL*		NOT†
		ppm	mg/m ³	ppm	mg/m ³	
Acetone	67-64-1	500	1210	—	—	—
Allyl alcohol	107-18-6	2	4.8	5	12.1	Skin
Ammonia	7664-41-7	20	14	50	36	—
Amylacetate, tert-	625-16-1	50	270	100	540	—
Benzene	71-43-2	RA‡	—	—	—	Skin
Butanone, 2-	78-93-3	100	300	—	—	—
Butoxyethanol, 2-	111-76-2	20	98	—	—	Skin
Butoxyethyl acetate, 2	112-07-2	20	134	—	—	Skin
Butylacrylate, n-	141-32-2	2	11	10	53	—
Carbon monoxide	630-08-0	20	23	100	117	—
Carbon tetrachloride	56-23-5	1	6.4	5	32	Skin
Chlorodifluoromethane	75-45-6	1000	3600	—	—	—
Chloroform	67-66-3	2	10	—	—	Skin
Cumene	98-82-8	20	100	50	250	Skin
Cyclohexane	110-82-7	50	175	—	—	—
Cyclohexanone	108-94-1	10	40.8	20	81.6	Skin
Dichlorobenzene, 1,2-	95-50-1	20	122	50	306	—
Dichlorobenzene, 1,4-	106-46-7	20	122	50	306	—
Dichloroethane, 1,1-	75-34-3	100	412	—	—	—
Diethylether	60-29-7	100	308	200	616	—
Dimethylacetamide, N,N-	127-19-5	10	36	—	—	Skin
Dimethylamine	124-40-3	2	3.8	5	9.4	—
Dimethylether	115-10-6	1000	1920	—	—	—
Dipropylene glycol	—	—	—	—	—	—
monomethylether	34590-94-8	50	308	—	—	Skin
Ethanolamine	141-43-5	1	2.5	3	7.6	Skin
Ethyl acetate	141-78-6	200	734	400	1468	—
Ethylamine	75-04-7	5	9.4	—	—	—
Ethylbenzene	100-41-4	100	422	200	884	Skin
Ethylene glycol	107-21-1	10	26	20	52	Skin
Heptanone, 2-	110-43-2	50	238	—	—	—
Heptanone, 3-	106-35-4	20	95	—	—	—
Hexane, n-	110-54-3	20	72	—	—	—
Hydrogen bromide	10035-10-6	—	—	2	6.7	—
Hydrogen chloride	7647-01-0	5	8	10	15	—
Hydrogen selenide	7783-07-5	0.02	0.7	0.05	0.17	—
Methoxypropanol-2, 1-	107-98-2	50	188	100	375	Skin
Methoxypropylacetate-2, 1	108-65-6	50	275	100	550	Skin
Methyl formate	107-31-3	—	—	—	no	Skin
Methylheptan-3-one, 5-	541-85-5	10	53	20	107	—
Methylhexan-2-one, 5-	110-12-3	20	95	—	—	—
Methylpentan-2-one, 4-	108-10-1	20	83	50	208	—
Monochlorobenzene	108-90-7	10	47	20	94	—
Monochloroethane	75-00-3	100	268	—	—	—
Nitric acid	7697-37-2	—	—	0.5	1.3	—
Pentylacetate	628-63-7	50	270	100	540	—
Pentylacetate, 2-	626-38-0	50	270	100	540	—
Pentylacetate, 3-	620-11-1	50	270	100	540	—
Pentylacetate, iso-	123-92-2	50	270	100	540	—
Phenol	108-95-2	2	7.8	—	—	Skin
Phosgene	75-44-5	0.02	0.08	0.1	0.4	—
Phosphoric acid	7664-38-2	—	1	—	2	—
Propionic acid	79-09-4	10	31	20	62	—
Silver, metallic	7440-22-4	0.1	—	—	—	—
Sodium azide	26628-22-8	—	0.1	—	0.3	Skin
Tetrahydrofuran	109-99-9	50	150	100	300	Skin
Toluene	108-88-3	20	76.6	50	191.5	Skin
Trichlorobenzene, 1,2,4-	120-82-1	2	15.1	5	37.8	Skin
Trichloroethane, 1,1,1-	71-55-6	100	555	200	1110	—
Triethylamine	121-44-8	2	8.4	3	12.6	Skin
Trimethylbenzene, 1,2,3-	526-73-8	20	100	—	—	—
Trimethylbenzene, 1,2,4-	95-63-6	20	100	—	—	—
Trimethylbenzene, 1,3,5-	108-67-8	20	100	—	—	—
Trimethylbenzenes	25551-13-7	20	100	—	—	—
Xylene, m-	108-38-3	20	221	100	442	Skin
Xylene, o-	95-47-6	20	221	100	442	Skin
Xylene, p-	106-42-3	20	221	100	442	Skin
Xylenes, isomers	1330-20-7	20	221	100	442	Skin

*The STEL is a limit value above which exposure should not occur and is related to a 15 minute period, unless otherwise specified.

†A skin notation assigned to the OEL identifies the possibility of significant uptake through the skin.

‡According to the risk assessment 8 h TWA should be < 1 ppm.

Appendix 3 Priorities of the work programme on OELs

Substances	CAS
Opinions in preparation:	
Acrolein	107-02-8
Butadiene, 1,3-	106-99-0
Caprolactam, epsilon-	105-60-2
Chlorine	7782-50-5
Chromium (II) compounds	—
Chromium (III) compounds	—
Chromium metal	7440-47-3
Cyclohexanol	108-93-0
Dichlorophenoxyacetic acid, 2,4-	94-75-7
Dinitro-o-cresol, 4,6-	534-52-1
Ethyl acrylate	140-88-5
Fluorides, inorganic several	—
Fluorine	7782-41-4
Glycerol	56-81-5
Heptane, n-	142-82-5
Hexanone, 2-	591-78-6
Hydrogen fluoride	7664-39-3
Hydrogen sulphide	7783-06-4
Hydrogenated terphenyls	61788-32-7
Isophorone	78-59-1
Lead	7439-92-1
Maleic anhydride	108-31-6
Mercury, inorganic	7439-97-6
Methyl acrylate	96-33-3
Methyl methacrylate	80-62-6
Nitrogen dioxide	10102-44-0
Pentane, iso	78-78-4
Pentane, n-	109-66-0
Pentane, neo-	590-35-2
Phenylpropene, 2-	98-83-9
Phosphine	7803-51-2
Piperazine	110-85-0
Sulfotep	3689-24-5
Sulphur dioxide	7446-09-5
Tetraethylsilicate	78-10-4
Trichloroacetic acid	76-03-9
Vanadium pentoxide	1314-62-1
Zinc oxide	1314-13-2
Future work:	
Acrylamide	79-06-1
Acrylonitrile	107-13-1
Aldicarb	116-06-3
Allyl chloride	107-05-1
Aniline	62-53-3
Arsine	7784-42-1
Benzo(a)pyrene	50-32-8
Benzyl alcohol	100-51-6
Bisphenol A	80-05-7
Butanol, 1-	71-36-3
Butanol, 2-	78-92-2
Cadmium, and compounds	7440-43-9
Captan	133-06-2
Carbon disulphide	75-15-0
Chloro-1,3-butadiene, 2-	126-99-8
Chloroacetylchloride	79-04-9
Chromium (VI) compounds	—
Cyanides	—
Diethylaminoethanol, 2-	100-37-8
Dimethylformamide, N,N-	68-12-2
Dinoterb	1420-07-1
Diphenylmethane-4,4'-diisocyanate	101-68-8
Enflurane	13838-16-9
Epichlorohydrine	106-89-8
Ethylene oxide	75-21-8
Formaldehyde	50-00-0
Furfural	98-01-1
Furfuryl alcohol	98-00-0
Glycolethers	—
Halothane	151-67-7
Hexamethylene diisocyanate	822-06-0
Isoflurane	26675-46-7
Isophorone diisocyanate	4098-71-9
Man made mineral fibres	—
Manganese, and compounds	7439-96-5
Mesityl oxide	141-79-7
Methamsodium	137-42-8
Methyl bromide	74-83-9
Methyl iodide	74-88-4
Methyl isocyanate	624-83-9
Methyl isothiocyanate	556-61-6
Methyl-2-pyrrolidone, N-	872-50-4
Methylene chloride	75-09-2
Morpholine	110-91-8
Nickel, and compounds	7440-02-0
Organic dusts	—
Organophosphorus compounds	—
Ozone	10028-15-6
Phthalic anhydride	85-44-9
Silica, crystalline quartz	14808-60-7
Stoddard solvent or white spirit	8052-41-3
Styrene	100-42-5
Talc (cosmetic grade)	14807-96-6
Tetrachloroethylene	127-18-4
Thioglycolic acid	68-11-1
Toluene-2,4-diiocyanate	584-84-9
Toluene-2,6-diiocyanate	91-08-7
Tributyltin compounds	—
Trichloroethylene	79-01-6
Triglycidal isocyanurate	2451-62-9
Vinyl acetate	108-05-4
Vinyl toluenes, all isomers	25013-15-4
Vinylidene chloride	75-35-4
Welding fumes	—
Wood dust	—

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- 4 Council Directive 90/394/EEC of 28 June 1990 on the protection of workers from the risks related to exposure to carcinogens at work. *Official Journal of the European Communities* 1990;L196/26-7-1990:1-7.
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- 13 Communication from the Commission on a Community programme concerning safety, hygiene, and health at work (1996-2000). (COM(95) 282 final.) Luxembourg: Publications of the European Communities, 1996.
- 14 Proposal for a Council Directive on the protection of the health and safety of workers from the risks related to chemical agents at work. *Official Journal of the European Communities* 1993;C165/16-6-1993:4-14. Modified proposal for a Council Directive on the protection of the health and safety of workers from the risks related to chemical agents at work. *Official Journal of the European Communities* 1994;C191/14-7-1994:7-29.
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Occupational and Environmental Medicine and the electronic age

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The Editor