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## HEALTH AND SAFETY COMMISSION

### IMPLEMENTATION OF THE 2<sup>nd</sup> LIST OF INDICATIVE OCCUPATIONAL EXPOSURE LIMIT VALUES (EUROPEAN DIRECTIVE 2006/15/EC)

A Paper by Richard Pedersen

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#### Issue

1. Commission agreement to HSE's proposals for implementation of European Directive 2006/15/EC; the 2<sup>nd</sup> list of Indicative Occupational Exposure Limit Values (IOELVs). This entails Commission approval of new and revised Workplace Exposure Limits (WELs) in line with the IOELVs set out in the Directive.

#### Timing

2. Routine. It is intended that the new and revised WELs should be published on 6 April 2007 in line with the Common Commencement Date and should come into force on 1 September 2007 as required by the Directive.

#### Recommendation

3. That the HSC approves the new and revised Workplace Exposure Limits contained in Annex 1 to this paper.

## Background

4. European Commission Directive 2006/15/EC was adopted by the Commission on 7 February 2006, having been agreed by Member States in a vote the previous October. It subsequently appeared in the *Official Journal of the European Union*. Member States have until 1 September 2007 to implement the Directive into domestic legislation. The text of the Directive is attached at Annex 2.
5. The Directive contains an Annex listing 33 hazardous substances together with indicative occupational exposure limit values (IOELVs) and, in certain cases, a "skin" notation signifying the possibility of significant uptake through the skin. In order to implement the Directive, Member States are required to introduce national occupational exposure limits for the 33 substances, taking account of the IOELV.
6. The Commission Directive sits within the framework of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work (the Chemical Agents Directive or CAD). This was implemented in Great Britain through COSHH, and there is therefore no need for additional legislation in order to implement 2006/15/EC. Implementation is achieved when the HSC agrees the new and revised Workplace Exposure Limits (WELs) and these are subsequently published in "EH40 Workplace Exposure Limits".
7. *[The proposed additions and revisions to EH40 were agreed by the Advisory Committee on Toxic Substances (ACTS) at its meeting held on 30 November 2006.]*

## Argument

8. Annex 1 to this paper contains the details of the necessary changes to EH40. Where only part of an existing entry is to be modified, this is marked accordingly. The changes are described in the paragraphs below.

### a) New additions to EH40

9. In order to implement the Directive, HSC is required to approve WELs for six additional substances, not currently listed. These are: 2-(2-butoxyethoxy) ethanol, isopentane, 2-(2-methoxyethoxy) ethanol, neopentane, pentane and pyrethrum (purified of sensitising lactones). HSC's proposals for new WELs provoked no comment during consultation. The proposed WELs for the three pentanes are lower than the IOELVs, but represent a formalisation of the guidance values previously assigned to these isomers. The guidance values were developed by an ACTS sub-group for use in setting in-house occupational exposure limits for mixtures of hydrocarbon solvents, using a procedure known as the Reciprocal Calculation Procedure (RCP), and have been in use for over 10 years.

## **b) Removal from EH40**

10. Because of the introduction of the new WEL for pyrethrum (purified of sensitising lactones) (see above), it is proposed that the existing WEL for pyrethrins be withdrawn completely. No comments were received on this proposal.

## **c) Revised entries in EH40**

11. Major revisions to EH40 are required for ten substances in order to comply with the Directive. These substances are: 2-aminoethanol, chlorine (short-term exposure limit), cyanamide, diethylamine, diphosphorus pentoxide, morpholine, nitric acid (short-term exposure limit), nitrobenzene, phosphine and toluene (short-term exposure limit).

12. Additionally, it is proposed that the existing 8-hour time-weighted average limits for chlorine and nitric acid, and the existing short-term exposure limit for nitrobenzene be withdrawn. No such limit is required by the Directive and no comments were received during the consultation that supported their retention.

13. It is proposed, in order to comply with the Directive, that "Skin" notations be imposed in the existing EH40 entries for 2-aminoethanol, cyanamide and resorcinol.

14. It is additionally proposed that three further changes be made to the entries in EH40 although these changes are not required by the Directive. The reasons behind these changes were set out in full in the Consultative Document and no adverse comments were received. It is therefore planned to introduce revised short-term exposure limits for bromine and diphosphorus pentasulphide, and a new short-term exposure limit for phosphorus pentachloride.

## **Consultation**

15. A Consultative Document (CD 208) setting out all these proposals was published in July 2006 with a consultation period running until 27 September. 280 copies of the CD were sent to stakeholders, comprising :

- Government Departments
- Public bodies
- The European Union
- Crown Dependencies and Overseas Territories
- Local Government Organisations
- Employers' organisations and representatives of small firms
- Trade unions and other employee organisations
- Trade associations and learned bodies
- Police and emergency services
- Health and safety specialists
- Academic institutions
- Individual companies known to use the substances in question.

16. In addition, a further 3,408 visits were registered as having been made to the HSE website where the CD was published.

17. Only 22 comments were received, of which 2 were “no comment”. All other consultees who commented, barring those mentioned below, were fully in agreement with the HSC’s proposals.
18. The Chemical Industries Association, BASF and INEOS raised the appropriateness of the inclusion of a “skin” notation for acetonitrile. All three consultees requested that this notation should not be implemented by the UK, because it lacked a sound scientific base. The matter had been brought to HSE’s after the adoption of the Directive. HSE nevertheless decided to include this particular notation in its consultation.
19. HSE is not convinced, on scientific grounds, of the need for a “Skin” notation for this substance. Last February we sent the European Commission an HSE assessment of the latest research on the dermal absorption of acetonitrile, and INEOS have also sent their documentation to the Commission requesting further consideration of the question by the Scientific Committee on Occupational Exposure Limits. The latest correspondence from the European Commission indicated that Commission officials stood by the correctness of the “Skin” notation.
20. [At its meeting on 30 November 2006 ACTS agreed that HSE should not implement the “Skin” notation for acetonitrile and should not include it in EH40.]
21. The TUC proposed that where there were slight differences in the conversion factors between the limits when expressed as parts per million (ppm) and milligrams per metre cubed ( $\text{mg.m}^{-3}$ ), the limit adopted should be the IOELV rather than a retention of the existing WEL. Having considered this issue, HSE proposes to retain the existing UK limits, rather than make minor cosmetic changes to EH40.

### **Presentation**

22. It is planned to amend the table of Workplace Exposure Limits which is on the HSE website, the new and revised entries being asterisked to indicate the delayed coming-into-force date. A Press Release will be issued at the same time. It is not planned to republish in full the HSE publication “EH 40 Workplace Exposure Limits” because of the large number of existing stock remaining from the 2005 publication (approximately two-years worth of stock at current rate of demand), and because of the cost of producing a fully-revised version (approximately £17k) . It is planned to send an amendment sheet to all previous purchasers of the 2005 publication, and the same amendment sheet will be included in all remaining stock. This can be done at minimal cost.
23. The changes to the list of WELs will be also be publicised to small businesses by the inclusion in the Regulation Update prepared by the DTI’s Small Business Service.

### **Costs and Benefits**

24. A partial RIA was completed prior to consultation and included in the Consultative Document. A full RIA is attached at Annex 3.

### **Financial/Resource Implications for HSE**

25. There are no financial implications for HSE other than the cost of producing and distributing the single page Addendum to EH40 2005.

### **Environmental Implications**

26. There are no environmental implications.

### **Other Implications**

27. None.

### **Action**

28. The Commission is asked to approve the new and revised Workplace Exposure Limits as set out in Annex 1.

### **Contact**

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**CHANGES TO THE LIST OF WORKPLACE EXPOSURE LIMITS IN EH40**

**1) New Entries**

| Substance                                    | CAS No.   | Workplace Exposure Limit                               |                    |  |                    | Comments               |
|--|-----------|--|--------------------|--|--------------------|------------------------|
|  |           | Long-term exposure limit (8-hour TWA reference period) |                    | Short-term exposure limit (15-minute reference period) |                    |                        |
|  |           | ppm  | mg.m <sup>-3</sup> | ppm  | mg.m <sup>-3</sup> |                        |
| 2-(2-Butoxyethoxy) ethanol                   | 112-34-5  | 10   | 67.5               | 15   | 101.2              | R36                    |
| Isopentane                                   | 78-78-4   | 600  | 1,800              | -  | -                  | R12, 51/53, 65,66,67   |
| 2-(2-Methoxyethoxy) ethanol                  | 111-77-3  | 10   | 50.1               | -  | -                  | Sk R63                 |
| Neopentane                                   | 590-35-2  | 600  | 1,800              | -  | -                  | R12, 51/53             |
| Pentane                                      | 109-66-0  | 600  | 1,800              | -  | -                  | R12, 51/53, 65, 66, 67 |
| Pyrethrum (purified of sensitising lactones) | 8003-34-7 | -  | 1                  | -  | -                  |                        |

**2) Removed entries**

| Substance        | CAS No.                           | Workplace Exposure Limit                               |                    |  |                    | Comments         |
|------------------|-----------------------------------|--|--------------------|--|--------------------|------------------|
|                  |                                   | Long-term exposure limit (8-hour TWA reference period) |                    | Short-term exposure limit (15-minute reference period) |                    |                  |
|                  |                                   | ppm  | mg.m <sup>-3</sup> | ppm  | mg.m <sup>-3</sup> |                  |
| Pyrethrins (ISO) | 8003-34-7<br>121-21-1<br>121-29-9 | -  | 5                  | -  | 10                 | R20/21/22, 50/53 |

### 3) Revised entries

| Substance                  | CAS No.    | Workplace Exposure Limit                               |                    |  |                    | Comments                                 |
|----------------------------|------------|--|--------------------|--|--------------------|--|
|                            |            | Long-term exposure limit (8-hour TWA reference period) |                    | Short-term exposure limit (15-minute reference period) |                    |  |
|                            |            | ppm  | mg.m <sup>-3</sup> | ppm  | mg.m <sup>-3</sup> |  |
| [Acetonitrile]             | 75-05-8    | 40   | 68                 | 60   | 102                | <b>Sk (new)</b><br>R11, 20, 21/22/36]    |
| 2-Aminoethanol             | 141-43-5   | <b>1 (new)</b>   | <b>2.5 (new)</b>   | <b>3 (new)</b>   | <b>7.6 (new)</b>   | <b>Sk (new)</b><br>R20/21/22, 34         |
| Bromine                    | 7726-95-6  | 0.1  | 0.66               | <b>0.2 (new)</b>                                       | <b>1.3 (new)</b>   | R26, 35, 50                              |
| Chlorine                   | 7782-50-5  | -<br><b>(new)</b>                                      | -<br><b>(new)</b>  | <b>0.5 (new)</b>                                       | <b>1.5 (new)</b>   | R23, 36/37/38, 50                        |
| Cyanamide                  | 420-04-2   | <b>0.58 (new)</b>                                      | <b>1 (new)</b>     | -  | -                  | <b>Sk (new)</b><br>R21, 25, 36/38, 43    |
| Diethylamine               | 109-89-7   | <b>5 (new)</b>   | <b>15 (new)</b>    | <b>10 (new)</b>  | <b>30 (new)</b>    | R11, 20/21.22, 35                        |
| Diphosphorus pentasulphide | 1314-80-3  | -  | 1                  | -  | <b>2 (new)</b>     | R11, 20/22, 29, 50                       |
| Diphosphorus pentoxide     | 1314-56-3  | -  | <b>1 (new)</b>     | -  | 2                  | R35                                      |
| Morpholine                 | 110-91-8   | <b>10 (new)</b>  | <b>36 (new)</b>    | <b>20 (new)</b>  | <b>72 (new)</b>    | Sk R10, 20/21/22, 34                     |
| Nitric acid                | 7697-37-2  | -<br><b>(new)</b>                                      | -<br><b>(new)</b>  | <b>1 (new)</b>   | <b>2.6 (new)</b>   | R8, 35                                   |
| Nitrobenzene               | 98-95-3    | <b>0.2 (new)</b>                                       | <b>1 (new)</b>     | -<br><b>(new)</b>                                      | -<br><b>(new)</b>  | Sk<br>R23/24/25, 40, 48/23/24, 62, 51/53 |
| Phosphine                  | 7803-51-2  | <b>0.1 (new)</b>                                       | <b>0.14 (new)</b>  | <b>0.2 (new)</b>                                       | <b>0.28 (new)</b>  | R12, 17, 26, 34, 50                      |
| Phosphorus pentachloride   | 10026-13-8 | 0.1  | 0.87               | <b>0.2 (new)</b>                                       | <b>2 (new)</b>     | R14, 22, 26, 34, 48/20                   |
| Resorcinol                 | 108-46-3   | 10   | 46                 | 20   | 92                 | <b>Sk (new)</b><br>R22, 36/38, 50        |
| Toluene                    | 108-88-3   | 50   | 191                | <b>100 (new)</b>                                       | <b>384 (new)</b>   | Sk R11, 38, 48/20, 63, 65                |

**COMMISSION DIRECTIVE 2006/15/EC  
of 7 February 2006**

**establishing a second list of indicative occupational exposure limit values in  
implementation of Council Directive 98/24/EC and amending Directives 91/322/EEC  
and 2000/39/EC**

**(Text with EEA relevance)**

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work<sup>1</sup>, and in particular Article 3(2) thereof,

Having regard to the opinion of the Advisory Committee on Safety, Hygiene and Health Protection at Work,

Whereas:

- (1) Pursuant to Directive 98/24/EC, the Commission is to propose European objectives in the form of indicative occupational exposure limit values (IOELVs) for the protection of workers from chemical risks, to be set at Community level.
- (2) In carrying out this task, the Commission is assisted by the Scientific Committee for Occupational Exposure Limits to Chemical Agents (SCOEL) set up by Commission Decision 95/320/EC<sup>2</sup>.
- (3) Indicative occupational exposure limit values are health-based, non-binding values, derived from the most recent scientific data available and taking into account the availability of measurement techniques. They set threshold levels of exposure below which no detrimental effects are expected for any given substance. They are necessary for the determination and assessment of risks by the employer in accordance with Article 4 of Directive 98/24/EC.
- (4) For any chemical agent for which indicative occupational exposure limit values are established at Community level, Member States are required to establish a national occupational exposure limit value taking into account the Community limit value, but may determine its nature in accordance with national legislation and practice.
- (5) Indicative occupational exposure limit values should be regarded as an important part of the overall approach to ensuring the protection of the health of workers at the workplace against the risks arising from hazardous chemicals

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<sup>1</sup> OJ L131, 5.5.1998, p. 11

<sup>2</sup> OJ L188, 9.8.1995, p.14

- (6) Results of the risk assessments and risk reduction strategies developed in the framework of Council Regulation (EEC) 793/93<sup>3</sup> on the evaluation and control of the risks of existing substances provide for the establishment or revision of OELs for a number of substances
- (7) A first and a second list of indicative occupational exposure limit values were established by Commission Directives 91/322/EEC<sup>4</sup> and 96/94/EC<sup>5</sup> under Council Directive 80/1107/EEC of 27 November 1980 on the protection of workers from the risks related to exposure to chemical, physical and biological agents at work<sup>6</sup>.
- (8) Directive 80/1107/EEC was repealed with effect from 5 May 2001 by Directive 98/24/EC.
- (9) Directive 98/24/EC established that Directives 91/322/EEC and 96/94/EEC were to remain in force.
- (10) Directive 96/94/EC was repealed with effect from 31 December 2001 by Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work<sup>7</sup>.
- (11) In the light of the evaluation of the latest available scientific data, it is appropriate to review the indicative occupational exposure limit values established by Directive 91/322/EEC.
- (12) In accordance with Article 3 of Directive 98/24/EC, SCOEL has assessed a total of 33 substances, which are listed in the Annex to the present Directive. Of these 33 substances, 17 were already listed in the Annex to Directive 91/322/EEC. For 4 of these substances, the SCOEL recommends the establishment of new indicative limit values and, for 13 substances, the maintenance of the previous limit values. Therefore those 17 substances now listed in the Annex to the present Directive should be deleted from the Annex to Directive 91/322/EEC, whereas the other 10 substances will remain in the Annex to Directive 91/322/EEC.
- (13) Ten substances should remain in the Annex to Directive 91/322/EEC. As to 9 of these substances the SCOEL has not yet recommended an indicative occupational exposure limit value, while for one remaining substance it is anticipated that additional scientific data will be available in the near future and that it will be submitted to SCOEL for consideration.
- (14) The list in the Annex to this Directive also incorporates 16 other substances for which indicative occupational exposure limit values have been recommended by SCOEL, following evaluation of the latest available scientific data on occupational health effects and taking into account the availability of measurement techniques in accordance with Article 3 of Directive 98/24/EC.

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<sup>3</sup> OJ L 084, 5.4.1993, p.1. Regulation as amended by Regulation (EC) No 1882/2003 of the European Parliament and Council (OJ L284, 31.10.2003, p. 1)

<sup>4</sup> OJ L177, 5.7.1991, p.22

<sup>5</sup> OJ L338, 28.12.1996, p. 86

<sup>6</sup> OJ L327, 3.12.1980, p. 8

<sup>7</sup> OJ L 142, 16.6.2000, p. 47

- (15) One of those 16 substances, monochlorobenzene, was included in the Annex of Directive 2000/39/EC. SCOEL has reviewed the IOELV in the light of the recent scientific data and recommended the establishment of a new IOELV. Therefore, this substance, now listed in the Annex of the present Directive, should be deleted from the Annex to Directive 2000/39/EC.
- (16) It is also necessary to establish short-term exposure limit values for certain substances to take account of effects arising from short-term exposure.
- (17) For some substances, it is necessary to take into account the possibility of penetration through the skin in order to ensure the best possible level of protection.
- (18) This Directive should constitute a practical step towards the achievement of the social dimension of the internal market.
- (19) The measures provided for in this Directive are in accordance with the opinion of the Committee instituted by Article 17 of Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work<sup>8</sup>.
- (20) Directive 91/322/EEC should therefore be amended accordingly.

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

In implementation of Directive 98/24/EC, a second list of Community indicative occupational exposure limit values is hereby established for the chemical agents listed in the Annex.

*Article 2*

Member States shall establish national occupational exposure limit values for the chemical agents listed in the Annex, taking into account the Community values.

*Article 3*

In the Annex to Directive 91/322/EEC the references to the substances nicotine, formic acid, methanol, acetonitrile, nitrobenzene, resorcinol, diethylamine, carbon dioxide, oxalic acid, cyanamide, diphosphorus pentoxide, diphosphorus pentasulphide, bromine, phosphorus pentachloride, pyrethrum, barium (soluble compounds as Ba), silver (soluble compounds as Ag) and their indicative limit values are deleted.

In the Annex to Directive 2000/39/EC the reference to the substance chlorobenzene is deleted.

*Article 4*

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 18 months after the entry into force at the latest.

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<sup>8</sup> OJ L. 183, 29.6.1989, p. 1

They shall forthwith communicate to the Commission the text of those provisions and a correlation table between those provisions and this Directive.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States shall communicate to the Commission the text of the provisions of national law which they adopt in the field covered by this Directive.

*Article 5*

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

*Article 6*

This Directive is addressed to the Member States.

Done at Brussels, 7 February 2006

*For the Commission*

Vladimir Špidla  
*Member of the Commission*

## ANNEX

## INDICATIVE OCCUPATIONAL EXPOSURE LIMIT VALUES

| EINECS <sup>(1)</sup> | CAS <sup>(2)</sup> | NAME OF AGENT  | LIMIT VALUES             |                    |                           |                    | NOTATION <sup>(3)</sup> |
|-----------------------|--------------------|--|--------------------------|--------------------|---------------------------|--------------------|-------------------------|
|                       |                    |  | 8 hours <sup>(4)</sup>   |                    | Short term <sup>(5)</sup> |                    |                         |
|                       |                    |  | mg/m <sup>3</sup><br>(6) | ppm <sup>(7)</sup> | mg/m <sup>3</sup> (6)     | ppm <sup>(7)</sup> |                         |
| 200-193-3             | 54-11-5            | Nicotine   | 0.5                      | -                  | -                         | -                  | skin                    |
| 200-579-1             | 64-18-6            | Formic acid  | 9                        | 5                  | -                         | -                  | -                       |
| 200-659-6             | 67-56-1            | Methanol   | 260                      | 200                | -                         | -                  | skin                    |
| 200-830-5             | 75-00-3            | Chloroethane   | 268                      | 100                | -                         | -                  | -                       |
| 200-835-2             | 75-05-8            | Acetonitrile   | 70                       | 40                 | -                         | -                  | skin                    |
| 201-142-8             | 78-78-4            | Isopentane   | 3000                     | 1000               | -                         | -                  | -                       |
| 202-716-0             | 98-95-3            | Nitrobenzene   | 1                        | 0.2                | -                         | -                  | skin                    |
| 203-585-2             | 108-46-3           | Resorcinol   | 45                       | 10                 | -                         | -                  | skin                    |
| 203-625-9             | 108-88-3           | Toluene  | 192                      | 50                 | 384                       | 100                | skin                    |
| 203-628-5             | 108-90-7           | Monochlorobenzene  | 23                       | 5                  | 70                        | 15                 | -                       |
| 203-692-4             | 109-66-0           | Pentane  | 3000                     | 1000               | -                         | -                  | -                       |
| 203-716-3             | 109-89-7           | Diethylamine   | 15                       | 5                  | 30                        | 10                 | -                       |
| 203-777-6             | 110-54-3           | n-Hexane   | 72                       | 20                 | -                         | -                  | -                       |
| 203-806-2             | 110-82-7           | Cyclohexane  | 700                      | 200                | -                         | -                  | -                       |
| 203-815-1             | 110-91-8           | Morpholine   | 36                       | 10                 | 72                        | 20                 | -                       |
| 203-906-6             | 111-77-3           | 2-(2-Methoxyethoxy)ethanol   | 50.1                     | 10                 | -                         | -                  | skin                    |
| 203-961-6             | 112-34-5           | 2-(2-Butoxyethoxy)ethanol  | 67.5                     | 10                 | 101,2                     | 15                 | -                       |
| 204-696-9             | 124-38-9           | Carbon dioxide   | 9000                     | 5000               | -                         | -                  | -                       |
| 205-483-3             | 141-43-5           | 2-Aminoethanol   | 2.5                      | 1                  | 7.6                       | 3                  | skin                    |
| 205-634-3             | 144-62-7           | Oxalic acid  | 1                        | -                  | -                         | -                  | -                       |
| 206-992-3             | 420-04-2           | Cyanamide  | 1                        | 0.58               | -                         | -                  | skin                    |
| 207-343-7             | 463-82-1           | Neopentane   | 3000                     | 1000               | -                         | -                  | -                       |
| 215-236-1             | 1314-56-3          | Diphosphorus pentaoxide  | 1                        | -                  | -                         | -                  | -                       |
| 215-242-4             | 1314-80-3          | Diphosphorus pentasulphide   | 1                        | -                  | -                         | -                  | -                       |
| 231-131-3             |                    | Silver (soluble compounds as Ag)   | 0.01                     | -                  | -                         | -                  | -                       |
|                       |                    | Barium (soluble compounds as Ba)   | 0.5                      | -                  | -                         | -                  | -                       |
|                       |                    | Chromium Metal, Inorganic Chromium (II) Compounds and Inorganic Chromium (III) Compounds (insoluble) | 2                        | -                  | -                         | -                  | -                       |
| 231-714-2             | 7697-37-2          | Nitric acid  | -                        | -                  | 2.6                       | 1                  | -                       |
| 231-778-1             | 7726-95-6          | Bromine  | 0.7                      | 0.1                | -                         | -                  | -                       |
| 231-959-5             | 7782-50-5          | Chlorine   | -                        | -                  | 1.5                       | 0.5                | -                       |
| 232-260-8             | 7803-51-2          | Phosphine  | 0.14                     | 0.1                | 0.28                      | 0.2                | -                       |
|                       | 8003-34-7          | Pyrethrum (purified of sensitising lactones)   | 1                        | -                  | -                         | -                  | -                       |
| 233-060-3             | 10026-13-8         | Phosphorus pentachloride   | 1                        | -                  | -                         | -                  | -                       |

<sup>(1)</sup> EINECS: European Inventory of Existing Chemical Substances.

<sup>(2)</sup> CAS: Chemical Abstract Service Registry Number.

- (<sup>3</sup>) A skin notation assigned to the occupational exposure limit value indicates the possibility of significant uptake through the skin.
- (<sup>4</sup>) Measured or calculated in relation to a reference period of eight hours as a time-weighted average.
- (<sup>5</sup>) A limit value above which exposure should not occur and which is related to a 15-minute period unless otherwise specified.
- (<sup>6</sup>) mg/m<sup>3</sup>: milligrams per cubic metre of air at 20°C and 101.3 Kpa.
- (<sup>7</sup>) ppm: parts per million by volume in air (ml/m<sup>3</sup>).

**REGULATORY IMPACT ASSESSMENT - FINAL**

**REGULATORY IMPACT ASSESSMENT FOR IMPLEMENTING A EUROPEAN  
COMMISSION DIRECTIVE ESTABLISHING A SECOND LIST OF INDICATIVE  
OCCUPATIONAL EXPOSURE LIMIT VALUES (IOELVs) (2006/15/EC)  
FINAL**

**PURPOSE AND INTENDED EFFECT**

**Objective**

1. (i) To implement in Great Britain the 2<sup>nd</sup> Indicative Occupational Exposure Limit Values Directive (2<sup>nd</sup> IOELV Directive), a European Commission Directive under the Chemical Agents Directive (98/24/EC), and to therefore ensure that occupational exposure limit values are in place to protect workers from chemical risks.  
(ii) By the implementation of this Directive throughout the European Union, to take a practical step towards the achievement of the social dimension of the internal market.

**Background**

2. Implementation of the Directive will not require additional legislation, as the framework for setting occupational exposure limits already exists. The Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended) provide the legal framework for setting Workplace Exposure Limits (WELs). WELs are approved by the Health and Safety Commission (HSC) and are published by the Health and Safety Executive (HSE) in its publication "*EH40 Workplace Exposure Limits*".

3. A WEL is defined as the concentration of a hazardous substance in the air that people breathe, averaged over a specified reference period referred to as a time-weighted average (TWA). Two periods are used; long-term (8 hours) and short-term (15 minutes). When a WEL is assigned to a substance, this limit must not be exceeded.

4. The full extent of work-related health damage from hazardous substances is not known. However, a report published by the HSE<sup>9</sup> of a survey of households in England and Wales, carried out eleven years ago, reported that nearly one fifth of respondents indicated that their current job sometimes exposed them to breathing fumes, dusts or other harmful substances, or required them to handle or touch harmful substances or materials. According to that survey, the occupations where people are most likely to be exposed are hairdressing and beauty treatment, nursing, farming, fishing, forestry, metal processing, construction, security and protective services, electrical processing and science and engineering.

5. The 33 substances listed in the Annex to the Directive are too numerous for a full risk assessment to be developed that covers them all. However, the hazards to human health of each substance, and the level of exposure at which each could cause harm to health, have been examined by the European Commission's Scientific Committee on Occupational Exposure Limits (SCOEL), a body of experts from throughout the European Union, including from the UK.

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<sup>9</sup>Self-reported working conditions in 1995 - results from a household survey. J R Jones, J T Hodgson and J Osman.

6. The Indicative Occupational Exposure Limit Values proposed by SCOEL are health-based, and are set at a level at which no harmful effects would be predicted to occur to workers or their progeny as a result of repeated exposure throughout their working lifetime. On this basis, implementation of the limits can be deemed to have an advantageous effect on health.

7. Of the 33 substances considered in this Regulatory Impact Assessment, 14 have proposed occupational exposure limit values that are the same or higher than the existing Workplace Exposure Limit (WEL), and a further 3 are not deemed to be of concern, either because the limit change is so small as to be irrelevant in practice, or because there is no known use of the substance in the UK. A further 7 substances have no known UK manufacture. A further 3 substances are manufactured by one company only.

8. Annex 1 of this RIA lists 18 substances where there is a proposed change to the existing limit, with an indication of use patterns, and the control measures already in place. It has not, however, been possible to give a precise figure of those likely to be exposed to these substances at work in Great Britain.

#### Rationale for Government intervention

9. Now that the 2<sup>nd</sup> IOELV Directive has been adopted by the European Commission, the United Kingdom is required to implement it into domestic legislation, or risk infraction proceedings.

10. HSC/E has already established Occupational Exposure Limits (OELs) in Great Britain for the majority of substances covered by the Directive. These limits are workplace exposure limits (WELs), and form part of HSC/E's new OEL framework, which requires employers to ensure that any WEL is not exceeded and, for substances that can cause cancer or occupational asthma, to reduce exposure to a level as low as is reasonably practicable below the WEL. In addition, regardless of whether a WEL exists, employers must apply the eight principles of good practice, set out in Schedule 2A of the COSHH Regulations, in order to control exposure to substances hazardous to health.<sup>10</sup>

#### **CONSULTATION**

11. Representatives of both industry and the trades unions have been consulted about this Directive, most recently in June 2005 through the HSC's Advisory Committee on Toxic Substances (ACTS).

12. In November 2004, the HSE consulted known, interested Trade Associations, organisations representing small and medium-sized firms, and a number of companies known to use the substances in question. This was done using two questionnaires, one dealing with chlorine and the other dealing with 17 other substances. Information was sought on the size of the company responding, the uses of the substance and the likely costs of complying with the new limit value. Trade Associations and small firms organisations were requested to distribute the questionnaire to a selection of companies that they knew to be users of the substances. 14 chlorine questionnaires were distributed

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<sup>10</sup>For more information on the "Principles of Good Practice", see Annex 2.

and 11 replies were received. For the other questionnaire, 90 copies were distributed and 20 responses were received.

## **OPTIONS**

### Option 1: Do nothing

13. Non-implementation of the Directive would cause infraction proceedings from the European Union, which would lead to a fine. This is something that the Government would not want to occur, other than in extreme cases of national interest.

### Option 2: Implement the Directive

14. The United Kingdom is required under European law to implement this Commission Directive. In Great Britain we will do so by the HSC approving national occupational exposure limits, which are published in the HSE publication "*EH40 Workplace Exposure Limits*". Workplace Exposure Limits are set by the HSC on the advice of ACTS. Comparable implementation will take place in both Northern Ireland and Gibraltar.

15. The Directive requires Member States of the European Union to establish a national exposure limit value for any chemical agent for which an IOELV has been set at Community level, taking into account the Community limit value. Member States therefore have limited scope to establish a national limit that differs numerically from the IOELV. ACTS agreed the limits on which the HSC consulted.

## **COSTS AND BENEFITS**

16. Costs and benefits are calculated in 2004 prices over a 10-year period. The base year for appraisal is 2004. In arriving at 10-year cost figures, two assumptions are made. Firstly, earnings are assumed to rise by 1.8% a year in real terms, which is equal to the observed increase for the whole economy over the past 25 years or so. Secondly, costs are discounted to present value using the Treasury-recommended 3.5% discount rate.

### **Sectors and Groups Affected**

17. Because the RIA covers 33 different substances, a large number of business sectors are affected. Key uses of the substances where there is a planned change to the occupational exposure limit are in chemical, pesticide and pharmaceutical manufacture, rubber manufacturing and processing and the manufacture of paints, dyes and varnishes. The Directive has no direct effect on other types of organisation, or on the general public.

18. We do not believe that any of the proposals will have differential impacts on any particular group in terms of ethnicity, gender, disability or atypical work patterns.

## BENEFITS

### Health and safety benefits

19. It is expected that the implementation of IOELVs as WELs will have a positive impact on occupational ill-health. The effect will, however, be limited to substances without an existing exposure limit value<sup>11</sup> or where current exposure limits are above the levels set by the Directive. Many of the substances covered in the Directive have the potential to cause irritation and possible damage to the respiratory tract. Hence, implementation of the Directive may contribute to a reduction in respiratory ill-health as a result of reducing exposures to substances that can cause respiratory tract irritation and lung damage.

20. However, it is not possible to provide a quantification of these health benefits, because there is no information on the number of ill-health cases caused by current levels of occupational exposure to the substances concerned. It is therefore not possible to estimate the number of cases of ill-health that might be prevented due to implementation of the Directive.

21. Implementation of the Directive may also have some positive effect on the environment, but its effect cannot be quantified.

## COSTS

22. Of the 33 substances covered by this RIA, 14 have limit values that are the same or higher than the current WEL. For 12 of these substances, there will be no additional cost as a result of implementing the Directive (one substance attracts an additional "skin" notation only). The 14 substances are:

|  |                                  |
|--|----------------------------------|
| Acetonitrile   | n-Hexane                         |
| Barium (soluble compounds as Ba)   | Methanol                         |
| Carbon dioxide   | Monochlorobenzene                |
| Chloroethane   | Nicotine                         |
| Chromium metal, Inorganic Chromium (II) Compounds and Inorganic Chromium (III) compounds | Oxalic acid                      |
| Cyclohexane  | Resorcinol ("skin" notation)     |
| Formic acid  | Silver (soluble compounds as Ag) |

23. Three further substances are not deemed to be of concern to UK industry, either because they are not used in the UK, or because the change to the limit is so minimal as to have no appreciable effect. These are:

Bromine  
2-(2-Methoxyethoxy) ethanol (DEGME)  
Phosphine

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<sup>11</sup> The substances concerned are: 2(2-Butoxyethoxy) ethanol, 2-(2-Methoxyethoxy) ethanol and the three pentanes. See Annex 1 for more detail.

24. HSE has investigated the implementation costs of 17 substances covered in this Regulatory Impact Assessment. These are:

|                                    |                          |
|------------------------------------|--------------------------|
| 2-Aminoethanol                     | Neopentane               |
| 2-(2-Butoxyethoxy) ethanol (DEGBE) | Nitric acid              |
| Chlorine                           | Nitrobenzene             |
| Cyanamide                          | Pentane                  |
| Diethylamine                       | Phosphorus pentachloride |
| Diphosphorus pentasulphide         | Pyrethrum                |
| Diphosphorus pentoxide             | Resorcinol               |
| Isopentane                         | Toluene                  |
| Morpholine                         |                          |

Information on the use profile and the consequences of implementing the Directive for each of these substances is at Annex 1.

25. Investigations conducted by HSE in November 2004 concluded that implementation of the Directive is unlikely to create additional costs to industry for most of the substances covered. The major part of the costs will fall on manufacturers and users of chlorine gas.

26. It has not been possible to estimate the total cost to industry of familiarisation with the new or revised limits resulting from the Directive. Nevertheless, it is unlikely that any one firm would need to familiarise itself with more than one or two new limits. Consequently HSE expects these costs to be very low.

### **Chlorine**

27. The revised occupational exposure limit will affect the following sectors:

- chlorine manufacturers. There are three manufacturers of chlorine gas in the UK<sup>12</sup>;
- chemical manufacturing companies using chlorine
- suppliers of chlorine in compressed gas cylinders
- companies installing and maintaining chlorination equipment
- swimming pools using chlorine for disinfection
- water utilities.

28. HSE investigations revealed that the Directive would substantially affect only the water utility companies. No additional costs are anticipated for the five other sectors from the revised limit. There are, in Great Britain, nine major water companies and approximately 15 smaller companies<sup>13</sup>. These smaller companies are owned by, managed

<sup>12</sup> The smallest producer is due to cease production.

<sup>13</sup> The following analysis considers smaller companies as part of the main water companies. Cost estimates take into account this simplification.

by or administered by, one or other of the main utilities. They are not considered to be SMEs. Only one part of these companies will need to make substantial changes to its working procedures to comply with the Directive. Furthermore, these costs vary significantly from one firm to another. According to HSE's findings, certain water utility companies are already complying with the lower exposure limit.

29. The detailed information received on the number of firms in the water utility sector enabled HSE to estimate familiarisation costs for this sector. On the assumption that a manager costing £20 per hour<sup>14</sup> spends an average of 1 hour familiarising him/herself with the revised limit for chlorine, the cost of familiarisation within the water utility sector will lie between £180 and £480<sup>15</sup>.

### Assumptions<sup>16</sup>

- 30.
- 1) 60% of companies will incur costs to comply with the Directive.
  - 2) Only one third of those companies will incur recurring costs (20% of all firms).
  - 3) Average one-off cost £1,000,000.<sup>17</sup>
  - 4) Average recurring cost £265,000.
31. The following table gives a breakdown of the costs.

**Table 1: Chlorine compliance costs for a typical water company<sup>18</sup>**

| Measure                             | Extra initial capital cost | Annual cost     |
|-------------------------------------|----------------------------|-----------------|
| LEV (Low Exhaust Ventilation)       | £100,000                   | £40,000         |
| Atmospheric Scrubbers               | £500,000                   | £50,000         |
| Training/supervisor                 | £100,000                   | £75,000         |
| Atmospheric monitoring of gas areas | £300,000                   | £25,000         |
| Remote closure systems improvement  | £0                         | £25,000         |
| Renewal of consumables              | £0                         | £50,000         |
| <b>Total</b>                        | <b>£1,000,000</b>          | <b>£265,000</b> |

<sup>14</sup> Source: "Annual Survey of Hours and Earnings (ASHE)", Office of National Statistics, 2004

<sup>15</sup> The range allows for each sub-company to familiarise itself individually with the new limit.

<sup>16</sup> These assumptions are based on companies' replies to an HSE questionnaire sent out in 2004.

<sup>17</sup> This figure includes costs of changes to sub companies

<sup>18</sup> Source: HSE 2005.

32. Therefore, with the assumptions set out in paragraph 30, we arrive at the following estimates: first year cost: £5.4 million at 2004 prices<sup>19</sup>; ten-year present value cost of £9.8 million at 2004 prices<sup>20</sup>.

### **Other substances**

33. *2-(2-Butoxyethoxy) ethanol, Cyanamide*. A number of companies expressed concerns about the need to develop analytical methods for exposure measurements. Such methods are already available for each substance covered by the Directive (see paragraph 11 of the Consultative Document). This should not, therefore, create costs to industry.

34. *Pentanes*. A few companies within the construction sector estimated the need for a low capital investment to comply with the new pentane exposure limit values. The total capital cost was estimated at £4,000. This suggests that the impact of the Directive will not be significant with regard to these substances.

35. *Pyrethrum*. A body representing pyrethrum growers responded to HSE's questionnaire claiming that the inclusion of pyrethrum within the Directive would lead to its cessation of use by pesticide manufacturers with serious knock-on effects for the growers, who are based mostly in East Africa. Nevertheless, an individual company known to process pyrethrum, and which HSE contacted, did not respond to the questionnaire.

### **Compliance costs to business**

#### **36. (i) One-off costs**

**Table 2: One-off costs incurred by industry**

| <b>Substance</b>                | <b>Industries affected</b> | <b>One-off costs £m, 2004prices</b> |
|---------------------------------|----------------------------|-------------------------------------|
| Pentane, Isopentane, Neopentane | Construction               | 0.004                               |
| Chlorine                        | Water utility companies    | £5.4                                |
| TOTAL                           |                            | £5.4                                |

#### **37. (ii) Recurring costs**

Total recurring costs to society are equal to the Water Utility sector recurring compliance costs for chlorine. Total recurring costs are then:

- First year: £265,000
- Ten year present value £4.4 million

#### **38. Total compliance costs**

<sup>19</sup> £5.4 million = £1 million capital costs x 9 water utility firms x 60% (proportion) of firms incurring costs.

<sup>20</sup> £9.8 million = £5.4 million + SUM (from year 1 to year 10) 9 firms x (60% x 33%) (20% proportion of firms having recurring costs) x £0.265 million adjusted to present value.

**Table 3: Total costs to industry**

|  | <b>Substance</b>                | <b>One-off costs, £m, 2004/05 prices</b> | <b>Recurring costs (over ten years) £m, 2004/05 prices</b> | <b>Annualised recurring costs, £m, 2004/05 prices</b> |
|--|---------------------------------|--|--|---|
| Implementation costs (familiarisation) | Chlorine                        | Not significant                          | £0   | £0  |
| Policy costs                           | Chlorine                        | £5                                       | £4.4   | £0.48   |
|  | Pentane, Isopentane, Neopentane | £0.004                                   | £0   | £0  |
|  | <b>TOTAL</b>                    | <b>£5.4</b>                              | <b>£4.4</b>  | <b>£0.48</b>  |

### **Costs to HSE**

39. There are not expected to be significant additional costs to HSE.

### **Total costs to society**

40. Total costs to society are equal to compliance costs of the Directive. Over 10 years, costs to society are £9.8 million in present value terms.

### **SMALL FIRMS IMPACT TEST**

41. When carrying out its evaluation of the likely cost of the Directive, HSE:
- contacted all trade associations known or thought to be associated with the substances in question and asked them to distribute the costs questionnaire to a broad range of their member companies, both large and small;
  - wrote individually to a further 19 companies known to manufacture one or more of the substances, asking them to complete the costs questionnaire;
  - wrote to organisations representing small firms, such as the Federation of Small Businesses and the Institute of Directors, requesting their input;
  - contacted an additional 7 user companies were contacted direct, in respect of chlorine, in addition to the questionnaire being sent to relevant trade associations and local authorities.

42. A quarter of the firms who responded to HSE's questionnaire had less than 50 employees, and none of these anticipated any additional costs in complying with the limit changes in the Directive. HSE therefore believes that the Directive will not have a disproportionate effect on small companies.

### **COMPETITION ASSESSMENT**

43. The Directive will affect many, diverse industrial sectors. Measuring the potential impact on competition in the numerous affected markets is difficult. In these circumstances, the Office of Fair Trading recommends to select markets with a high

degree of supplier concentration, as adverse competition impacts are more likely to occur in such markets. In this case, the water utility industry is identified as a key sector.

44. There are, in Great Britain, 9 main water companies and approximately 15 smaller companies. Some of the smaller companies are owned by, managed by, under contract to or administered by, one or other of the main utilities.

45. The Directive will affect the market by lowering the short-term exposure limit for chlorine from 1 ppm to 0.5 ppm. This measure is likely to affect some water utility firms more than others. According to HSE investigations, some firms would incur substantial costs to comply with an occupational exposure limit of 0.5 ppm, while others already comply with the Directive. This may lead to a change in the existing market structure. Implementation of the Directive would not, however, have any differential impact on existing water utility companies compared to potential new entrants.

46. Production processes have been changing in recent years. The use of chlorine gas is declining within the industry, particularly in favour of SO<sub>2</sub> and hypochlorite. The Directive may accelerate this changing process. Finally, the Directive would not impose minimum requirements, thus not limiting firms' choices on the market.

### **ENFORCEMENT, SANCTIONS AND MONITORING**

47. Compliance with this Directive will be through the enforcing authorities of the Health and Safety at Work etc. Act 1974. The enforcement of health and safety law is informed by the principles of *proportionality*, in applying the law and securing compliance, *consistency* of approach, *targeting* of enforcement action and *transparency* about how the regulator operates and what those regulated may expect.

### **ARRANGEMENTS FOR MONITORING AND EVALUATION**

48. No formal evaluation of the effects of the imposition of the new limits is planned. However, the new limits will be implemented through the new OEL framework. This forms part of HSE's Disease Reduction Programme, which places more emphasis on activities that will have a direct impact on the workplace. The evaluation of some new limits will form part of the evaluation of the impact of key projects on skin and respiratory disease under the Disease Reduction Programme.

### **RESULTS OF CONSULTATION**

49. A wide public consultation was conducted between July and September 2006 on the proposals for implementation of the Directive. Almost all those who commented during the 12-week consultation exercise were in favour of the HSC's proposals. Minor points of detail were raised by two consultees, and these will be taken into consideration before the HSC is asked to approve the new and revised WELs. A list of Government Departments and Agencies consulted is attached at Annex 3.

### **IMPLEMENTATION AND DELIVERY PLAN**

50. Implementation of the Directive will be achieved by the publication of the new and revised WELs on the HSE website on the Common Commencement Date of 6 April 2007.

They will then formally come into force on 1 September 2007, as required by the Directive. Additionally HSE intends to publish an Amendment Sheet to the Guidance Document EH40 2005 Workplace Exposure Limits with the new and revised entries, which will be sent to previous purchasers of the document and which will be included in unsold copies remaining in stock. The changes will be publicised by means of a Press Release.

## **POST-IMPLEMENTATION REVIEW**

51. Any review of the new and revised limits post-implementation, would only be carried out in conjunction with a similar review undertaken by the European Commission. The United Kingdom would not seek unilaterally to review and potentially amend the limits.

## **SUMMARY AND RECOMMENDATION**

### **Balance of costs and benefits**

52. Exposure to the chemical substances, for which the Directive sets IOELVs, can result in adverse health effects. Limiting exposure to the substances is therefore necessary to protect human health. However, the UK currently has regulations which place a limit on the level of permitted exposure and HSE considers that the lower limits set by the Directive are not expected to offer any additional quantifiable benefits. Over a ten-year period, total costs are estimated to be around £9.8 million in present value terms (2004 prices). It is worth noting that the costs in this RIA are subject to the uncertainties set out in the following section.

### **Uncertainties**

53. The total costs of compliance are based on best estimates of the main uses of the substances, the number of firms affected and the number of people affected.

### **Contact point**

Richard Pedersen, International Chemicals Unit, Disease Reduction Division, Health and Safety Executive, Rose Court, 2 Southwark Bridge, London SE1 9HS  
Telephone: 020 7717 6216

**Information on Individual Substances**

**1) 2-Aminoethanol**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 2.5 mg.m <sup>-3</sup> /1 ppm (8-hour TWA)<br>7.6 mg.m <sup>-3</sup> / 3 ppm (STEL)<br>Skin notation |
| Current GB limit                | 7.6 mg.m <sup>-3</sup> / 3 ppm (8-hour TWA)<br>15 mg.m <sup>-3</sup> / 6 ppm (STEL)                  |

***IDENTITY AND PROPERTIES***

CAS No: 141-43-5

EC No: 205-483-3

Empirical formula: NH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>OH

Synonyms: Ethanolamine, monoethanolamine

Molecular Weight: 61.08

Conversion factor: (20°C, 101 kPa): 2.54 mg.m<sup>-3</sup> = 1ppm

2-Aminoethanol is classified in the Approved Supply List (ASL) under the CHIP 2002 Regulations as acutely harmful by inhalation and irritant, and is assigned the risk (R) phrases *R20* and *R36/37/38*. Consultation has recently concluded on amendments to the ASL under which this will change to harmful by all routes of exposure and corrosive, with the R phrases *R20/21/22* and *R34*.

***OCCURRENCE AND USE***

2-Aminoethanol is a colourless liquid, with an ammoniacal odour. It has a melting-point of 10.5°C, a boiling point of 170°C and a vapour pressure of 0.05 kPa at 20°C. It has a vapour density of 2.1 times that of air and is explosive in the range of 2.5 to 17% in air. The odour threshold is 2 to 3 ppm (5 to 8 mg.m<sup>-3</sup>).

2-Aminoethanol is widely used in industry, including production of detergents and soaps, synthesis of dyestuffs, rubber vulcanisation and the removal of acidic gases from atmospheres, such as carbon dioxide from submarines. Use of the substance is believed to be diminishing. One cosmetics manufacturing company uses small amounts of 2-aminoethanol with good controls in place and very few people exposed.

There is no longer any UK manufacture of this substance.

***EFFECT OF DIRECTIVE***

The 8-hour TWA limit will be reduced by a factor of 3. The STEL will be halved. There will be an additional "skin" notation.

## **2) 2-(2-Butoxyethoxy) ethanol**

|                                 |   |
|---------------------------------|---|
| Limit proposed in the Directive | 67.5 mg.m <sup>-3</sup> /10ppm (8-hour TWA)<br>101.2 mg.m <sup>-3</sup> / 15 ppm (STEL) |
| Current GB limit                | None  |

### ***IDENTITY AND PROPERTIES***

CAS No: 112-34-5

EC No: 203-961-6

Empirical formula: C<sub>8</sub>H<sub>18</sub>O<sub>3</sub>

Synonyms: DEGBE, diethylene glycol butyl ether, butyl diglycol

Molecular Weight: 162.23

Conversion factor: (20°C, 101 kPa): 6.75 mg.m<sup>-3</sup> = 1ppm

2-(2-Butoxyethoxy) ethanol is classified in the Approved Supply List under the CHIP 2002 regulations as irritating to eyes, and is assigned the risk (R) phrase R36.

### ***OCCURRENCE AND USE***

2-(2-Butoxyethoxy) ethanol (DEGBE) is a liquid. It is miscible with water (log Pow = 0.56). Mpt is -68°C, bpt 228-234°C at 1013 hPa, vapour pressure 0.027 hPa at 20°C.

DEGBE is used as a solvent in paints, dyes, inks, detergents and cleaners. It is also used as intermediate, as component of fire extinguisher foam and of hydraulic fluids. Two-thirds of the total tonnage of DEGBE is used in a range of formulated detergents, hard surface cleaners and metal cleaners used by professional trades and members of the public. The second largest usage of DEGBE is as a solvent in surface coatings.

There is one known UK manufacturer of DEGBE.

### ***EFFECT OF DIRECTIVE***

New limits (both 8-hour TWA and STEL) will be introduced where none so far exist.

### **3) Chlorine**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 1.5 mg.m <sup>-3</sup> / 0.5 ppm (STEL)  |
| Current GB limit                | 1.5 mg.m <sup>-3</sup> / 0.5 ppm (8-hour TWA)<br>2.9 mg.m <sup>-3</sup> / 1 ppm (STEL) |

#### ***IDENTITY AND PROPERTIES***

CAS No: 7782-50-5

EC No: 231-959-5

Empirical formula: Cl<sub>2</sub>

Conversion factor: 1 ppm = 2.9 mg.m<sup>-3</sup> at 25° C

Chlorine is classified in the Approved Supply List under the CHIP 2002 regulations as toxic by inhalation, irritating to eyes, respiratory system and skin, and very toxic to aquatic organisms, and is assigned the risk (R) phrases R23, R36/37/38, R50.

#### ***OCCURRENCE AND USE***

Chlorine is a major tonnage chemical produced by the electrolysis of brine, and is used widely in the manufacture of plastics, agrochemicals, pharmaceuticals, flame retardants, bromine and titanium oxide and as a disinfectant. It is also released when using sodium hypochlorite solution for bleaching, water treatment and disinfection. Workers are exposed to chlorine during manufacture, in its use as a chemical intermediate, and its use as a disinfectant in water treatment systems.

The largest manufacturer of chlorine in Great Britain produces approximately 600,000 tonnes per annum, of which 70-80% is consumed on-site for the manufacture of other chemicals such as ethylene dichloride and sodium hypochlorite. The other manufacturer produces around 100,000 tonnes per annum of which 60% is used on-site for the manufacture of hydrochloric acid, hypochlorite and ferric chloride. Controls in chemical manufacturing using chlorine are believed to be more than adequate to ensure that exposures, if any, are below proposed limits. Full facepiece air-fed or filtered canister RPE is used for potential exposure from uncoupling during off-loading bulk chlorine deliveries to site storage, which is the most likely source of exposure.

There are believed to be 4 GB-based companies who install and maintain chlorination equipment. They usually supply equipment to water utilities, larger swimming pools and other chlorine gas users. Exposure only occurs if there are leaks. The areas where chlorination equipment is located often have chlorine detectors as standard, and where this is not the case, air-fed RPE is worn during those parts of the set-up and testing and maintenance of the installation when a possibility of exposure exists.

Chlorine gas is still used in some municipal or large, privately-owned swimming pools as a direct means of disinfection. Direct chlorination has largely been superseded by the use of hypochlorite tablets and solutions.

There are believed to be two GB companies supplying chlorine as a compressed gas in cylinders obtained from chlorine manufacturers. Empty cylinders are subsequently returned for re-filling and, once filled, transported back to the supplier. Exposure is only possible if there is accidental release.

There are nine main water companies and approximately 15 smaller companies in GB, some of these being owned or managed under contract or administered by one or other of the main Utilities. Virtually all water

companies use chlorine as the primary disinfection agent, as it is generally the most economic option. This is despite the additional control measures that need to be taken to ensure it is managed properly and safely. The number of people potentially exposed is declining as companies prefer to use specialist trained staff to manage the use of chlorine and other systems, rather than use generalist employees for whom changing gas cylinders etc. would only be part of their duty. Air-fed RPE is worn as standard when changing cylinders.

#### **EFFECT OF DIRECTIVE**

There will be a reduction of the STEL by one half. It is planned to additionally remove the current British 8-hour TWA limit, as it will cease to be relevant.

#### **4) Cyanamide**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 0.58 ppm/ 1 mg.m <sup>-3</sup> (8-hour TWA)<br>Sk notation |
| Current GB limit                | 2 mg.m <sup>-3</sup> (8-hour TWA)                          |

#### ***IDENTITY AND PROPERTIES***

CAS No: 420-04-2

EC No: 206-992-3

Empirical formula: CH<sub>2</sub>N<sub>2</sub> H<sub>2</sub>N-C≡N

Synonyms: Amidocyanogen, Carbimide, Carbamonitrile, Cyanoamine, N-cyanoamine, Cyanogenamide

Molecular Weight: 42.04

Conversion factor: (20°C, 101 kPa): 1 mg.m<sup>-3</sup> = 0.58 ppm; 1 ppm = 1.72 mg.m<sup>-3</sup>

Cyanamide is classified in the Approved Supply List under the CHIP 2002 regulations as toxic by ingestion, harmful in contact with skin, irritating to eyes and skin, and a skin sensitiser, and is assigned the risk (R) phrases: *R21, R25, R36/38, R43.*

#### ***OCCURRENCE AND USE***

At room temperature, cyanamide is a crystalline solid but is deliquescent and combustible. It is often stored as a 25 % liquid solution but can, by the evaporation of aqueous solutions to dryness, undergo explosive polymerisation. It is soluble in water (78g/100ml), alcohols, ethers, ketones, but is less soluble in benzene and halogenated hydrocarbons. Decomposition, which begins at 122°C, produces dicyandiamide (via dimerisation), hydrogen cyanide, oxides of nitrogen and carbon monoxide.

Cyanamide is used in chemical syntheses including as an intermediate for dicyandiamide in melamine production, as a fumigant, in metal cleaning and refining of ores and the production of synthetic rubber. Cyanamide and its calcium salt has been used as a therapeutic agent for its "Antabuse-like " effect in the treatment of alcoholics. It is not known which of these uses occur in the UK. There is no known UK manufacture of cyanamide.

#### ***EFFECT OF DIRECTIVE***

The 8-hour TWA limit will be halved. There will be an additional "Skin" notation.

## 5) Diethylamine

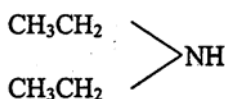
|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 15 mg.m <sup>-3</sup> / 5 ppm (8-hour TWA)<br>30 mg.m <sup>-3</sup> / 10 ppm (STEL)  |
| Current GB limit                | 30 mg.m <sup>-3</sup> / 10 ppm (8-hour TWA)<br>76 mg.m <sup>-3</sup> / 25 ppm (STEL) |

### *IDENTITY AND PROPERTIES*

CAS No: 109-89-7

EC No: 203-716-3

Empirical formula:



Synonyms: DEA, Diethamine, N-Ethylethanamine, N,N-Diethylamine, Ethanamine, Amin, diethyl-

Conversion factor: 1 ppm=3.04 mg.m<sup>-3</sup>, 1 mg.m<sup>-3</sup>=0.334 ppm

Diethylamine is classified in the Approved Supply List under the CHIP 2002 regulations as highly flammable, harmful by inhalation, contact with skin and ingestion, and corrosive, and is assigned the risk (R) phrases R11, R20/21/22, R35.

### **OCCURRENCE, PRODUCTION AND USE**

Diethylamine (DEA) is an alkaline, colourless, volatile liquid with a strong ammoniacal odour. The human olfactory threshold for diethylamine is 0.14 ppm (0.42 mg.m<sup>-3</sup>), it is miscible in water and many organic solvents.

Diethylamine is used in the production of the corrosion inhibitor N, Ndiethylethanolamine (DEAF), and in the production of some pesticides and insect repellents, pharmaceuticals (eg. the alcohol antagonist disulfiram ANTABUS®, flurazepam, lidocaine) and rubber processing chemicals. Diethylamine is also used in the paint, lacquer, and varnish industries. Workers who handle with triethylamine, a volatile amine used as a catalyst, are indirectly exposed to diethylamine, since it has been shown that triethylamine is metabolized to form diethylamine in humans (Akesson et al., 1989).

There is no UK manufacture of diethylamine. When used in the manufacture of acrylates at one known plant, only small amounts are used in fume cupboards or with the use of air-fed hoods in sealed vessels. Exposure is not therefore considered to be a problem.

### **EFFECT OF DIRECTIVE**

The 8-hour TWA limit will be halved. The STEL will be reduced by slightly more than half.

## **6) Diphosphorus pentasulphide**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 1 mg.m <sup>-3</sup> (8-hour TWA)<br>(No STEL)                   |
| Current GB limit                | 1 mg.m <sup>-3</sup> (8-hour TWA)<br>3 mg.m <sup>-3</sup> (STEL) |
| HSE recommendation              | 2 mg.m <sup>-3</sup> (STEL)                                      |

### ***IDENTITY AND PROPERTIES***

CAS No: 1314-80-3

EC No: 215-242-1

Empirical formula: P<sub>4</sub>S<sub>10</sub>

Synonyms: Phosphorus pentasulphide, phosphorus sulphide, thiophosphoric anhydride, phosphoric sulphide, phosphorus persulphide, sulphur phosphide, phosphorus (v) sulphide, tetraphosphorus decasulphide.

Molecular Weight: 444.54

Conversion factor:

Diphosphorus pentasulphide is classified in the Approved Supply List under the CHIP 2002 regulations as highly flammable, harmful by inhalation and ingestion, and very toxic to aquatic organisms, and is assigned the risk (R) phrases *R11*, *R20/22*, *R29*, *R50*.

### ***OCCURRENCE AND USE***

Diphosphorus pentasulphide is a yellow to green flammable, hygroscopic crystal. It is prepared by reaction of phosphorus with sulphur.

It is a starting material to produce a large number of compounds including lube-oil additives (mainly zinc dialkyldithiophosphates), rubber additives, insecticides and flotation agents.

There is no UK manufacture or large-scale use of diphosphorus pentasulphide. Only small-scale R&D use is known to occur in the UK.

### ***EFFECT OF DIRECTIVE***

None. However, HSE wishes to reduce the existing STEL by one third to comply with a recommendation by WATCH. All the phosphorus-containing compounds are then subject to the same limit.

## **7) Diphosphorus pentoxide**

Limit proposed in the Directive

1 mg.m<sup>-3</sup> (8-hour TWA)

Current GB limit

2 mg.m<sup>-3</sup> (STEL)

### ***IDENTITY AND PROPERTIES***

CAS No: 1314-56-3

EC No: 215-236-1

Empirical formula: P<sub>2</sub>O<sub>2</sub> (P<sub>4</sub>O<sub>10</sub>)

Synonyms: Diphosphorus pentoxide, phosphorus (V) oxide, phosphorus pentoxide

Diphosphorus pentoxide is classified in the Approved Supply List under the CHIP 2002 regulations as corrosive, and assigned the risk (R) phrase *R35*.

### ***OCCURRENCE AND USE***

Diphosphorus pentoxide is a white polymorphic solid which decomposes in water to form orthophosphoric acid. It is manufactured by burning elemental phosphorus in excess dry air at 200°C and it is used extensively as a dehydrating agent and in the manufacture of other phosphoric compounds. Workplace exposures are likely to be minimal due to containment of the process during manufacture and use. The principal risk of exposure is from inhalation of aerosol and from splashes and spillages. Exposure data are limited.

There is no known UK manufacture of diphosphorus pentoxide. HSE's discussions with user firms have revealed no concerns over the new 8-hour TWA limit because of the existing controls that are already in place.

### ***EFFECT OF DIRECTIVE***

There will be an 8-hour TWA limit where one does not exist at the moment. The existing STEL will remain unchanged.

## **8) Morpholine**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 36 mg.m <sup>-3</sup> / 10 ppm (8-hour TWA)<br>72 mg.m <sup>-3</sup> / 20 ppm (STEL)                   |
| Current GB limit                | 72 mg.m <sup>-3</sup> / 20 ppm (8-hour TWA)<br>109 mg.m <sup>-3</sup> / 30 ppm (STEL)<br>Skin notation |

### **IDENTITY AND PROPERTIES**

CAS No: 110-91-8

EC No: 203-815-1

Empirical formula: C<sub>4</sub>H<sub>9</sub>NO

Synonyms: 1-oxa-4-azacyclohexane; tetra-2H-1,4-oxazine; diethylene oximide; diethyleneimide oxide.

Molecular Weight: 87.12

Conversion factor: (20°C, 101.3 kPa) 3.62 mg/m<sup>3</sup> = 1 ppm.

Morpholine is classified in the Approved Supply List under the CHIP 2002 regulations as flammable, harmful by inhalation, skin contact and ingestion, and corrosive, and is assigned the risk (R) phrases *R10*, *R20/21/22*, *R34*.

### **OCCURRENCE AND USE**

Morpholine is a colourless, oily, hygroscopic, volatile liquid with a characteristic amine ('fishy') smell. The human olfactory threshold for morpholine is 0.036 mg.m<sup>-3</sup>. It is completely miscible with water, as well as with many organic solvents, but has limited solubility in alkaline aqueous solutions. Morpholine is a strong base, the 0.01% (w/w) mixtures having a pH of 9.4, and the 10% (w/w) mixtures having a pH of 11.2. It has an MPt of -3.1°C (-3.1 to -5), a BPt of 128.9°C (128-130) and a vapour pressure of 1.1 kPa at 20°C. The saturated vapour concentration is 38,000 mg/m<sup>3</sup> (20°C).

N-nitrosomorpholine (NMOR) can be formed by reaction of aqueous solutions of nitrite with morpholine or by reaction of gaseous nitrogen oxides in aqueous solutions of morpholine.

Morpholine is an extremely versatile chemical. It is most used as a chemical intermediary in the rubber industry, in corrosion control, and in the synthesis of a large number of drugs, crop protection agents, dyes and optical brighteners. It is also a solvent for a large variety of organic materials, including resins, dyes and waxes. UK use is thought to be limited to detergent manufacture and tyre manufacture and additionally as a corrosion inhibitor and for medical purposes. There is one known UK manufacturer of morpholine, making around 5,000 tonnes each year.

### **EFFECT OF DIRECTIVE**

The existing 8-hour TWA limit will be halved. The existing STEL will be reduced by one third. The skin notation will be retained.

## **9) Nitric Acid**

|                                 |   |
|---------------------------------|---|
| Limit proposed in the Directive | 2.6 mg.m <sup>-3</sup> /1 ppm (STEL)  |
| Current GB limit                | 5.2 mg.m <sup>-3</sup> / 2 ppm (8-hour TWA)<br>10 mg.m <sup>-3</sup> / 4 ppm (STEL) |

### **IDENTITY AND PROPERTIES**

CAS No: 7697-37-2

EC No: 231-714-2

Empirical formula: HNO<sub>3</sub>

Synonyms: Hydrogen nitrate, nitrous fumes, nitryl hydroxide, aqua fortis

Molecular Weight: 63.01

Conversion factor: (20°C, 101 kPa): 2.62 mg.m<sup>-3</sup> = 1 ppm

Nitric acid is classified in the Approved Supply List under the CHIP 2002 regulations as oxidising and corrosive, and is assigned the risk (R) phrases *R8*, *R35*.

### **OCCURRENCE AND USE**

Nitric acid is a clear colourless or yellowish liquid with a characteristic choking odour. It has a MPt of -41.6°C, a BPt of 83°C and a vapour pressure of 6.2 kPa at 20°C. The vapour density is 2.2 that of air. The odour threshold is in the region of 0.3-1 ppm (0.75-2.5 mg.m<sup>-3</sup>). In moist air it forms a white fume, containing 0.1- 0.4 % NO<sub>2</sub>, and when heated or in the presence of light it readily decomposes to red fuming nitric acid, containing 8-17 % NO<sub>2</sub>.

Nitric acid is formed as a reaction product of water and nitrogen dioxide from various natural sources and ambient air. Nitric acid is a major industrial acid. It is used in the manufacture of fertilisers and in etching, dipping, plating and engraving processes. Exposure to nitric acid also occurs indirectly by exposure to nitrogen dioxide, a major air pollutant, which is converted to nitric acid in the aqueous environment of the upper respiratory tract. The production rate in the EU is in excess of 10,000 tonnes per annum.

### **EFFECT OF DIRECTIVE**

The existing STEL will be reduced by a factor of 4. HSE plans, additionally, to remove the existing 8-hour TWA limit, as it will be higher than the new STEL.

## **10) Nitrobenzene**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 1 mg.m <sup>-3</sup> / 0.2 ppm (8-hour TWA)<br>Skin notation   |
| Current GB limit                | 5.1 mg.m <sup>-3</sup> / 1 ppm (8-hour TWA)<br>10 mg.m <sup>-3</sup> / 2 ppm (STEL)<br>Skin notation |

### ***IDENTITY AND PROPERTIES***

CAS No: 98-95-3

EC No: 202-716-0

Empirical formula: C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub>

Molecular Weight: 123.11

Nitrobenzene is classified in the Approved Supply List under the CHIP 2002 regulations as a Category 3 carcinogen and reprotoxin, acutely toxic by inhalation, skin contact and ingestion, toxic by prolonged exposure by inhalation and skin contact and toxic to aquatic organisms. Nitrobenzene is assigned the risk (R) phrases *R40, R62, R23/24/25, R48/23/24, R51, R53*.

### ***OCCURRENCE AND USE***

Nitrobenzene is used industrially as an intermediate in the production of aniline and aniline-derived products. Potential for human exposure is principally via inhalation and dermal uptake (Piotrowski 1967, Dorigan and Hushon 1976).

There is one known UK manufacturer of nitrobenzene, all of which is then used to make aniline. All exposures here are well below the current GB limit. Another company is known to import nitrobenzene for conversion to p-amino phenol, and again, exposures are normally well below the existing GB limit.

### ***EFFECT OF DIRECTIVE***

Reduction of the 8-hour TWA limit by a factor of 5. It is additionally planned to withdraw the existing British STEL.

### **11/12/13) Pentane, Isopentane and Neopentane**

Limit proposed in the Directive 3000 mg.m<sup>-3</sup>/ 1000 ppm (8-hour TWA)

Current UK limit 1800 mg.m<sup>-3</sup>/ 600 ppm (8-hour TWA)  
(non-statutory)

#### ***IDENTITY AND PROPERTIES***

CAS No: Pentane: 109-66-0

Isopentane: 78-78-4

Neopentane: 463-82-1

EC No: Pentane: 203-692-4

Isopentane: 201-142-8

Neopentane: 207-343-7

Empirical formula: Pentane: CH<sub>3</sub>-(CH<sub>2</sub>)<sub>3</sub>-CH<sub>3</sub>

Isopentane: (CH<sub>3</sub>)<sub>2</sub>-CH-CH<sub>2</sub>-CH<sub>3</sub>

Neopentane: C(CH<sub>3</sub>)<sub>4</sub>

Synonyms: Pentane: n-pentane

Isopentane: 2-methylbutane

Neopentane: 2,2-dimethylpropane

Molecular Weight: 72.15

Conversion factor: (20°C, 101 kPa): 3.00 mg.m<sup>-3</sup> = 1 ppm

Pentane and isopentane and neopentane are classified in the Approved Supply List under the CHIP 2002 regulations as extremely flammable, and toxic to aquatic organisms, and are assigned the risk (R) phrases *R12, R51/53*.

Pentane and isopentane are additionally classified in the Approved Supply List under the CHIP 2002 regulations as harmful to the lungs if swallowed, and as causative agents of skin dryness, drowsiness and dizziness. They are assigned the additional risk (R) phrases *R65, R66, R67*.

## **OCCURRENCE AND USE**

Pentane is a colourless liquid at room temperature, with an odour similar to that of petrol. It has a MPt of -129.7°C, a BPt of 36.1°C and a vapour pressure of 68.3 kPa at 25°C. The vapour density is 2.49 times that of air and it is explosive in the range 1.42 to 7.8% in air.

Isopentane is also a colourless liquid at room temperature. It has a MPt of -19.8°C, a BPt of 27.9°C and a vapour pressure of 91.7 kPa at 25°C. The vapour density is 2.49 times that of air and it is explosive in the range 1.32 to 8.3% in air.

Neopentane is gaseous at room temperature. It has a BPt of 95°C and a vapour pressure of 171 kPa at 25°C. The vapour density is 2.49 times that of air and it is explosive in the range 1.4 to 8.3% in air.

Pentane and its isomers are components of gasolines and different volatile fractions of petroleum distillation. They are used in many synthetic processes, including the manufacture of intermediate products, blowing agents and propellants, in polymerisation reactions and as extraction solvents. The most important application is in the production of petrol.

Data for production and use in the EU are not available. As commercial products, pentane and isopentane both exist as mixtures of saturated hydrocarbons with 5, 6 and 7 carbon atoms. They may be obtained as laboratory reagents with purity exceeding 99%.

Exposure levels to all pentanes are controlled to well below the proposed IOELV for reasons of flammability.

## **EFFECT OF DIRECTIVE**

In order to comply with the Directive, specific OELs are required. Currently there are no formal OELs in place for these three pentane isomers. However, these isomers fall into one of the generic groups for which the Advisory Committee on Toxic Substances (ACTS) has recommended guidance values for use in the UK Reciprocal Calculation Procedure (RCP). Although it would be feasible to adopt the IOELV set at 1000 ppm, HSE has decided that a better option is to consult on adoption of the guidance values for these three isomers as formal limits. Guidance values for the remaining substances that fall into the generic groups for the purposes of the RCP will remain guidance values and will not become formal limits. This approach would follow the generic approach previously endorsed by ACTS and should not pose any problems of reasonable practicability.

#### **14) Phosphorus pentachloride**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 1 mg.m <sup>-3</sup> (8-hour TWA)<br>(No STEL)             |
| Current GB limit                | 0.87 mg.m <sup>-3</sup> /0.1 ppm (8-hour TWA)<br>(No STEL) |
| WATCH recommendation            | 2 mg.m <sup>-3</sup> (STEL)                                |

#### ***IDENTITY AND PROPERTIES***

CAS No: 10026-13-8

EC No: 233-060-3

Empirical formula: PCl<sub>5</sub>

Synonyms: Phosphorus perchloride, phosphorus (v) chloride, pentachlorophosphorane, phosphoric chloride

Molecular Weight: 208.24

Phosphorus pentachloride is classified in the Approved Supply List under the CHIP 2002 regulations as very toxic by inhalation, acutely harmful by inhalation, harmful by prolonged exposure through inhalation, and corrosive. It is assigned the risk (R) phrases: *R14, R22, R26, R29, R34 and R48/20*.

#### ***OCCURRENCE AND USE***

Phosphorus pentachloride is a pale yellow solid that fumes in moist air. It is prepared by direct union of phosphorus with excess chlorine.

Phosphorus pentachloride is used as a chlorinating agent and dehydrating agent for the synthesis of a variety of inorganic and organic phosphorus derivatives, used as pesticides, water treatment chemicals, flame retardants, phosphite antioxidants, plasticisers and stabilisers for plastic and elastomers, lube oil and paint additives. It is used to improve grain structure in metal casting.

There is no UK manufacture or large-scale use of phosphorus pentachloride. Only small-scale R&D use is known to occur in the UK.

#### ***EFFECT OF DIRECTIVE***

None. However, HSE wishes introduce a STEL set at 2mg.m<sup>-3</sup> to comply with a recommendation by WATCH. For reasons of consistency, HSE believes that it is appropriate for the STEL for this substance to be the same as those for the other phosphorus-containing compounds.

## **15) Pyrethrum (purified of sensitising lactones)**

Limit proposed in the Directive 1 mg.m<sup>-3</sup> (8-hour TWA)  
(No STEL)

Current GB limit 5 mg.m<sup>-3</sup> (8-hour TWA)  
10 mg.m<sup>-3</sup> (STEL)

### ***IDENTITY AND PROPERTIES***

CAS No: 8003-34-7

EC No: 232-319-8

Synonyms: Dalmatian insect flowers; pyrethrins; pyrenone.

The term "pyrethrum" identifies a natural insecticide produced by certain species of the chrysanthemum plant. Pyrethrum contains a variable mixture of pyrethrins, mainly cinerin I and II, jasmolin I and II, and pyrethrin I and II. Usually, pyrethrins account for around 25% of the mixture, with smaller amounts of the related cinerin and jasmolin.

Molecular Weight: 328.4

Conversion factor: (for pyrethrin I) 1 mg.m<sup>-3</sup> = 0.074 ppm; 1 ppm = 13.51 mg.m<sup>-3</sup>

Pyrethrum itself does not appear in the Approved Supply List under the CHIP 2002 regulations, although several of its components including Pyrethrin I and II and Cinerin I and II are listed. Pyrethrin I and II are classified as harmful by inhalation, skin contact and ingestion and are assigned the risk (R) phrases R20/21/22, R50/53. Cinerin I and II are harmful by ingestion.

### ***OCCURRENCE AND USE***

The flowers of the plant are harvested shortly after blooming and are either dried and powdered or the oils within the flowers are extracted with solvents. The resulting pyrethrin containing extracts usually have an active ingredient content of about 30%, the remaining consists of oleoresins containing glycoproteins and sesquiterpene lactones. These compounds are not usually present in the purified commercially available formulations.

After extraction with solvents, Pyrethrum is a viscous liquid or oil-coloured from yellow to brown, depending on state of purity.

Pyrethrum compounds have been used primarily to control human lice and scabies, mosquitoes, cockroaches, beetles and flies. Some "pyrethrin dusts", used to control insects in horticultural crops, contain from 0.3% to 0.5% pyrethrins, and are used at rates of up to 50 lb/A. Other pyrethrin compounds may be used in grain storage and in poultry and on dogs and cats to control lice and fleas. The natural pyrethrins are contact poisons that quickly penetrate the nerve system of the insect.

Pyrethrins, generally combined with a synergist, piperonyl butoxide, are used in sprays and aerosols against a wide range of flying insects.

The most common pyrethrum formulations are the following:

Public health purposes: 0.2-0.4% in dusty formulations; 0.2-0.4% dissolved in kerosene or petroleum distillate; 0.05-0.10% in solution, with additional agents, in kerosene as flying insects spray; 0.5-2% in shampoos for human and pet usage.

Household use: 0.15-0.30% in dusty formulations; 0.015-1.2% in aerosol pressure packs;0.05-0.10% in sprays

#### **EFFECT OF DIRECTIVE**

There will be a reduction of the 8-hour TWA limit (for pyrethrins) by a factor of 5. It is additionally planned to withdraw the existing STEL. The limit proposed in the Directive does not apply to unrefined pyrethrum.

## **16) Resorcinol**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 45 mg.m <sup>-3</sup> / 10 ppm (8-hour TWA)<br>(No STEL)<br>Skin notation            |
| Current GB limit                | 46 mg.m <sup>-3</sup> / 10 ppm (8-hour TWA)<br>92 mg.m <sup>-3</sup> / 20 ppm (STEL) |

### ***IDENTITY AND PROPERTIES***

CAS No: 108-46-3

EEC No: 203-585-2

Empirical formula: C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> or C<sub>6</sub>H<sub>6</sub>O<sub>2</sub>

Synonyms: Resorcin, m-dihydroxybenzene, 1,3-dihydroxybenzene, 1,3-benzenediol, 3-hydroxyphenol, m-hydroquinone

Molecular Weight: 110.11

Resorcinol is classified in the Approved Supply List under the CHIP 2002 regulations as harmful by ingestion and irritant to eyes and skin, and is assigned the risk (R) phrases *R22, R36/38, R50*.

### ***OCCURRENCE AND USE***

There are three isomeric compounds of dihydroxybenzene molecule structure. The meta (1,3) isomer is resorcinol, which forms clear needle crystals used in the production of diazo dyes and plasticisers. It is produced by sulfonating benzene with fuming sulphuric acid and fusing the resulting benzenedisulphonic acid with sodium hydroxide.

Resorcinol is used in resins as a UV absorber. It is used in manufacturing fluorescent and leather dyes and adhesives. Reaction with formaldehyde produces resins used to make rayon and nylon. It is used as a pharmaceutical to treat acne and other greasy skin conditions in combination with other treatments. It is used as an anti-dandruff agent in shampoo and sunscreen cosmetics. It is also used as a chemical intermediary to synthesise pharmaceuticals and other organic compounds.

### ***EFFECT OF DIRECTIVE***

There will be a new "Skin" notation. The existing GB limits (8-hour TWA and STEL) will remain unchanged.

## **17) Toluene**

|                                 |  |
|---------------------------------|--|
| Limit proposed in the Directive | 192 mg.m <sup>-3</sup> / 50 ppm (8-hour TWA)<br>384 mg.m <sup>-3</sup> / 100 ppm (STEL)<br>Skin notation |
| Current GB limit                | 191 mg.m <sup>-3</sup> / 50 ppm (8-hour TWA)<br>574 mg.m <sup>-3</sup> / 150 ppm (STEL)<br>Skin notation |

### **IDENTITY AND PROPERTIES**

CAS No: 108-88-3

EC No: 203-625-9

Empirical formula: C<sub>8</sub>H<sub>5</sub>CH<sub>3</sub>

Synonyms: Methylbenzene, phenylmethane, toluol

Molecular Weight: 92.13

Conversion factor: (20°C, 101 kPa): 3.83 mg.m<sup>-3</sup> = 1 ppm

Toluene is classified in the Approved Supply List (ASL) under the CHIP 2002 regulations as highly flammable and harmful by inhalation. Consultation has recently concluded on amendments to the ASL under which this will change to highly flammable, reprotoxic category 3, harmful by prolonged exposure by inhalation and because of aspiration hazard, and irritating to eyes. The risk (R) phrases assigned to toluene will be *R11, R63, R48/20, R65, R38 and R67*.

### **OCCURRENCE AND USE**

Toluene is a colourless flammable liquid with an unpleasant sour to burned aromatic odour. It has a melting point of -95°C, a boiling point of 111 °C and a vapour pressure of 3.73 kPa at 25°C. It has a vapour density 3.2 times that of air and is explosive over the range 1.2 to 7.1 %. The odour threshold is about 5 ppm (18 mg.m<sup>-3</sup>).

The production rate of toluene in the European Union is in the order of 1 million tonnes per annum. It is used in many types of industry as a solvent for paints, lacquers, fats, resins and other applications. It is an additive in petrol and therefore occurs worldwide. Toluene often occurs together with other solvents. Occupational exposure levels reported recently are generally below 200 ppm (750 mg.m<sup>-3</sup>).

Occupational exposure is possible in the chemical industry and mineral oil and fuel industry where toluene and gasoline are produced, and where toluene is used as a chemical agent or as an ingredient (e.g. in polymers, paints, lacquers and varnishes, pulp, paper and board and in textile processing).

Relevant working populations potentially exposed are workers in the chemical industry, the paint industry and workers using products containing toluene (e.g. painters). In particular, the workers with most direct contact with toluene are most likely involved in:

- the production, drumming and transferal of toluene and gasoline;
- the use of toluene as an intermediate, process regulator or solvent in the chemical industry;
- the production and drumming of products containing toluene;
- the maintenance and cleaning of production facilities; and
- the use of toluene-containing products such as in printing and cleaning.

## **EFFECT OF DIRECTIVE**

There will be a reduction of the existing STEL by a third. The 8-hour TWA limit, and the Skin notation will remain unchanged.

**Principles of Good Practice (Paragraph 10)**

These eight principles of good practice apply regardless of whether a substance has an occupational exposure limit.

1. Design and operate processes and activities to minimise emission, release and spread of substances hazardous to health.
2. Take into account all relevant routes of exposure – inhalation, skin absorption and ingestion – when developing control measures.
3. Control exposure by measures that are proportionate to the health risk.
4. Choose the most effective and reliable control options which minimise the escape and spread of substances hazardous to health.
5. Where adequate control of exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment.
6. Check and review regularly all elements of control measures for their continuing effectiveness.
7. Inform and train all employees on the hazards and risks from the substances with which they work, and the use of control measures developed to minimise the risks.
8. Ensure that the introduction of control measures does not increase the overall risk to health and safety.

**Government Departments and Public Bodies Consulted**

**1) Government Departments**

Cabinet Office – European Secretariat  
Cabinet Office – Office of Public Service  
Cabinet Office – Better Regulation Executive  
Central Office of Information  
Crown Estate Commissioners  
Department of Agriculture and Rural Development – Northern Ireland  
Department for Communities and Local Government  
Department for Constitutional Affairs  
Department for Education and Skills  
Department for Environment, Food and Rural Affairs  
    Chemicals and Nanotechnology Division  
    Global Atmosphere Division  
    Pesticides Safety Directorate  
    Waste Management Division  
    Water Quality Division  
  
Department of Health  
Department of Trade and Industry  
Department of Trade and Industry – Small Business Service  
Department for Transport  
Department for Work and Pensions – Workplace Health Division  
Foreign and Commonwealth Office  
Health and Safety Agency for Northern Ireland  
HM Prison Service  
HM Revenue and Customs  
HM Treasury  
Home Office  
Law Officers' Departments  
Ministry of Defence  
National Assembly for Wales  
Northern Ireland Department of Enterprise, Trade and Investment  
Northern Ireland Office  
Scottish Executive Environment and Rural Affairs Department  
Scottish Executive Health Department

**2) Public Bodies**

British Broadcasting Corporation  
Civil Aviation Authority  
Countryside Agency  
Environment Agency  
Forestry Commission  
Historic Royal Palaces Agency  
House of Commons Library  
House of Lords Library

Joint Nature Conservation Committee  
Laboratory of the Government Chemist  
Law Commission  
Maritime and Coastguard Agency  
National Consumer Council  
Office for National Statistics  
Scottish Environment Protection Agency  
Scottish Law Commission

### **3) European Union, Crown Dependencies and Overseas Territories**

Government of Gibraltar – Ministry of Employment  
Health and Safety Authority – Republic of Ireland  
Health and Safety Executive, Guernsey  
Department of Local Government and the Environment, Isle of Man  
Department of Employment and Social Security, Jersey  
UK Permanent Representation to the European Union