



## RRC Technical Update

EH40 Workplace Exposure Limits 2005  
(second edition, published 2011)



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Second Edition, published 2011

*“What is that strange smell?”*

*“What is that mist in the air?”*



Have you ever asked yourself these questions at work? They're usually followed by wondering if it is likely to cause you any harm...

If this sounds familiar, then this update to EH40 contains important information for you!

Firstly, you need to find out where the smell or mist is coming from. Once you know that, you can use EH40 to establish whether exposure to it is likely to cause you any harm.

EH40/2005 (revised 2011) contains 'Workplace Exposure Limits' - or WELs<sup>1</sup> - which can help you to decide how much of a hazardous substance you can safely be 'exposed' to. In conjunction with **COSHH**<sup>2</sup>, we can then ensure we follow the correct precautions to prevent the harm which can result from over-exposure.

This latest thriller does have its drawback of course – WELs can only guide us on amounts that we can safely breathe. So if you are one of those clumsy types who spill things or splash them on your skin, it's back to the library, I'm afraid!

<sup>1</sup> It's worth noting that different terms are used in other parts of the world – OEL (Occupational Exposure Limit) is an over-arching term; a WEL is a UK-specific OEL.

<sup>2</sup> **COSHH** is the **Control of Substances Hazardous to Health Regulations 2002 (as amended)**.



### What is EH40 About?

EH40 is all about protecting us from harm. It begins by showing us that substances can cause harm:

- if we breathe in (inhale) too much of them;
- if they are absorbed through the skin;
- if we swallow (ingest) them; or
- if they act directly on the body at the point of contact, e.g. on contact with the skin.

EH40 is concerned with the first method of exposure – inhalation.

Not all substances are harmful, and many only become harmful once exposure reaches a certain level, so EH40 outlines exactly which substances we need to protect ourselves against. It also details how exposure should be measured so we can gauge current exposure levels.

Ill-health caused by exposure (or over-exposure) to hazardous substances may take a long time to appear - the symptoms don't always develop immediately. So, knowing how much we can be exposed to before harm will occur can help protect us from harmful exposure to these hazardous substances at work. That's where WELs come in.



*The effects of hazardous substances can be difficult to identify, but if the substance is included in EH40, exposure to it needs to be controlled.*

### How does EH40 Work?

EH40 contains a comprehensive list of acceptable WELs for 500 different hazardous substances. If a substance is included in this list, then exposure to it must be controlled.

#### Workplace Exposure Limits (WELs)

WELs are set for certain substances in order to protect the health of workers. According to EH40:

*“WELs are concentrations of hazardous substances in the air, averaged over a specific period of time, referred to as a time-weighted average (TWA).”*

These averages can be measured across two time periods:

- long-term exposure limits (LTELs) – averaged over 8 hours, and
- short-term exposure limits (STELs) – measured over 15 minutes.

STELs can help to prevent such effects as eye irritation, which may happen after just a few minutes exposure, as well as longer-term problems from inhalation.

So, to establish the level of exposure in a particular workplace, we can measure over 8 hours (where exposure is constant, but low-level) or over 15 minutes (where exposure is less frequent, but in higher concentrations).

Once we know of how much of these harmful substances we can safely be exposed to through inhalation, we can begin to consider what to do to ensure these maximums are not exceeded. All substances which are assigned a WEL are subject to **COSHH** requirements.



### EH40 and COSHH

Whenever we're faced with hazardous substances at work, we turn to **COSHH** for guidance.

All substances that have been given a WEL in EH40 must also follow the requirements of **COSHH**. That means that employers have got to prevent or control exposure of workers to hazardous substances.

**COSHH** tells us that control of exposure has to be "adequate", and to be adequate we must apply the principles of good control practice and any WELs shown in EH40 must not be exceeded.

Furthermore, if the substance can cause cancer (carcinogens) or cause heritable genetic defects (mutagens), or even asthma, exposure has got to be reduced to 'as low as reasonably practicable', which is likely to be below the WEL shown in EH40.

Even when controls are in place, it's important that a regular monitoring system is used to ensure these controls remain adequate.



*Regular monitoring is required to ensure WELs are not exceeded.*

### Scope of the Limits

The Workplace Exposure Limits in EH40 (with a few exceptions) relate to personal exposure to hazardous substances that are in the air in the workplace. They are only meant to control exposure for people who are at work.

Obviously, the effects of exposure to hazardous substances will depend on the exact nature of the substance and the pattern of exposure (how much we inhale, and for how long). Some effects will not appear straight away, but will need prolonged or accumulated exposure to cause us any harm.

The **LTEL (8-hour TWA)** should control these effects by restricting inhalation over one or more work shifts (depending on the length of the shift).

The **STEL (15 minute TWA)** controls exposure over brief periods, much less than one shift.

If a substance doesn't have a STEL its recommended that a figure three times (3×) the long-term limit is used.

Some work tasks are likely to expose a worker to frequent but short exposure periods (less than 15 minutes), but with high levels of contaminant. Even though these may not exceed either the LTEL or STEL, they can still cause harm, and should be adequately controlled.



### How do we Measure the Substance to Determine the Limits?

Concentrations of fumes, dust, etc. are usually measured by drawing air containing the contaminant through a filter and measuring what is collected; the amounts are described in **mg/m<sup>3</sup>**. That is how many milligrams of the contaminant there are in every cubic metre of air drawn through the filter. It sounds complicated, but it's actually a very simple idea – if you know how much air you've 'sampled' and how much contaminant you've collected, you can work out the average concentration of the contaminant in the air.

We can also apply the alternative measure of parts per million (**ppm**) of the sample collected. That is how many contaminant parts there are in every million parts collected.

Once you know how much of the contaminant is in the air, you can compare this to the WEL in EH40 to determine whether additional controls are required to reduce exposure to an acceptable level.

### Other Factors to Consider

As well as how much we inhale and the concentration of what we inhale, factors such as exposure to ultra-violet radiation, working in high-temperatures, pressure and humidity can all increase the toxic response to a substance.

### Absorption Through the Skin

WELs are associated with things we can inhale, but some substances also have the ability to get through undamaged skin and become absorbed into the body. Substances that can do this are indicated in EH40 entries as 'Sk' in addition to the WEL.



*Wearing gloves can help to protect against absorption through the skin*

### Personal/Workplace Air Monitoring

**COSHH** imposes a duty to monitor the exposure of employees to substances hazardous to health in certain specified situations. Sampling strategies may involve measurement of the hazardous substance in the breathing zone of the worker (personal sampling) or in the workplace air. Methods for the sampling and analysis of many substances which have been assigned WELs are described in the HSE series 'Methods for the Determination of Hazardous Substances' (MDHS).



## Using EH40

Exactly what does the information in EH40 look like? The following table shows *some* of the information, namely the LTEL and STEL of some of the first (under 'A') substances in the list.

*CAS numbers and comments (such as 'Sk' notations) have been omitted.*

**Extract from Table 1: List of approved workplace exposure limits**

Substance	8hr LTEL (ppm)	8hr LTEL (mg/m <sup>3</sup> )	15min STEL (ppm)	15min LTEL (mg/m <sup>3</sup> )
Acetaldehyde	20	37	50	92
Acetic anhydride	0.5	2.5	2	10
Acetone	500	1210	1500	3620
Acetonitrile	40	68	60	102
Acrylaldehyde (acrolein)	0.1	0.23	0.3	0.7
Acrylamide	-	0.3	-	-
Acrylonitrile	2	4.4	-	-
Allyl alcohol	2	4.8	4	9.7
Aluminium alkyl compounds	-	2	-	-

All in all there are *409 entries* in the tables over *19 pages*.

## Mixed Exposures

Most of the WELs listed are for single compounds (or compounds with a common radical, such as 'tungsten and compounds'), or for substances commonly encountered as complex mixtures (such as 'rubber fume'). These are without prejudice to any WELs for individual components of mixtures.

Employers should ensure WELs on safety data sheets are not exceeded.



### And Finally....

Now we know what that strange smell in the workplace is, we can use EH40 to determine its potential for harm and use **COSHH** to decide what to do about it.

### References:

EH40/2005 Workplace Exposure Limits  
ISBN 978 0 7176 6446 7 Price £15 (UK)  
downloadable free as a web-friendly version  
at:

<http://www.hse.gov.uk>

Further information can also be found at:

<http://www.hse.gov.uk/coshh>