

Health and
Safety
Executive

EH40/94
Occupational exposure limits 1994

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FOREWORD

EH40/94 revises the 1993 edition.

The Control of Substances Hazardous to Health Regulations 1988 and all subsequent amendments are this year to be consolidated into a single set of Regulations to be called the Control of Substances Hazardous to Health Regulations 1994 (COSHH). COSHH 1994 will implement the Biological Agents Directive (90/679/EEC) and will extend the application of COSHH to offshore installations. COSHH 1994 will come into force in the summer of 1994.

The improvements and additions to EH40 particularly worth noting are:

- A new Index has been created, containing all the names, synonyms and references for the substances which appear in the Tables.
- CAS numbers have been added for substances in the Tables.
- The old Table 4 has been updated and replaced by a list of substances which comprise the ACTS and WATCH work programme until the end of 1994.
- A number of changes have been made to Appendix 9 on carcinogens and to related parts of the text to take into account the implementation of the Chemicals (Hazard Information and Packaging) Regulations 1993 (CHIP), which replace the requirements of the Classification, Packaging and Labelling Regulations 1984 (CPL).
- The reference period for short-term limits has now been changed to 15 minutes. This change has been incorporated into appropriate parts of the text, the Tables and Appendix 1.
- A proposal is presented for consultation in Table 3B to change the reference temperature and pressure in setting occupational exposure limits in order to align with European practice.
- Table 3C gives notice of the new and revised MELs which will take effect with the coming into force of COSHH 1994.
- The occupational exposure standards (OESs) set out in this document at Table 2 have been set taking due account of Indicative Limit Values published by the Commission of the European Communities as set out in Commission Directive 91/332/EEC.

This year sees the operation of the new consultation procedure for OESs. In EH40/94 Table 3A lists the proposed OESs which will be subject to consultation from May 1994 to 31 August 1994.

PREVENTION AND CONTROL OF EXPOSURE

1 Exposure of employees to substances hazardous to health should be prevented, or, where this is not reasonably practicable, adequately controlled. This is a fundamental requirement of the Control of Substances Hazardous to Health (COSHH) Regulations 1988. Exposure can occur by inhalation, ingestion or absorption through the skin, but inhalation is usually the main route of entry into the body. *EH40* lists the occupational exposure limits which should be used in determining the adequacy of control of exposure by inhalation, as required by the COSHH Regulations.

2 The advice in *EH40* should be taken in the context of the requirements of the COSHH Regulations, especially Regulation 6 (Assessment), Regulation 7 (Control of exposure), Regulations 8 and 9 (Use and maintenance of control measures) and Regulation 10 (Monitoring of exposure). Substances hazardous to health are defined in Regulations 2 and 5. Additional guidance may be found in the *COSHH General Approved Code of Practice (ACOP)* and in the *Control of Carcinogenic Substances ACOP*. There is separate legislation for lead and asbestos and these substances are not covered in detail in *EH40*, but further information may be found in Appendices 5 and 8. *EH40* also does not apply to exposure below ground in mines (see paragraph 36) or exposure to micro-organisms.

3 Adequate control of exposure (when prevention is not reasonably practicable) should be achieved by a hierarchy of control measures described in Regulation 7 of COSHH and the COSHH General and Carcinogens ACOPs. Control by personal protective equipment should only be applied when other means are not reasonably practicable.

HEALTH SURVEILLANCE

4 Health surveillance of employees is often an important addition to control measures in the workplace. Regulation 11(2) of the COSHH Regulations specifies where health surveillance is appropriate for the protection of the health of employees. Further advice on this subject is given in the guidance on health surveillance in the *COSHH General ACOP*, in the booklet *Health surveillance under COSHH: Guidance for Employers*¹, and in *Surveillance of people exposed to health risks at work*².

LEGAL BACKGROUND TO EXPOSURE LIMITS

5 There are two types of occupational exposure limit, defined in Regulation 2 of the COSHH Regulations and applied in Regulation 7. These are maximum exposure limits (MELs), (which are listed in Schedule 1 of COSHH and are therefore part of the Regulations), and occupational exposure standards (OESs). The key difference between the two types of limit is that an OES is set at a level at which there is no indication of risk to health; for a MEL, a residual risk may exist and the level set takes socio-economic factors into account. Further details are given in paragraphs 8 to 16.

6 Regulation 7 of the COSHH Regulations lays down the requirements for the use of MELs and OESs for the purposes of achieving adequate control. Regulation 7(4) requires that where there is exposure to a substance for which a MEL is specified in Schedule 1, the control of exposure shall, so far as inhalation of that substance is concerned, only be treated as being adequate if the level of exposure is reduced so far as is reasonably practicable and in any case below the MEL.

7 Regulation 7(5) of the COSHH Regulations requires that, without prejudice to the generality of Regulation 7(1), where there is exposure to a substance for which an OES has been approved, the control of exposure shall, so far as the inhalation of that substance is concerned, be treated as being adequate if:

- (a) that OES is not exceeded; or
- (b) where that OES is exceeded, the employer identifies the reasons for the standard being exceeded and takes appropriate action to remedy the situation as soon as is reasonably practicable.

SETTING OCCUPATIONAL EXPOSURE LIMITS

ACTS and WATCH

8 OESs and MELs are set on the recommendation of the Advisory Committee on Toxic Substances (ACTS) following assessment, by the Working Group on the Assessment of Toxic Chemicals (WATCH), of the toxicological, epidemiological and other data.

9 The committees have to consider, firstly, what **type** of limit is appropriate, OES or MEL, and secondly, at what **concentration** the limit should be set. Each substance is first reviewed by WATCH which considers whether an OES is appropriate and, if so, what value should be recommended to ACTS. Setting an OES is the first option to be considered and WATCH comes to a decision based on a scientific judgement of the available information on health effects. If, however, WATCH decides that a MEL is more appropriate then consideration of the level at which to set the limit passes to ACTS, since it involves socio-economic judgements, balancing risk to health against the cost and effort of reducing exposure. Recommendations for OESs and MELs are made by ACTS to the Health and Safety Commission (HSC). Following public consultation, new OESs are added to the HSC Approved List, published in *EH40*, whilst new MELs, after having been approved by the Secretary of State, are listed in the Schedule 1 of the COSHH Regulations. Schedule 1 of COSHH is reproduced as Table 1.

The indicative criteria

10 For a substance to be assigned an OES it must meet all the following three criteria:

- Criterion 1 The available scientific evidence allows for the identification, with reasonable certainty, of a concentration averaged over a reference period, at which there is no indication that the substance is likely to be injurious to employees if they are exposed by inhalation day after day to that concentration; and
- Criterion 2 exposures to concentrations higher than that derived under criterion 1 and which could reasonably occur in practice, are unlikely to produce serious short or long-term effects on health over the period of time it might reasonably be expected to take to identify and remedy the cause of excessive exposure; and
- Criterion 3 the available evidence indicates that compliance with the OES, as derived under criterion 1, is reasonably practicable.

For a substance to be assigned a MEL it must meet either of the following criteria:

- Criterion 4 The available evidence on the substance does not satisfy criterion 1 and/or 2 for an OES and exposure to the substance has, or is liable to have, serious health implications for workers; or
- Criterion 5 socio-economic factors indicate that although the substance meets criteria 1 and 2 for an OES, a numerically higher value is necessary if the controls associated with certain uses are to be regarded as reasonably practicable.

Setting an OES

11 OES Criterion 1 sets out the fundamental basis for establishing such a limit: the existence of a threshold above which there may be evidence of significant effects on health but below which, on existing knowledge, there are thought to be no adverse effects. Essentially the limit-setting process consists of the identification of the critical health effect, the determination of a no-adverse-effect-level (NOAEL) and then the derivation of a limit. The NOAEL is based for preference on human exposure by inhalation but often only animal data or information on exposure by a different route are available. The step between the NOAEL and the exposure limit may thus involve the application of extrapolation factors or confidence factors where the data quality is uncertain. Scientific judgement has to be exercised at all stages in the process.

12 Criterion 2 is necessary in order to take account of COSHH Regulation 7(5)(b) whereby exposures above an OES are allowed providing the employer identifies the reasons for exceeding the standard and takes steps to reduce exposure to the OES as soon as is reasonably practicable. Clearly it is necessary to take account of the likelihood and probable extent of cases in deciding whether an OES is appropriate. The health effects taken into account include sensory and other effects, such as the slowing of reflexes which might result in the impairment of safety.

13 Criterion 3 takes account of whether industry can reasonably comply with the exposure limit derived under the first criterion. There is no purpose in setting an OES which plainly cannot be achieved in practice. It should be noted that industry's ability to comply influences the decision of whether to set an OES, but does not influence the level at which the OES is set.

Setting a MEL

14 For a substance to be assigned an OES it must meet all the first three criteria; if it does not then it becomes a candidate for a MEL. However, for it to be assigned a MEL there should be serious implications for the health of workers exposed to the substance. Serious health implications include both the risk of serious health effects to a small population of workers and the risk of relatively minor health effects to a large population. In practice, MELs have been most often allocated to carcinogens and to other substances for which no threshold of effect can be identified and for which there is no doubt about the seriousness of the effects of exposure.

15 MELs and OESs, therefore, differ not only in their status in law, but also in the way in which they are set. For OESs the only consideration in setting the level is the protection of the health of the employee; for MELs this is still the primary consideration but socio-economic factors are also taken into account.

16 The indicative criteria, then, provide the framework within which the discussions at the various stages of limit-setting can be conducted.

APPLYING OCCUPATIONAL EXPOSURE LIMITS

General

17 The lists of occupational exposure limits given in the Tables which follow, unless otherwise stated, relate to personal exposure to substances hazardous to health in the air of the workplace (see paragraph 33). The limits cannot readily be extrapolated to evaluate or control non-occupational exposure, eg levels of contamination in the neighbourhood close to an industrial plant. OESs are approved only for application to persons at work. Employers should also take into account their duties under the Environmental Protection Act. The OESs are also only approved for use where the atmospheric pressure is between 900 and 1100 millibars. This covers the normal range of meteorological variations and slightly pressurised work places such as clean rooms, but not the higher pressures which may be encountered in, for example, tunnelling or underwater hyperbaric chambers. Such situations require special assessment.

Units of measurement

18 In occupational exposure limits, concentrations of gases and vapours in air are usually expressed in parts per million (ppm), a measure of concentration by volume, as well as in milligrams per cubic metre of air (mg m^{-3}), a measure of concentration by mass. In converting from ppm to mg m^{-3} a temperature of 25°C and an atmospheric pressure of one bar are used. Concentrations of airborne particles

(fume, dust, etc) are usually expressed in mg m^{-3} . In the case of dusts the limits in the tables refer to the 'total inhalable' fraction unless specifically indicated as referring to the 'respirable' fraction (see paragraph 39). Exceptionally the limits for man-made mineral fibre can be expressed as either mg m^{-3} or as fibres per millilitre of air (fibres ml^{-1}) (See Appendix 8 for Asbestos).

Calculation of exposure

19 Exposure to substances hazardous to health should be calculated according to the approved method, which is reproduced as Appendix 1. The calculated exposure should then be compared with the occupational exposure limits for that substance for the purposes of determining compliance with COSHH Regulation 7. Some limits have been annotated "as 'X' " where 'X' is a component of the substance listed. In these cases the exposure should be calculated and expressed as the notional concentration of 'X' in air. Where an occupational exposure limit is listed both for a long-term reference period and a short-term reference period it will be necessary to compare the calculated exposures with both occupational exposure limits.

Maximum exposure limits (Table 1)

20 A MEL is the maximum concentration of an airborne substance, averaged over a reference period, to which employees may be exposed by inhalation under any circumstances and is specified, together with the appropriate reference period, in Schedule 1 of the COSHH Regulations.

21 COSHH Regulation 7(4), when read in conjunction with Regulation 16 imposes a duty on the employer to take all reasonable precautions and to exercise all due diligence to ensure that exposure is kept as far below the MEL as is reasonably practicable.

22 To comply with this duty, in the case of substances with an 8-hour reference period, employers should undertake a programme of monitoring in accordance with Regulation 10 so that they can show (if it is the case), that the MEL is not normally exceeded, ie that an occasional result above the MEL is without real significance and is not indicative of a failure to maintain adequate control. Such a programme of monitoring need not be undertaken if the assessment carried out in accordance with Regulation 6 shows that the level of exposure is most unlikely ever to exceed the MEL. For substances assigned a short-term MEL (eg 15-minute reference period), the MEL should **never** be exceeded.

23 The assessment should also be used to determine the extent to which it is reasonably practicable to reduce exposure further below the MEL as required by Regulation 7(4). In assessing reasonable practicability the nature of the risk presented by the substance in question should be weighed against the cost and the effort involved in taking measures to reduce the risk.

Occupational exposure standards (Table 2)

24 An OES is the concentration of an airborne substance, averaged over a reference period, at which, according to current knowledge, there is no evidence that it is likely to be injurious to employees if they are exposed by inhalation, day after day, to that concentration. The OESs are approved by the HSC and are applicable only to persons at work and where the atmospheric pressure is between 900 and 1100 millibars.

25 For a substance which has been assigned an OES, exposure by inhalation should be reduced to that standard. However, if exposure by inhalation exceeds the OES, then control will still be deemed to be adequate provided that the employer has identified why the OES has been exceeded and is taking appropriate steps to comply with the OES as soon as reasonably practicable. In such a case the employer's objective must be to reduce exposure to the OES, but the final achievement of this objective may take some time. The assessment under Regulation 6 will determine the urgency of the necessary action, taking into account the extent and cost of the required measures in relation to the nature and degree of exposure involved.

26 Control to the OES or below it, can always be regarded as adequate control of that substance for the purposes of the COSHH Regulations, so far as exposure from inhalation is concerned. However, due to the variations in process control and the fluctuations in substance concentrations in the workplace, it will be prudent for employers to reduce exposure below the OES so as to ensure that the exposure of all employees does not exceed the OES. Similarly, it is not intended that the statutory requirements under Regulation 7(5) should discourage the further application of good occupational hygiene principles in order to reduce exposure below the OES.

New limits and those subject to amendment (Table 3)

27 The HSC proposes to make new or revised entries to the list of approved OESs and these are set out in Table 3. However, proposals for amending Schedule 1 of the COSHH Regulations 1994 will be published separately by HSC as a Consultative Document, available from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS, Tel: 0787 881165, Fax: 0787 313995.

Substances to be reviewed (Table 4)

28 When the COSHH Regulations came into force a number of substances were not included in the lists of MELs and OESs and it was considered that they should be reviewed by ACTS and WATCH. The reviews of most of those substances have now been completed, allowing the substances for review to be reprioritised. Table 4 in EH40/94 lists the substances currently on the WATCH review programme. Pending the outcome of these reviews, exposure should be controlled in accordance with the guidance on regulation 7 of COSHH in the COSHH General Approved Code of Practice.

Toxic substances bulletin

29 Details of substances currently under review by WATCH may be found in the recent editions of *Toxic substances bulletin* (see centre pull-out for order form).

Inhaled substances not assigned MELs or OESs

30 The absence of a substance from the lists of MELs or OESs does not indicate that it is safe. In these cases exposure should be controlled to a level to which nearly all the working population could be exposed, day after day at work, without adverse effects on health. As part of the assessment required under regulation 6, employers should determine their own working practices, and in-house standards for control. These requirements will also apply in situations where the substance has an OES, but it is not applicable for the reasons described in paragraph 17. In some cases there may be sufficient information to set a self-imposed working standard, eg from manufacturers and suppliers of the substance, from publications of industry associations, occupational medicine and hygiene journals. (Relevant information on micro-organisms includes that which has been prepared by the Advisory Committee on Dangerous Pathogens.) Further information may be found in *Monitoring strategies for toxic substances*.³

Long-term and short-term exposure limits

31 The pattern of effects due to exposure to substances hazardous to health varies considerably depending on the nature of the substance and the exposure. Some effects require prolonged or accumulated exposure. The long-term (8-hour time weighted average) exposure limit is intended to control such effects by restricting the total intake by inhalation over one or more workshifts. Other effects may be seen after brief exposures. Short-term exposure limits (usually 15-minutes) may be applied to control these effects. Where long-term limits also apply, the short-term limits restrict the magnitude of excursions above the average concentration during longer exposures. For substances assigned both an 8-hour TWA and a short-term reference period, the total duration of peak exposures above the 8-hour TWA values should be limited to one hour in a 24-hour period, but without prejudice to the generality of the 8-hour TWA. For those substances for which no short-term limit is specified it is recommended that a figure of three times the long-term limit be used as a guideline for controlling short-term excursions in exposure. With some other substances, brief exposure may be critical and the exposure limit necessary to prevent these will also control any other effects. A separate long-term limit is not considered necessary in such cases and the short-term limit applies throughout the shift.

32 Both the long-term and short-term exposure limits are expressed as airborne concentrations averaged over a specified period of time. The period for the long-term limit is normally eight hours; when a different period is used this is stated. The averaging period for the short-term exposure limit is normally 15 minutes; such a limit applying to any 15-minute period throughout the working shift.

Limitations to the application of exposure limits

33 The exposure limits relate to personal exposure with the exception of the annual MEL for vinyl chloride (see Appendix 1 Part 3) and the OESs for cotton dust (see Appendix 3) and subtilisins (Table 2).

34 Occupational exposure limits as set out in Regulation 7 of COSHH, are intended to be used for normal working conditions in factories or other workplaces. Employers should also take into account their duties and the provisions of the Environmental Protection Act. OESs are not, however, designed to deal with serious accidents or

emergencies, particularly where employees may be exposed to rapidly rising concentrations of gas, as may arise from a major escape due to plant failure. Over and above their responsibilities to ensure that the requirements of COSHH are met, employers also have a clear responsibility to ensure that the plant is designed, operated and maintained in a way that avoids accidents and emergencies. Where appropriate, detection, alarm and response measures should be used in order to minimise the effect of any such unplanned events.

35 To help in maintaining adequate operational control employers may find it helpful to select their own indicators of control when undertaking investigations or corrective action. Further information may be found in *Monitoring strategies for toxic substances*³.

Exposure in mines

36 The COSHH Regulations and the occupational exposure limits in this publication do not apply to exposure to substances hazardous to health underground in mines. Specific requirements relating to particular processes and substances are contained in the Mines and Quarries Act 1954 and associated legislation.

Lead and asbestos

37 Work with asbestos or lead is not subject to the COSHH Regulations. The control limits for various types of asbestos are specified in the Control of Asbestos at Work Regulations 1987 as amended by the Control of Asbestos at Work (Amendment) Regulations 1992⁴ and these limits are reproduced in Appendix 8. The lead-in-air standards are set out in Appendix 1 of the HSC ACOP *Control of lead at work*⁵ supporting the Control of Lead at Work Regulations 1980⁶ and these standards are listed in Appendix 5. Reference should also be made to HSE Guidance Notes *Asbestos – exposure limits and measurement of airborne dust concentrations*⁷ and *Control of lead: air sampling techniques and strategies*⁸.

Pesticides

38 Substances used as active ingredients in pesticides are listed under their systematic chemical names and/or their (ISO) common names. These may sometimes be used as parts of the names of proprietary pesticide formulations. In all cases the exposure limit applies to the specific active ingredient and not the formulation as a whole.

Dusts

39 The general approach necessary to control occupational exposure to dusts is outlined in *Dust: general principles of protection*⁹. Not all dusts have been assigned occupational exposure limits but the lack of such limits should not be taken to imply an absence of hazard. Further information may be found in the guidance on Regulation 7 of COSHH in *COSHH General Approved Code of Practice*. In the absence of a specific exposure limit for a particular dust, exposure should be adequately controlled and where there is no indication of the need for a lower value, personal exposure should be kept below both 10 mg m⁻³ 8-hour TWA total inhalable dust and 5 mg m⁻³ 8-hour TWA respirable dust (see paragraph 40). Such, or greater, dust concentrations should be taken as the 'substantial concentrations' to which Regulation 2 of the COSHH Regulations refers, and as such they are defined as 'substances hazardous to health'.

Total inhalable dust and respirable dust

40 'Total inhalable dust' approximates to the fraction of airborne material which enters the nose and mouth during breathing and is therefore available for deposition in the respiratory tract. 'Respirable dust' approximates to the fraction which penetrates to the gas exchange region of the lung. Fuller definitions and explanatory material are given in *General methods for the gravimetric determination of respirable and total inhalable dust*¹⁰.

41 Where dusts contain components which have their own assigned occupational exposure limits, all the relevant limits should be complied with.

Fume

42 Where a separate exposure limit has been set for 'fume' it should normally be applied to solid particles generated by chemical reactions or condensed from the gaseous state, usually after volatilisation from melted substances. The generation of fume is often accompanied by a chemical reaction such as oxidation or thermal breakdown.

Absorption through the skin

43 In general, for most substances the main route of entry into the body is by inhalation and the exposure limits given in this booklet solely relate to exposure by this route. Certain substances, such as phenol, aniline and certain pesticides (marked in the Tables with an 'Sk' notation), have the ability to penetrate the intact skin and thus become absorbed into the body. Absorption through the skin can result from localised contamination, for example from a splash on the skin or clothing, or in certain cases from exposure to high atmospheric concentrations of vapour. Serious effects can result with little or no warning and it is necessary to take special precautions to prevent skin contact when handling these substances. Where the properties of the substances and the methods of use provide a potential exposure route via skin absorption, then these factors should be taken into account in determining the adequacy of the control measures. Further information is given in guidance on adequate control of exposure by routes other than inhalation found in the *COSHH General Approved Code of Practice* and in the *COSHH Pesticides Approved Code of Practice*.

Sensitisers

44 Certain substances may cause sensitisation of the respiratory tract if inhaled, or of the skin if contact occurs. Respiratory sensitisers can cause asthma, rhinitis, or extrinsic allergic alveolitis. Skin sensitisers cause allergic contact dermatitis. Substances which cause skin sensitisation are not necessarily respiratory sensitisers or vice-versa. Only a proportion of the exposed population will become sensitised, and those who do could not have been identified in advance. Individuals who have become sensitised may produce symptoms of ill-health after exposure even to minute concentrations of the sensitiser.

45 Wherever it is reasonably practicable exposure to sensitisers should be prevented. Where this cannot be achieved exposure should be kept as low as is reasonably practicable and activities giving rise to short-term peak-concentrations should receive particular attention. As with other substances the spread of contamination by sensitisers to other working areas should also be prevented, as far as is reasonably practicable.

46 The 'Sen' notation in the lists of occupational exposure limits has been assigned only to those respiratory sensitisers in the categories shown in the preface to the Tables. It should be remembered that other substances not in these Tables can act as respiratory sensitisers.

47 Further information may be found in HSE Guidance: *Health surveillance of occupational skin disease*¹¹ and *Medical aspects of occupational asthma*¹², and in other Guidance Notes covering specific sensitisers, eg platinum salts and isocyanates. The leaflet *Respiratory sensitisers*¹³ also provides useful advice on the strategies to be adopted for preventing or adequately controlling exposure to such substances.

Carcinogenic substances

48 The Approved Code of Practice *Control of carcinogenic substances* gives additional practical guidance on the provisions of the COSHH Regulations as they relate to carcinogenic substances. The Code applies to any carcinogen defined as such in the COSHH Regulations 1994 (see Appendix 9). This will include:

- (a) substances and preparations defined as carcinogens by regulation 2 (1), in terms of the categories of danger carcinogenic, category 1 or carcinogenic, category 2; and
- (b) substances, preparations and processes listed in Schedule 10 of the COSHH Regulations.

Appendix 9 lists those substances assigned the risk phrases R45 and R49 in the Approved List current from July 1993 and those substances, preparations and processes in Schedule 10 of the COSHH Regulations. At 1 January 1994 nine substances had been assigned: "R49" in the then current List (see Appendix 9).

Other factors

49 Working conditions which impose additional stress on the body, such as exposure to ultra-violet radiation, high temperatures, pressures and humidity, may increase the toxic response to a substance. In such cases specialist advice may be necessary to evaluate the effects of these factors.

MIXED EXPOSURES

General

50 The majority of exposure limits listed in *EH40* are for single compounds or for substances containing a common element or radical, eg 'tungsten and compounds', 'isocyanates'. A few of the limits relate to substances commonly encountered as complex mixtures or compounds eg 'white spirit', 'rubber fume', and 'welding fume'. (On welding fume further information may be found in *Assessment of exposure to fume from welding and allied processes*¹⁴ and *The control of exposure to fume from welding, brazing and similar processes*¹⁵). However, workers are frequently subject to other mixed exposures involving solid or liquid aerosols or gases. These can arise as a result of work with materials containing a mixture of substances, or from work with several individual substances, simultaneously or successively, in a workshift. Mixed exposures require careful assessment of their health effects and the appropriateness of control standards. The following paragraphs provide a brief summary of the advice on the application of exposure limits in these circumstances. In all cases of doubt specialist advice should be sought.

Effects of mixed exposures

51 The ways in which the constituent substances of a mixed exposure interact vary considerably. Some mixed exposures involve substances that act on different body tissues or organs, or by different toxicological mechanisms; these various effects being independent of each other. Other mixtures will include substances that act on the same organs, or by similar mechanisms, so that the effects reinforce each other and the substances are additive in their effect. In some cases the overall effect is considerably greater than the sum of the individual effects and the system is synergistic. This may arise from mutual enhancement of the effects of the constituents or because one substance potentiates another, causing it to act in a way which it would not do alone.

Assessment and control

52 With all types of mixed exposures it is essential that assessments should be based on the concentrations of each of the constituents in air to which workers are exposed. Depending on the nature of the constituents and the circumstances of use, the relative concentrations of the constituents in air may differ considerably from those in the liquid or solid source material. The composition of the bulk material should not be relied on for assessment unless there is good evidence for doing so.

53 Where mixed exposures occur the first step is to ensure adequate control of exposure for each individual substance. However, the nature and amount of the other substances in a mixture can influence the level to which it is reasonably practicable to reduce exposure to a substance subject to a MEL (see paragraph 53 (b)). When limits for specific mixtures have been established they should be used only where they are applicable and in addition to any relevant individual limits. They should not be extended to inappropriate situations. It is then necessary to assess whether further control is needed to counteract any increased risk from the substances acting in conjunction. Expert assessments for some particular mixed exposures may be available and can be used as guidelines in similar cases. In other cases, close examination of the toxicological data will be necessary to determine which of the main types of interaction (if any) are likely for the particular combination of substances concerned; the various types should be considered in the following order.

- (a) **Synergistic substances:** known cases of synergism and potentiation are considerably less common than the other types of behaviour in mixed exposures. However, they are the most serious in their effects and require the most strict control. They are also the most difficult to assess and wherever there is reason to suspect such interaction specialist advice should be obtained;
- (b) **Additive substances:** where there is reason to believe that the effects of the constituents are additive, and where the exposure limits are based on the same health effects, the mixed exposure should be assessed by means of the formula:

$$C_1/L_1 + C_2/L_2 + C_3/L_3 \dots < 1$$

where C_1, C_2 etc are the time weighted average (TWA) concentrations of constituents in air and L_1, L_2 etc are the corresponding exposure limits. The use of this formula is only applicable where the additive substances have been assigned OESs and L_1, L_2 etc relate to the same reference period in the list of approved OESs. Where the sum of the C/L fractions does not exceed one, the exposure is considered not to exceed the notional exposure limits. If one of the constituents has been assigned a MEL, then the additive effect should be taken into account in deciding the extent to which it is reasonably practicable to further reduce exposure;

- (c) **Independent substances:** where no synergistic or additive effects are known or considered likely, the constituents can be regarded as acting independently. It is then sufficient to ensure compliance with each of the exposure limits individually.

54 The above steps provide basic protocol for assessment of mixed exposures. It is open to people responsible for control of exposure to treat all non-synergistic systems as though they were additive. This avoids the need to distinguish additive and independent systems and can be regarded as the more prudent course, particularly where the toxicity data are scarce or difficult to assess.

Monitoring mixed exposure

55 Further information on monitoring airborne contaminants is given in paragraphs 57 to 61 and also in *Monitoring strategies for toxic substances*³. The number of components of a mixed exposure for which routine air monitoring is required can be reduced if their relative concentrations can be shown to be constant. This involves the selection of a key or marker, which may be one of the constituents, as a measure of the total contamination. Exposure to the marker is controlled at a level selected so that exposures to all components will be controlled in accordance with the criteria in paragraphs 53(a) and (b) above. However, if one of the components has been assigned a MEL, then the level of the exposure to that substance should always be reduced so far as is reasonably practicable. If this approach is to be used it should be under the guidance of suitable specialist advice.

Complicating factors

56 Several factors that complicate the assessment and control of exposure to individual substances will also affect cases of mixed exposures and will require similar special consideration. Such factors include:

- (a) exposure to a substance for which there is no established limit (see guidance on Regulation 7 of COSHH in the *COSHH General ACOP*) or for which a MEL has been set;
- (b) the relevance of such factors as alcohol, medication, smoking and additional stresses;
- (c) exposure of the skin to one or more substances that can be absorbed by this route as well as by inhalation; and
- (d) substances in mixture may mutually affect the extent of their absorption, as well as their health effects, at a given level of exposure.

In each of these circumstances specialist advice should be obtained, as in paragraph 63.

MONITORING EXPOSURE

57 Regulation 10 of the COSHH Regulations imposes a duty to monitor the exposure of employees to substances hazardous to health in certain specified situations. Further advice on these requirements may be found in the guidance on monitoring of exposure in the *COSHH General Approved Code of Practice*.

58 Details of routine sampling strategies for individual substances are outside the scope of this document. However, advice is available in *Monitoring strategies for toxic substances*, which provides practical guidance on monitoring substances hazardous to health in air.

59 Methods for the sampling and analysis of substances which have been assigned MELs are described in the HSE series Methods for the Determination of Hazardous Substances (MDHS) (see Reference section). This series, comprising some 70 publications, also includes methods for certain substances with occupational exposure standards or listed for review in Table 4 of *EH40*. It also incorporates publications of a more general nature such as method validation protocols and guidance on analytical quality improvement.

60 To complement the MDHS series, HSE has produced a database¹⁶ of methods for sampling and analysis of all substances in *EH40* and which is available through HSE Books. The methods listed range from simple field tests to sophisticated laboratory techniques and are drawn from the international literature such as the publications from NIOSH in the USA; they include the MDHS series. The database is supplied on floppy disc and will run on any fully IBM compatible PC (see centre page pull-out).

61 HSE also operates an external quality assessment or proficiency testing scheme for the analysis of a range of common substances in workplace air. Details of the WASP scheme (Workplace Analysis Scheme for Proficiency), which is administered by the HSE's Occupational Medicine and Hygiene Laboratory, are available through the HSE Public Enquiry Point (see paragraph 64).

FURTHER INFORMATION AND ADVICE

62 Scientific information and literature references pertinent to the substances listed may be found in the *Toxicity review*¹⁷ published by HSE and the documentation accompanying other national lists,^{18,19}. Information for individual substances on toxic effects, typical exposure levels, measurement methods and the basis for the exposure limits, as taken into account by WATCH and ACTS, are given in Criteria Documents. These will be available for most of the substances reviewed by WATCH and ACTS since 1991. A summary of this information is given in *EH64 Occupational Exposure Limits: Criteria Documents Summaries*. This publication is updated annually and includes summaries for all substances with a MEL, substances with an OES agreed since the introduction of the COSHH Regulations and substances with an OES currently subject to consultation. Information on exposure data may be obtained from HSE's Technology and Health Services Division, who maintain the HSE National Exposure Database, and from such information as may be published by HSE from time to time.

63 Further advice on the application and use of occupational exposure limits and other aspects of occupational health and safety may be obtained from occupational hygienists, toxicologists, occupational physicians or from HSE area offices.

64 *EH40* is revised and reprinted annually. Further advice on this and other publications produced by HSE is obtainable from:

HSE Public Enquiry Point
Broad Lane
Sheffield
S3 7HQ
Tel: 0742 892345
Fax: 0742 892333

Index to lists of occupational exposure limits and other substance references

| <i>Substance</i> | <i>Location</i> |
|--|--|
| AGE | <i>see Allyl 2,3-epoxypropyl ether in Table 2</i> |
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| Acetic acid | <i>Table 2</i> |
| Acetic anhydride | <i>Table 2</i> |
| Acetone | <i>Table 2</i> |
| Acetonitrile | <i>Table 2</i> |
| Acetylene | Asphyxiant <i>see Appendix 4</i> |
| o-Acetylsalicylic acid | <i>Table 2</i> |
| Acrolein | <i>see Acrylaldehyde in Table 2</i> |
| Acrylaldehyde | <i>Table 2</i> |
| Acrylamide | <i>Table 1 (and see Table 4)</i> |
| Acrylic acid | <i>Table 2</i> |
| Acrylonitrile | <i>Table 1</i> |
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| Allyl alcohol | <i>Table 2</i> |
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| Aluminium alkyl compounds | <i>Table 2</i> |
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| 2-Aminopyridine | <i>see 2-Pyridylamine in Table 2</i> |
| Ammonia | <i>Table 2</i> |
| Ammonium chloride, fume | <i>Table 2</i> |
| Ammonium sulphamidate | <i>Table 2</i> |
| n-Amyl acetate | <i>see Pentyl acetate in Table 2</i> |
| sec-Amyl acetate | <i>see 1-Methylbutyl acetate in Table 2</i> |
| Anisidines, o- and p- isomers | <i>Table 2</i> |
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| Arsenic & compounds, except arsine (as As) | <i>Table 1</i> |
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| Asphalt, petroleum fumes | <i>Table 2</i> |
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| Azinphos-methyl (ISO) | <i>Table 2</i> |
| Azodicarbonamide | <i>Table 4</i> |
| BCME | <i>see Bis(chloromethyl) ether in Table 1</i> |
| BGE | <i>see n-Butyl glycidyl ether in Table 2</i> |
| γ-BHC (ISO) | <i>Table 2 (and see Table 4)</i> |
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| Bis(2,3-epoxypropyl) ether | <i>Table 2</i> |
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| 2,2-Bis(p-methoxyphenyl)-1,1,1-trichloroethane | <i>see Methoxychlor (ISO) in Table 2</i> |

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| <i>Substance</i> | <i>Location</i> |
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| Bismuth telluride, selenium-doped | <i>see Dibismuth tritelluride, selenium-doped in Table 2</i> |
| Borates, (tetra) sodium salts | <i>see Disodium tetraborate in Table 2</i> |
| Bornan-2-one | <i>Table 2</i> |
| Boron oxide | <i>see Diboron trioxide in Table 2</i> |
| Boron tribromide | <i>Table 2</i> |
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| Bromine pentafluoride | <i>Table 2</i> |
| Bromochloromethane | <i>Table 2</i> |
| Bromoethane | <i>Table 2</i> |
| Bromoform | <i>Table 2</i> |
| Bromomethane | <i>Table 2</i> |
| Bromotrifluoromethane | <i>Table 2</i> |
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| Butan-2-ol | <i>Table 2</i> |
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| Butyl acrylate | <i>Table 2</i> |
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| Chloroacetaldehyde | <i>Table 2</i> |
| 2-Chloroacetophenone | <i>Table 2</i> |
| Chlorobenzene | <i>Table 2</i> |
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| 2-Chlorobuta-1,3-diene | <i>Table 2</i> |
| Chlorodifluoromethane | <i>Table 2</i> |
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| 2-Chloroethanol | <i>Table 2</i> |
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| Chloroform | <i>Table 2</i> |
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| 1-Chloro-4-nitrobenzene | <i>Table 2</i> |
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| DDM | <i>see 4,4'-Methylenedianiline in Table 3C</i> |

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| Substance | Location |
|--|--|
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| DDVP | see Dichlorvos (ISO) in Table 2 |
| 2,4-DES | see Sodium 2-(2,4-dichlorophenoxy) ethyl sulphate in Table 2 |
| DMDT | see Methoxychlor (ISO) in Table 2 |
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| Ethyl cyanoacrylate | Asphyxiant see Appendix 4 |
| Ethylene | see 2-Chloroethanol in Table 2 |
| Ethylene chlorohydrin | see 1,2-Diaminoethane in Table 2 |
| Ethylenediamine | see 1,2-Dibromoethane in Table 1 |
| Ethylene dibromide | see 1,2-Dichloroethane in Table 3C |
| Ethylene dichloride | Table 2 |
| Ethylene dinitrate | see Ethane-1,2-diol in Table 2 |
| Ethylene glycol | see Ethylene dinitrate in Table 2 |
| Ethylene glycol dinitrate | see 2-Butoxyethanol in Table 1 |
| Ethylene glycol monobutyl ether | see 2-Ethoxyethyl acetate in Table 1 |
| Ethylene glycol monoethyl ether acetate | see 2-Ethoxyethanol in Table 1 |
| Ethylene glycol monoethyl ether | see 2-Methoxyethyl acetate in Table 1 |
| Ethylene glycol monomethyl ether acetate | see 2-Methoxyethanol in Table 1 |
| Ethylene glycol monomethyl ether | Table 1 |
| Ethylene oxide | see Diethyl ether in Table 2 |
| Ethyl ether | Table 2 |
| Ethyl formate | Table 2 |
| 2-Ethylhexyl chloroformate | Table 2 |
| Ethylidene dichloride | see 1,1-Dichloroethane in Table 2 |
| Ethyl mercaptan | see Ethanethiol in Table 2 |
| 4-Ethylmorpholine | Table 2 |
| Ethyl silicate | see Tetraethyl orthosilicate in Table 2 |
| Fenchlorphos (ISO) | Table 2 |
| Ferbam (ISO) | Table 2 |
| Ferrocene | Table 2 |
| Ferrous foundry particulate | Table 4 |
| Flour dust | Table 4 |
| Fluoride (as F) | Table 2 |
| Fluorine | Table 2 |
| Fluorodichloromethane | see Dichlorofluoromethane in Table 2 |
| Fluorotrchloromethane | see Trichlorofluoromethane in Table 2 |
| Formaldehyde | Table 1 |
| Formamide | Table 2 |
| Formic acid | Table 2 |
| 2-Furaldehyde | Table 2 |
| Furfural | see 2-Furaldehyde in Table 2 |
| Furfuryl alcohol | Table 2 |
| Germane | Table 2 |
| Germanium tetrahydride | see Germane in Table 2 |
| Glutaraldehyde | Table 2 (and see Table 4) |
| Glycerol, mist | Table 2 |
| Glycerol trinitrate | Table 2 |
| Glycol ethers | Table 4 |
| Glycol monoethyl ether | see 2-Ethoxyethanol in Table 1 |

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| <i>Substance</i> | <i>Location</i> |
|---|--|
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| Graphite | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Guthion | see Azinphos-methyl (ISO) in Table 2 |
| Gypsum | Table 2 |
| total inhalable dust | |
| respirable dust | |
| HFC-134A | Table 4 |
| Halothane | Table 3A |
| γ -HCH (ISO) | see γ -BHC (ISO) in Table 2 |
| Helium | Asphyxiant see Appendix 4 |
| Hafnium | Table 2 |
| <i>n</i> -Heptane | Table 2 |
| Heptan-2-one | Table 2 (and see Table 3A) |
| Heptan-3-one | Table 2 (and see Table 3A) |
| γ -Hexachlorocyclohexane | see γ -BHC (ISO) in Table 2 |
| Hexachloroethane | Table 2 |
| vapour | |
| total inhalable dust | |
| respirable dust | |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | Table 2 |
| Hexane, all isomers except <i>n</i> -Hexane | Table 2 |
| <i>n</i> -Hexane | Table 2 |
| 1,6-Hexanolactam | Table 2 |
| dust | |
| vapour | |
| Hexan-2-one | Table 2 |
| Hexone | see 4-Methylpentan-2-one in Table 2 |
| Hexylene glycol | see 2-Methylpentan-2,4-diol in Table 2 |
| Hydrazine | Table 4 |
| Hydrazoic acid (as vapour) | Table 2 |
| Hydrocarbon solvents | Table 4 |
| Hydrogen | Asphyxiant see Appendix 4 |
| Hydrogen bromide | Table 2 |
| Hydrogen chloride | Table 2 |
| Hydrogen cyanide | Table 1 |
| Hydrogen fluoride (as F) | Table 2 |
| Hydrogen peroxide | Table 2 |
| Hydrogen selenide (as Se) | Table 2 |
| Hydrogen sulphide | Table 2 |
| Hydroquinone | Table 2 |
| 4-Hydroxy-4-methyl-pentan-2-one | Table 2 |
| 2-Hydroxypropyl acrylate | Table 2 |
| IGE | see 2,3-Epoxypropyl isopropyl ether in Table 2 |
| IPDI | see Isocyanates, all, in Table 1 |
| 2,2'-Iminodiethanol | Table 2 |
| 2,2'-Iminodi(ethylamine) | Table 2 |
| Indene | Table 2 |
| Indium & compounds (as In) | Table 2 |
| Iodine | Table 2 |
| Iodoform | Table 2 |
| Iodomethane | Table 4 |
| Iron oxide, fume (as Fe) | Table 2 |
| Iron pentacarbonyl | see Pentacarbonyliron in Table 2 |
| Iron salts (as Fe) | Table 2 |
| Isoamyl acetate | see Isopentyl acetate in Table 2 |
| Isoamyl alcohol | see 3-Methylbutan-1-ol in Table 2 |
| Isoamyl methyl ketone | see 5-Methylhexan-2-one in Table 2 |
| Isocyanates, all | Table 1 |
| Isobutyl acetate | Table 2 |
| Isobutyl alcohol | see 2-Methylpropan-1-ol in Table 2 |
| Isobutyl methyl ketone | see 4-Methylpentan-2-one in Table 2 (and see Table 3A) |

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| <i>Substance</i> | <i>Location</i> |
|---|--|
| Isoflurane | Table 3A |
| Isooctyl alcohol (mixed isomers) | Table 2 |
| Isopentyl acetate | Table 2 |
| Isophorone | see 3,5,5-Trimethylcyclohex-2-enone in Table 2 |
| Isophorone diisocyanate | see Isocyanates, all, in Table 1 |
| Isopropyl acetate | Table 2 |
| Isopropyl alcohol | see Propan-2-ol in Table 2 |
| Isopropyl benzene | see Cumene in Table 2 |
| Isopropyl chloroformate | Table 2 |
| Isopropyl ether | see Diisopropyl ether in Table 2 |
| Isopropyl glycidyl ether | see 2,3-Epoxypropyl isopropyl ether in Table 2 |
| Kaolin | Table 3A |
| Ketene | Table 2 |
| LPG | see Liquefied petroleum gas in Table 2 |
| Lead and compounds | see Appendix 5 (and see Table 4) |
| Limestone | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Lindane | see γ -BHC (ISO) in Table 2 |
| Liquefied petroleum gas | Table 2 |
| Lithium hydride | Table 2 |
| Lithium hydroxide | Table 2 |
| MbOCA | see 2,2'-Dichloro-4,4'-methylene-dianiline in Table 1 |
| MDA | see 4,4'-Methylenedianiline in Table 3C |
| MDI | see Isocyanates, all, in Table 1 |
| MEK | see Butan-2-one in Table 2 (and see Table 3A) |
| MIKB | see 4-Methylpentan-2-one in Table 2 (and see Table 3A) |
| Magnesite | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Magnesium oxide (as Mg) | Table 2 |
| fume and respirable dust | |
| total inhalable dust | |
| Malathion (ISO) | Table 2 |
| Maleic anhydride | Table 4 |
| Manganese, fume (as Mn) | Table 2 |
| Manganese and compounds (as Mn) | Table 2 |
| Manganese cyclopentadienyl tricarbonyl | see Tricarbonyl(eta-cyclopentadienyl) manganese in Table 2 |
| Manganese tetroxide | see Trimanganese tetraoxide in Table 2 |
| Man-made mineral fibre | Table 1 |
| Marble | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Mequinol (INN) | Table 2 |
| Mercaptoacetic acid | Table 2 |
| Mercury alkyls (as Hg) | Table 2 |
| Mercury & compounds, except mercury alkyls, (as Hg) | Table 2 (and see Table 4) |
| Mesityl oxide | see 4-Methylpent-3-en-2-one in Table 2 |
| Methacrylic acid | Table 2 |
| Methacrylonitrile | Table 2 |
| Methane | Asphyxiant see Appendix 4 |
| Methanethiol | Table 2 |
| Methanol | Table 2 |
| Methomyl (ISO) | Table 2 |
| Methoxychlor (ISO) | Table 2 |
| 2-Methoxyethanol | Table 1 |
| 2-Methoxyethyl acetate | Table 1 |
| <i>p</i> -Methoxyphenol | see Mequinol (INN) in Table 2 |
| 1-Methoxypropan-2-ol | Table 2 |
| Methyl acetate | Table 2 |
| Methyl acrylate | Table 2 |
| Methylal | see Dimethoxymethane in Table 2 |

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| Substance | Location |
|--|--|
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| Methylamine | Table 2 |
| Methyl-n-amyl-ketone | see <i>Heptan-2-one</i> in Table 2 (and see Table 3A) |
| N-Methylaniline | Table 2 |
| Methyl bromide | see <i>Bromomethane</i> in Table 2 |
| 3-Methylbutan-1-ol | Table 2 |
| 1-Methylbutyl acetate | Table 2 |
| Methyl-t-butyl ether | Table 4 |
| Methyl-n-butyl ketone | see <i>Hexan-2-one</i> in Table 2 |
| Methyl chloride | see <i>Chloromethane</i> in Table 2 |
| Methyl chloroform | see <i>1,1,1-Trichloroethane</i> in Table 1 (and see Table 4) |
| Methyl 2-cyanoacrylate | Table 2 (and see Table 4) |
| Methylcyclohexane | Table 2 |
| Methylcyclohexanol | Table 2 |
| 2-Methylcyclohexanone | Table 2 |
| Methylcyclopentadienyl manganese, tricarbonyl (as Mn) | see <i>Tricarbonyl (methylcyclopentadienyl)-manganese</i> in Table 2 |
| 2-Methyl-4,6-dinitrophenol | Table 2 |
| 4,4'-Methylenebis-(2-chloroaniline) | see <i>2,2'-Dichloro-4,4'-methylenedianiline</i> in Table 1 |
| Methylene chloride | see <i>Dichloromethane</i> in Tables 1 and 3C |
| 4,4'-Methylene-diphenyl diisocyanate | see <i>Isocyanates, all</i> , in Table 1 |
| 4,4'-Methylenedianiline | Table 3C |
| Methyl ethyl ketone | see <i>Butan-2-one</i> in Table 2 (and see Table 3A) |
| Methyl ethyl ketone peroxides (MEKP) | Table 2 |
| Methyl formate | Table 2 |
| 5-Methylheptan-3-one | Table 2 |
| 5-Methylhexan-2-one | Table 2 (and Table 3A) |
| Methyl iodide | see <i>Iodomethane</i> in Table 4 |
| Methyl isoamyl ketone | see <i>5-Methylhexan-2-one</i> in Table 2 (and see Table 3A) |
| Methyl isobutyl carbinol | see <i>4-Methylpentan-2-ol</i> in Table 2 |
| Methyl isobutyl ketone | see <i>4-Methylpentan-2-one</i> in Table 2 (and see Table 3A) |
| Methyl isocyanate | see <i>Isocyanates, all</i> , in Table 1 |
| Methyl mercaptan | see <i>Methanethiol</i> in Table 2 |
| Methyl methacrylate | Table 2 (and see Table 4) |
| Methyl parathion | see <i>Parathion-methyl (ISO)</i> in Table 2 |
| 2-Methylpentane-2,4-diol | Table 2 |
| 4-Methylpentan-2-ol | Table 2 |
| 4-Methylpentan-2-one | Table 2 (and Table 3A) |
| 4-Methylpent-3-en-2-one | Table 2 |
| 4-Methyl- <i>m</i> -phenylene diisocyanate | see <i>Isocyanates, all</i> , in Table 1 |
| 2-Methylpropan-1-ol | Table 2 |
| 2-Methylpropan-2-ol | Table 2 |
| Methyl propyl ketone | see <i>Pentan-2-one</i> in Table 2 |
| 1-Methyl-2-pyrrolidone | Table 2 |
| Methyl silicate | see <i>Tetramethyl orthosilicate</i> in Table 2 |
| α -Methylstyrene | see <i>2-Phenylpropene</i> in Table 2 |
| Methylstyrenes, all isomers except α -methylstyrene | Table 2 |
| N-Methyl-N,2,4,6-tetranitroaniline | Table 2 |
| Mevinphos (ISO) | Table 2 |
| Mica | Table 2 |
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| respirable dust | |
| Mineral wool | see <i>Man-made mineral fibre</i> in Table 1 |
| Molybdenum compounds (as Mo), | Table 2 |
| soluble compounds | |
| insoluble compounds | |
| Monochloroacetic acid | Table 2 |
| Morpholine | Table 2 |
| Naled (ISO) | Table 2 |
| Naphthalene | Table 2 |
| 1,5-Naphthylene diisocyanate | see <i>Isocyanates, all</i> in Table 1 |
| Neon | Asphyxiant see Appendix 4 |
| Nickel | Table 1 |
| Nickel carbonyl | see <i>Tetracarbonylnickel</i> in Table 2 |

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| <i>Substance</i> | <i>Location</i> |
|--|--|
| Nickel, inorganic compounds (as Ni) | Table 1 |
| Nickel, organic compounds (as Ni) | Table 2 |
| Nicotine | Table 2 |
| Nitrapyrin | see 2-Chloro-6-(trichloromethyl) pyridine in Table 2 |
| Nitric acid | Table 2 |
| Nitric oxide | see Nitrogen monoxide in Table 2 |
| 4-Nitroaniline | Table 2 |
| Nitrobenzene | Table 2 |
| Nitroethane | Table 2 |
| Nitrogen | Asphyxiant see Appendix 4 |
| Nitrogen dioxide | Table 2 |
| Nitrogen monoxide | Table 2 |
| Nitrogen trifluoride | Table 2 |
| Nitroglycerine | see Glycerol trinitrate in Table 2 |
| Nitromethane | Table 2 |
| 1-Nitropropane | Table 2 |
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| Nitrotoluene, all isomers | Table 2 |
| Nitrous oxide | Table 3A |
| Octachloronaphthalene | Table 2 |
| <i>n</i> -Octane | Table 2 |
| Oil mist, mineral | see Ref 20 (and see Table 4) |
| Oil mist, water | Table 4 |
| Orthophosphoric acid | Table 2 (and also Table 3A) |
| Osmium tetroxide (as Os) | Table 2 |
| Oxalic acid | Table 2 |
| Oxalonitrile | Table 2 |
| 2,2'-Oxydiethanol | Table 2 |
| Ozone | Table 2 (and see Table 4) |
| PCBs | see Chlorinated biphenyls in Table 4 |
| PGDN | see Propylene dinitrate in Table 2 |
| PVC | see Polyvinyl chloride in Table 2 |
| Paracetamol | Table 3A |
| Paraquat dichloride (ISO) respirable dust | Table 2 |
| Parathion (ISO) | Table 2 |
| Parathion-methyl (ISO) | Table 2 |
| Pentacarbonyliron (as Fe) | Table 2 |
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| Pentaerythritol total inhalable dust respirable dust | Table 2 |
| Pentane, all isomers | Table 2 (and see Table 4) |
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| Pentyl acetate | Table 2 (and see Table 4) |
| Perchloroethylene | see Tetrachloroethylene in Table 2 (and see Table 4) |
| Perchloryl fluoride | Table 2 |
| Phenacyl chloride | see 2-Chloroacetophenone in Table 2 |
| Phenol | Table 2 (and see Table 4) |
| <i>p</i> -Phenylenediamine | Table 2 |
| Phenyl-2,3-epoxypropyl ether | Table 2 |
| Phenylethylene | see Styrene in Table 1 |
| Phenylhydrazine | Table 4 |
| 2-Phenylpropene | Table 2 |
| Phorate (ISO) | Table 2 |
| Phosdrin | see Mevinphos (ISO) in Table 2 |
| Phosgene | Table 2 (and see Table 3A) |
| Phosphine | Table 2 (and see Table 4) |
| Phosphoric acid | see Orthophosphoric acid in Table 2 (and see Table 3A) |
| Phosphorus, yellow | Table 2 |
| Phosphorus pentachloride | Table 2 |

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| Substance | Location |
|--|---|
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| Phosphorus pentoxide | see <i>Diphosphorus pentoxide</i> in Table 3A |
| Phosphorus trichloride | Table 2 |
| Phosphoryl trichloride | Table 2 |
| Phthalic anhydride | Table 4 |
| Picloram (ISO) | Table 2 |
| Picric acid | Table 2 |
| Piperazine dihydrochloride | Table 2 |
| Piperidine | Table 2 |
| Plaster of Paris | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Platinum metal | Table 2 (and see Table 3A) |
| Platinum salts, soluble (as Pt) | Table 2 (and see Table 4) |
| Polychlorinated biphenyls | see <i>Chlorinated biphenyls</i> in Table 4 |
| Polyvinyl chloride | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Portland Cement | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Potassium hydroxide | Table 2 |
| Propane | Asphyxiant see Appendix 4 |
| Propane-1,2-diol | Table 2 |
| total (vapour and particulates) | |
| particulates | |
| <i>n</i> -Propanol | see <i>Propan-1-ol</i> in Table 2 |
| Propan-1-ol | Table 2 |
| Propan-2-ol | Table 2 |
| Propargyl alcohol | see <i>Prop-2-yn-1-ol</i> in Table 2 |
| Propionic acid | Table 2 |
| Propoxur (ISO) | Table 2 |
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| <i>n</i> -Propyl acetate | Table 2 |
| Propylene | Asphyxiant see Appendix 4 |
| Propylene dinitrate | Table 2 |
| Propylene glycol | see <i>Propane-1,2-diol</i> in Table 2 |
| Propylene glycol dinitrate | see <i>Propylene dinitrate</i> in Table 2 |
| Propylene glycol monomethyl ether | see <i>1-Methoxypropan-2-ol</i> in Table 2 |
| Propylene oxide | see <i>1,2-Epoxypropane</i> in Table 4 |
| Prop-2-yn-1-ol | Table 2 |
| Pulverised fuel ash | Table 2 |
| Pyrethrins (ISO) | Table 2 |
| Pyridine | Table 2 |
| 2-Pyridylamine | Table 2 |
| Pyrocatechol | Table 2 |
| Quartz, crystalline | see <i>Silica, crystalline</i> in Table 1 |
| Quinone | see <i>p-Benzoquinone</i> in Table 2 |
| RDX | see <i>Hexahydro-1,3,5-trinitro-1,3,5-triazine</i> in Table 2 |
| Resorcinol | Table 2 |
| Rhodium (as Rh), metal fume and dust soluble salts | Table 2 |
| Ronnel | see <i>Fenchlorphos (ISO)</i> in Table 2 |
| Rosin core solder pyrolysis products (as formaldehyde) | Table 2 |
| Rotenone (ISO) | Table 2 |
| Rouge | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Rubber fume | Table 1 |
| Rubber process dust | Table 1 (and see Table 3C) |

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| <i>Substance</i> | <i>Location</i> |
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| Silane | Table 2 |
| Silica, amorphous | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Silica, crystalline, respirable dust | Table 1 (and see Table 4) |
| Silica, fused | Table 2 |
| respirable dust | |
| Silicon | Table 2 |
| total inhalable dust | |
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| Silicon carbide | Table 2 |
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| Silicon tetrahydride | see Silane in Table 2 |
| Silver, metallic | Table 4 |
| Silver compounds (as Ag) | Table 2 |
| Sodium azide (as NaN ₃) | Table 2; see also hydrazoic acid in Table 2 |
| Sodium 2-(2,4-dichlorophenoxy) ethyl sulphate | Table 2 |
| Sodium fluoroacetate | Table 2 |
| Sodium hydrogensulphite | Table 2 |
| Sodium hydroxide | Table 2 |
| Sodium metabisulphite | see Disodium disulphite in Table 2 |
| Starch | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Stibine | Table 2 |
| Strychnine | Table 2 |
| Styrene | Table 1 (and see Table 4) |
| Subtilisins (Proteolytic enzymes as 100% pure crystalline enzyme) | Table 2 |
| Sucrose | Table 2 |
| Sulfotep (ISO) | Table 2 |
| Sulphur dioxide | Table 2 |
| Sulphur hexafluoride | Table 2 |
| Sulphuric acid | Table 2 |
| Sulphur monochloride | see Disulphur dichloride in Table 2 |
| Sulphur pentafluoride | see Disulphur decafluoride in Table 2 |
| Sulphur tetrafluoride | Table 2 |
| Sulphuryl difluoride | Table 2 |
| 2,4,5-T (ISO) | Table 2 |
| TDI | see Isocyanates, all, in Table 1 |
| TEDP | see Sulfotep (ISO) in Table 2 |
| TEPP (ISO) | Table 2 |
| TNT | see 2,4,6-Trinitrotoluene in Table 2 |
| Talc | Table 2 (and see Table 4) |
| total inhalable dust | |
| respirable dust | |
| Tantalum | Table 2 |
| Tellurium & compounds, except hydrogen telluride, (as Te) | Table 2 |
| Terphenyls, all isomers | Table 2 |
| 1,1,2,2-Tetrabromoethane | Table 2 |
| Tetrabromomethane | see Carbon tetrabromide in Table 2 |
| Tetracarbonylnickel (as Ni) | Table 2 |
| 1,1,1,2-Tetrachloro-2,2-difluoroethane | Table 2 |
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| Tetrachloroethylene | Table 2 (and see Table 4) |
| Tetrachloromethane | see Carbon tetrachloride in Table 2 |
| Tetrachloronaphthalenes, all isomers | Table 2 |
| O,O,O',O'-Tetraethyl dithio-pyrophosphate | see Sulfotep (ISO) in Table 2 |
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| Tetraethyl orthosilicate | Table 2 |
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| Substance | Location |
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| Tetramethyl orthosilicate | Table 2 |
| Tetramethyl succinonitrile | Table 2 |
| Tetrasodium pyrophosphate | Table 2 |
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| Thallium, soluble compounds (as Tl) | Table 2 |
| 4,4'-Thiobis(6- <i>tert</i> -butyl- <i>m</i> -cresol) | see <i>6,6'-Di-<i>tert</i>-butyl-4,4'-thiodi-<i>m</i>-cresol</i> in Table 2 |
| Thioglycollic acid | see <i>Mercaptoacetic acid</i> in Table 2 |
| Thionyl chloride | Table 2 |
| Thiram (ISO) | Table 2 |
| Tin compounds, inorganic, except SnH ₄ , (as Sn) | Table 2 |
| Tin compounds, organic, except Cyhexatin (ISO), (as Sn) | Table 2 |
| Titanium dioxide | Table 2 |
| total inhalable dust | |
| respirable dust | |
| Toluene | Table 2 |
| Toluene diisocyanate | see <i>Isocyanates, all</i> , in Table 1 |
| <i>p</i> -Toluenesulphonyl chloride | Table 2 |
| <i>o</i> -Toluidine | Table 4 |
| 1,4,7-Tri-(aza)-heptane | see <i>2,2'-Iminodi(ethylamine)</i> in Table 2 |
| Tribromomethane | see <i>Bromoform</i> in Table 2 |
| Tributyl phosphate, all isomers | Table 2 |
| Tricarbonyl(<i>eta</i> -cyclopenta-dienyl) manganese (as Mn) | Table 2 |
| Tricarbonyl(methylcyclo-pentadienyl) manganese (as Mn) | Table 2 |
| 1,2,4-Trichlorobenzene | Table 2 |
| 1,1,1-Trichlorobis(chlorophenyl) ethane | Table 2 |
| 1,1,1-Trichloroethane | Table 1 (and see Table 4) |
| Trichloroethylene | Table 1 (and see Table 4) |
| Trichlorofluoromethane | Table 2 |
| Trichloromethane | see <i>Chloroform</i> in Table 2 |
| Trichloronitromethane | Table 2 |
| 2,4,5-Trichlorophenoxyacetic acid | see <i>2,4,5-T (ISO)</i> in Table 2 |
| 1,2,3-Trichloropropane | Table 2 |
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| Tri- <i>o</i> -cresyl phosphate | see <i>Tri-<i>o</i>-tolyphosphate</i> in Table 2 |
| Tricyclohexyltin hydroxide | see <i>Cyhexatin (ISO)</i> in Table 2 |
| Tridymite, respirable dust | see <i>Silica, crystalline</i> in Table 1 |
| Triethylamine | Table 2 |
| Trifluorobromomethane | see <i>Bromotrifluoromethane</i> in Table 2 |
| Trimanganese tetraoxide | Table 2 |
| Trimellitic anhydride | see <i>Benzene-1,2,4-tricarboxylic acid 1,2-anhydride</i> in Table 2 (and see Table 4) |
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| Trimethylbenzenes, all isomers or mixtures | Table 2 |
| 3,5,5-Trimethylcyclohex-2-enone | Table 2 |
| Trimethyl phosphite | Table 2 |
| 2,4,6-Trinitrophenol | see <i>Picric acid</i> in Table 2 |
| 2,4,6-Trinitrotoluene | Table 2 |
| Triphenyl phosphate | Table 2 |
| Tripoli, respirable dust | see <i>Silica, crystalline</i> in Table 1 |
| Tri- <i>o</i> -tolyl phosphate | Table 2 |
| Tungsten & compounds (as W), soluble | Table 2 |
| insoluble | |
| Turpentine | Table 2 |
| Uranium compounds, natural, soluble, (as U) | Table 2 |
| Vanadium pentoxide | see <i>Divanadium pentaoxide</i> in Table 2 |
| Vinyl acetate | Table 2 |
| Vinyl benzene | see <i>Styrene</i> in Table 1 |
| Vinyl chloride | Table 1 |

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| <i>Substance</i> | <i>Location</i> |
|---|---|
| Vinylidene chloride | <i>Table 1</i> |
| Vinyl toluenes, all isomers | <i>see Methylstyrenes, all isomers in Table 2</i> |
| Warfarin (ISO) | <i>Table 2</i> |
| Welding fume | <i>Table 2</i> |
| White spirit | <i>Table 2</i> |
| Wood dust, (hard wood) | <i>Table 1</i> |
| Wood dust, (soft wood) | <i>Table 4</i> |
| Wool | <i>Table 4</i> |
| Xylene, <i>o</i> -, <i>m</i> -, <i>p</i> - or mixed isomers | <i>Table 2</i> |
| Xylidine, all isomers | <i>Table 2</i> |
| Yttrium | <i>Table 2</i> |
| Zinc chloride, fume | <i>Table 2</i> |
| Zinc distearate | <i>Table 2</i> |
| total inhalable dust | |
| respirable dust | |
| Zinc oxide, fume | <i>Table 2</i> |
| Zirconium compounds (as Zr) | <i>Table 2</i> |

LISTS OF OCCUPATIONAL EXPOSURE LIMITS

| | | |
|--------------------|----------|--|
| Annotations | Sk | Can be absorbed through skin |
| | ISO | International Organisation for Standardisation |
| | INN | International Non-proprietary Name |
| | Sen | Capable of causing respiratory sensitisation. The identified substances are those which: — are assigned the risk phrase "R42: May cause sensitisation by inhalation" in Part IA1 of the Approved List; or — are listed under the Social Security Act 1975 or Schedule 2 of the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1985 in connection with prescribed or reportable diseases respectively. |
| | New | This indicates either a new addition to the lists or an amended entry. |
| | Pr | This signifies that the Health and Safety Commission proposes to set a MEL for the substance (see paragraph 14). |
| | (as "x") | See paragraph 19. |

| | | |
|--------------|---|---|
| Notes | 1 | The system of nomenclature for the substances listed below is based, in the main, on the convention adopted by the International Union of Pure Applied Chemistry (IUPAC). |
| | 2 | For the purposes of these limits, respirable dust and total inhalable dust are those fractions of the airborne dust which will be collected when sampling is undertaken in accordance with the methods described in MDHS 14 <i>General methods for the gravimetric determination of respirable and total inhalable dust</i> , ¹¹ published by HSE. |
| | 3 | Where no specific short-term exposure limit is listed, a figure of 3 times the long-term exposure limit should be used (see paragraph 30). |

Table 1: List of maximum exposure limits (paragraphs 20 to 23)

This list reproduces Schedule 1 of the COSHH Regulations. However, the right-hand column headed 'Notes' and the entries therein, together with the references to asbestos and lead, are not part of Schedule 1. The maximum exposure limits of the dusts included in the list below refer to the total inhalable dust fraction, unless otherwise stated. Table 3C gives notice of the new and revised MELs which will take effect with the coming into force of COSHH 1994.

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|---|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Acrylamide | CH ₂ =CHCONH ₂ | 79-06-1 | — | 0.3 | — | — | Sk |
| Acrylonitrile | CH ₂ =CHCN | 107-13-1 | 2 | 4 | — | — | Sk |
| Arsenic & compounds, except arsine (as As) | As | 7440-38-2 | — | 0.1 | — | — | |
| Asbestos | <i>see Appendix 8</i> | | | | | | |
| Benzene | C ₆ H ₆ | 71-43-2 | 5 | 16 | — | — | |
| Bis (chloromethyl) ether (BCME) | ClCH ₂ OCH ₂ Cl | 542-88-1 | 0.001 | 0.005 | — | — | |
| Buta-1,3-diene | CH ₂ =CHCH=CH ₂ | 106-99-0 | 10 | 22 | — | — | |
| 2-Butoxyethanol | C ₄ H ₉ OCH ₂ CH ₂ OH | 111-76-2 | 25 | 120 | — | — | Sk |
| Cadmium & cadmium compounds, except cadmium oxide fume, and cadmium sulphide pigments (as Cd) | Cd | 7440-43-9 | — | 0.05 | — | — | |
| Cadmium oxide fume (as Cd) | CdO | 1306-19-0 | — | 0.05 | — | 0.05 | |
| Cadmium sulphide pigments respirable dust (as Cd) | CdS | 1306-23-6 | — | 0.04 | — | — | |
| Carbon disulphide | CS ₂ | 75-15-0 | 10 | 30 | — | — | Sk |
| Chromium (VI) compounds (as Cr) | Cr | | — | 0.05 | — | — | |
| 1,2-Dibromoethane (ethylene dibromide) | BrCH ₂ CH ₂ Br | 106-93-4 | 0.5 | 4 | — | — | Sk |
| Dichloromethane | CH ₂ Cl ₂ | 75-09-2 | 100 | 350 | — | — | |
| 2,2'-Dichloro-4,4'-methylene dianiline (MBOCA) | CH ₂ (C ₆ H ₃ Cl ₂ NH ₂) ₂ | 101-14-4 | — | 0.005 | — | — | Sk |
| 2-Ethoxyethanol | C ₂ H ₅ OCH ₂ CH ₂ OH | 110-85-5 | 10 | 37 | — | — | Sk |
| 2-Ethoxyethyl acetate | C ₂ H ₅ OCH ₂ CH ₂ OOCCH ₃ | 111-15-9 | 10 | 54 | — | — | Sk |
| Ethylene oxide | CH ₂ CH ₂ O | 75-21-8 | 5 | 10 | — | — | |
| Formaldehyde | HCHO | 50-00-0 | 2 | 2.5 | 2 | 2.5 | |
| Grain dust | <i>see Appendix 7</i> | | | | | | |
| | | | — | 10 | — | — | Sen |

Table 1: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|-------------------------------------|---|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Hydrogen cyanide | HCN | 74 90 8 | — | — | 10 | 10 | Sk |
| Isocyanates, all (as-NCO) | | | — | 0.02 | — | 0.07 | Sen |
| Lead and compounds | <i>see Appendix 5</i> | | | | | | |
| ** Man-made mineral fibre | <i>see Appendix 2</i> | | | | | | |
| 2-Methoxyethanol | CH ₃ OCH ₂ CH ₂ OH | 109-86-4 | 5 | 16 | — | — | Sk |
| 2-Methoxyethyl acetate | CH ₃ COOCH ₂ CH ₂ OCH ₃ | 110-49-6 | 5 | 24 | — | — | Sk |
| Nickel | Ni | | — | 0.5 | — | — | |
| Nickel, inorganic compounds (as Ni) | Ni (<i>see Table 2 for Nickel carbonyl</i>) | | | | | | |
| soluble compounds | | | — | 0.1 | — | — | |
| insoluble compounds | | | — | 0.5 | — | — | |
| Rubber fume | <i>see Appendix 6*</i> | | | | | | |
| Rubber process dust | <i>see Appendix 6</i> | | | | | | |
| Silica, crystalline respirable dust | SiO ₂ | | — | 0.4 | — | — | |
| Styrene | C ₆ H ₅ CH=CH ₂ | 100-42-5 | 100 | 420 | 250 | 1050 | |
| 1,1,1-Trichloroethane | CH ₃ CCl ₃ | 71-55-6 | 350 | 1900 | 450 | 2450 | |
| Trichloroethylene | CCl ₂ =CHCl | 79-01-6 | 100 | 535 | 150 | 802 | Sk |
| Vinyl chloride | CH ₂ =CHCl† | 75-01-4 | 7 | — | — | — | |
| Vinylidene chloride | CH ₂ =CCl ₂ | 75-35-4 | 10 | 40 | — | — | |
| Wood dust (hard wood) | | | — | 5 | — | — | Sen |

* Limit relates to cyclohexane soluble material.

† Vinyl chloride is also subject to an overriding annual maximum exposure limit of 3 ppm (see Appendix 1).

** In addition to the maximum exposure limit specified above man-made mineral fibre is also subject to a maximum exposure limit of 2 fibres ml⁻¹, 8-hour TWA, when measured by a method approved by the Health and Safety Commission.

Table 2: List of approved occupational exposure standards (paragraphs 20-26)

This list reproduces the list of occupational exposure standards which has been approved by the Health and Safety Commission.

The right hand column headed 'Notes' and the entries in it are not part of the list of approved occupational exposure standards.

The occupational exposure standards of the dusts included in the list below refer to the total inhalable dust fraction unless otherwise stated.

The occupational exposure standards set out in this list have been set taking due account of Indicative Limit Values published by the Commission of the European Communities as set out in Commission Directive 91/332/EEC.

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Acetic acid | CH ₃ COOH | 64-19-7 | 10 | 25 | 15 | 37 | |
| Acetic anhydride | (CH ₃ CO) ₂ O | 108-24-7 | — | — | 5 | 20 | |
| Acetone | CH ₃ COCH ₃ | 67-64-1 | 750 | 1780 | 1500 | 3560 | |
| Acetonitrile | CH ₃ CN | 75-05-8 | 40 | 70 | 60 | 105 | |
| o-Acetylsalicylic acid | CH ₃ COOC ₆ H ₄ COOH | 50-78-2 | — | 5 | — | — | |
| Acrylaldehyde | CH ₂ =CHCHO | 107-02-8 | 0.1 | 0.25 | 0.3 | 0.8 | |
| Acrylic acid | CH ₂ =CHCOOH | 79-10-7 | 10 | 30 | 20 | 60 | |
| Aldrin (ISO) | C ₁₂ H ₈ Cl ₆ | 309-00-2 | — | 0.25 | — | 0.75 | Sk |
| Allyl alcohol | CH ₂ =CHCH ₂ OH | 107-18-6 | 2 | 5 | 4 | 10 | Sk |
| Allyl-2,3-epoxypropyl ether | CH ₂ =CHCH ₂ OCH ₂ CHCH ₂ O | 106-92-3 | 5 | 22 | 10 | 44 | Sk |
| Aluminium alkyl compounds | | | — | 2 | — | — | |
| *Aluminium metal | Al | 7429-90-5 | — | 10 | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| *Aluminium oxides | Al ₂ O ₃ , Al(OH) ₃ and AlOOH | 1344-28-1 | — | 10 | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Aluminium salts, soluble | | 1344-28-1 | — | 2 | — | — | |
| 2-Aminoethanol | NH ₂ CH ₂ CH ₂ OH | 141-43-5 | 3 | 8 | 6 | 15 | |
| Ammonia | NH ₃ | 7664-41-7 | 25 | 17 | 35 | 24 | |
| Ammonium chloride, fume | NH ₄ Cl | 12125-02-9 | — | 10 | — | 20 | |
| Ammonium sulphamidate | NH ₂ SO ₃ NH ₄ | 7773-06-0 | — | 10 | — | 20 | |
| Anisidines, o- and p- isomers | NH ₂ C ₆ H ₄ OCH ₃ | 90-04-0 | 0.1 | 0.5 | — | — | Sk |
| Antimony & compounds (as Sb) | Sb | 7440-36-0 | — | 0.5 | — | — | |
| except antimony trisulphide and antimony trioxide | | | | | | | |
| Arsine | AsH ₃ | 7784-42-1 | 0.05 | 0.2 | — | — | |
| Asphalt, petroleum fumes | | 8052-42-4 | — | 5 | — | 10 | |
| Azinphos-methyl (ISO) | (CH ₃ O) ₂ PSSCH ₂ (C ₇ H ₄ N ₃ O) | 86-50-0 | — | 0.2 | 0.6 | — | Sk |
| γ-BHC (ISO) | C ₆ H ₆ Cl ₆ | 58-89-9 | — | 0.5 | — | 1.5 | Sk |
| Barium compounds, soluble (as Ba) | Ba | 7440-39-3 | — | 0.5 | — | — | |
| Barium sulphate, respirable dust | BaSO ₄ | 7727-43-7 | — | 2 | — | — | |
| Benomyl (ISO) | C ₁₄ H ₁₈ N ₄ O ₃ | 17804-35-2 | — | 10 | — | 15 | |
| Benzenethiol | C ₆ H ₅ SH | 108-98-5 | 0.5 | 2 | — | — | |
| Benzene-1,2,4-tricarboxylic acid 1,2-anhydride | C ₉ H ₄ O ₅ | 552-30-7 | — | 0.04 | — | — | Sen |
| p-Benzoquinone | C ₆ H ₄ O ₂ | 106-51-4 | 0.1 | 0.4 | 0.3 | 1.2 | |
| Benzyl butyl phthalate | C ₆ H ₅ CH ₂ COOC ₆ H ₄ COOC ₄ H ₉ | 85-68-7 | — | 5 | — | — | |
| Biphenyl | (C ₆ H ₅) ₂ | 92-52-4 | 0.2 | 1.5 | 0.6 | 4 | |
| Bis(2,3-epoxypropyl) ether | (OCH ₂ CHCH ₂) ₂ O | 2238-07-5 | 0.1 | 0.6 | — | — | |
| Bis(2-ethylhexyl)phthalate | C ₆ H ₄ [COOCH ₂ CH(C ₂ H ₅)C ₄ H ₉] ₂ | 117-81-7 | — | 5 | — | 10 | |
| Bornan-2-one | C ₁₀ H ₁₆ O | 76-22-2 | 2 | 12 | 3 | 18 | |
| Boron tribromide | BBr ₃ | 10294-33-4 | — | — | 1 | 10 | |
| Boron trifluoride | BF ₃ | 7637-07-2 | — | — | 1 | 3 | |
| Bromacil (ISO) | C ₉ H ₁₃ BrN ₂ O ₂ | 314-40-9 | 1 | 10 | 2 | 20 | |
| Bromine | Br ₂ | 7726-95-6 | 0.1 | 0.7 | 0.3 | 2 | |
| Bromine pentafluoride | BrF ₅ | 7789-30-2 | 0.1 | 0.7 | 0.3 | 2 | |
| Bromochloromethane | CH ₂ BrCl | 74-97-5 | 200 | 1050 | 250 | 1300 | |
| Bromoethane | C ₂ H ₅ Br | 74-96-4 | 200 | 890 | 250 | 1110 | |

* Note: The OES for aluminium does not include exposure to aluminium coated with mineral oil, or to fume arising from aluminium welding processes. The OES for welding fume applies to this type of exposure.

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|--------------------------------------|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Bromoform | CHBr ₃ | 75-25-2 | 0.5 | 5 | — | — | Sk |
| Bromomethane | CH ₃ Br | 74-83-9 | 5 | 20 | 15 | 60 | Sk |
| Bromotrifluoromethane | CF ₃ Br | 75-63-8 | 1000 | 6100 | 1200 | 7300 | |
| Butane | C ₄ H ₁₀ | 106-97-8 | 600 | 1430 | 750 | 1780 | |
| Butan-1-ol | CH ₃ CH ₂ CH ₂ CH ₂ OH | 71-36-3 | — | — | 50 | 150 | Sk |
| Butan-2-ol | CH ₃ CH ₂ CHOHCH ₃ | 78-92-2 | 100 | 300 | 150 | 450 | |
| Butan-2-one | CH ₃ COC ₂ H ₅ | 78-93-3 | 200 | 590 | 300 | 885 | |
| Butyl acetate | CH ₃ COO(CH ₂) ₃ CH ₃ | 123-86-4 | 150 | 710 | 200 | 950 | |
| sec-Butyl acetate | CH ₃ COOCH(CH ₃)CH ₂ CH ₃ | 105-46-4 | 200 | 950 | 250 | 1190 | |
| tert-Butyl acetate | CH ₃ COOC(CH ₃) ₃ | 540-88-5 | 200 | 950 | 250 | 1190 | |
| Butyl acrylate | C ₇ H ₁₂ O ₂ | 141-32-2 | 10 | 55 | — | — | |
| n-Butylamine | CH ₃ CH ₂ CH ₂ CH ₂ NH ₂ | 109-73-9 | — | — | 5 | 15 | Sk |
| n-Butyl chloroformate | ClCO ₂ C ₄ H ₁₀ | 592-34-7 | 1 | 5.6 | — | — | |
| n-Butyl glycidyl ether | C ₄ H ₉ OCH ₂ CHCH ₂ O | 2426-08-6 | 25 | 135 | — | — | |
| Butyl lactate | C ₇ H ₁₄ O ₃ | 138-22-7 | 5 | 25 | — | — | |
| 2-sec-Butylphenol | C ₇ H ₈ (CH ₃)CHC ₆ H ₄ OH | 89-72-5 | 5 | 30 | — | — | Sk |
| Caesium hydroxide | CsOH | 21351-79-1 | — | 2 | — | — | |
| Calcium carbonate | CaCO ₃ | 1317-65-3 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Calcium cyanamide | CaNC≡N | 156-62-7 | — | 0.5 | — | 1 | |
| Calcium hydroxide | Ca(OH) ₂ | 1305-62-0 | — | 5 | — | — | |
| Calcium oxide | CaO | 1305-78-8 | — | 2 | — | — | |
| Calcium silicate | | 1344-95-2 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Captafol (ISO) | C ₁₀ I ₉ Cl ₄ NO ₂ S | 2425 06 1 | — | 0.1 | — | — | Sk |
| Captan (ISO) | C ₉ H ₈ Cl ₃ NO ₂ S | 133-06-2 | — | 5 | — | 15 | |
| Carbaryl (ISO) | C ₁₀ H ₇ OCONHCH ₃ | 63-25-2 | — | 5 | — | 10 | |
| Carbofuran (ISO) | C ₁₂ H ₁₅ NO ₃ | 1563-66-2 | — | 0.1 | — | — | |
| Carbon black | C | 1333-86-4 | — | 3.5 | — | 7 | |
| Carbon dioxide | CO ₂ | 124-38-9 | 5000 | 9000 | 15000 | 27000 | |
| Carbon monoxide | CO | 630-08-0 | 50 | 55 | 300 | 330 | |
| Carbon tetrabromide | CBr ₄ | 558-13-4 | 0.1 | 1.4 | 0.3 | 4 | |
| Carbon tetrachloride | CCl ₄ | 56-23-5 | 2 | 12.6 | — | — | Sk |
| Cellulose | | 9004-34-6 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | 20 | |
| respirable dust | | | — | 5 | — | — | |
| Chlorine | Cl ₂ | 7782-50-5 | 0.5 | 1.5 | 1 | 3 | |
| Chlorine dioxide | ClO ₂ | 10049-04-4 | 0.1 | 0.3 | 0.3 | 0.9 | |
| Chlorine trifluoride | ClF ₃ | 7790-91-2 | — | — | 0.1 | 0.4 | |
| Chloroacetaldehyde | ClCH ₂ CHO | 107-20-0 | — | — | 1 | 3 | |
| 2-Chloroacetophenone | C ₆ H ₅ COCH ₂ Cl | 532-27-4 | 0.05 | 0.3 | — | — | |
| Chlorobenzene | C ₆ H ₅ Cl | 180-90-7 | 50 | 230 | — | — | |
| 2-Chlorobuta-1,3-diene | CH ₂ =CClCH=CH ₂ | 126-99-8 | 10 | 36 | — | — | Sk |
| Chlorodifluoromethane | CHClF ₂ | 75-45-6 | 1000 | 3500 | — | — | |
| Chloroethane | C ₂ H ₅ Cl | 75-00-3 | 1000 | 2600 | 1250 | 3250 | |
| 2-Chloroethanol | ClCH ₂ CH ₂ OH | 107-07-3 | — | — | 1 | 3 | Sk |
| Chloroform | CHCl ₃ | 67-66-3 | 2 | 9.8 | — | — | Sk |
| Chloromethane | CH ₃ Cl | 74-87-3 | 50 | 105 | 100 | 210 | |
| 1-Chloro-4-nitrobenzene | ClC ₆ H ₄ NO ₂ | 100-00-5 | — | 1 | — | 2 | Sk |
| Chloropentafluoroethane | CClF ₂ CF ₃ | 76-15-3 | 1000 | 6320 | — | — | |
| Chlorosulphonic acid | HSO ₃ Cl | 7790-94-5 | — | 1 | — | — | |
| 2-Chlorotoluene | C ₇ H ₇ Cl | 95-49-8 | 50 | 250 | — | — | |
| 2-Chloro-6-(trichloromethyl)pyridine | C ₆ H ₃ Cl ₄ N | 1929-82-4 | — | 10 | — | 20 | |
| Chlorpyrifos (ISO) | C ₉ H ₁₁ Cl ₃ NO ₃ PS | 2921-88-2 | — | 0.2 | — | 0.6 | Sk |
| Chromium | Cr | 7440-47-3 | — | 0.5 | — | — | |
| Chromium (II) compounds (as Cr) | Cr | — | — | 0.5 | — | — | |
| Chromium (III) compounds (as Cr) | Cr | — | — | 0.5 | — | — | |
| Coal dust | — | — | — | 2 | — | — | |
| respirable dust | | | — | 2 | — | — | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|--|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Copper | Cu | | | | | | |
| fume | | 7440-50-8 | — | 0.2 | — | — | |
| dusts and mists (as Cu) | | 7440-50-8 | — | 1 | — | 2 | |
| Cotton dust | see Appendix 3 | — | — | 0.5 | — | — | |
| Cresols, all isomers | CH ₃ C ₆ H ₄ OH | 1319-77-2 | 5 | 22 | — | — | Sk |
| Cryofluorane (INN) | CClF ₂ CClF ₂ | 76-14-2 | 1000 | 7000 | 1250 | 8750 | |
| Cumene | C ₆ H ₅ CH(CH ₃) ₂ | 98-28-8 | 25 | 120 | 75 | 370 | Sk |
| Cyanamide | H ₂ NCN | 420-04-2 | — | 2 | — | — | |
| Cyanides, except hydrogen cyanide, cyanogen & cyanogen chloride, (as CN) | | 57-12-5 | — | 5 | — | — | Sk |
| Cyanogen chloride | ClCN | 506-77-4 | — | — | 0.3 | 0.6 | |
| Cyclohexane | C ₆ H ₁₂ | 110-82-7 | 100 | 340 | 300 | 1030 | |
| Cyclohexanol | C ₆ H ₁₁ OH | 108-93-0 | 50 | 200 | — | — | |
| Cyclohexanone | C ₆ H ₁₀ O | 108-94-1 | 25 | 100 | 100 | 400 | |
| Cyclohexene | C ₆ H ₁₀ | 110-83-8 | 300 | 1015 | — | — | |
| Cyclohexylamine | C ₆ H ₁₁ NH ₂ | 108-91-8 | 10 | 40 | — | — | Sk |
| Cyhexatin (ISO) | (C ₆ H ₁₁) ₃ SnOH | 13121-70-5 | — | 5 | — | 10 | |
| 2,4-D (ISO) | C ₆ H ₃ Cl ₂ OCH ₂ COOH | 94-75-7 | — | 10 | — | 20 | |
| Dialkyl 79 phthalate | C ₆ H ₄ (COOC ₇₋₉ H ₁₅₋₁₉) ₂ | — | — | 5 | — | — | |
| Diallyl phthalate | C ₆ H ₄ (COOCH ₂ CHCH ₂) ₂ | 131-17-9 | — | 5 | — | — | |
| 1,2-Diaminoethane | NH ₂ CH ₂ CH ₂ NH ₂ | 107-15-3 | 10 | 25 | — | — | |
| Diammonium peroxodisulphate (measured as [S ₂ O ₈]) | (NH ₄) ₂ S ₂ O ₈ | 7727-54-0 | — | 1 | — | — | |
| Diatomaceous earth, natural, respirable dust | | 68855-54-9 | — | 1.5 | — | — | |
| Diazinon (ISO) | C ₁₂ H ₂₁ N ₂ O ₃ PS | 333-41-5 | — | 0.1 | — | 0.3 | Sk |
| Dibenzoyl peroxide | (C ₆ H ₅ CO) ₂ O ₂ | 94-36-0 | — | 5 | — | — | |
| Dibismuth tritelluride | Bi ₂ Te ₃ | 1304-82-1 | — | 10 | — | 20 | |
| Dibismuth tritelluride, selenium doped | Bi ₂ Te ₃ | — | — | 5 | — | 10 | |
| Diborane | B ₂ H ₆ | 19287-45-7 | 0.1 | 0.1 | — | — | |
| Diboron trioxide | B ₂ O ₃ | 1303-86-2 | — | 10 | — | 20 | |
| Dibromodifluoromethane | CBBr ₂ F ₂ | 75-61-6 | 100 | 860 | 150 | 1290 | |
| Dibutyl hydrogen phosphate | (<i>n</i> -C ₄ H ₉ O) ₂ (OH)PO | 107-66-4 | 1 | 5 | 2 | 10 | |
| Dibutyl phthalate | C ₆ H ₄ (CO ₂ C ₄ H ₉) ₂ | 84-74-2 | — | 5 | — | 10 | |
| 6,6'-Di- <i>tert</i> -butyl-4,4'-thiodi- <i>m</i> -cresol | C ₂₂ H ₃₀ O ₂ S | — | — | 10 | — | 20 | |
| Dichloroacetylene | ClC≡CCl | 7572-29-4 | — | — | 0.1 | 0.4 | |
| 1,2-Dichlorobenzene | C ₆ H ₄ Cl ₂ | 95-50-1 | — | — | 50 | 300 | |
| 1,4-Dichlorobenzene | C ₆ H ₄ Cl ₂ | 106-46-7 | 25 | 150 | 50 | 300 | |
| Dichlorodifluoromethane | CCl ₂ F ₂ | 75-71-8 | 1000 | 4950 | 1250 | 6200 | |
| 1,3-Dichloro-5,5-dimethyl-hydantoin | C ₅ H ₆ Cl ₂ N ₂ O ₂ | 118-52-5 | — | 0.2 | — | 0.4 | |
| 1,1-Dichloroethane | CH ₃ CHCl ₂ | 75-34-3 | 200 | 810 | 400 | 1620 | |
| 1,2-Dichloroethylene, <i>cis:trans</i> isomers 60:40 | ClCH = CHCl | 540-59-0 | 200 | 790 | 250 | 1000 | |
| Dichlorofluoromethane | CHCl ₂ F | 75-43-4 | 10 | 40 | — | — | |
| Dichlorvos (ISO) | (CH ₃ O) ₂ POOCH=CCl ₂ | 62-73-7 | 0.1 | 1 | 0.3 | 3 | Sk |
| Dicyclohexyl phthalate | C ₆ H ₄ (COOC ₆ H ₁₁) ₂ | 84-61-7 | — | 5 | — | — | |
| Dicyclopentadiene | C ₁₀ H ₁₂ | 77-73-6 | 5 | 30 | — | — | |
| Dieldrin (ISO) | C ₁₂ H ₈ Cl ₆ O | 60-57-1 | — | 0.25 | — | 0.75 | Sk |
| Diethylamine | (C ₂ H ₅) ₂ NH | 109-89-7 | 10 | 30 | 25 | 75 | |
| 2-Diethylaminoethanol | (C ₂ H ₅) ₂ NCH ₂ CH ₂ OH | 100-37-8 | 10 | 50 | — | — | Sk |
| Diethyl ether | C ₂ H ₅ OC ₂ H ₅ | 60-29-7 | 400 | 1200 | 500 | 1500 | |
| Diethyl phthalate | C ₆ H ₄ (COOC ₂ H ₅) ₂ | 84-66-2 | — | 5 | — | 10 | |
| Diisobutyl phthalate | C ₆ H ₄ [COOCH ₂ CH(CH ₃) ₂] ₂ | 84-69-5 | — | 5 | — | — | |
| Diisodecyl phthalate | (C ₁₀ H ₂₁ CO) ₂ C ₆ H ₄ | 26761-40-0 | — | 5 | — | — | |
| Diisononyl phthalate | C ₆ H ₄ (COOC ₉ H ₁₉) ₂ | 28553-12-0 | — | 5 | — | — | |
| Diisooctyl phthalate | C ₆ H ₄ (COOC ₈ H ₁₇) ₂ | 117-81-7 | — | 5 | — | — | |
| Diisopropylamine | (CH ₃) ₂ CHNHCH(CH ₃) ₂ | 108-18-9 | 5 | 20 | — | — | Sk |
| Diisopropyl ether | (CH ₃) ₂ CHOCH(CH ₃) ₂ | 108-20-3 | 250 | 1050 | 310 | 1320 | |
| Di-linear 79 phthalate | C ₆ H ₄ (COOC ₇₋₉ H ₁₅₋₁₉) ₂ | — | — | 5 | — | — | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|--|---|-------------|--|--------------------|--|--------------------|------------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Dimethoxymethane | CH ₂ (OCH ₃) ₂ | 109-87-5 | 1000 | 3100 | 1250 | 3880 | |
| <i>NN</i> -Dimethylacetamide | CH ₃ CON(CH ₃) ₂ | 127-19-5 | 10 | 36 | 20 | 71 | Sk Revised |
| Dimethylamine | (CH ₃) ₂ NH | 124-40-3 | 10 | 18 | — | — | |
| <i>NN</i> -Dimethylaniline | C ₆ H ₅ N(CH ₃) ₂ | 121-69-7 | 5 | 25 | 10 | 50 | Sk |
| 1,3-Dimethylbutyl acetate | CH ₃ CO ₂ CH(CH ₃)CH ₂ CH(CH ₃) ₂ | 108-84-9 | 50 | 300 | 100 | 600 | |
| <i>NN</i> -Dimethylethylamine | C ₂ H ₅ (CH ₃) ₂ N | 00598-56-1 | 10 | 30 | 15 | 45 | |
| Dimethylformamide | HCON(CH ₃) ₂ | 68-12-2 | 10 | 30 | 20 | 60 | Sk |
| 2,6-Dimethylheptan-4-one | [(CH ₃) ₂ CHCH ₂] ₂ CO | 108-83-8 | 25 | 150 | — | — | |
| Dimethyl phthalate | C ₆ H ₄ (COOCH ₃) ₂ | 131-11-3 | — | 5 | — | 10 | |
| Dinitrobenzene, all isomers | C ₆ H ₄ (NO ₂) ₂ | 25154-54-5 | 0.15 | 1 | 0.5 | 3 | Sk |
| Dinonyl phthalate | C ₆ H ₄ (COOC ₉ H ₁₉) ₂ | 84-76-4 | — | 5 | — | — | |
| 1,4-Dioxane,tech. grade | OCH ₂ CH ₂ OCH ₂ CH ₂ | 123-91-1 | 25 | 90 | 100 | 360 | Sk |
| Dioxathion (ISO) | C ₁₂ H ₂₆ O ₆ P ₂ S ₂ | 78-34-2 | — | 0.2 | — | — | Sk |
| Diphenylamine | (C ₆ H ₅) ₂ NH | 122-39-4 | — | 10 | — | 20 | |
| Diphenyl ether (vapour) | C ₆ H ₅ OC ₆ H ₅ | 101-84-8 | 1 | 7 | — | — | |
| Diphosphorus pentasulphide | P ₂ S ₅ | 1314-80-3 | — | 1 | — | 3 | |
| Dipotassium peroxydisulphate (measured as [S ₂ O ₈]) | K ₂ S ₂ O ₈ | 7727-21-1 | — | 1 | — | — | |
| Diquat dibromide (ISO) | C ₁₂ H ₁₂ Br ₂ N ₂ | 85-00-7 | — | 0.5 | — | 1 | |
| Disodium disulphite | Na ₂ S ₂ O ₅ | 7681-57-4 | — | 5 | — | — | |
| Disodium peroxydisulphate (measured as [S ₂ O ₈]) | Na ₂ S ₂ O ₈ | 7775-27-1 | — | 1 | — | — | |
| Disodium tetraborate, anhydrous | Na ₂ B ₄ O ₇ | 1330-33-4 | — | 1 | — | — | |
| decahydrate | Na ₂ B ₄ O ₇ ·10H ₂ O | 1303-96-4 | — | 5 | — | — | |
| pentahydrate | Na ₂ B ₄ O ₇ ·5H ₂ O | 11130-12-4 | — | 1 | — | — | |
| Disulfoton (ISO) | (C ₂ H ₅ O) ₂ PSC ₂ H ₂ SC ₂ H ₅ | 298-04-4 | — | 0.1 | — | 0.3 | |
| Disulphur dichloride | S ₂ Cl ₂ | 10025-67-9 | — | — | 1 | 6 | |
| Disulphur decafluoride | S ₂ F ₁₀ | 5714-22-7 | 0.025 | 0.25 | 0.075 | 0.75 | |
| 2,6-Ditertiary-butyl-para-cresol | (C ₄ H ₉) ₂ CH ₃ C ₆ H ₂ OH | 128-37-0 | — | 10 | — | — | |
| 6,6-Di-tert-butyl-4,4-thiodi-m-cresol | C ₂₂ H ₃₀ O ₂ S | 96-69-5 | — | 10 | — | 20 | |
| Diuron (ISO) | C ₉ H ₁₀ Cl ₂ N ₂ O | 330-54-1 | — | 10 | — | — | |
| Divanadium pentaoxide (as V) total inhalable dust | V ₂ O ₅ | 1314-62-1 | — | 0.5 | — | — | |
| fume and respirable dust | | | — | 0.05 | — | — | |
| Divinylbenzene | C ₆ H ₄ (CHCH ₂) ₂ | 108-57-6 | 10 | 50 | — | — | |
| Emery total inhalable dust | | 1302-74-5 | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Endosulfan (ISO) | C ₉ H ₆ Cl ₆ O ₃ S | 115-29-7 | — | 0.1 | — | 0.3 | Sk |
| Endrin (ISO) | C ₁₂ H ₈ Cl ₆ O | 72-20-8 | — | 0.1 | — | 0.3 | Sk |
| 2,3-Epoxypropyl isopropyl ether | C ₃ H ₇ OCH ₂ CHCH ₂ O | 4016-14-2 | 50 | 240 | 75 | 360 | |
| Ethane-1,2-diol, particulate | CH ₂ OHCH ₂ OH | 107-21-1 | — | 10 | — | — | |
| vapour | | | — | 60 | — | 125 | |
| Ethanethiol | C ₂ H ₅ SH | 75-08-1 | 0.5 | 1 | 2 | 3 | |
| Ethanol | C ₂ H ₅ OH | 64-17-5 | 1000 | 1900 | — | — | |
| Ethyl acetate | CH ₃ COOC ₂ H ₅ | 141-78-6 | 400 | 1400 | — | — | |
| Ethyl acrylate | CH ₂ =CHCOOC ₂ H ₅ | 140-88-5 | 5 | 20 | 15 | 60 | Sk |
| Ethylamine | C ₂ H ₅ NH ₂ | 75-04-7 | 10 | 18 | — | — | |
| Ethylbenzene | C ₆ H ₅ C ₂ H ₅ | 100-41-1 | 100 | 435 | 125 | 545 | |
| Ethyl chloroformate | ClCO ₂ C ₂ H ₅ | 541-41-3 | 1 | 4.4 | — | — | |
| Ethylene dinitrate | CH ₂ NO ₂ CH ₂ NO ₂ | 628-96-6 | 0.2 | 1.2 | 0.2 | 1.2 | Sk |
| Ethyl formate | HCOOC ₂ H ₅ | 109-94-4 | 100 | 300 | 150 | 450 | |
| 2-Ethylhexyl chloroformate | ClCO ₂ CH ₂ CH(CH ₂) ₃ CH ₃ | 24468-13-1 | 1 | 7.9 | — | — | |
| 4-Ethylmorpholine | C ₂ H ₅ C ₆ H ₁₃ NO | 100-74-3 | 5 | 23 | 20 | 95 | Sk |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Fenchlorphos (ISO) | (CH ₃ O) ₂ PSOC ₆ H ₂ Cl ₃ | 299-84-3 | — | 10 | — | — | |
| Ferbam (ISO) | [(CH ₃) ₂ NCSS] ₃ Fe | 14484-64-1 | — | 10 | — | 20 | |
| Ferrocene | C ₁₀ H ₁₀ Fe | 102-54-5 | — | 10 | — | 20 | |
| Fluoride (as F) | F | 16984-48-8 | — | 2.5 | — | — | |
| Fluorine | F ₂ | 7782-41-4 | — | — | 1 | 1.5 | |
| Formamide | HCONH ₂ | 75-12-7 | 20 | 30 | 30 | 45 | |
| Formic acid | HCOOH | 64-18-6 | 5 | 9 | — | — | |
| 2-Furaldehyde | C ₆ H ₄ O ₂ | 98-01-1 | 2 | 8 | 10 | 40 | Sk |
| Furfuryl alcohol | OCH=CHCH=CCH ₂ OH | 98-00-0 | 5 | 20 | 15 | 60 | Sk |
| Germane | GeH ₄ | 7782-65-2 | 0.2 | 0.6 | 0.6 | 1.8 | |
| Glutaraldehyde | OCH(CH ₂) ₃ CHO | 111-30-8 | — | — | 0.2 | 0.7 | |
| Glycerol, mist | CH ₂ OHCHOHCH ₂ OH | 56-81-5 | — | 10 | — | — | |
| Glycerol trinitrate | CH ₂ NO ₃ CHNO ₃ CH ₂ NO ₃ | 55-63-0 | 0.2 | 2 | 0.2 | 2 | Sk |
| Graphite | C | 7440-44-0 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Gypsum | CaSO ₄ .2H ₂ O | 10101-41-4 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Hafnium | Hf | 7440-58-6 | — | 0.5 | — | 1.5 | |
| n-Heptane | C ₇ H ₁₆ | 142-82-5 | 400 | 1600 | 500 | 2000 | |
| Heptan-2-one | CH ₃ (CH ₂) ₄ COCH ₃ | 110-43-0 | 50 | 240 | — | — | |
| Heptan-3-one | CH ₃ CH ₂ CO(CH ₂) ₃ CH ₃ | 106-35-4 | 50 | 230 | 75 | 345 | |
| Hexachloroethane | CCl ₃ CCl ₃ | 67-72-1 | — | — | — | — | |
| vapour | | | 5 | 50 | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Hexahydro-1,3,5-trinitro-1,3,5-triazine | C ₃ H ₆ N ₆ O ₆ | 121-82-4 | — | 1.5 | — | 3 | Sk |
| Hexane, all isomers except n-Hexane | C ₆ H ₁₄ | 110-54-3 | 500 | 1800 | 1000 | 3600 | |
| n-Hexane | C ₆ H ₁₄ | 110-54-3 | 20 | 70 | — | — | |
| 1,6-Hexanolactam | NH(CH ₂) ₅ CO | 105-60-2 | — | — | — | — | |
| dust | | | — | 1 | — | 3 | |
| vapour | | | 5 | 20 | 10 | 40 | |
| Hexan-2-one | CH ₃ (CH ₂) ₃ COCH ₃ | 591-78-6 | 5 | 20 | — | — | Sk |
| Hydrazoic acid (as vapour) | HN ₃ | 7782-79-8 | — | — | 0.1 | — | |
| Hydrogen bromide | HBr | 10035-10-6 | — | — | 3 | 10 | |
| Hydrogen chloride | HCl | 7647-01-0 | — | — | 5 | 7 | |
| Hydrogen fluoride (as F) | HF | 7664-39-3 | — | — | 3 | 2.5 | |
| Hydrogen peroxide | H ₂ O ₂ | 7722-84-1 | 1 | 1.5 | 2 | 3 | |
| Hydrogen selenide (as Se) | H ₂ Se | 7783-07-5 | 0.05 | 0.2 | — | — | |
| Hydrogen sulphide | H ₂ S | 7783-06-4 | 10 | 14 | 15 | 21 | |
| Hydroquinone | C ₆ H ₄ (OH) ₂ | 123-31-9 | — | 2 | — | 4 | |
| 4-Hydroxy-4-methyl-pentan-2-one | CH ₃ COCH ₂ C(CH ₃) ₂ OH | 123-42-2 | 50 | 240 | 75 | 360 | |
| 2-Hydroxypropyl acrylate | CH ₂ CHCOOCH ₂ CHOHCH ₃ | 999-61-1 | 0.5 | 3 | — | — | Sk |
| 2,2'-Iminodiethanol | HO(CH ₂) ₂ NH(CH ₂) ₂ OH | 111-42-2 | 3 | 15 | — | — | |
| 2,2'-Iminodi(ethylamine) | (NH ₂ CH ₂ CH ₂) ₂ NH | 111-40-0 | 1 | 4 | — | — | Sk |
| Indene | C ₉ H ₈ | 95-13-6 | 10 | 45 | 15 | 70 | |
| Indium & compounds (as In) | In | 7440-74-6 | — | 0.1 | — | 0.3 | |
| Iodine | I ₂ | 7553-56-2 | — | — | 0.1 | 1 | |
| Iodoform | CHI ₃ | 75-47-8 | 0.6 | 10 | 1 | 20 | |
| Iron oxide, fume (as Fe) | Fe ₂ O ₃ | 1309-37-1 | — | 5 | — | 10 | |
| Iron salts (as Fe) | Fe | — | — | 1 | — | 2 | |
| Isobutyl acetate | CH ₃ COOCH ₂ CH(CH ₃) ₂ | 110-19-0 | 150 | 700 | 187 | 875 | |
| Isooctyl alcohol (mixed isomers) | C ₈ H ₁₇ OH | 26952-21-6 | 50 | 270 | — | — | |
| Isopentyl acetate | CH ₃ COOCH ₂ CH ₂ CH(CH ₃) ₂ | 123-92-2 | 100 | 525 | 125 | 655 | |
| Isopropyl acetate | CH ₃ COOCH(CH ₃) ₂ | 108-21-4 | — | — | 200 | 840 | |
| Isopropyl chloroformate | ClCO ₂ CH(CH ₃) ₂ | 108-23-6 | 1 | 5 | — | — | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Ketene | CH ₂ =CO | 163-51-4 | 0.5 | 0.9 | 1.5 | 3 | |
| Limestone | | 1317-65-3 | | | | | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Liquefied petroleum gas | Mixture: C ₃ H ₆ ; C ₃ H ₈ ; C ₄ H ₆ ; C ₄ H ₁₀ | 68476-85-7 | 1000 | 1800 | 1250 | 2250 | |
| Lithium hydride | LiH | 7580-67-8 | — | 0.025 | — | — | |
| Lithium hydroxide | LiOH | 1310-65-2 | — | — | — | 1 | |
| Magnesite | | 546-93-0 | | | | | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Magnesium oxide (as Mg) | MgO | 1309-48-4 | | | | | |
| fume and respirable dust | | | — | 5 | — | 10 | |
| total inhalable dust | | | — | 10 | — | — | |
| Malathion (ISO) | C ₁₀ H ₁₉ O ₆ PS ₂ | 121-75-5 | — | 10 | — | — | Sk |
| Manganese, fume (as Mn) | Mn | 7439-96-5 | — | 1 | — | 3 | |
| Manganese and compounds (as Mn) | Mn | 7439-96-5 | — | 5 | — | — | |
| Marble | | 1317-65-3 | | | | | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Mequinol (INN) | CH ₃ OC ₆ H ₄ OH | 150-76-5 | — | 5 | — | — | |
| Mercaptoacetic acid | C ₂ H ₄ O ₂ S | 68-11-1 | 1 | 5 | — | — | |
| Mercury alkyls (as Hg) | | | — | 0.01 | — | 0.03 | Sk |
| Mercury & compounds, except mercury alkyls, (as Hg) | Hg | 7439-97-6 | — | 0.05 | — | 0.15 | |
| Methacrylic acid | CH ₂ =C(CH ₃)COOH | 79-41-4 | 20 | 70 | 40 | 140 | |
| Methacrylonitrile | CH ₂ =C(CH ₃)CN | 126-98-7 | 1 | 3 | — | — | Sk |
| Methanethiol | CH ₃ SH | 74-93-1 | 0.5 | 1 | — | — | |
| Methanol | CH ₃ OH | 67-56-1 | 200 | 260 | 250 | 310 | Sk |
| Methomyl (ISO) | C ₅ H ₁₀ N ₂ O ₂ S | 16752-77-5 | — | 2.5 | — | — | Sk |
| Methoxychlor (ISO) | C ₁₆ H ₁₅ Cl ₃ O ₂ | 72-43-5 | — | 10 | — | — | |
| 1-Methoxypropan-2-ol | CH ₃ OCH ₂ CHOHCH ₃ | 107-98-2 | 100 | 360 | 300 | 1080 | Sk |
| Methyl acetate | CH ₃ COOCH ₃ | 79-20-9 | 200 | 610 | 250 | 760 | |
| Methyl acrylate | CH ₂ =CHCOOCH ₃ | 96-33-3 | 10 | 35 | — | — | |
| Methylamine | CH ₃ NH ₂ | 74-89-5 | 10 | 12 | — | — | |
| N-Methylaniline | C ₆ H ₅ NHCH ₃ | 100-61-8 | 0.5 | 2 | — | — | Sk |
| 3-Methylbutan-1-ol | (CH ₃) ₂ CHCH ₂ CH ₂ OH | 123-51-3 | 100 | 360 | 125 | 450 | |
| 1-Methylbutyl acetate | CH ₃ COOCH(CH ₂) ₃ CH ₃ | 626-38-0 | — | — | 150 | 800 | |
| Methyl 2-cyanoacrylate | CH ₂ =C(CN)COOCH ₃ | 137-05-3 | 2 | 8 | 4 | 16 | |
| Methylcyclohexane | C ₇ H ₁₄ | 108-87-2 | 400 | 1600 | 500 | 2000 | |
| Methylcyclohexanol | CH ₃ C ₆ H ₁₀ OH | 25639-42-3 | 50 | 235 | 75 | 350 | |
| 2-Methylcyclohexanone | CH ₃ CHCO(CH ₂) ₃ CH ₂ | 583-60-8 | 50 | 230 | 75 | 345 | Sk |
| 2-Methyl-4,6-dinitrophenol | CH ₃ C ₆ H ₂ (OH)(NO ₂) ₂ | 534-52-1 | — | 0.2 | — | 0.6 | Sk |
| Methyl ethyl ketone peroxides | C ₈ H ₁₆ O ₄ or C ₈ H ₁₈ O ₆ | 1338-23-4 | — | — | 0.2 | 1.5 | |
| Methyl formate | HCOOCH ₃ | 107-31-3 | 100 | 250 | 150 | 375 | |
| 5-Methylheptan-3-one | CH ₃ CH ₂ COCH ₂ CH ₂ CH ₂ CH ₂ CH ₃ | 541-85-5 | 25 | 130 | — | — | |
| 5-Methylhexan-2-one | CH ₃ COCH ₂ CH ₂ CH ₂ CH ₂ CH ₃ | 110-12-3 | 50 | 240 | 75 | 360 | |
| Methyl methacrylate | CH ₂ =C(CH ₃)COOCH ₃ | 80-62-6 | 100 | 410 | 125 | 510 | |
| 2-Methylpentane-2,4-diol | (CH ₃) ₂ COHCH ₂ CHOHCH ₃ | 107-41-5 | 25 | 125 | 25 | 125 | |
| 4-Methylpentan-2-ol | CH ₃ CHOHCH ₂ CH(CH ₃) ₂ | 108-11-2 | 25 | 100 | 40 | 160 | Sk |
| 4-Methylpentan-2-one | (CH ₃) ₂ CHCH ₂ COCH ₃ | 108-10-1 | 50 | 205 | 75 | 300 | Sk |
| 4-Methylpent-3-en-2-one | CH ₃ COCH=C(CH ₃) ₂ | 141-79-7 | 15 | 60 | 25 | 100 | |
| 2-Methylpropan-1-ol | (CH ₃) ₂ CHCH ₂ OH | 78-83-1 | 50 | 150 | 75 | 225 | |
| 2-Methylpropan-2-ol | (CH ₃) ₃ COH | 75-65-0 | 100 | 300 | 150 | 450 | |
| 1-Methyl-2-pyrrolidone | CH ₃ N(CH ₂) ₃ CO | 872-50-4 | 100 | 400 | — | — | |
| Methylstyrenes, all isomers except α-methylstyrene | CH ₃ C ₆ H ₄ CH=CH ₂ | 25013-15-4 | 100 | 480 | 150 | 720 | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|-------------------------------------|--|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| N-Methyl-N, 2,4,6-tetranitroaniline | (NO ₂) ₃ C ₆ H ₂ N(NO ₂)CH ₃ | 479-45-8 | — | 1.5 | — | 3 | Sk |
| Mevinphos (ISO) | C ₇ H ₁₃ O ₆ P | 7786-34-7 | 0.01 | 0.1 | 0.03 | 0.3 | Sk |
| Mica | | 12001-26-2 | | | | | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 1 | — | — | |
| Molybdenum compounds (as Mo), | Mo | | | | | | |
| soluble compounds | | | — | 5 | — | 10 | |
| insoluble compounds | | | — | 10 | — | 20 | |
| Monochloroacetic acid | ClCH ₂ CO ₂ H | 79-11-8 | 0.3 | 1 | — | — | Sk |
| Morpholine | C ₄ H ₉ NO | 110-91-8 | 20 | 70 | 30 | 105 | Sk |
| Naled (ISO) | C ₄ H ₇ Br ₂ Cl ₂ O ₄ P | 300-76-5 | — | 3 | — | 6 | |
| Naphthalene | C ₁₀ H ₈ | 91-20-3 | 10 | 50 | 15 | 75 | |
| Nickel, organic compounds(as Ni) | Ni | 7440-02-0 | — | 1 | — | 3 | |
| Nicotine | C ₁₀ H ₁₄ N ₂ | 54-11-5 | — | 0.5 | — | 1.5 | Sk |
| Nitric acid | HNO ₃ | 7697-37-2 | 2 | 5 | 4 | 10 | |
| 4-Nitroaniline | NO ₂ C ₆ H ₄ NH ₂ | 100-01-6 | — | 6 | — | — | Sk |
| Nitrobenzene | C ₆ H ₅ NO ₂ | 98-95-3 | 1 | 5 | 2 | 10 | Sk |
| Nitroethane | C ₂ H ₅ NO ₂ | 79-24-3 | 100 | 310 | — | — | |
| Nitrogen dioxide | NO ₂ | 10102-44-0 | 3 | 5 | 5 | 9 | |
| Nitrogen monoxide | NO | 10102-43-9 | 25 | 30 | 35 | 45 | |
| Nitrogen trifluoride | NF ₃ | 7783-54-2 | 10 | 30 | 15 | 45 | |
| Nitromethane | CH ₃ NO ₂ | 75-52-5 | 100 | 250 | 150 | 375 | |
| 1-Nitropropane | C ₃ H ₇ NO ₂ | 108-03-2 | 25 | 90 | — | — | |
| Nitrotoluene, all isomers | CH ₃ C ₆ H ₄ NO ₂ | | 5 | 30 | 10 | 60 | Sk |
| Octachloronaphthalene | C ₁₀ Cl ₈ | 2234-13-1 | — | 0.1 | — | 0.3 | Sk |
| n-Octane | CH ₃ (CH ₂) ₆ CH ₃ | 111-65-9 | 300 | 1450 | 375 | 1800 | |
| Oil mist, mineral | see Ref 20 | | — | 5 | — | 10 | |
| Orthophosphoric acid | H ₃ PO ₄ | 7664-38-2 | — | 1 | — | 3 | |
| Osmium tetroxide (as Os) | OsO ₄ | 20816-12-0 | 0.0002 | 0.002 | 0.0006 | 0.006 | |
| Oxalic acid | COOHCOOH | 144-62-7 | — | 1 | — | 2 | |
| Oxalonnitrile | (CN) ₂ | 460-19-5 | 10 | 20 | — | — | |
| 2,2'-Oxydiethanol | (HOCH ₂ CH ₂) ₂ O | 111-46-6 | 23 | 100 | — | — | |
| Ozone | O ₃ | 10028-15-6 | 0.1 | 0.2 | 0.3 | 0.6 | |
| Paraffin wax, fume | | 8002-74-2 | — | 2 | — | 6 | |
| Paraquat dichloride (ISO) | [CH ₃ (C ₅ H ₄ N ⁺) ₂ CH ₃][Cl ⁻] ₂ | 1910-42-5 | — | 0.1 | — | — | |
| respirable dust | | | — | 0.1 | — | — | |
| Parathion (ISO) | (C ₂ H ₅ O) ₂ PSOC ₆ H ₄ NO ₂ | 56-38-2 | — | 0.1 | — | 0.3 | Sk |
| Parathion-methyl (ISO) | C ₈ H ₁₀ NO ₅ PS | 298-00-0 | — | 0.2 | — | 0.6 | Sk |
| Pentacarbonyliron (as Fe) | Fe(CO) ₅ | 13463-40-6 | 0.01 | 0.08 | — | — | |
| Pentachlorophenol | C ₆ Cl ₅ OH | 87-86-5 | — | 0.5 | — | 1.5 | Sk |
| Pentaerythritol | C(CH ₂ OH) ₄ | 115-77-5 | — | 10 | — | 20 | |
| total inhalable dust | | | — | 10 | — | 20 | |
| respirable dust | | | — | 5 | — | — | |
| Pentane, all isomers | C ₅ H ₁₂ | 109-66-0 | 600 | 1800 | 750 | 2250 | |
| Pentan-2-one | CH ₃ COC ₃ H ₇ | 107-87-9 | 200 | 700 | 250 | 875 | |
| Pentan-3-one | C ₂ H ₅ COC ₂ H ₅ | 96-22-0 | 200 | 700 | 250 | 875 | |
| Pentyl acetate | CH ₃ COOC ₅ H ₁₁ | 628-63-7 | 100 | 530 | 150 | 800 | |
| Perchloryl fluoride | ClO ₃ F | 7616-94-6 | 3 | 14 | 6 | 28 | |
| Phenol | C ₆ H ₅ OH | 108-95-2 | 5 | 19 | 10 | 38 | Sk |
| p-Phenylenediamine | C ₆ H ₄ (NH ₂) ₂ | 106-50-3 | — | 0.1 | — | — | Sk |
| Phenyl-2,3-epoxypropyl ether | C ₆ H ₅ OCH ₂ CHCH ₂ O | 122-60-1 | 1 | 6 | — | — | |
| 2-Phenylpropene | C ₆ H ₅ C(CH ₃)=CH ₂ | 98-83-9 | — | — | 100 | 480 | |
| Phorate (ISO) | C ₇ H ₁₇ O ₂ PS ₃ | 298-02-2 | — | 0.05 | — | 0.2 | Sk |
| Phosgene | COCl ₂ | 75-44-5 | 0.1 | 0.4 | — | — | |
| Phosphine | PH ₃ | 7803-51-2 | — | — | 0.3 | 0.4 | |
| Phosphorus, yellow | P ₄ | 7723-14-0 | — | 0.1 | — | 0.3 | |
| Phosphorus pentachloride | PCl ₅ | 10026-13-8 | 0.1 | 1 | — | — | |
| Phosphorus trichloride | PCl ₃ | 7719-12-2 | 0.2 | 1.5 | 0.5 | 3 | |
| Phosphoryl trichloride | POCl ₃ | 10025-87-3 | 0.2 | 1.2 | 0.6 | 3.6 | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|---|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Picloram (ISO) | C ₆ H ₃ Cl ₃ N ₂ O ₂ | 1918-02-1 | — | 10 | — | 20 | |
| Picric acid | HOC ₆ H ₂ (NO ₂) ₃ | 88-89-1 | — | 0.1 | — | 0.3 | Sk |
| Piperazine dihydrochloride | C ₄ H ₁₀ N ₂ ·2HCl | 142-64-3 | — | 5 | — | — | |
| Piperidine | C ₅ H ₁₁ N | 110-89-4 | 1 | 3.5 | — | — | Sk |
| Plaster of Paris | (CaSO ₄) ₂ ·H ₂ O | 26499-65-0 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Platinum metal | Pt | 7440-06-4 | — | 5 | — | — | |
| Platinum salts, soluble (as Pt) | Pt | | — | 0.002 | — | — | Sen |
| Polyvinyl chloride | | 9002-86-2 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Portland Cement | | 65997-15-1 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Potassium hydroxide | KOH | 1310-58-3 | — | — | — | 2 | |
| Propane 1,2 diol | CH ₃ CHOHCH ₂ OH | 57-55-6 | — | — | — | — | |
| total (vapour and particulates) | | | 150 | 470 | — | — | |
| particulates | | | — | 10 | — | — | |
| Propan-1-ol | CH ₃ CH ₂ CH ₂ OH | 71-23-8 | 200 | 500 | 250 | 625 | Sk |
| Propan-2-ol | (CH ₃) ₂ CHOH | 67-63-0 | 400 | 980 | 500 | 1225 | Sk |
| Propionic acid | CH ₃ CH ₂ COOH | 79-09-4 | 10 | 30 | 15 | 45 | |
| Propoxur (ISO) | H ₃ CNHCOOC ₆ H ₄ OCH(CH ₃) ₂ | 114-26-1 | — | 0.5 | — | 2 | |
| <i>n</i> -Propyl acetate | CH ₃ COOC ₃ H ₇ | 109-60-4 | 200 | 840 | 250 | 1050 | |
| Propylene dinitrate | CH ₂ NO ₃ CHNO ₃ CH ₃ | 6423-43-4 | 0.2 | 1.2 | 0.2 | 1.2 | Sk |
| Prop-2-yn-1-ol | HC≡CCH ₂ OH | 107-19-7 | 1 | 2 | 3 | 6 | Sk |
| Pulverised fuel ash | | | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | New |
| respirable dust | | | — | 5 | — | — | New |
| Pyrethrins (ISO) | | 8003-34-7 | — | 5 | — | 10 | |
| Pyridine | C ₅ H ₅ N | 110-86-1 | 5 | 15 | 10 | 30 | |
| 2-Pyridylamine | NH ₂ C ₅ H ₄ N | 502-29-0 | 0.5 | 2 | 2 | 8 | |
| Pyrocatechol | C ₆ H ₄ (OH) ₂ | 120-80-9 | 5 | 20 | — | — | |
| Resorcinol | C ₆ H ₄ (OH) ₂ | 108-46-3 | 10 | 45 | 20 | 90 | |
| Rhodium (as Rh), metal fume and dust | Rh | 7440-16-6 | — | 0.1 | — | 0.3 | |
| soluble salts | | | — | 0.001 | — | 0.003 | |
| Rosin core solder pyrolysis products (as formaldehyde) | | | — | 0.1 | — | 0.3 | Sen |
| Rotenone (ISO) | C ₂₃ H ₂₂ O ₆ | 83-79-4 | — | 5 | — | 10 | |
| Rouge | | 1309-37-1 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Selenium and compounds, except hydrogen selenide (as Se) | Se | 7782-49-2 | — | 0.1 | — | — | |
| Silane | SiH ₄ | 7803-62-5 | 0.5 | 0.7 | 1 | 1.5 | |
| Silica, amorphous | SiO ₂ | | — | — | — | — | |
| total inhalable dust | | | — | 6 | — | — | |
| respirable dust | | | — | 3 | — | — | |
| Silica, fused | SiO ₂ | 60676-86-0 | — | — | — | — | |
| respirable dust | | | — | 0.1 | — | — | |
| Silicon | Si | 7440-21-3 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Silicon carbide | SiC | 409-21-2 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Silver compounds (as Ag) | Ag | | — | 0.01 | — | — | |
| Sodium azide (as NaN ₃) | NaN ₃ | 26628-22-8 | — | — | — | 0.3 | |
| Sodium 2-(2,4-dichlorophenoxy)ethyl sulphate | C ₈ H ₇ Cl ₂ NaO ₅ S | 136-78-7 | — | 10 | — | 20 | |
| Sodium fluoroacetate | CH ₂ FCOONa | 62-74-8 | — | 0.05 | — | 0.15 | Sk |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|---|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Sodium hydrogensulphite | NaHSO ₃ | 7631-90-5 | — | 5 | — | — | |
| Sodium hydroxide | NaOH | 1310-73-2 | — | — | — | 2 | |
| Starch | | 9005-25-8 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Stibine | SbH ₃ | 7803-52-3 | 0.1 | 0.5 | 0.3 | 1.5 | |
| Strychnine | C ₂₁ H ₂₂ N ₂ O ₂ | 57-24-9 | — | 0.15 | — | 0.45 | |
| Subtilisins (Proteolytic enzymes as 100% pure crystalline enzyme) | | | — | 0.00006 | — | 0.00006 | |
| Sucrose | C ₁₂ H ₂₂ O ₁₁ | 57-50-1 | — | 10 | — | 20 | |
| Sulfotep (ISO) | (C ₂ H ₅) ₄ P ₂ S ₂ O ₅ | 3689-24-5 | — | 0.2 | — | — | Sk |
| Sulphur dioxide | SO ₂ | 7446-09-5 | 2 | 5 | 5 | 13 | |
| Sulphur hexafluoride | SF ₆ | 2551-62-4 | 1000 | 6000 | 1250 | 7500 | |
| Sulphuric acid | H ₂ SO ₄ | 7664-93-9 | — | 1 | — | — | |
| Sulphur tetrafluoride | SF ₄ | 7783-60-0 | 0.1 | 0.4 | 0.3 | 1 | |
| Sulphuryl difluoride | SO ₂ F ₂ | 2699-79-8 | 5 | 20 | 10 | 40 | |
| 2,4,5-T (ISO) | C ₈ H ₅ Cl ₃ O ₃ | 93-76-5 | — | 10 | — | 20 | |
| TEPP (ISO) | (C ₂ H ₅) ₄ P ₂ O ₇ | 107-49-3 | 0.004 | 0.05 | 0.01 | 0.2 | Sk |
| Talc | | 14807-96-6 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 1 | — | — | |
| Tantalum | Ta | 7440-25-7 | — | 5 | — | 10 | |
| Tellurium & compounds, except hydrogen telluride, (as Te) | Te | 13494-80-9 | — | 0.1 | — | — | |
| Terphenyls, all isomers | C ₁₈ H ₁₄ | 26140-60-3 | — | — | 0.5 | 5 | |
| 1,1,2,2-Tetrabromoethane | CHBr ₂ CHBr ₂ | 79-27-6 | 0.5 | 7 | — | — | Sk |
| Tetracarbonylnickel (as Ni) | Ni(CO) ₄ | 13463-39-3 | — | — | 0.1 | 0.24 | |
| 1,1,1,2-Tetrachloro-2,2-difluoroethane | CCl ₃ CClF ₂ | 76-11-9 | 100 | 834 | 100 | 834 | |
| 1,1,2,2-Tetrachloro-1,2-difluoroethane | CCl ₂ FCCl ₂ F | 76-12-0 | 100 | 834 | 100 | 834 | |
| Tetrachloroethylene | CCl ₂ =CCl ₂ | 127-18-4 | 50 | 335 | 150 | 1000 | |
| Tetrachloronaphthalenes, all isomers | C ₁₀ H ₄ Cl ₄ | 1335-88-2 | — | 2 | — | 4 | |
| Tetraethyl orthosilicate | Si(OC ₂ H ₅) ₄ | 78-10-4 | 10 | 85 | 30 | 255 | |
| Tetrahydrofuran | (C ₂ H ₄) ₂ O | 109-99-9 | 200 | 590 | 250 | 735 | |
| Tetramethyl orthosilicate | (CH ₃ O) ₄ Si | 681-84-5 | 1 | 6 | 5 | 30 | |
| Tetramethyl succinonitrile | C ₈ H ₁₂ N ₂ | 3333-56-6 | 0.5 | 3 | 2 | 9 | Sk |
| Tetrasodium pyrophosphate | Na ₄ P ₂ O ₇ | 7722-88-5 | — | 5 | — | — | |
| Thallium, soluble compounds (as Tl) | Tl | 7440-28-0 | — | 0.1 | — | — | Sk |
| Thionyl chloride | SOCl ₂ | 7719-09-7 | — | — | 1 | 5 | |
| Thiram (ISO) | (CH ₃) ₂ NCS ₂ CS ₂ N(CH ₃) ₂ | 137-26-8 | — | 5 | — | 10 | |
| Tin compounds, inorganic, except SnH ₄ , (as Sn) | Sn | 7440-31-5 | — | 2 | — | 4 | |
| Tin compounds, organic, except cyhexatin (ISO), (as Sn) | Sn | | — | 0.1 | — | 0.2 | Sk |
| Titanium dioxide | TiO ₂ | 13463-67-7 | — | — | — | — | |
| total inhalable dust | | | — | 10 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Toluene | C ₆ H ₅ CH ₃ | 108-88-3 | 50 | 188 | 150 | 560 | Sk |
| p-Toluenesulphonyl chloride | CH ₃ C ₆ H ₄ SO ₂ Cl | 98-59-9 | — | — | — | 5 | |
| Tributyl phosphate, all isomers | (C ₄ H ₉) ₃ PO ₄ | 126-73-8 | — | 5 | — | 5 | |
| Tricarbonyl(eta-cyclopentadienyl)manganese (as Mn) | (C ₅ H ₅)—Mn(CO) ₃ | 12079-65-1 | — | 0.1 | — | 0.3 | Sk |
| Tricarbonyl(methylcyclopentadienyl)manganese (as Mn) | ((CH ₃)C ₅ H ₄)—Mn(CO) ₃ | 12108-13-3 | — | 0.2 | — | 0.6 | Sk |
| 1,2,4-Trichlorobenzene | C ₆ H ₃ Cl ₃ | 120-82-1 | 5 | 40 | 5 | 40 | |
| 1,1,1-Trichlorobis(chlorophenyl)ethane | C ₁₄ H ₉ Cl ₅ | 50-29-3 | — | 1 | — | 3 | |
| Trichlorofluoromethane | CCl ₃ F | 75-69-4 | 1000 | 5600 | 1250 | 7000 | |
| Trichloronitromethane | CCl ₃ NO ₂ | 76-06-2 | 0.1 | 0.7 | 0.3 | 2 | |
| 1,2,3-Trichloropropane | CH ₂ ClCHClCH ₂ Cl | 96-18-4 | 50 | 300 | 75 | 450 | |
| 1,1,2-Trichlorotrifluoroethane | CCl ₂ FCClF ₂ | 76-13-1 | 1000 | 7600 | 1250 | 9500 | |

Table 2: (cont).

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|---|---|-------------|--|--------------------|--|--------------------|-------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Triethylamine | (C ₂ H ₅) ₃ N | 121-44-8 | 10 | 40 | 15 | 60 | |
| Trimanganese tetraoxide | Mn ₃ O ₄ | 1317-35-7 | — | 1 | — | — | |
| Trimethylamine | (CH ₃) ₃ N | 75-50-3 | 10 | 24 | 15 | 36 | |
| Trimethylbenzenes, all isomers or mixtures | C ₆ H ₃ (CH ₃) ₃ | 25551-13-7 | 25 | 123 | — | — | New |
| 3,5,5-Trimethylcyclohex-2-enone | C ₉ H ₁₄ O | 78-59-1 | — | — | 5 | 25 | |
| Trimethyl phosphite | (CH ₃ O) ₃ P | 121-45-9 | 2 | 10 | — | — | |
| 2,4,6-Trinitrotoluene | CH ₃ C ₆ H ₂ (NO ₂) ₃ | 118-96-7 | — | 0.5 | — | — | Sk |
| Triphenyl phosphate | (C ₆ H ₅) ₃ PO ₄ | 115-86-6 | — | 3 | — | 6 | |
| Tri- <i>o</i> -tolyl phosphate | (CH ₃ C ₆ H ₄ O) ₃ P=O | 78-30-8 | — | 0.1 | — | 0.3 | |
| Tungsten & compounds (as W), soluble | W | 7440-33-7 | — | 1 | — | 3 | |
| insoluble | | | — | 5 | — | 10 | |
| Turpentine | ~C ₁₀ H ₁₆ | 8008-84-2 | 100 | 560 | 150 | 840 | |
| Uranium compounds, natural, soluble, (as U) | U | 7440-61-1 | — | 0.2 | — | 0.6 | |
| Vinyl acetate | CH ₃ COOCH=CH ₂ | 108-05-4 | 10 | 30 | 20 | 60 | |
| Warfarin (ISO) | C ₁₉ H ₁₆ O ₄ | 81-81-2 | — | 0.1 | — | 0.3 | |
| Welding fume | <i>see paragraph 50 and references 14 & 15</i> | | — | 5 | — | — | |
| White spirit | | 8052-41-3 | 100 | 575 | 125 | 720 | |
| Xylene, <i>o</i> -, <i>m</i> -, <i>p</i> - or mixed isomers | C ₆ H ₄ (CH ₃) ₂ | 1330-20-7 | 100 | 435 | 150 | 650 | Sk |
| Xylidine, all isomers | (CH ₃) ₂ C ₆ H ₃ NH ₂ | 1300-73-8 | 2 | 10 | 10 | 50 | Sk |
| Yttrium | Y | 7440-65-5 | — | 1 | — | 3 | |
| Zinc chloride, fume | ZnCl ₂ | 7646-85-7 | — | 1 | — | 2 | |
| Zinc distearate | Zn(C ₁₈ H ₃₅ O ₂) ₂ | 557-05-1 | — | 10 | — | 20 | |
| total inhalable dust | | | — | 5 | — | — | |
| respirable dust | | | — | 5 | — | — | |
| Zinc oxide, fume | ZnO | 1314-13-2 | — | 5 | — | 10 | |
| Zirconium compounds (as Zr) | Zr | 7440-67-7 | — | 5 | — | 10 | |

Table 3: Changes to the list of approved OESs and forthcoming changes to the list of MELs

Table 3A. Proposed changes for 1995

The Health and Safety Commission proposes to make the following changes which will affect the list of approved OESs. Any comments on these proposals should be forwarded to the WATCH Secretariat, Room 501, Health and Safety Executive, Baynards House, 1 Chepstow Place, London W2 4TF by 31 August 1994. Some of these substances do not yet have OESs and, in such cases, exposure should be controlled in accordance with the guidance on regulation 7 of COSHH in the *COSHH General Approved Code of Practice*. **This applies to Tables A and B.**

Proposals for occupational exposure standards to take effect from 1 January 1995.

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|------------------------------------|---|-------------|--|--------------------|--|--------------------|--------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Butan-2-one | C ₄ H ₈ O | 78-93-3 | 200 | 600 | 300 | 900 | Sk Rev |
| Diphosphorus pentoxide | P ₂ O ₅ (P ₄ O ₁₀) | 1314-56-3 | - | - | - | 2 | New |
| *Enflurane | CHF ₂ OCF ₂ CHClF | 13838-16-9 | 50 | 380 | - | - | New |
| *Halothane | CF ₃ CHClBr | 151-67-7 | 10 | 80 | - | - | New |
| Heptan-2-one | C ₇ H ₁₄ O | 110-43-0 | 50 | 240 | 100 | 480 | Sk Rev |
| Heptan-3-one | C ₇ H ₁₄ O | 106-35-4 | 50 | 240 | 100 | 480 | Sk Rev |
| *Isoflurane | CF ₃ CHClOCHF ₂ | 26675-46-7 | 50 | 380 | - | - | New |
| **Kaolin respirable dust | Al ₄ Si ₄ O ₁₀ (OH) ₈ | 1332-58-7 | - | 2.5 | - | - | New |
| 5-Methylhexan-2-one | C ₇ H ₁₄ O | 110-12-3 | 50 | 240 | 100 | 480 | Sk Rev |
| 4-Methylpentan-2-one | C ₆ H ₁₂ O | 108-10-1 | 50 | 205 | 100 | 410 | Sk Rev |
| *Nitrous oxide | N ₂ O | 10024-97-2 | 100 | 180 | - | - | New |
| Orthophosphoric acid | H ₃ PO ₄ | 7664-38-2 | - | - | - | 2 | Rev |
| **Paracetamol total inhalable dust | C ₈ H ₉ NO ₂ | 103-90-2 | - | 10 | - | - | New |
| Phosgene | COCl ₂ | 75-44-5 | 0.02 | 0.08 | 0.06 | 0.25 | Rev |
| Platinum metal | Pt | 7440-06-4 | - | 5 | - | - | Same |
| Tetrahydrofuran | C ₄ H ₈ O | 109-99-9 | 100 | 295 | 200 | 590 | Sk Rev |

* These four OES proposals were consulted on during 1993. The consultation period has been extended until the end of May 1994.

** Criteria documents are available for this OES proposal (order form on centre insert of this publication).

B. Proposed changes to the reference temperature and pressure in setting Occupational Exposure Limits

1 From January 1995 it is proposed to adjust the values used as the reference temperature and pressure in setting occupational exposure limits to bring the UK into line with European practice. It is proposed that the new reference temperature will change from 25C to 20C and that the reference pressure will change from one bar (equivalent to 100 kPa or 750 mm mercury pressure) to 101.3 kPa (equivalent to 760 mm mercury pressure).

2 This proposed change will slightly alter some of the limit values. For example:

- the current OES for acetic acid is 10 ppm. Converting this standard to mg.m⁻³ using a reference temperature of 25C and a reference pressure of 750 mm mercury gives us 24.2 mg.m⁻³. Using a reference temperature of 20C and a reference pressure of 760 mm mercury gives us 24.9 mg.m⁻³. Rounding off the figures we get an OES of 24 mg.m⁻³ using our current standards and an OES of 25 mg.m⁻³ using the European standards.
- the current OES for nitrobenzene is 1 ppm: using our current reference temperature and pressure, the conversion to mg.m⁻³ gives us 5.0 mg.m⁻³; using the European standards, the conversion gives us 5.1 mg.m⁻³. Rounded down these figures both give an OES of 5mg.m⁻³.

3 Also from January 1995 it is proposed to modify the appropriate values in Table 1 and Table 2. By definition this will make no difference to limits expressed in ppm. For limits expressed in ppm and mg.m⁻³, the mg.m⁻³ value will be increased numerically by 3.1%. It is proposed to make no change to limits expressed only in mg.m⁻³.

4 From the same date it is proposed to modify paragraph 18 of EH40, *Units of measurement*. The proposed text is as follows:

"18 In occupational exposure limits, concentrations of gases and vapours in air are usually expressed in parts per million (ppm), a measure of concentration by volume, as well as in milligrams per cubic metre of air (mg.m⁻³), a measure of concentration by mass. Where limits are expressed in both ppm and mg.m⁻³, the figure in ppm is the primary value. The value in mg.m⁻³ is obtained by conversion assuming reference conditions of 20C and 101.3 kPa and rounding to the nearest significant figure. Concentrations of airborne particles (fume, dust, etc) are usually expressed in mg.m⁻³. In the case of dusts the limits in the tables refer to the 'total inhalable' fraction unless specifically indicated as referring to the 'respirable' fraction (see paragraph 39). Exceptionally the limits for man-made mineral fibre can be expressed as either mg.m⁻³ or as fibres per millilitre of air (fibres.ml⁻¹) (see Appendix 8 for Asbestos)."

Table 3C. New and revised maximum exposure limits

COSHH 1994 will come into force in the summer of 1994, after publication of EH40/94. Table 3C therefore gives notice of the new and revised maximum exposure limits which will be included in Schedule 1 of COSHH 1994 and will take effect with the coming into force of COSHH 1994.

| Substance | Formula | CAS Numbers | Long-term exposure limit (8-hour TWA reference period) | | Short-term exposure limit (15-minute reference period) | | Notes |
|--|---|-------------|--|--------------------|--|--------------------|----------|
| | | | ppm | mg m ⁻³ | ppm | mg m ⁻³ | |
| Beryllium and beryllium compounds (as Be) | Be | | - | 0.002 | - | - | New |
| Cadmium and cadmium compounds, except cadmium oxide fume, cadmium sulphide and cadmium sulphide pigments (as Cd) | Cd | | - | 0.025 | - | - | Revised |
| Cadmium oxide fume (as Cd) | CdO | 1306-19-0 | - | 0.025 | - | 0.05 | Revised |
| Cadmium sulphide and cadmium sulphide pigments respirable dust (as Cd) | CdS | 1306-23-6 | - | 0.04 | - | - | Revised |
| 1-Chloro-2,3-epoxypropane | C ₂ H ₅ OCl | 106-89-8 | 0.5 | 2 | 1.5 | 6 | New |
| Cobalt and cobalt compounds (as Co) | Co | | - | 0.1 | - | - | New |
| 1,2-Dichloroethane | ClCH ₂ CH ₂ Cl | 107-06-2 | 5 | 20 | - | - | Sk New |
| Dichloromethane | CH ₂ Cl ₂ | 75-09-2 | 100 | 350 | 300 | 1050 | New STEL |
| 4,4'-Methylenedianiline | C ₁₃ H ₁₄ N ₂ | 101-77-9 | 0.01 | 0.08 | - | - | Sk New |
| 2-Nitropropane | CH ₃ CH(NO ₂)CH ₃ | 79-46-9 | 5 | 18 | - | - | New |
| Rubber process dust | | | - | 6 | - | - | Revised |

Table 4: Substances to be reviewed (paragraph 28)

Table 4 previously contained a list of those substances which were not included in the list of MELs and OESs when the COSHH Regulations came into force as it was considered that they should be reviewed by ACTS and WATCH. The reviews of most of these substances have now been completed, allowing the reprioritisation of substances for review. Printed below is the current list of substances on the WATCH review programme.

Any comments or information on these substances should be forwarded to the WATCH Secretariat, Room 501, Health and Safety Executive, Baynards House, 1 Chepstow Place, London W2 4TF.

Exposure to substances which have not been assigned MELs or OESs should be controlled in accordance with the guidance on regulation 7 of COSHH General Approved Code of Practice.

Substances to be reviewed by ACTS/WATCH until December 1994

| | |
|-----------------------------|---------------------------------|
| Antimony metals & compounds | Methyl methacrylate |
| Diethyl ether | Phenyl hydrazine |
| Iodomethane | Propranolol |
| Phenol | Wool |
| Dimethylether | Pentyl acetate |
| Hydrocarbon Solvents | Lindane (γ - BHC (ISO)) |
| Aramid fibres | Coal tar pitch volatiles |
| Pentanes | Mercury & compounds |
| HFC 134.A | Phosgene |
| Talc (cosmetic grade) | Maleic anhydride |
| Phosphine | Trimellitic anhydride |
| Buta-1,3-diene | Dimethyl formamide |
| Styrene | Ethyl cyanoacrylate |
| Trichloroethylene | Methyl cyanoacrylate |
| Acrylamide | Ozone |
| Glycol ethers | Flour dust |
| Lead & compounds | Colophony |
| Silica, crystalline | Silver, metallic |
| Hydrazine | Azodicarbonamide |
| Chlorinated biphenyls | Oil mists - mineral oils |
| Platinum salts, soluble | - water oils |
| 1,2-Epoxypropane | Tetrachloroethylene |
| Dialkyl sulphates | Wood dust (softwood) |
| Ferrous foundry particulate | Acetaldehyde |
| Cotton dust | o-Toluidine |
| 1,1,1-Trichloroethane | |

APPENDIX 1: CALCULATION OF EXPOSURE WITH REGARD TO THE SPECIFIED REFERENCE PERIODS

This Appendix reproduces the approved method for the calculation of exposure in relation to the 8-hour, short-term and one-year reference periods. The short-term reference period for maximum exposure limits will be 10 minutes until the COSHH Regulations 1994 come into force.

Notice of approval

The Health and Safety Commission has on 12 April 1994 approved the methods of calculation set out in the Schedule to this notice for the purpose of determining exposure in relation to the reference periods for maximum exposure limits and occupational exposure standards as specified in regulation 2(1) of the Control of Substances Hazardous to Health Regulations.

Signed:

T A GATES

Secretary to the Health and Safety Commission.
12 April 1994

Schedule

Part 1 The 8-hour reference period

- 1 The term '8-hour reference period' relates to the procedure whereby the occupational exposures in any 24-hour period are treated as equivalent to a single uniform exposure for 8 hours (the 8-hour time-weighted average (TWA) exposure).
- 2 The 8-hour TWA may be represented mathematically by:

$$\frac{C_1T_1 + C_2T_2 + \dots + C_nT_n}{8}$$

where C_1 is the occupational exposure and T_1 is the associated exposure time in hours in any 24-hour period.

Example 1

- 3 The operator works for 7 h 20 min on a process in which he is exposed to a substance hazardous to health. The average exposure during that period is measured as 0.12 mg m^{-3} .

The 8-hour TWA therefore is –

7 h 20 min (7.33 h) at 0.12 mg m^{-3}
40 min (0.67 h) at 0 mg m^{-3}

That is

$$\frac{(0.12 \times 7.33) + (0 \times 0.67)}{8} = 0.11 \text{ mg m}^{-3}$$

Example 2

- 4 The operator works for eight hours on a process in which he is exposed to a substance hazardous to health. The average exposure during that period is measured as 0.15 mg m^{-3} .

The 8-hour TWA therefore is –

$$\frac{0.15 \times 8}{8} = 0.15 \text{ mg m}^{-3}$$

Example 3

- 5 Working periods may be split into several sessions for the purpose of sampling to take account of rest and meal breaks, etc.

This is illustrated by the following example:

| Working period | Exposure (mg m^{-3}) | Duration of sampling (h) |
|----------------|---------------------------------|--------------------------|
| 0800-1030 | 0.32 | 2.5 |
| 1045-1245 | 0.07 | 2 |
| 1330-1530 | 0.20 | 2 |
| 1545-1715 | 0.10 | 1.5 |

Exposure is assumed to be zero during the periods 1030 to 1045, 1245 to 1330 and 1530 to 1545.

The 8-hour TWA therefore is –

$$\frac{(0.32 \times 2.5) + (0.07 \times 2) + (0.20 \times 2) + (0.10 \times 1.5) + (0 \times 1.25)}{8}$$

$$= \frac{0.80 + 0.14 + 0.40 + 0.15 + 0}{8}$$

$$= 0.19 \text{ mg m}^{-3}$$

Example 4

6 An operator works for eight hours during the night shift on a process in which he is intermittently exposed to a substance hazardous to health. The operator's work pattern during the working period should be known and the best available data relating to each period of exposure should be applied in calculating the 8-hour TWA. These should be based on direct measurement, estimates based on data already available or reasonable assumptions.

| Working period | Task | Exposure (mg m^{-3}) |
|----------------|---|--|
| 2200 to 2400 | Helping in workshop | 0.10 (known to be exposure of full-time group in workshop) |
| 2400 to 0100 | Cleaning elsewhere in factory | 0 (assumed) |
| 0100 to 0400 | Working in canteen | 0 (assumed) |
| 0400 to 0600 | Cleaning-up after breakdown in workshop | 0.21 (measured) |

The 8-hour TWA =

$$\frac{(0.10 \times 2) + (0.21 \times 2) + (0 \times 4)}{8}$$

$$= 0.078 \text{ mg m}^{-3}$$

Part 2 The short-term reference period

7 Exposure should be recorded as the average over the specified short-term reference period, normally 15 minutes, and should be determined by sampling over that period. For short-term emissions of less than the reference period appropriate action should be taken to ensure that exposure does not exceed three times the short-term limit unless a suitable and sufficient assessment has indicated that such exposures do not present a risk to health.

Examples of how the short-term reference period of 15 minutes is applied.

(a) *Exposure period is less than 15 minutes.*

The sampling result should be averaged over 15 minutes. For example, if a 5-minute sample produces a level of 600 ppm and is immediately followed by a period of zero exposure, the 15-minute average exposure will be 200 ppm.

(b) *Exposure period is longer than 15 minutes*

Measurements should be taken over a 15-minute period and the result is the 15-minute average exposure. Measurements for periods of greater than 15 minutes should not be used to calculate a 15-minute average exposure, but if the average exposure over a longer period exceeds the 15-minute exposure limit, then this limit must have been exceeded over some 15-minute period.

For substance assigned both an 8-hour TWA and a short-term reference period, the total duration of peak exposures above the 8-hour TWA value should be limited to one hour in a 24-hour period, but without prejudice to the generality of the 8-hour TWA.

Part 3 The one-year reference period for vinyl chloride

8 Exposure should be recorded as the time-weighted average of vinyl chloride in the atmosphere of a working area over a period of one year. At enclosed vinyl chloride polymerisation plants continuous or permanent sequential sampling methods must be used. Where discontinuous measurements are made, the frequency of measurements and the number per year should be such that it is possible to state with a statistical confidence coefficient of at least 95% that the true mean annual concentration did not exceed the annual maximum exposure limit. Only periods of plant operation including, where necessary, maintenance time should be taken into account.

APPENDIX 2: METHODS OF MEASUREMENT AND CALCULATION FOR DETERMINING THE FIBRE CONCENTRATIONS OF MAN-MADE MINERAL FIBRE

Notice of approval

This Appendix reproduces the Notice of Approval which is based upon the method detailed in *Man-Made Mineral Fibre* MDHS 59.

The Health and Safety Commission has on 25th October 1990 approved the methods of measurement and calculation set out in the Schedule to this notice for the purpose of determining the fibre concentration of man-made mineral fibre (MMMF) in air for comparison with the maximum exposure limit specified in Schedule 1 of the Control of Substances Hazardous to Health Regulations 1988.

Signed:

J L GRUBB

Secretary to the Health and Safety Commission
25 October 1990

Schedule

1 The method shall measure the exposure of employees by sampling in the breathing zone of the employee exposed.

2 'Fibre' means a particle with a length $> 5 \mu\text{m}$, average diameter $< 3 \mu\text{m}$, and a ratio of length to diameter > 3 to 1, which can be seen using the system specified in paragraph 3.

3 Fibres shall be counted with a phase contrast microscope of such a quality and maintained in such condition at all times during use that Block 5 on the HSE/NPL Test Slide Mark II would be visible when used in accordance with the manufacturer's instructions. The microscope shall be tested with the Slide frequently enough to establish this. The microscope magnification shall be between 400x and 600x. During counting, the difference in refractive index between the fibres and the medium in which they are immersed shall be between 0.05 and 0.30. The microscopist shall be properly trained in relevant techniques.

4 The results shall be regularly tested by quality assurance procedures to ensure that the results are in satisfactory agreement with the average of results obtained by British laboratories participating in a national quality assurance scheme using the method specified in paragraphs 1 to 3, above.

APPENDIX 3: COTTON DUST

1 The occupational exposure standard for cotton dust is 0.5 mg m^{-3} total dust less fly, 8-hour TWA. This figure is not a personal exposure standard but a background air standard determined by using static samplers in accordance with the procedure

specified in *Cotton dust sampling*²¹. This OES applies to dust from the processing and handling of raw and waste cotton, including blends containing raw or waste cotton with the following exceptions:

- (a) dust from weaving, knitting, braiding and subsequent processes; and
- (b) dust from bleached or dyed cotton.

2 Assessors under the COSHH Regulations must satisfy themselves that the assessment takes account of people who work intensively with the material eg at bale opening, waste handling, maintenance of dust extraction equipment and cleaning procedures, and who are therefore likely to be exposed to more dust.

3 ACTS has not set a personal exposure standard for cotton dust less fly but is expected to consider doing so in 1993.

4 Where the OES does not apply, exposure should be kept below both 10 mg m⁻³ 8-hour TWA total inhalable dust and 5 mg m⁻³ 8-hour TWA respirable dust, determined by a personal sampling method (see paragraph 39).

APPENDIX 4: ASPHYXIANTS

1 Some gases and vapours, when present at high concentrations in air, act as simple asphyxiants by reducing the oxygen content by dilution to such an extent that life cannot be supported. Many asphyxiants are odourless and colourless and not readily detectable. Monitoring the oxygen content of the air is often the best means of ensuring safety. The oxygen content of air in the workplace should never be allowed to fall below a minimum of 18% by volume under normal atmospheric pressure subject to specific statutory requirements, see in particular paragraph 36 with regard to coal mines. Particular care is necessary when dense asphyxiants, eg argon, are used since localised very high concentrations can arise due to their collecting in pits, confined spaces and other low lying areas where ventilation is likely to be poor.

2 Many asphyxiants present a fire or explosion risk. The concentrations at which these risks can arise are liable to be well below those at which asphyxiation is likely to occur and should be taken into account when assessing the hazards.

3 Asphyxiants are listed in the Index to lists of occupational exposure limits and other substance references. They are not substances hazardous to health for the purpose of the COSHH Regulations.

APPENDIX 5: LEAD

The lead-in-air standard

1 The lead-in-air standards for lead are as set out in Appendix 1 of the HSC *Approved Code of Practice*⁵ supporting the Control of Lead at Work Regulations 1980, ie:

2 The standard for lead-in-air is an 8-hour time-weighted average concentration:
Lead and lead compounds except for tetraethyl lead (as Pb) 0.15 mg m⁻³ of air
Tetraethyl lead (as Pb) 0.10 mg m⁻³ of air
When determining lead-in-air concentrations for comparison with the standard, appropriate methods as published by HSE, or other methods which have standards of accuracy equivalent to or better than those methods, should be used.

3 As the extent of lead absorption is related not only to the amount of lead present but also to factors such as composition, solubility, particle size and period of exposure, some departure from the lead-in-air standard may be allowed for the purposes of Regulations 6 (Control measures for material, plant and processes) and 7 (Respiratory protective equipment) provided that:

- (a) there is sufficient information available from biological test results to indicate that the degree of lead absorption is at an acceptable level;
- (b) 8-hour time-weighted average concentrations do not exceed 3 times the standard set out in paragraph 2 above; and
- (c) 40-hour time-weighted average concentrations do not exceed 0.15 mg m⁻³ of lead-in-air.

To be valid for this purpose, the biological tests should have been carried out on people who do not wear respiratory protective equipment at work, are regularly employed in the workplace and work a standard week in that workplace. Evaluation of lead-in-air results and biological test results in relation to working conditions should be made by an occupational hygienist or other competent person.

4 As far as exposure by inhalation is concerned, control is considered adequate when the exposure does not exceed the lead-in-air standard. It should be remembered that other routes of exposure may be important.

APPENDIX 6: RUBBER FUME AND RUBBER PROCESS DUST

1 Rubber fume is fume evolved in the mixing, milling and blending of natural rubber or synthetic elastomers, or of natural rubber and synthetic polymers combined with chemicals, and in the processes which convert the resultant blends into finished products or parts thereof, and including any inspection procedures where fume continues to be evolved.

2 The limit relates to Cyclohexane soluble material determined by the method described in *Rubber fume in air, measured as 'total particulates' and 'cyclohexane soluble material'*²².

3 Rubber process dust is dust arising in the stages of rubber manufacture where ingredients are handled, weighed, added to or mixed with uncured natural or synthetic elastomers. It does not include dusts arising from the abrasion of cured rubber.

4 Where the airborne material contains a mixture of substances, one or more of which is assigned a MEL or an OES, those limit(s) will apply to the individual substances and at the same time the rubber process dust limit will apply to the mixed dust as a whole. Where the airborne material is effectively a single substance with a MEL or an OES, that limit alone will apply.

5 Methods for personal sampling and measurement of total inhalable dusts are available in *General methods for the gravimetric determination of respirable and total inhalable dust*¹⁰ and *Rubber fume in air measured as total particulates and cyclohexane soluble material*²². As with the fume the dust is determined gravimetrically but, unlike the fume, the dust determination does not involve solvent extraction.

Note: Dust produced by the abrasion of cured rubber should be dealt with as described in para 34. Personal exposure should be kept below both 10 mg m⁻³ 8-hour TWA total inhalable dust and 5 mg m⁻³ 8-hour TWA respirable dust.

APPENDIX 7: THE DEFINITION OF GRAIN DUST

1 The MEL for grain dust came into effect on 1st January 1992.

2 'Grain dust' is taken to be dust arising from the harvesting, drying, handling, storage or processing of barley, wheat, oats, maize and rye, including contaminants.

3 HSE has issued Guidance Note EH66, *Grain dust*²³ which further advises on the scope and application of the limit.

APPENDIX 8: ASBESTOS

1 The Control of Asbestos at Work Regulations 1987⁴, as amended by the Control of Asbestos at Work (Amendment) Regulations 1992, set control limits for asbestos based on both four hour and ten minute TWAs. They also set action levels based on cumulative exposure which determine whether or not certain regulations apply in any given case. HSC has approved a method of measurement which must be used when dust levels are being checked against any of these limits.

2 Information about the exposure limits and measurement methods for asbestos is given in HSE's Guidance Note EH10 (Rev) *Asbestos – exposure limits and measurement of airborne dust concentrations*⁷ which also contains guidance on the use of airborne fibre measurement in checking the effectiveness of enclosures or other control measures, or for site clearance when work is finished. More technical detail about measurement is given in HSE's publication MDHS 39/3 *Asbestos fibres in air: light microscope methods for use with the Control of Asbestos at Work Regulations*²⁴.

3 The full set of requirements for asbestos is complex and cannot be reproduced here. However, details of the action levels and control limits are set out below.

Control limits and action levels

4 The control limits to be used depend upon the type of asbestos which is present. The limits are more stringent when amphibole asbestos (eg amosite or crocidolite) are present either alone or as mixtures of amphiboles or amphiboles with chrysotile. For each of the two categories (with and without amphibole asbestos) there are two limits: one is a limit on the average dust level over any continuous 4 hour period, and the other is a limit on the average dust level over any continuous 10 minute period. Each is a control limit in its own right. If either is exceeded then RPE is required under Regulation 8 of the Control of Asbestos at Work Regulations.

5 The *control limits* as defined in the Regulations are

(a) for chrysotile

- (i) 0.5 fibres per millilitre of air averaged over any continuous period of 4 hours;
- (ii) 1.5 fibres per millilitre of air averaged over any continuous period of 10 minutes;

(b) for any other form of asbestos either alone or in mixtures including mixtures of chrysotile with any other form of asbestos

- (i) 0.2 fibres per millilitre of air averaged over any continuous period of 4 hours;
- (ii) 0.6 fibres per millilitre of air averaged over any continuous period of 10 minutes.

Employers may choose to assume that the asbestos is not chrysotile alone and apply the more stringent limits; they do not then need to identify the type of asbestos.

6 The action levels apply to exposure in the longer term. They are specified as cumulative exposures within any continuous 12 week period. Cumulative exposure is calculated by multiplying each airborne fibre level by the time for which it lasts and adding up all these products over the 12 week period in question. If the exposure of any employee exceeds an action level then the regulations on notification, designated areas and medical surveillance apply (regulations 6, 14 and 16 respectively).

7 The *action levels* are:

(a) where the exposure is solely to chrysotile, 96 fibre-hours per millilitre of air; or

- (b) where the exposure is to any other form of asbestos either alone or in mixtures including mixtures of chrysotile with any other form of asbestos, 48 fibre-hours per millilitre of air; or
- (c) where both types of exposure occur separately during the 12-week period concerned, a proportionate number of fibre-hours per millilitre of air.

The composite limit at (c) above applies only when the two types of exposure occur at different times within the 12-week period; if both types of asbestos are present simultaneously the mixture must be treated as if it were not chrysotile alone.

APPENDIX 9: SUBSTANCES DEFINED AS CARCINOGENS FOR THE PURPOSES OF THE COSHH REGULATIONS 1994

Regulation 2(1) of the COSHH Regulations defines a carcinogen as:

- (a) any substance or preparation which if classified in accordance with regulation 5 of the Chemicals (Hazard Information and Packaging) Regulations 1993 (SI 1993/1746) would be in the categories of danger carcinogenic, category 1 or carcinogenic, category 2 whether or not the substance or preparation would be required to be classified under those Regulations²⁵; or
- (b) any substance or preparation listed in Schedule 10 and any substance or preparation arising from a process specified in that Schedule which is a substance hazardous to health.

[This definition also covers substances and preparations which would require labelling with the risk phrases "R45" or "R49" if they were not exceptions to all or part of the Chemicals (Hazard Information and Packaging) Regulations 1993. Examples of these exceptions are medicines, unpackaged substances and substances being moved around within a factory.]

Listed below are all the substances, preparations and processes defined as carcinogens for the purpose of the COSHH Regulations 1994 and to which the special provisions for carcinogens in the COSHH Regulations apply.

SUBSTANCES WITH THE RISK PHRASE "R45" (may cause cancer)

Note: This list contains the current list of substances with the Risk Phrase "R45" (from the 15th adaptation of the approved list for supply). The Chemicals (Hazard Information and Packaging) Regulations (CHIP) are likely to be amended in March 1995, which will mean that this list will then be out of date. Reference should be made to CHIP documentation and to the March 1995 issue of *Toxic substances bulletin* for the amended list of substances.

Acrylamide
 Acrylonitrile
 4-Aminoazobenzene
 4-Aminobiphenyl
 Salts of 4-aminobiphenyl
 Arsenic acid and its salts
 Arsenic pentoxide
 Arsenic trioxide
 Asbestos
 Benzene
 Benzidine
 Salts of benzidine
 Benzo-(a)-anthracene

Benzo-(a)-pyrene
 Benzo-(b)-fluoranthene
 Benzo-(j)-fluoranthene
 Benzo-(k)-fluoranthene
 Bis(chloromethyl)ether
 1,3-Butadiene
 Cadmium chloride
 Calcium chromate
 Captafol (ISO)
 Carbadox (INN)
 2-Chloroallyl diethyldithiocarbamate (Sulfallate ISO)
 Chlorodimethyl ether
 1-Chloro-2,3-epoxypropane (Epichlorohydrin)
 Chromium III chromate (Chromic chromate)
 o-Dianisidine
 Salts of o-dianisidine
 Diazomethane
 Dibenz(a,h)anthracene
 1,2-Dibromo-3-chloropropane
 1,2-Dibromoethane (Ethylene dibromide)
 3,3'-Dichlorobenzidine
 Salts of 3,3'-dichlorobenzidine
 1,2-Dichloroethane (Ethylene dichloride)
 2,2'-Dichloro-4,4'-methylenedianiline (MbOCA)
 Salts of 2,2-Dichloro-4,4'-methylenedianiline
 1,3-Dichloro-2-propanol
 Diethyl sulphate
 3,3'-Dimethylbenzidine
 Salts of 3,3'-dimethylbenzidine
 Dimethylcarbamoyl chloride
 1,2-Dimethylhydrazin
 NN-Dimethylhydrazine
 Dimethylnitrosamine
 Dimethylsulfamoyl chloride
 Dimethyl sulphate
 {Disodium5-[(4'-((2,6-hydroxy-3-((2-hydroxy-5-sulphophenyl)azo)phenyl)azo)
 (1,1'-biphenyl)-4-yl)azo]salicylato(4-)}cuprate(2-)
 Distillate aromatic extracts
 1,2-Epoxypropane (Propylene oxide)
 Erionite
 Ethyleneimine
 Ethylene oxide
 Hexachlorobenzene
 Hexamethylphosphoric triamide
 Hydrazine
 Salts of hydrazine
 2-Methylaziridine
 4,4'-Methylenedi-o-toluidine
 1-Methyl-3-nitro-1-nitrosoguanidine
 Methyl-ONN-azoxymethyl acetate (Methyl azoxy methyl acetate)
 2-Naphthylamine
 Salts of 2-naphthylamine
 5-Nitroacenaphthene
 4-Nitrobiphenyl
 Nitrofen (ISO)
 2-Nitronaphthalene
 2-Nitropropane
 N-Nitrosodimethylamine
 2,2'-(Nitrosoimino)bisethanol
 Potassium bromate
 1,3-Propanesultone
 3-Propanolide (Propiolactone)
 Strontium chromate
 Styrene oxide

o-Toluidine
Salts of o-toluidine
4-o-Tolylazo-o-toluidine
Urethane (INN)
Vinyl chloride (Chloroethylene)
Zinc chromates (including zinc potassium chromate)

SUBSTANCES WITH THE RISK PHRASE "R49" (may cause cancer by inhalation)

Beryllium
Beryllium compounds with the exception of aluminium beryllium silicates
Cadmium oxide
Cadmium sulphate
Dinickel trioxide
Nickel dioxide
Nickel monoxide
Nickel subsulphide
Nickel sulphide

OTHER SUBSTANCES AND PROCESSES TO WHICH THE DEFINITION OF "CARCINOGENIC" RELATES SCHEDULE 10 OF COSHH

Aflatoxins
Bichromate manufacture involving the roasting of chromite ore
Electrolytic chromium processes, excluding passivation, which involve hexavalent chromium compounds
Mustard gas (B,B'-Dichlorodiethyl sulphide)
Calcining, sintering or smelting of nickel copper matte or acid leaching or electrorefining of roasted matte
Coal soots, coal tar, pitch and coal tar fumes

The following mineral oils:

- (i) unrefined and mildly refined vacuum distillates;
- (ii) catalytically cracked petroleum oils with final boiling points above 320C;
- (iii) used engine oils

Auramine manufacture
Leather dust in boot and shoe manufacture, arising during preparation and finishing
Hardwood dusts
Isopropyl alcohol manufacture (strong acid process)
Rubber manufacturing and processing giving rise to rubber process dust and rubber fume
Magenta manufacture

**Health and Safety
Executive and
HMSO
Publications**

REFERENCES

- 1 *Health surveillance under COSHH: Guidance for employers* HSE 1990
ISBN 0 7176 0491 8
- 2 *Surveillance of people exposed to health risks at work* HS(G)61 HSE 1990
ISBN 011 885574 3*
- 3 *Monitoring strategies for toxic substances* Guidance Note EH 42 (rev) HSE 1989
ISBN 011 885412 7

- 4 The Control of Asbestos at Work Regulations 1987 as amended by *The Control of Asbestos at Work (Amendment) Regulations 1992*.
- 5 *Control of lead at work* Approved Code of Practice COP 2 1985
ISBN 0 11 883780 X*
- 6 *The Control of Lead at Work Regulations 1980*. SI 1980 No 1248 HMSO
ISBN 0 11 007248 0
- 7 *Asbestos – exposure limits and measurement of airborne dust concentrations*
Guidance Note EH 10 (rev) HSE 1990 ISBN 0 11 885552 2
- 8 *Control of lead: air sampling techniques and strategies* Guidance Note EH 28
(rev) HSE 1986 ISBN 0 11 883555 6
- 9 *Dust: general principles of protection* Guidance Note EH 44 (rev) HSE 1991
ISBN 0 7176 0507 8
- 10 *General methods for the gravimetric determination of respirable and total
inhalable dust* MDHS 14 (rev) HSE 1989 ISBN 0 7176 0509 4
- 11 *Health surveillance of occupational skin disease* Guidance Note MS 24 HSE
ISBN 0 11 885583 2
- 12 *Medical aspects of occupational asthma* Guidance Note MS 25 HSE 1991
ISBN 0 11 885584 0
- 13 *Respiratory sensitisers* HSE leaflet IND(G)95(L) 1990
- 14 *Assessment of exposure to fume from welding and allied processes* Guidance
Note EH 54 HSE 1990 ISBN 0 11 885429 1
- 15 *Control of exposure to fume from welding, brazing and similar processes*
Guidance Note EH55 HSE 1990 ISBN 0 11 885439 9
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