# COSHH essentials:

## Controlling exposure to chemicals – a simple control banding approach


### What's new?

1 This guide has been updated to reflect changes under the classification, labelling and packaging (CLP) regulation.[1]

### Who is this guide for?

2 It is aimed at occupational hygienists and others who want to use the COSHH essentials control banding approach to identify suitable options for mitigating risks from substances hazardous to health.

3 Paragraphs 34–61 are aimed at more specialist users, with a summary of the rules, conversion factors and default values used in COSHH essentials.

### What is the purpose of this guide?

4 This guidance describes how the COSHH essentials control banding was derived from a generic risk assessment scheme. A table in Appendix 1 lists the control guidance sheets that fall within each control approach (CA). These 'generic' sheets contain basic descriptions of control equipment and good practice for a range of activities and also for some common operations (eg mixing, filling, weighing).

5 Please note that the generic risk assessment applies to liquids and solids only; it does not apply to gases or to liquids used above their boiling point.

6 This guide also explains the parameters, defaults and assumptions used in the COSHH essentials e-tool[2] and its application to some common situations.

7 It does not cover the validation or development of COSHH essentials – this can be found in other sources.[3, 4, 5]

### The generic risk assessment scheme

8 The generic risk assessment scheme was developed by a subgroup of HSE's former Advisory Committee on Toxic Substances (ACTS). The scheme provides a practical route for selecting an appropriate generic control approach. It primarily involves:

- the allocation of substances to particular hazard groups, based on their toxicological classification and labelling under CLP;
- the anticipated exposures, based on:
  – the physical properties of the substances;

– the amounts used;
– potential control options chosen.

9 The generic risk assessment takes account of the chemical or product's health hazard classification and the exposure potential as illustrated in Figure 1.

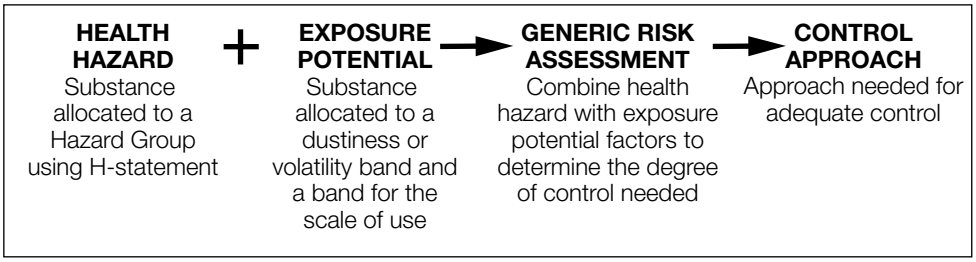



**Figure 1** Factors used in risk assessment to identify appropriate control approach

- The health hazard is represented by the Hazard (H) statements assigned to substances during classification by suppliers under CLP.
- The exposure potential is represented by physical properties of the substances (dustiness for solids, volatility for liquids) and the amount used in an operation or process.
- The generic risk assessment scheme (which is not intended for use as an exposure model) categorises substances into hazard groups and anticipated exposure ranges associated with the proposed use, for a range of different situations, to identify suitable control approaches.

10 The generic risk assessment scheme is divided into four steps:

**Step 1** Group hazards that have 'adequate control' at similar airborne concentrations, ie:

- identify the hazardous properties of the substances from labelling and safety data sheet information or other sources;
- place into a particular hazard group or band (seeTable 1).

**Step 2** Group the 'physical properties' with 'amounts used' to assign to exposure predictor bands with similar potentials for exposure.

**Step 3** Assess the anticipated exposure by applying each CA to each exposure predictor band, based on expert judgement (each CA gives an expected reduction in exposure).

**Step 4** Compare the predicted or anticipated exposure concentrations in air with the 'acceptable' airborne concentrations outlined in Table 1, to help select a suitable control approach.

**Table 1** Allocation of H-statements to hazard groups and the associated airborne concentration ranges deemed to represent adequate control.

| Hazard group | Type | Acceptable concentration range | Units | H-statements |
|---|---|---|---|---|
| A | Dust | >1 to 10 | mg/m$^3$ | H304, H315, H319, H336, EU66 |
| | Vapour | >50 to 500 | ppm | |
| B | Dust | >0.1 to 1 | mg/m$^3$ | H302, H312, H332, H371 |
| | Vapour | >5 to 50 | ppm | |

| | | | | |
|---|---|---|---|---|
| C | Dust | >0.01 to 0.1 | mg/m$^3$ | H301, H311, H314, H317, H318, H331, H335, H370, H373, EU71 |
| | Vapour | >0.5 to 5 | ppm | |
| D | Dust | <0.01 | mg/m$^3$ | H300, H310, H330, H351, H360, H361, H362, H372 |
| | Vapour | <0.5 | ppm | |
| E | Dust | - | mg/m$^3$ | H334, H340, H341, H350, EU70 |
| | Vapour | - | ppm | |

## The generic risk assessment scheme in further detail

### *Step 1: grouping hazards*

11 Under CLP, the potentially adverse properties of a substance are represented by symbols and H-statements that appear on the label and in safety data sheets. In COSHH essentials, the H-statements that represent toxicological hazards (ie threats to health) have been allocated to one of five groups, A to E. Appendix 3 lists all of the H-statements used in COSHH essentials.

12 Groups A, B, C and D have each been assigned to, or relate to, a logarithmic airborne concentration range, for both dusts and for vapours. Table 1 shows these ranges and the grouping of H-statements. For the H-statements shown, the corresponding airborne concentration range is judged to represent 'adequate control' within the COSHH essentials scheme.

13 The upper boundary (the higher limit of Hazard Group A) represents levels that should not be exceeded (with the exception of occasional peak exposures for any substance), in accordance with good control practice.[6] This is 500 parts per million (ppm) for vapours and 10 milligrams per cubic metre (mg/m3) for dusts.

14 For some toxicological effects – genetic damage and cancer arising from it, and respiratory sensitisation – the available data and our current state of knowledge do not allow confident identification of exposure levels that present no significant risk. The H-statements relating to these hazardous properties have been assigned to Hazard Group E. For these substances, specialist advice should be sought and implemented on a case-by-case basis.

### *Hazard Group S – skin and eye contact*

15 Some substances are of particular concern if they come into direct contact (in solid or liquid form) with the skin or eyes. Hazard Group S signifies the importance of additional control measures for those substances whose H-statements denote:

- irritation, corrosivity or sensitisation arising from direct contact;
- the possibility of adverse effects inside the body resulting from absorption of substances through the skin after direct skin contact.

16 Additional control measures are listed in Appendix 1 as Control approach S, and focus on prevention of direct skin (or eye) contact. Further information on controlling skin exposure can be found on HSE's skin website: www.hse.gov.uk/skin/.

### *Step 2: Grouping physical properties and amounts*

17 The determinants of exposure in COSHH essentials are physical property and amount in use.

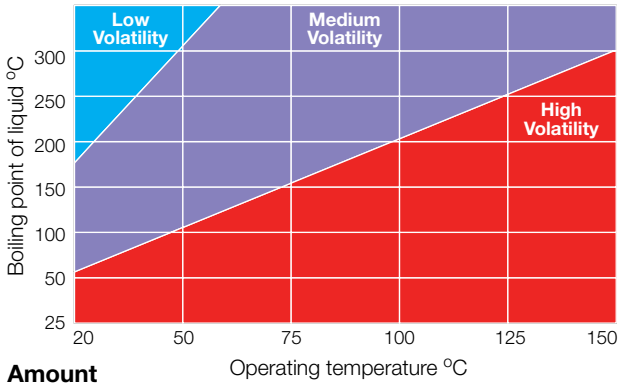
18 The physical property for solids is a subjective assessment of the material's dustiness. Simple descriptors of dustiness put a substance into a high, medium or low dustiness band.

19 The physical property for liquids is volatility at the process temperature. A chart relating boiling point to process temperature allocates a substance into a high, medium or low volatility band.

20 The other determinant is the amount in use for the task.

21 Figure 2 describes these determinants.

| Determinant | Solid Dustiness | Liquid Volatility |
|---|---|---|
| Low | | |
| Medium | Pellet does not break up | |
| High | Granular or crystalline | |
| | Fine solid and light powder | |




| Determinant | Amount | Amount |
|---|---|---|
| Small | Grams | Millilitres |
| Medium | Kilograms | Litres |
| Large | Tonnes | Cubic metres |

**Figure 2** Exposure potential

The ACTS subgroup used professional judgement to allocate combinations of physical property and amount into one of four exposure predictor (EP) bands. These EP bands are shown in Table 2.

Table 2 Definitions of exposure predictor bands from amount and exposure potential

| Low dustiness | Medium dustiness | High dustiness | EP band |
|---|---|---|---|
| Grams | Grams | | EP1 Solid |
| Kilograms and tonnes | | Grams | EP2 Solid |
| | Kilograms | Kilograms | EP3 Solid |
| | Tonnes | Tonnes | EP4 Solid |

| Low volatility | Medium volatility | High volatility | EP band |
|---|---|---|---|
| Millilitres | | | EP1 Liquid |
| Litres and cubic metres | Millilitres | Millilitres | EP2 Liquid |
| | Litres and cubic metres | Litres | EP3 Liquid |
| | | Cubic metres | EP4 Liquid |

23 Table 4 associates the EP bands with the COSHH control approach bands.

24 A third factor, duration of exposure, influences exposure potential. This was not included in the generic risk assessment scheme. However, COSHH essentials contains a filter for activity with a total time below 15 minutes per day. An explanation for 'Time' is in the 'Cut-off values' section in Paragraphs 44– 47.

### *Step 3: Predicting exposures using control approaches*

25 There are four basic control approaches used in COSHH essentials generic risk assessment and these are shown in Table 3.

**Table 3** Four control approaches

| Control approach | Type | Relative efficacy* | General description |
|---|---|---|---|
| **1** | General ventilation | 1 | A good standard of general ventilation and good working practices. |
| **2** | Engineering control | 10-fold reduction | Local exhaust ventilation ranging from well-positioned capturing and receiving hoods to effective partial enclosing hoods. |
| **3** | Containment | 100-fold reduction | Full enclosures and containment, where small-scale breaches may be expected. |
| **4** | Special | - | Expert advice is required to select appropriate control measures. |

***Note:** The efficacy estimate is, in many cases, precautionary and relative to general ventilation (=1).*

26 The ACTS subgroup applied professional judgement to determine the exposure levels that would result from applying control approach 1, 2 or 3 in Table 3 to each EP band (1–4, solid or liquid) in Table 2, the outcome of this is shown in Table 4.

Table 4 Relating EP bands to control approaches

| **Predicted exposures for dust in air (mg/m³)** | | | |
|---|---|---|---|
| EP band | Control approach 1 | Control approach 2 | Control approach 3 |
| EP1 Solid | 0.01 to 0.1 | 0.001 to 0.01 | <0.001 |
| EP2 Solid | 0.1 to 1 | 0.01 to 0.1 | 0.001 to 0.01 |
| EP3 Solid | 1 to 10 | 0.1 to 1 | 0.01 to 0.1 |
| EP4 Solid | >10 | 1 to 10 | 0.1 to 1 |
| **Predicted exposures for vapour in air (ppm)** | | | |
| EP band | Control approach 1 | Control approach 2 | Control approach 3 |
| EP1 Liquid | <5 | <0.5 | <0.05 |
| EP2 Liquid | 5 to 50 | 0.5 to 5 | 0.05 to 0.5 |
| EP3 Liquid | 50 to 500 | 5 to 50 | 0.5 to 5 |
| EP4 Liquid | >500 | 5 to 500 | 0.5 to 5 |

### *Step 4: Linking the hazard's 'acceptable exposure' with predicted exposure*

The final step to complete the risk assessment scheme is to relate the target airborne exposure range for each hazard group (Table 1) to the EP bands (Table 4). See Figure 3.

**Figure 3** Method to decide control approach based on EP band and hazard group concentration range

Method
For a given EP Band:

- Does general ventilation (CA1) give exposures within or below the hazard group concentration range (Table 1)? If so, CA1 is appropriate; otherwise it is not.
- Does engineering control (CA2) give exposures within or below the hazard group concentration range? If so, CA2 is appropriate; otherwise it is not.
- A similar analysis applies for CA3.

If none of these approaches is able to give sufficiently low exposures, specialist advice is recommended (CA4).

28 This method allows the allocation of hazard groups to Table 4, and these are shown in Table 5 while Figure 4 shows a working example.

**Table 5** Relating EP bands and control approaches to hazard groups

| **Predicted exposure ranges for dust in air mg/m³** | | | | |
|---|---|---|---|---|
| EP band | Control approach 1 | Control approach 2 | Control approach 3 | Control approach 4 |
| EP1 Solid | 0.01 to 0.1 | 0.001 to 0.01 | <0.001 | |
| Hazard groups | A, B, C | D | - | - |
| EP2 Solid | 0.1 to 1 | 0.01 to 0.1 | 0.001 to 0.01 | |
| Hazard groups | A, B | C | D | - |
| EP3 Solid | 1 to 10 | 0.1 to 1 | 0.01 to 0.1 | |
| Hazard groups | A | B | C | D |
| EP4 Solid | >10 | 1 to 10 | 0.1 to 1 | |
| Hazard groups | - | A | B | C, D |
| **Predicted exposure ranges for vapour in air (ppm)** | | | | |
| EP band | Control approach 1 | Control approach 2 | Control approach 3 | Control approach 4 |
| EP1 Liquid | <5 | <0.5 | <0.05 | |
| Hazard groups | A, B, C | D | - | - |
| EP2 Liquid | 5 to 50 | 0.5 to 5 | 0.05 to 0.5 | |
| Hazard groups | A, B | C | D | - |
| EP3 Liquid | 50 to 500 | 5 to 50 | 0.5 to 5 | |
| Hazard group | A | B | C | D |
| EP4 Liquid | >500 | 5 to 500 | 0.5 to 5 | |
| Hazard groups | - | A, B | C | D |

29 These predictions were validated and refined either by comparison with published exposure data, or where this has not been available, by extensive peer review. Independent validation of some general ventilation and engineering control scenarios was undertaken, based on BAuA.[7] Validation of containment scenarios continues.

**Example: a solid in Hazard Group B**
Hazard Group B: target exposure range = 0.1 to 1 mg/m$^3$ of dust.

**Gram quantities**
EP1, low/medium dusty solid à 0.01 to 0.1 mg/m$^3$ with general ventilation
- Below target range of 0.1 to 1 mg/m3: CA1 is adequate.

EP2, high dusty solid à 0.1 to 1 mg/m$^3$ with general ventilation
- Within target range of 0.1 to 1 mg/m$^3$: CA1 is adequate.

**Kilogram quantities**

EP3, medium dusty material à 1 to 10 mg/m$^3$ with general ventilation
- Outside target range of 0.1 to 1 mg/m$^3$ with CA1.
- With CA2 à 0.1 to 1 mg/m$^3$ is within target range. CA2 is adequate

**Tonne quantities**

EP4, medium dusty material à > 10 mg/m$^3$ with general ventilation
- Outside target range of 0.1 to 1 mg/m$^3$ with CA1
- Outside target range of 0.1 to 1 mg/m$^3$ with CA2 (1 to 10 mg/m3)
- With CA3 à 0.1 to 1 mg/m$^3$ is within target range. CA3 is adequate

**Figure 4** Example relating exposure predictor bands and control approaches to hazard groups

30 These can be rearranged to relate the hazard groups directly to the control approaches, see Table 6.

**Table 6** Control approaches needed for each hazard group

| Hazard group and phrase | Exposure predictor band | | | |
|---|---|---|---|---|
| | **EP1** | **EP2** | **EP3** | **EP4** |
| A solid | CA1 | CA1 | CA1 | CA2 |
| A liquid | CA1 | CA1 | CA1* | CA2 |
| B solid | CA1 | CA1 | CA2 | CA3 |
| B liquid | CA1 | CA1 | CA2 | CA2 |
| C solid | CA1 | CA2 | CA3 | CA4 |
| C liquid | CA1 | CA2 | CA3 | CA3 |
| D solid | CA2 | CA3 | CA4 | CA4 |
| D liquid | CA2 | CA3 | CA4 | CA4 |
| E solid | CA4 | CA4 | CA4 | CA4 |
| E liquid | CA4 | CA4 | CA4 | CA4 |

***Note:*** **CA1 for EP3, Hazard Group A liquid. Subsequent validation tests found that medium-scale use of high-volatility liquid required CA2.*

31 This was reconfigured further and published as shown in Appendix 2, and later redesigned as shown in Figure 5.

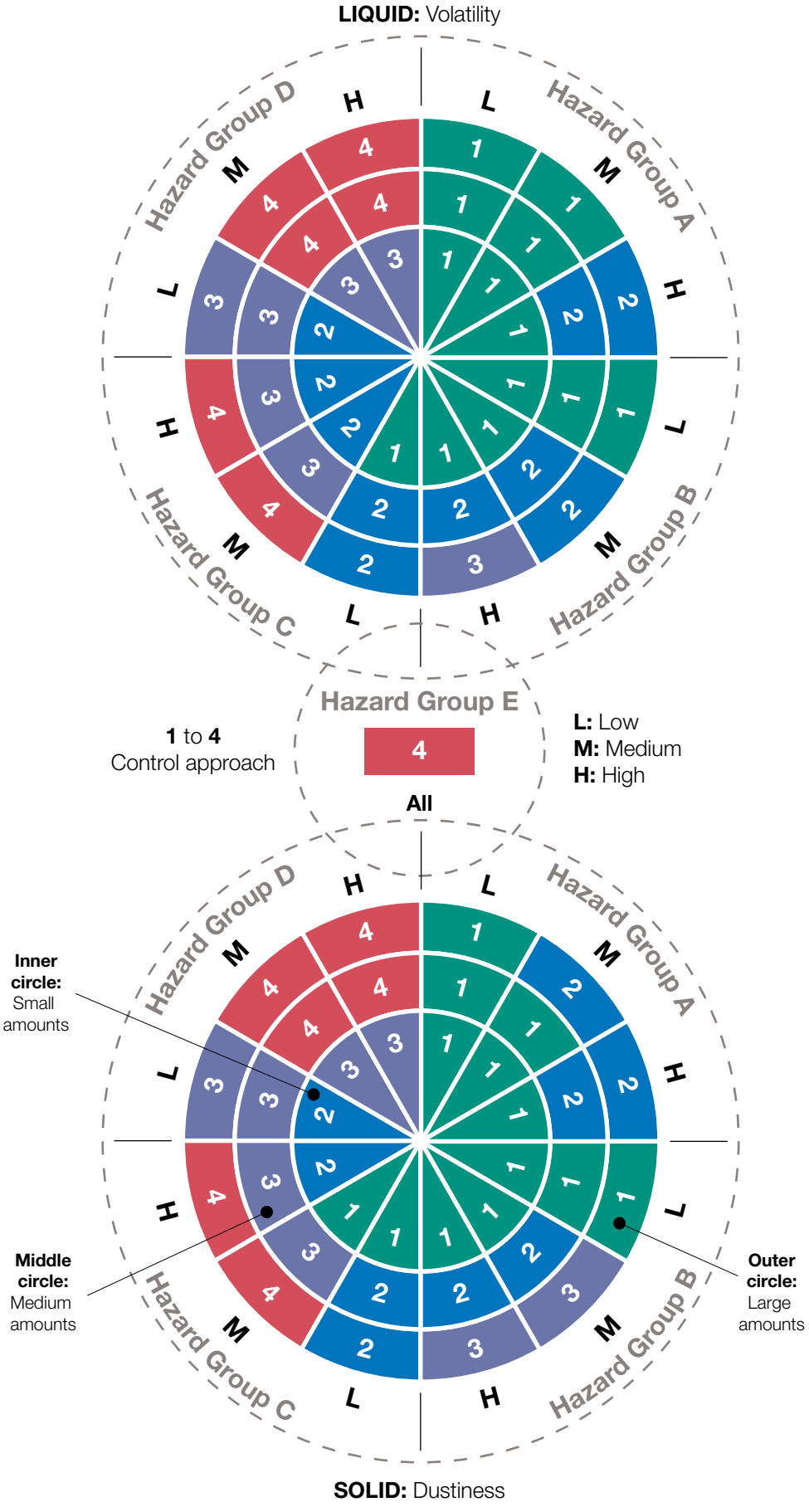



**Figure 5** Example relating exposure predictor bands and control approaches to hazard groups

32 There are three differences between Table 6 and Figure 5:

- as noted in the footnote to Table 6, a medium amount of high-volatility liquid in Hazard Group A takes CA2;
- a precautionary difference compared with Table 6, a large amount of high-volatility liquid in Hazard Group B takes CA3 rather than CA2;
- a precautionary difference compared with Table 6, a large amount of medium volatility liquid in Hazard Group C takes CA4 rather than CA3.

## Further information on how to use COSHH essentials

33 COSHH essentials provides simple control advice for many commonly occurring situations, using information from Part 15 of the safety data sheet. The system makes no attempt to cover every possible exposure scenario or use additional toxicological information. REACH[8] safety data sheets should stipulate risk management measures for specific exposure scenarios.

34 The schemes in COSHH essentials can be used to compare substances and help in making decisions on substitution.

### *Hazard grouping*

35 The hazard group according to the CLP is as set out in Appendix 3.

### *Conversion factors*

*Temperatures*

36 Celsius to Kelvin: $^{o}K = {}^{o}C + 273$. Room temperature (default) is taken as 25 $^{o}C$.

37 For activities at room temperature, low volatility means a boiling point above 150 $^{o}C$, medium volatility a boiling point between 50 $^{o}C$ and 150 $^{o}C$, and high volatility a boiling point at or below 50 $^{o}C$. There is no conversion from Fahrenheit to Celsius, $^{o}C = 5/9 \times ({}^{o}F - 32)$.

38 Where heating or cooling is applied for process temperature (PT) the volatility band is determined as follows:

- If boiling point <=2 x PT + 10, then volatility = high.
- If boiling point between 2 x PT + 10 and 5 x PT + 50, then volatility = medium.
- If boiling point >= 5 x PT + 50, then volatility = low.

*Pressures*

1 atmosphere = 760 mm mercury (mm Hg) or 760 torr
= 101.325 kPa = 101325 Pa (Pascals)
= 0.98 Bar = 980 mBar

40 The values used in COSHH essentials to allocate high, medium and low volatility are given in Table 7.

**Table 7** Volatility and vapour pressures

| Volatility band | Vapour pressure (Pa) |
|---|---|
| Low | Less than 500 |
| Medium | 500 to 25 000 |
| High | More than 25 000 |

### Calculation of vapour pressure at one temperature for data quoted at another temperature

41 This calculation combines the Clausius-Clapeyron equation with the Trouton Rule, as described in Horvath.[9] It is an approximation that is acceptable given the precautionary nature of COSHH essentials.

42 LnPatm = -10.6 x (Tbp/T – 1) where Ln is the natural logarithm, P is in atmospheres, and Tbp (boiling point) and T (temperature of the process) are in Kelvin.

43 The quoted value for the vapour pressure at a specified temperature is used to calculate a notional boiling point. Substituting this value in the equation with the temperature at which you use the substance will produce the vapour pressure at that temperature.

## Cut-off values

### *Temperature and pressure*

44 A lower temperature cut-off was set for boiling point = 20 °C. A cut-off for vapour pressure was set at 1 atmosphere. Such substances will be in the vapour phase at room temperature (a gas), and COSHH essentials cannot deal with gases.

### *Frequency and duration of use (time-weighting)*

45 A threshold of 15 minutes' use per day was built in to the e-tool for COSHH essentials. Below this, the control approach drops from CA3 (containment) to CA2 (engineering control), or from CA2 to CA1 (general ventilation). The superficial reason for this is that COSHH essentials is task-based and precautionary.

46 ACTS judged that the level of control needed for (undefined) short-term activity did not hold the same degree of 'reasonable practicability' as the level of control for prolonged use.

47 The hypothesis underlying COSHH essentials is that an increase in CA (CA1 to CA2, or CA2 to CA3) affords at least a 10-fold increase in protection from dusts and vapours. If an 8-hour limit value were exceeded ten-fold over 30 minutes, with no further exposure, that would equate to the limit value over 300 minutes, ie less than 8 hours.

## Dissolved substances, aerosols and volatile solids

### *Solutions of a solid in a liquid*

48 The COSHH essentials scheme produces different controls for dusts and vapours. It cannot deal with both at once. The most common situation is mixing a

solid and liquid. The controls are considered separately for transfer into the mixing container. Once in a liquid, dustiness is not relevant. In an assessment, treat solids dissolved or dispersed in water as liquid with low volatility (despite water having a boiling point that normally causes it to be 'medium volatility'). Take the volatility as that of the main solvent.

### *Aerosol formation and generation*

49 Where a task is likely to generate an aerosol, there is a significant increase in the exposure potential. It can be difficult to estimate the amount of aerosol, so it is precautionary to consider the 'amount' as the total amount of substance in use.

50 Aerosols form in:

- spraying and printing;
- electroplating with gas generation;
- hot vapour condensation (fume);
- dispersal through contact with fast-moving machinery;
- decompression, such as a pre-packaged hand-held aerosol spray product.

51 Specific control guidance sheets are available for some aerosol-generating tasks (Appendix 1). Otherwise, the precautionary principle is advised – to adopt a more stringent control approach than indicated by COSHH essentials.

52 COSHH essentials was not designed to assess gases. For hand-held aerosol sprays, the propellant is considered as a gas by COSHH essentials and the assessment halts. The solution is to ignore the propellant, to take the boiling point as that of the lowest boiling ingredient in the product, and the amount as small or, if several cans are used (as in artwork), medium.

### *Volatile solids*

53 Few solids have an appreciable vapour pressure. For those that do (eg iodine, benzoquinone, paraformaldehyde, naphthalene), their dustiness may not show their full exposure potential; it may also be necessary to consider volatility. The safety data sheet or supplier should give information on volatility.

54 For such substances, compare the control approaches for the solid and for the vapour. The more stringent CA takes precedence. The vapour pressure bands in Table 7 apply. However, it is unlikely that many solids have volatility above 0.5 kPa (4934 ppm) at room temperature.

### *Approach for mixtures made by the user*

All mixtures are considered as made by the user and not intended for supply. The routine for mixtures in COSHH essentials is:

- If any component is in Hazard Group S, then the mixture is Hazard Group S.
- If any component is in Hazard Group E, then the mixture is Hazard Group E.
- If any component is in Hazard Group D at >=0.05% then the mixture is Hazard Group D.
- If any component is in Hazard Group C at >=0.05% then the mixture is Hazard Group C.
- If any component has a classification 'H334' then see subsidiary H334 rules (paragraph 57).
- If any component is in Hazard Group 'B' at >=10% then the mixture is Hazard Group B
- Otherwise the mixture is Hazard Group A.

### *Subsidiary rules for mixtures made by the user*

57 Where any component of the mixture has H334 at or above 0.1% but less than 0.5%, classing the mixture as Hazard Group C results in an over-precautionary control approach. The volatility or dustiness should relate to the major component of the mixture (Hazard Group A or B). See Table 8.

**Table 8** Matrix for mixtures in Hazard Group A and B that contain 0.1 % to less than 0.5 % of an H334 component

| | **Low dustiness/ volatility** | **Medium volatility** | **Medium dustiness** | **High dustiness/ volatility** |
|---|---|---|---|---|
| **Amount** | Substance with >=0.1% to <0.5% of a component with H334 and no other mixture component giving Hazard Group C or D | | | |
| **Small** | CA1 | CA2 | CA1 | CA2 |
| **Medium** | CA1 | CA2 | CA2 | CA2 |
| **Large** | CA2 | CA3 | CA3 | CA3 |

***Note:*** *CA1, CA2 and CA3 are control approaches.*

58 The option for stipulating water as a mixture ingredient is not implemented (water, by default, is Hazard Group A). However for mixtures of solids in water, the volatility may be assumed as 'low' rather than medium (ie boiling point >150 °C, not 100 °C).

### *Respiratory Protective equipment (RPE)*

59 The underpinning logic of RPE protection for particular combinations of COSHH essentials input data (ie hazard groups, amounts, volatility or dustiness) is outlined in Table 9.

60 Note that RPE is considered 'the last line of defence', and principles of good control practice should be followed as outlined in Schedule 2A of L5.[10] Further guidance concerning the use of RPE in controlling exposures can also be found in paragraphs 155–162 of L5, and in HSG 53.[11]

**Table 9** Selection of an RPE standard with COSHH essentials input data

| **Hazard Group** | **Amount** | **Dustiness or volatility** | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| A | Small | - | - | - |
| | Medium | - | APF = 4 | APF = 10 |
| | Large | APF = 4 | APF = 10 | APF = 20 |
| B | Small | - | APF = 4 | APF = 4 |
| | Medium | - | APF = 10 | APF = 20 |
| | Large | APF = 10 | APF = 20 | APF = 40 |

| | | | | |
|---|---|---|---|---|
| C | Small | - | APF = 4 | APF = 4 |
| | Medium | APF = 10 | APF = 10 | APF = 20 |
| | Large | APF = 20 | APF = 20 | APF = 40 |
| D | Small | APF = 10 | APF = 20 | APF = 40 |
| | Medium | APF = 20 | APF = 40 | APF = 40 |
| | Large | APF = 20 | APF = 40 | APF = 2000 |
| E | Small | APF = 10 | APF = 20 | APF = 40 |
| | Medium | APF = 20 | APF = 40 | APF = 40 |
| | Large | APF = 20 | APF = 40 | APF = 2000 |

***Note:*** *UK Standard Assigned Protection Factors are based on those in EN 529* [12]

## Appendix 1: Index of generic COSHH essentials guidance sheets

1 Table 1 contains an index to control guidance sheets which may be considered relevant for each control approach.

**Table 1** Index to generic series control guidance sheets

| **Control approach 1: General ventilation** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unit Operation | Sheet topic | Solids | | | Liquids | | |
| | | Small | Medium | Large | Small | Medium | Large |
| General tasks | General ventilation | G100 | G100 | G100 | G100 | G100 | G100 |
| Storage | General storage | G101 | G101 | G101 | G101 | G101 | G101 |
| | Open bulk storage | | | G102 | | | |
| Dust extraction | Removing waste from a dust extraction unit | G103 | G103 | G103 | | | |
| **Control approach 2: Engineering control** | | | | | | | |
| Unit Operation | Sheet topic | Solids | | | Liquids | | |
| | | Small | Medium | Large | Small | Medium | Large |
| General tasks | Local exhaust ventilation | G200 | G200 | G200 | G200 | G200 | G200 |
| | Fume cupboards | G201 | | | G201 | | |
| | Laminar flow booth | | G202 | | | G202 | |
| | Ventilated workbench | G203 | | | G203 | | |
| Storage | General storage | G101 | G101 | G101 | G101 | G101 | G101 |
| Dust extraction | Removing waste from a dust extraction unit | G204 | G204 | G204 | | | |
| Transfer | Conveyor transfer | | G205 | G205 | | | |
| | Sack filling | | G206 | G207 | | | |
| | Sack emptying | | G208 | | | | |
| | Filling kegs | | G209 | | | | |
| | Charging reactors/mixers from a drum or keg | G210 | G210 | | | | |
| | IBC filling and emptying | | | G211 | | | |
| | Drum filling | | | | | G212 | |
| | Drum emptying (drum pump) | | | | | G213 | |
| Weighing | Weighing | G2001 | G214 | | G201 | | |
| Mixing | Mixing | G201 | G215 | G216 | G201 | G217 | G217 |
| Sieving | Sieving (and filtering | G218 | G218 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Screening | Screening | | | G219 | | | |
| Surface coating | Spray painting | | | | G220 | G221 | |
| | Powder coating | | G222 | G222 | | | |
| Lamination | Batch lamination | | | | | G223 | G223 |
| | Continuous lamination | | | | | G224 | G224 |
| Dipping | Pickling bath | | | | | G225 | G226 |
| | Vapour degreasing bath | | | | | G227 | G227 |
| Drying | Tray drying oven | | G228 | | | G228 | |
| | Continuous drying labyrinth oven | | | | | G229 | G229 |
| Pelletising | Pelletising | | G230 | G230 | | | |
| | Tablet press | | G231 | | | | |

**Control approach 3: Containment**

| Unit Operation | Sheet topic | Solids | | | Liquids | | |
|---|---|---|---|---|---|---|---|
| | | Small | Medium | Large | Small | Medium | Large |
| General tasks | Containment | G300 | G300 | G300 | G300 | G300 | G300 |
| | Glove box | G301 | | | G301 | | |
| Storage | General storage | G101 | G101 | G101 | G101 | G101 | G101 |
| Dust extraction | Removing waste from a dust extraction unit | G204 | G204 | G302 | | | |
| Transfer | Transferring solids | | G303 | G303 | | | |
| | Sack emptying | | G304 | | | | |
| | Drum filling | | | | | G305 | G305 |
| | Drum emptying | | | | | G306 | |
| | Infrequent charging of reactors/mixers from a sack or keg | G210 | G210 | | | | |
| | IBC filling and emptying | | | G307 | | | G308 |
| | Tanker filling and emptying | | | G309 | | | G310 |
| | Filling kegs | | G311 | | | G213 | |
| | Transferring liquid by pump | | | | | G312 | G312 |
| | Packet filling | G301 | G313 | G313 | | | |
| | Bottle filling | | | | G301 | G314 | G314 |
| Weighing | Weighing | G301 | G315 | G317 | G301 | G316 | G316 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mixing | Mixing | G301 | G317 | G317 | G301 | G318 | G318 |
| Surface coating | Robot spray booth | | | | | G319 | G319 |
| | Automated powder coating | | G320 | G320 | | | |
| Dipping | Vapour degreasing bath | | | | G321 | G321 | G321 |
| Drying | Spray drying | | G322 | G322 | | G322 | G322 |
| Pelletising | Tablet press | | G231 | | | | |
| **Control approach 4: Special** | | | | | | | |
| G400 | General principles | | | | | | |
| G402 | Health surveillance for occupational asthma | | | | | | |
| G401 | Health monitoring for chronic obstructive pulmonary disease | | | | | | |
| G403 | Health surveillance for occupational dermatitis | | | | | | |
| G406 | Health surveillance – exposed to respirable crystalline silica (RCS) | | | | | | |
| G408 | Urine sampling for isocyanate exposure measurement | | | | | | |
| G409 | Exposure measurement – air sampling | | | | | | |
| **Control Approach S: Harm via skin or eye contact** | | | | | | | |
| S100 | General advice | | | | | | |
| S101 | Selecting protective gloves | | | | | | |
| S102 | Selecting personal protective equipment | | | | | | |
| S200 | Skin or eye contact | | | | | | |
| **Control Approach R: Respiratory protective equipment (RPE)** | | | | | | | |
| R1 | UK Standard Assigned Protection Factor 4 (APF4) | | | | | | |
| R2 | UK Standard Assigned Protection Factor 10 (APF10) | | | | | | |
| R3 | UK Standard Assigned Protection Factor 20 (APF20) | | | | | | |
| R4 | UK Standard Assigned Protection Factor 40 (APF40) | | | | | | |
| R5 | UK Standard Assigned Protection Factor 200 (APF200) | | | | | | |
| R6 | UK Standard Assigned Protection Factor 2000 (APF2000) | | | | | | |

**Table 2:** Useful generic guidance sheets relating to controlling exposures to or via skin for each control option

| | **S100** | **S101** | **S102** | **Other** |
|---|---|---|---|---|
| **CA1** | | | | N/A |
| **CA2** | ✔ | ✔ | ✔ | |
| **CA3 – maintenance** | ✔ | ✔ | ✔ | |
| **CA3** | ✔ | ✔ | ✔ | |
| **CA4** | ✔ | | | |
| **Where H334 classification appears** | | | | G403 |
| **Other relevant sheets for:** | | | | |
| **CA2 and CA3** | | | | G406 (LEV care) |
| **All CAs** | | | | G409 (air sampling) |

## Appendix 2 HSG139 look-up table

Table 1 is reproduced from HSG193 (withdrawn).

**Table 1** Selecting CA approach according to hazard Group

| Amount used | Low volatility or dustiness | Medium volatility | Medium dustiness | High volatility or dustiness |
|---|---|---|---|---|
| | Hazard Group A substances | | | |
| **Small** | 1 | 1 | 1 | 1 |
| **Medium** | 1 | 1 | 1 | 2 |
| **Large** | 1 | 1 | 2 | 2 |
| | Hazard Group B substances | | | |
| **Small** | 1 | 1 | 1 | 1 |
| **Medium** | 1 | 2 | 2 | 2 |
| **Large** | 1 | 2 | 3 | 3 |
| | Hazard Group C substances | | | |
| **Small** | 1 | 2 | 1 | 2 |
| **Medium** | 2 | 3 | 3 | 3 |
| **Large** | 2 | 4 | 4 | 4 |
| | Hazard Group D substances | | | |
| **Small** | 2 | 3 | 2 | 3 |
| **Medium** | 3 | 4 | 4 | 4 |
| **Large** | 3 | 4 | 4 | 4 |
| | Hazard Group E substances | | | |
| **All amounts** | 4 | 4 | 4 | 4 |

***Note:*** *the values in the box give the control approach*

The colour convention is carried through to COSHH essentials control guidance sheets, with the addition of Control approach R (where the control is principally RPE in addition to other measures) and Control approach S (where added controls are required to prevent skin or eye contact).

| |
|---|
| R |

## Appendix 3: CLP H statements

Table 1 A full list of the Hazard (H) statements used in COSHH essentials.

| H statement | Phrase | Group |
|---|---|---|
| 300 | Fatal if swallowed | D |
| 301 | Toxic if swallowed | C |
| 302 | Harmful if swallowed | B |
| 304 | May be fatal if swallowed and enters airways | A |
| 310 | Fatal in contact with skin | D |
| 311 | Toxic in contact with skin | C |
| 312 | Harmful in contact with skin | B |
| 314 | Causes severe burns and eye damage | C |
| 315 | Causes skin irritation | A |
| 317 | May cause an allergic skin reaction | C |
| 318 | Causes serious eye damage | C |
| 319 | Causes serious eye irritation | A |
| 330 | Fatal if inhaled | D |
| 331 | Toxic if inhaled | C |
| 332 | Harmful if inhaled | B |
| 334 | May cause allergy or asthma symptoms or breathing difficulties if inhaled | E |
| 335 | May cause respiratory irritation | C |
| 336 | May cause dizziness or drowsiness | A |
| 340 | May cause genetic defects (route if relevant) | E |
| 341 | Suspected of causing genetic defects (route if relevant) | E |
| 350 | May cause cancer (route if relevant) | E |
| 351 | Suspected to causing cancer (route if relevant) | D |
| 360 | May damage fertility or the unborn child (effect if known, route if relevant) | D |
| 361 | Suspected of damaging fertility or the unborn child (effect if known, route if relevant) | D |
| 362 | May cause harm to breast-fed children | D |

| | | |
|---|---|---|
| 370 | Causes damage to organs (organ if known, route if relevant) | C |
| 371 | May cause damage to organs (organ if known, route if relevant) | B |
| 372 | Causes damage to organs through prolonged or repeated exposure (organ if known, route if relevant) | D |
| 373 | May cause damage to organs through prolonged or repeated exposure (organ if known, route if relevant) | C |
| EU66 | Repeated exposure may cause skin dryness or cracking | A |
| EU70 | Toxic by eye contact | E |
| EU71 | Corrosive to the respiratory tract | C |

## References

1 CLP: European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, which adopts adopts the United Nations' Globally Harmonised System on the classification and labelling of chemicals (GHS) across all European Union countries, including the UK – see HSE's Chemical classification web pages www.hse.gov.uk/ chemical-classification/index.htm

2 The COSHH essentials e-tool is at www.hse.gov.uk/coshh/essentials/coshh-tool.htm

3 Russell RM, Maidment SC, Brooke IM et al 'An introduction to a UK scheme to help small firms control health risks from chemicals' *Annals of Occupational Hygiene August 1998* **42** (6) 367–376

4 Brooke IM 'A UK scheme to help small firms control risks to health from exposure to chemicals: toxicological considerations' *Annals of Occupational Hygiene* August 1998 **42** (6) 377–390

5 Maidment SC 'Occupational hygiene considerations in the development of a structured approach to select chemical control strategies' *Annals of Occupational Hygiene* August 1998 **42** (6) 391–400

6 HSE's web pages on the principles of good control practice: www.hse.gov.uk/coshh/detail/goodpractice.htm

7 Tischer M, Bredendiek-Kamper S, Poppek U 'Evaluation of the HSE COSHH essentials exposure predictive model on the basis of BAuA field studies and existing substances exposure data' *Annals of Occupational Hygiene* August 2003 **47** (7) 557–569

8 REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals. See HSE's REACH web pages www.hse.gov.uk/reach/index.htm

9 Horvath A L *Molecular design* Elsevier 1992 p.285).

10 *Control of substances hazardous to health (Sixth edition). The Control of Substances Hazardous to Health Regulations 2002. Approved Code of Practice and guidance* L5 (Sixth edition) HSE 2013 www.hse.gov.uk/pubns/books/l5.htm

11 *Respiratory protective equipment at work. A practical guide* HSG53 (Fourth edition) HSE 2013 www.hse.gov.uk/pubns/books/hsg53.htm

12 BS EN 529:2005 *Respiratory protective devices. Recommendations for selection, use, care and maintenance. Guidance document* British Standards Institution

## Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

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