NIOSH Safety and Health Topic:

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/m^3) 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.	Target Range of Exposure Concentration	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.

Control banding is a complimentary approach to protecting worker health that focuses resources on exposure controls and describes how strictly a risk needs to be managed. 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)

The *FAQs About Control Banding* are also available in printer-friendly PDF form.

FAQs About Control Banding

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?

An international example of control banding concepts in use is the procedure 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.

Another example of control banding is the implementation of controls and work practices for safe handling of new drugs and materials in the pharmaceutical industry.

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 associated with chemicals. 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:

The type of task (e.g. mixing liquids, sack filling, manually cleaning and disinfecting surfaces)
The hazard classification from the material safety data sheet, or MSDS, part 15 (obtained from the chemical manufacturer or supplier)
The volatility or dustiness of the chemical or product

The amount used in the task (small quantities = grams or milliliters; medium quantities = kilograms or liters; large quantities = tons or cubic meters)

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. Both the web and paper versions of the COSHH Essentials tools are designed to assist the small or medium sized employer meet regulatory requirements.

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. These situations involve more complex explosives requiring additional considerations that are not yet fully addressed by current control banding strategies. 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.

A study of another control banding tool, the International Labor Organization (ILO) Toolkit, was conducted in the United States. The study found small safety margins for the hazard bands that included high-potency chemicals. [Jones and Nicas 2004] 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. Additional work is required 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. Additional information about the GHS is available on the OSHA Web site at http://www.osha.gov/STLC/hazardcommunications/global.html.

Where else is control banding being tried?

The International Programme on Chemical Safety (IPCS, comprised of the International Labour Association [ILO], the World Health Association [WHO], and the United Nations Environment Programme [UNEP]) has published the International Chemical Control Toolkit on the ILO Web site. A useful feature of the Toolkit is the table showing the correspondence between European risk phrases and the GHS hazard classifications. The IPCS 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, psychosocial factors, 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 March 9−10, 2005, in Washington, DC, 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.