



FAQs About Control Banding

4/1/2005

NIOSH considers control banding a potentially useful tool for small businesses. Control banding has been evaluated in various settings, particularly in the United Kingdom. NIOSH is currently evaluating its utility for the United States.

Control Banding—Frequently Asked Questions (FAQs)

- What is control banding?
- Why is control banding needed?
- What are the control bands for health risks from chemicals?
- Does control banding remove the need for consultants?
- Where is control banding already in use?
- What is *COSHH Essentials*?
- What situations are not appropriate for control banding?
- Where did the idea of control banding come from?
- What do users of *COSHH Essentials* think of it?
- Does control banding work?
- Will control banding for chemical health risks work in the United States?
- Where else is control banding being tried?
- Can control banding be applied beyond chemicals?
- What is the status of control banding in the United States?

What is control banding?

Control banding is a process in which a single **control** technology (such as *general ventilation* or *containment*) is applied to one range or **band** of exposures to a chemical (such as 1–10 mg/m³) that falls within a given hazard group (such as *skin and eye irritants* or *severely irritating and corrosive*). Table 1 lists four control bands identified for chemical exposures. The most developed model for control banding has been established by the Health and Safety Executive (HSE) of the United Kingdom.

The control banding approach focuses resources on exposure controls and describes how strictly a risk needs to be managed. This qualitative risk assessment and management tool is intended to help small businesses by providing an easy-to-understand, practical approach to controlling hazardous exposures at work.

The principle of control banding was first applied to dangerous chemicals, chemical mixtures, and fumes. The control banding process emphasizes the controls needed to prevent hazardous substances from causing harm to people at work. The greater the potential for harm, the greater the degree of control needed to manage the situation and make the risk “acceptable.”

Table 1. Control bands for exposures to chemicals by inhalation

Band No.	Range of exposure concentrations	Hazard group	Control
1	>1 to 10 mg/m ³ dust >50 to 500 ppm vapor	Skin and eye irritants	Use good industrial hygiene practice and general ventilation.
2	>0.1 to 1 mg/m ³ dust >5 to 50 ppm vapor	Harmful on single exposure	Use local exhaust ventilation.
3	>0.01 to 0.1 mg/m ³ dust >0.5 to 5 ppm vapor	Severely irritating and corrosive	Enclose the process.
4	<0.01 mg/ m ³ dust <0.5 ppm vapor	Very toxic on single exposure, reproductive hazard, sensitizer*	Seek expert advice.

*Exposure to any concentration of a sensitizer requires expert advice.

Why is control banding needed?

The occupational exposure limit (OEL) is the marker that shows the level of control needed for a chemical. Repeated daily exposure by inhaling a chemical at an airborne concentration below its OEL is unlikely to lead to harm in most workers. However, many thousands of chemicals are in use, and it is not possible to have an OEL for every chemical, chemical mixture, fume, or emission. Nonetheless, it is possible to determine the broad hazard group to which a chemical belongs (Table 1) and on that basis to determine the necessary level of control, or *control band*.

What are the control bands for health risks from chemicals?

Four main control bands have been developed for exposure to chemicals by inhalation (Table 1):

- Band 1: Use good industrial hygiene practice and general ventilation.
- Band 2: Use local exhaust ventilation.
- Band 3: Enclose the process.
- Band 4: Seek expert advice.

For some activities, processes, tasks, or jobs, experts can specify that respiratory protective equipment (in combination with other control approaches) is always necessary.

Does control banding remove the need for consultants?

No. Control banding does not replace industrial hygiene expertise. Sometimes the control banding advice directly guides employers to seek such advice.

Specific operating knowledge and professional judgment are required to implement the best combination of controls that are “reasonably practicable” and to minimize risks to workers.

Where is control banding already in use?

Control banding is used worldwide for the transportation of dangerous chemicals. These chemicals are classified with United Nations (UN) codes that are used for identifying safe storage rules, permitted types of transport container, and actions to take in an emergency.

In Europe, a combination of the hazard and the amount of chemical stored are banded, leading to a range of duties to prepare formal safety assessments. In the United Kingdom, the HSE has developed a scheme for banding the control of health risks. This scheme, or control banding tool, is called *COSHH Essentials*. Other European countries are exploring similar schemes and ideas.

What is *COSHH Essentials*?

COSHH Essentials (<http://www.coshh-essentials.org.uk>) is a control banding tool that helps small and medium-sized enterprises to do risk assessments for chemicals and mixtures of chemicals. COSHH stands for *control of substances hazardous to health*. This tool requires four pieces of information:

1. The type of task
2. The hazard classification (from the material safety data sheet, or MSDS, part 15)
3. The volatility or dustiness of the chemical or product
4. The amount used in the task

The system then

- identifies the control band (control approach),
- produces advice on controlling risk from the chemical used in the specified task, and
- provides written guidance and documentation as a result of the assessment.

In British law, the duty to control risk remains with the employer.

What situations are not currently appropriate for control banding?

Control banding is not currently appropriate for many situations, including "hot" processes, open spray applications, gases, and pesticides. In addition, control banding does not yet cover safety hazards, environmental issues, or ergonomic issues. Researchers are exploring ways to integrate these additional workplace issues into the control banding concept.

Where did control banding originate?

The concept of control banding was developed in the late 1980s by occupational health experts in the pharmaceutical industry. This industry uses large numbers of new chemical compounds with few toxicity data. The experts reasoned that such compounds could be classified into bands by their toxicity and by their need for restriction of exposure. Each band was aligned with a control scheme.

Early references on the concept included a manual published by the Association of the British Pharmaceutical Industry in October 1995 and a paper by Naumann et al. [1996] (see reference list below).

In the early 1990s, as the European system for classification and labeling developed, occupational health experts began to examine the alignment between the classification, the exposure limit, and data on exposure and control systems [Gardner and Oldershaw 1991].

What do users of *COSHH Essentials* think of it?

In a telephone survey, 500 purchasers of the paper version of *COSHH Essentials* were interviewed, with the following results:

- 79% of the people buying the guidance had used it.
- 76% of those who had used it took action of some sort (including substitution).
- 94% would recommend it to other businesses.
- Fewer than 5% found it fairly difficult to use.

Does control banding work?

Yes—for the most part, evidence supports the effectiveness of control banding (or *COSHH Essentials*). The German authority (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin - BAuA) evaluated the system based on about 1,000 personal measurements from field studies in 18 industrial applications. They found that for solids (dusts and powders) and medium-scale use (liter quantities) of liquids, exposures were within the range predicted by *COSHH Essentials* or lower. For the use of small quantities (milliliters) of solvent-based products (such as paint or adhesive), exposures sometimes exceeded the range.

Another study of *COSHH Essentials* was conducted in the United States. The study found small safety margins for the hazard bands that included high-potency chemicals. For example, high airborne exposures were measured during vapor degreasing operations even though local exhaust ventilation had been installed. These results underscore the need to follow up new engineering controls with air monitoring to verify the effectiveness of their installation.

Will control banding for chemical health risks work in the United States?

The philosophy of control banding can work anywhere. However, to apply control banding in the United States in the form of *COSHH Essentials* or another approach, some adaptation of the materials will be required along with review of the legal and regulatory implications. *COSHH Essentials* is based on risk phrases developed by the European Union and classification rules for chemicals and chemical mixtures. A matrix of equivalencies is available to convert the typical toxicological phrases used in American MSDSs to equivalent risk phrases.

Because the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals was recently adopted by the United Nations, global consistency will be possible in the international classification of chemicals. Such consistency will enable the development and adoption of control banding schemes.

Where else is control banding being tried?

The International Labour Organization (ILO) has recently published the ILO Chemical Control Toolkit on the Web. A useful feature of the ILO Toolkit is the table showing the correspondence between European risk phrases and the GHS hazard classifications. The International Programme on Chemical Safety is planning to add GHS hazard classifications to its more than 1,300 chemical safety cards. Control banding approaches are also being developed in Belgium (REGETOX project), the Netherlands (Stoffenmanager), and Norway (KjemiRisk). The World Health Organization is working with its Collaborating Centres to pilot control banding programs in more than a dozen countries.

Can the control banding concept be applied beyond chemicals?

Efforts are under way to develop control banding approaches for ergonomics, safety hazards, and environmental applications.

What is the status of control banding in the United States?

The *2nd International Control Banding Workshop: Validation and Effectiveness of Control Banding* was held March 1–2, 2004, in Cincinnati, Ohio, with the sponsorship of the American Conference of Governmental Industrial Hygienists, the American Industrial Hygiene Association, the International Labour Organization, the International Occupational Health Association, the National Institute for Occupational Safety and Health, the National Safety Council, the Occupational Safety and Health Administration, and the World Health Organization. Platform and poster presentations highlighted the progress and future activities regarding control banding in both developed and developing countries. A national control banding workshop was held in Washington, DC, in March 2005 to discuss planning and implementation of control banding strategies in the United States.

These FAQs were adapted from comments initially prepared by Deborah Nelson and Paul Evans, March 2004.

International Control Banding Workshop, Symposia, and Presentations

Report of the 1st International Control Banding Workshop (November 2002)

External Link: http://www.bohs.org/mod.php? mod=fileman&op=view_cat&id=14

2nd International Control Banding Workshop: Validation and Effectiveness of Control Banding (March 1-2, 2004)

External Link: <http://www.acgih.org/events/ControlBand/>

IOHA 6th International Scientific Conference (September 2005)

External Link: <http://www.saioh.org/ioha2005/index.htm>

NIOSH Activities

NIOSH researchers are investigating the potential applications and utility of control banding to address occupational safety and health challenges, particularly in small business enterprises. Examples of demonstration projects and activities are noted below:

- Draft hazard guidance materials to address glutaraldehyde exposures in health care
- NIOSH/OSHA/HSE Partnership to develop control-focused guidance solutions
- National Control Banding Workshop (March 2005)
- Draft state-of-the-art critical review document
- CD-ROM (under development)
- DVD training module (in production)

NIOSH Contacts

For additional information, contact T.J. Lentz (TLentz@cdc.gov) or Rick Niemeier (RNiemeier@cdc.gov).

Additional Control Banding Links

Several Web sites now address control banding, including the following:

- **International Occupational Hygiene Association**
External link: <http://www.ioha.net/content/view/14/>
- **International Labour Organization**
External link: http://www.ilo.org/public/english/protection/safework/ctrl_banding/index.htm

Control Banding Selected References

ACGIH [2004]. 2nd International Control Banding Workshop: Validation and Effectiveness of Control Banding. Cincinnati, Ohio, March 1-2, 2004.

External link: <http://www.acgih.org/events/ControlBand/>

Ahasan, MR [2002]. Occupational health, safety and ergonomic issues in small and medium-sized enterprises in a developing country. Oulu, Finland: University of Oulu. Dissertation.

External link: <http://herkules oulu.fi/isbn9514268121/html/index.html>

Balsat A, deGraeve J, and Mairiaux P [2003]. A structured strategy for assessing chemical risks suitable for small and medium-sized enterprises. *Ann Occup Hyg* 47(7): 549-556.

BOHS [2002]. Control Banding Workshop: A Joint Workshop Held in November 2002 with BIOH and IOHA Supported by HSE, WHO, and ILO

External Link: http://www.bohs.org/mod.php?mod=fileman&op=view_cat&id=14

Brooke IM [1998]. A UK scheme to help small firms control health risks from chemicals: toxicological considerations. *Ann Occup Hyg* 42(6): 377-390.

Garrod AN, Rajan-Sithamparanadarajah R [2003]. Developing COSHH Essentials: dermal exposure, personal protective equipment and first aid. *Ann Occup Hyg* 47(7):577-588.

Goede HA, Tijssen SC, Schipper HJ, Warren N, Oppl R, Kalberlah F, and Van Hemmen JJ [2003]. Classification of dermal exposure modifiers and assignment of values for a risk assessment toolkit. *Ann Occup Hyg* 47(8): 609-618.

GTZ (Gesellschaft für Technische Zusammenarbeit) [2005]. Pilot project chemical safety.

External link: <http://www2.gtz.de/chs/englisch/index.htm>

HSE (United Kingdom Health and Safety Executive) [2005]. COSHH essentials.

External link: <http://www.coshh-essentials.org.uk/>

Hudspith B, Hay AW [1998]. Information needs of workers. *Occup Hyg* 42(6):401-406.

ILO (International Labour Organization [2005a]. ILO chemical control toolkit: draft guidelines.

External link: http://www.ilo.org/public/english/protection/safework/ctrl_banding/toolkit/main_guide.pdf

ILO (International Labour Organization [2005b]. Safework: chemical control banding.

External link: http://www.ilo.org/public/english/protection/safework/ctrl_banding/index.htm

IOHA (International Occupational Hygiene Association) [2004]. WHO/IPCS Planning meeting on Control Banding.

External link: http://www.ioha.com/topics/control_banding/index.htm

Jackson H [2002]. Control banding - practical tools for controlling exposure to chemicals. *Asian-Pacific Newsletter* (9):62-63.

Jackson H, Vickers C [2003]. Report of the international control banding workshop, London, November 2002. International Occupational Hygiene Association.

External link: http://www.ioha.net/index.php?option=com_docman&task=download&id=59

Maidment SC [1998]. Occupational hygiene considerations in the development of a structured approach to select chemical control strategies. *Ann Occup Hyg* 42(6):391-400.

Marquart J, Brouwer DH, Gijsbers JH, Links IH, Warren N, Van Hemmen JJ [2003]. Determinants of dermal exposure relevant for exposure modelling in regulatory risk assessment. *Ann Occup Hyg* 47(8): 599-607.

Money CD [2003]. European experiences in the development of approaches for the successful control of workplace health risks. *Ann Occup Hyg* 47(7):533-40.

Naumann BD, Sargent EV, Starkman BS, Fraser WJ, Becker GT, Kirk GD [1996]. Performance-based exposure control limits for pharmaceutical active ingredients. *Am Ind Hyg Assoc J* 57(1):33-42.

Oldershaw PJ [2001]. Control banding - a practical approach to judging control methods for chemicals. *Journal of Preventive Medicine* 9(4): 52-58.

Oldershaw, PJ [2003]. Control Banding Workshop, 4-5 November 2002, London. Editorial. *Ann Occup Hyg* 47(7):531-32.

Oppl R, Kalberlah F, Evans PG, Van Hemmen JJ [2003]. A toolkit for dermal risk assessment and management: an overview. *Ann Occup Hyg* 47(8): 629-640.

Ruden C, Hansson SO [2003]. How accurate are the European Union's classifications of chemical substances. *Toxicology Letters* 144:159-172.

Russell RM, Maidment SC, Brooke I, and Topping MD [1998]. An introduction to a UK scheme to help small firms control health risks from chemicals. *Ann Occup Hyg* 42(6): 367-376.

Schuhmacher-wolz U, Kalberlah F, Oppl R, Van Hemmen JJ [2003]. A toolkit for dermal risk assessment: toxicological approach for hazard characterization. *Ann Occup Hyg* 47(8): 641-652.

Swuste P, Hale A, Pantry S [2003]. Solbase: a databank of solutions for occupational hazards and risks. *Ann Occup Hyg* 47(7):541-48.

Tischer M, Scholaen S [2003]. Chemical management and control strategies: experiences from the GTZ pilot project on chemical safety in Indonesian small and medium-sized enterprises. *Ann Occup Hyg* 47(7): 571-575.

Tischer M, Bredendiek-Kamper S, Poppek U [2003]. Evaluation of the HSE COSHH Essentials exposure predictive model on the basis of BauA field studies and existing substances exposure data. *Ann Occup Hyg* 47(7): 557-569.

Topping MD, Williams CR, and Devine JM [1998]. Industry's perception and use of occupational exposure limits. *Ann Occup Hyg* 42(6): 357-366.

UNECE (United Nations Economic Commission for Europe) [2005]. Globally harmonized system of classification and labeling of chemicals (GHS).

External link: http://www.unece.org/trans/danger/publi/ghs/ghs_rev00/00files_e.html

Van Hemmen JJ, Auffarth J, Evans PG [2003]. Rajan-Sithamparanadarajah B, Marquart H, Oppl R [2003]. RISKOFDERM: risk assessment of occupational dermal exposure to chemicals; an introduction to a series of papers on the development of a toolkit. *Ann Occup Hyg* 47(8): 595-598.

Warren N, Goede HA, Tijssen SC, Oppl R, Schipper HJ, and Van Hemmen JJ [2003]. Deriving default dermal exposure values for use in a risk assessment toolkit for small and medium-sized enterprises. *Ann Occup Hyg* 47(8): 619-627.

Zalk DM [2002]. Participatory occupational hygiene: a path to practical solutions. *Asian-Pacific Newsletter* (9):51.

Zalk DM [2003]. Control banding principles to reduce musculoskeletal disorders: the ergonomics toolkit. In: Proceedings of the International Ergonomics Association Triennial Congress, South Korea, V5(327).

NIOSH Resources

National Occupational Research Agenda - Emerging Technologies

<http://www2.cdc.gov/nora/noratopictemp.asp?rscharea=et>

The NORA Emerging Technologies Team is working to establish mechanisms to ensure that worker safety and health are considered when new technologies are developed and implemented.

Other Related NIOSH Topic Pages

Aerosols <http://www.cdc.gov/niosh/topics/aerosols/>

Chemical Safety <http://www.cdc.gov/niosh/topics/chemical-safety/>

Nanotechnology <http://www.cdc.gov/niosh/topics/nanotech/>

Small Business <http://www.cdc.gov/niosh/topics/smbus/>

For additional information, contact NIOSH:

1-800-35-NIOSH

(1-800-356-4674)

Fax: 513-533-8573

or visit the NIOSH Web site:

www.cdc.gov/niosh