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## Preface

Chemicals are essential part of our daily life. In fact, the variety of chemicals introduced into our workplaces is quite diverse, such as solvents, cleaning agents, adhesives, lubricants etc. Chemicals can enter our body through inhalation, skin absorption or ingestion. Some of them might not cause adverse health effects even after day-to-day exposure, but some are hazardous to our health even after short-term exposure. It also leads to dangerous situations when chemicals are misused or spilt that may result in harm to people and damage to environment.

In Hong Kong, the Occupational Safety and Health Ordinance enacted in 1997 was a milestone to enhance our workplace safety and health standards. It defines the general duties of employers, employees and occupiers, so far as is reasonably practicable, in maintaining the workplaces safe and without being hazardous to employees' health. It also advocates the use of risk assessment method to identify the hazards arising from the work processes, evaluate the risks and lead to adequate control measures to eliminate or reduce the associated risks.

This book outlines a tool for chemicals control at work derived from the Draft Guidelines for INTERNATIONAL CHEMICAL CONTROL TOOLKIT (ICCK)<sup>1</sup> produced by the International Labour Office (ILO) in which a generic risk assessment based on either the European Union Risk-phrases or Globally Harmonized System for the Classification and Labelling of Chemicals (GHS) defined exposure conditions is used to lead the user to an appropriate approach to control.

GHS<sup>2</sup> is an international initiative to promote common, consistent criteria for classifying chemicals according to their health, physical and environmental hazards, and to develop compatible labelling, safety data sheets for workers, and other information based on the resulting classifications. Chapter 19 of Agenda 21 adopted at the United Nations Conference on Environment and Development (UNCED, 1992) provided the international mandate to implement the initiative. GHS was developed by international organizations and agencies and it is a voluntary international system, in that it does not impose binding treaty obligations on countries. One of the fundamental premises of the GHS is a "Building Block" approach. Countries are not obliged to cover all GHS classes and categories in order to be considered consistent with the GHS, but for those effects that are covered, it is expected that countries will consistently apply GHS criteria for classification and require GHS hazard communication elements. The UN Economic and Social Council (ECOSOC) adopted the new system in 2003. There has been no detailed, internationally agreed-upon GHS implementation

schedule. Several international bodies have proposed implementation goals. The World Summit on Sustainable Development (WSSD) and the Intergovernmental Forum for Chemical Safety (IFCS) have encouraged countries to implement the GHS as soon as possible with a view to having the system operational by 2008.

The objective of this tool is to identify control solutions that mainly provide health protection for the large majority of the working population. Whilst primarily developed for the workplace control of risks to health, it also is recognized that many chemicals may also pose risks to safety (explosion and fire) and the environment. To this end, the tool also provides basic advice on the control of these risks, and further control measures should also be considered to deal with these potential risks adequately if necessary. The European Union Risk-phrases and GHS hazard classification are only used as reference criteria for hazard group allocation in this tool and they shall not override the local statutory requirements for hazard classification and labelling.

It is noteworthy to consider this approach as a model to develop further and to use it with caution. The tool provides basic control approaches to cope with general use of chemicals that is commonly observed in Hong Kong. There is a set of task guidance sheets for control approaches provided in the above-mentioned ILO draft guidelines, so it is advised that the guidelines should be referred to gather more information as necessary and even expert advice would be sought as you are in the handling of hazardous chemicals and processes.

We would like to take this opportunity to express our sincere gratitude to ILO for its consent to our book production based on its work.

The tool aims at providing simple and practical approach on how to prevent and reduce the risks from chemicals at work, but it serves no purpose for conferring immunity from any legal obligations.

We hope the tool will assist you in creating a safer and healthier workplace!

Chemical Safety and Health Advisory Committee  
Occupational Safety and Health Council

1. [http://www.ilo.org/public/english/protection/safework/ctrl\\_banding/toolkit/main\\_guide.pdf](http://www.ilo.org/public/english/protection/safework/ctrl_banding/toolkit/main_guide.pdf)  
2. <http://www.unece.org/trans/danger/publi/ghs/ghs.html>

## Scope

Many substances used regularly at work will contain chemicals, which if not handled correctly can cause harm. These chemicals can be solids or liquids, include paints, varnishes, glues, printing inks, solvents, cleaning fluids, food additives and pesticides etc. This tool gives advice on how chemicals can be safely handled providing the material supplied has been classified and has the classification on the product label or material safety data sheet. The tool does not generally apply to process generated dusts and fumes, as these are not classified.

This tool is designed to provide health protection for the large majority of the population. However for the susceptible groups of individuals, such as pregnant women and aged workers, a more precautionary approach may be cautious and contact with hazardous chemical of concern should either be avoided or a greater degree of control provided.

Five stages have to be followed in the tool. Information gathered for each stage is compiled on a Checklist as shown in Annex 1. The five stages are as follows:

- Stage 1** Find the hazard classification and match it to a hazard group using the table provided
- Stage 2** Find out scale of the chemical you are going to use
- Stage 3** Find out ability of the chemical to become airborne
- Stage 4** Find the control approach
- Stage 5** Find the control guidance sheets

## Stage 1 Hazard classification

Different chemicals can harm you in different ways, some are more poisonous or can cause more harm than others can. Some effects will be obvious straight away, whilst other effects will take many years to appear. It is important that all these effects are controlled, but chemicals which can cause more serious effects will need a greater degree of control than less harmful chemicals.

Chemicals are placed into six different groups. Five groups, from group A to E, tell you how dangerous it is to breathe in the chemical. Group A is the safest and group E is the most dangerous. The sixth group, group S tells you if it is dangerous to get the chemical on the skin or in your eyes.

To find which hazard groups apply to the chemicals you use, follow the three steps described below.

**Step 1** If the chemical you use is a solvent, refer to Table 1 that contains a list of common solvents and their hazard groups, then read off its hazard group(s) and record them on the checklist in Annex 1.

**Step 2** If the chemical is not listed in Table 1, check whether it is a pesticide or not. If it is, record this on the checklist and then you may refer to the ILO International Chemical Control Toolkit draft guidelines at ICCK<sup>1</sup> for the task control sheets in connection with pesticide.

**Step 3** If the chemical has not been identified by either of the above steps; find the chemical classification information from the Material Safety Data Sheet (MSDS), Safety Data Card or Product Label. Compare this information against the information in Table 2 and exactly match the classification data against the data for each hazard group A to E for inhalation. Then check the classification data against the data for hazard group S to see if the chemical also falls into hazard group S. A chemical can be in both an inhalation hazard group (A - E) and the hazard group S. Record the hazard group or groups on the checklist.



**Table 1: Hazard group identification for common solvents**

Chemical	Hazard group	Volatility
1. Acetone	A & S	Medium
2. Butyl acetate	A & S	Medium
3. Diesel	B & S	Low
4. Ethyl acetate	A & S	Medium
5. Hexane	B & S	Medium
6. Isopropyl alcohol	A & S	Medium
7. Methanol	C & S	Medium
8. Methyl ethyl ketone	A & S	Medium
9. Methyl isobutyl ketone	B & S	Medium
10. Paraffin (Kerosene)	A & S	Low
11. Perchloroethylene	C & S	Medium
12. Petrol	B & S	High
13. Toluene	B & S	Medium
14. Trichloroethylene	C & S	Medium
15. White spirit (Mineral spirit)	B & S	Low
16. Xylene	A & S	Medium

**Table 2: Hazard group allocation**

Hazard Group	European Union Risk-Phrases (EU R-Phrases)	GHS hazard classification
<b>A</b>	R36, R38, R65, R66 All dusts and vapours not allocated to another band	Acute toxicity (lethality), any route, category 5 Skin irritancy category 2 or 3 Eye irritancy category 2 All dusts and vapours not allocated to another band
<b>B</b>	R20/21/22, R40/20/21/22, R33, R67	Acute toxicity (lethality), any route, category 4 Acute toxicity (systemic), any route, category 2
<b>C</b>	R23/24/25, R34, R35, R37, R39/23/24/25, R41, R43, R48/20/21/22	Acute toxicity (lethality), any route, category 3 Acute toxicity (systemic), any route, category 1 Corrosivity, subcategory 1A, 1B or 1C Eye irritancy category 1 Respiratory system irritancy (GHS criteria to be agreed) Skin sensitisation Repeated exposure toxicity, any route, category 2
<b>D</b>	R48/23/24/25, R26/27/28, R39/26/27/28, R40 Carc. Cat.3, R60, R61, R62, R63, R64	Acute toxicity (lethality), any route, category 1 or 2 Carcinogenicity category 2 Repeated exposure toxicity, any route, category 1 Reproductive toxicity category 1 or 2
<b>E</b>	R42, R45, R46, R49, R68	Mutagenicity category 1 or 2 Carcinogenicity category 1 Respiratory sensitisation
<b>S</b> <b>Skin and eye contact</b>	R21, R24, R27, R34, R35, R36, R38, R39/24, R39/27, R40/21, R41, R43, R48/21, R48/24, R66	Acute toxicity (lethality), dermal only, category 1, 2, 3 or 4 Acute toxicity (systemic), dermal only, category 1 or 2 Corrosivity, subcategory 1A, 1B or 1C Skin irritation category 2 Eye irritation category 1 or 2 Skin sensitization Repeated exposure toxicity, dermal only, category 1 or 2

## Stage 2 Scale of use

The quantity of chemical you use determines how the chemical is handled and affects how much of it you are exposed to. The amount of chemical handled in a batch needs to be identified. Use this information in Table 3 to see if your use is small, medium or large and record it on the checklist.

**Table 3: Quantity of chemical in use**

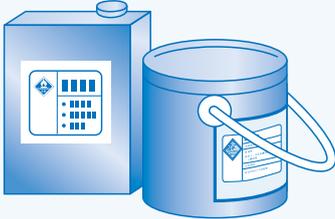
Quantity	Solid		Liquid	
	Weight	Typically received in	Volume	Typically received in
<b>Small</b>	Grams	Packets or bottles	Millilitres	Bottles
<b>Medium</b>	Kilograms	Kegs or drums	Litres	Drums
<b>Large</b>	Tonnes	Bulk	Cubic metres	Bulk



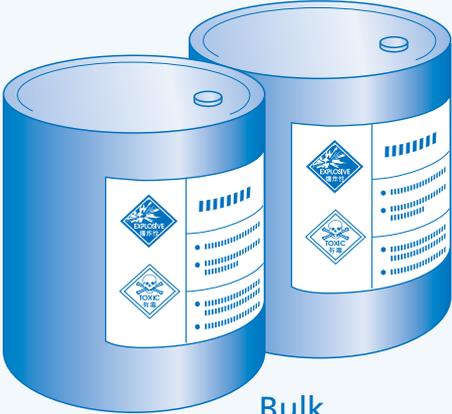
Bottles

**Small**



Drums

**Medium**



Bulk

**Large**

## Stage 3 Ability to become airborne

The physical form of a chemical affects how likely it is to get into the air. In this tool, we use dustiness for solids and volatility for liquids to define this aspect. The dustier or more volatile the chemical, the more it is likely to become airborne. It may be possible to reduce the amount of chemical getting into the air by using the chemical in a different form, for example, replacing fine powders with pellets or less dusty granules.

### 3.1 Solids

The dustiness of a solid is classified as low, medium or high. If you are using a solid, find the description below that best fits the chemical you are using and record it on the checklist.

Low	Pellet like solids that don't break up. Little dust is seen during use e.g. PVC pellets.
Medium	Crystalline, granular solids. Dust is seen during use but settles out quickly. Dust is left on surfaces after use e.g. soap powder.
High	Fine, light powders. Dust clouds can be seen during use and remain in the air for several minutes e.g. cement, carbon black, chalk dust.

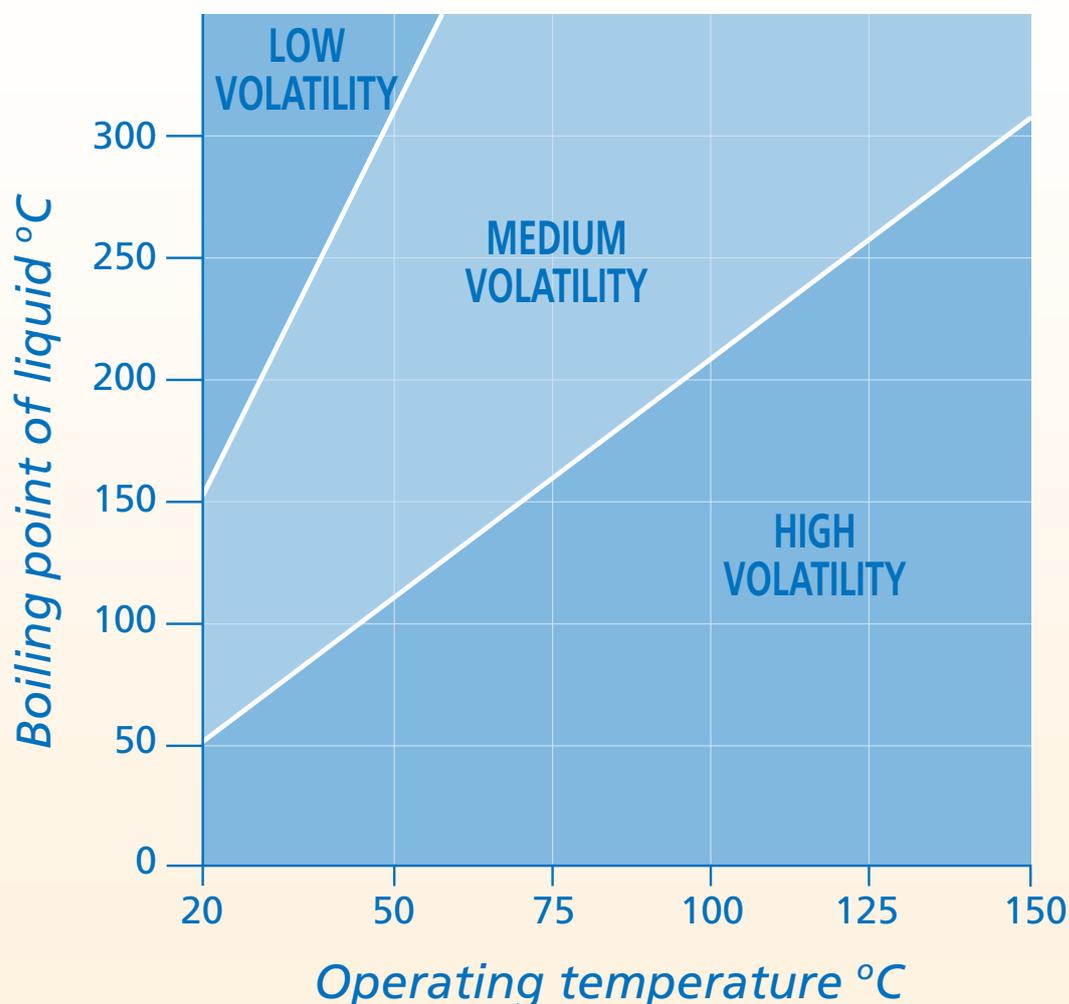
### 3.2 Liquids

To work out the volatility of a liquid, its boiling point needs to be found from the MSDS. This tool classifies volatility as low, medium or high. For tasks carried out at room temperature, compare the boiling point against the ranges below and record the description that best fits on the checklist.

Low	Boiling point above 150°C
Medium	Boiling point between 50°C and 150°C
High	Boiling point below 50°C

For tasks carried out above room temperature, you will need to know the process temperature in addition to the boiling point. These two pieces of information are used to decide volatility from the graph below. Read across from the boiling point and up from the process temperature. The segment in which the two lines meet on the graph will tell you the volatility. If you fall on a dividing line, select the higher volatility.

**Graph to select volatility of liquid**



## Stage 4 Selection of the control approach

The checklist will now contain all the information that is needed to work out how to control the chemical. The control approach needed from Table 4 is found by first going to the hazard group to which the chemical has been allocated. Read across from the scale of use to the appropriate volatility/dustiness column. The number in the box identifies the control approach. Record the control approach number on the checklist.

If the chemical is a pesticide, please refer to the ILO International Chemical Control Toolkit draft guidelines for the related task control sheets.

If the chemical is not a pesticide, but has a hazard group A to E, use the information recorded on the checklist to identify the control approach needed from **Table 4**.

If the chemical also has a hazard group S recorded, this will also be needed in Stage 5 to find the control guidance sheets that apply.

**Table 4: Control approach selection**

Amount used	Low dustiness or volatility	Medium volatility	Medium dustiness	High dustiness or volatility
<b>Hazard group A</b>				
Small	1	1	1	1
Medium	1	1	1	2
Large	1	1	2	2
<b>Hazard group B</b>				
Small	1	1	1	1
Medium	1	2	2	2
Large	1	2	3	3
<b>Hazard group C</b>				
Small	1	2	1	2
Medium	2	3	3	3
Large	2	4	4	4
<b>Hazard group D</b>				
Small	2	3	2	3
Medium	3	4	4	4
Large	3	4	4	4
<b>Hazard group E</b>				
<b>For all hazard group E, chemicals choose control approach 4</b>				

## Stage 5 Selection of control guidance sheets

Your checklist should have identified the chemical you are handling as a pesticide or it has identified a control approach 1 - 4. It may also have identified the need for skin protection. For the control needs identified, go to the Annex 2 to find the control guidance sheets you need.

### 5.1 Pesticides

If the chemical is identified as a pesticide, you may refer to the ILO International Chemical Control Toolkit draft guidelines for the related task control sheets, such as concentrate dilution, spraying, fumigation, using poison baits and disposing, they give advices on how to reduce exposure to an adequate level. Moreover, you have to abide by the requirements of related local legislation regarding the pesticides, such as Pesticides Ordinance, Occupational Safety and Health Ordinance, Dangerous Goods Ordinance, Waste Disposal Ordinance etc.

### 5.2 Control Approach 1 - 4

This section contains the index of control guidance sheets that set out the principles of the control approaches 1 - 4 and the details please refer to the Annex 2.

Control Approach Number	Control Guidance Sheet
1	C1
2	C2
3	C3
4	C4

### 5.3 Skin and respiratory protection

If the chemical has been allocated to the skin hazard group, then you will need to read the control guidance sheet Sk at **Annex 2**.

If the guidance sheets suggest that respiratory protective equipment is appropriate, then you should look at the control guidance sheet Rpe at **Annex 2**.

## 5.4 Safety and environmental issues

The above-mentioned control guidance sheets are designed mainly to protect human health against the harmful effects caused by high exposures to hazardous chemicals. However many chemicals can also cause harm by burning, or can harm the environment if they escape from the workplace. To this end, the tool also provides basic advice on the control of these risks.

As many chemical substances may also pose safety hazards such as fire and explosion; or may harm the environment, further control measures to deal with these potential risks should also be considered.

Discharge of chemical waste to the environment through whatever means is in general not allowed under the Waste Disposal Ordinance. Chemical waste must be properly packaged, labelled and stored before collection by a licensed waste collector, who will deliver the chemical waste to an appropriate facility for treatment. You have to abide by the requirements of local environmental protection legislation regarding the discharge of chemical waste materials to the environment.



## Chemical Control Tool Checklist

**Task Description:** \_\_\_\_\_

**Date:** \_\_\_\_\_

### **Stage 1: Hazard classifications**

i. Is the chemical on the list of common solvents in Table 1? Yes / No  
 If Yes: Hazard group \_\_\_\_\_

ii. Is the chemical a pesticide? Yes / No  
 If Yes: Refer to the ILO International Chemical Control Toolkit draft guidelines for the task control sheets in connection with pesticide.

iii. Hazard Bands after matching against Table 2

A	B	C	D	E	S
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### **Stage 2: Scale of use**

Small	Medium	Large
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### **Stage 3: Ability to become airborne**

Low	Medium	High
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### **Stage 4: Control approach needed**

1	2	3	4
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### **Stage 5: Control Guidance Sheet**

Control Guidance Sheets	C1	C2	C3	C4
Skin Sheet (Sk)	Yes/No			
Respiratory Protection Sheet (Rpe)	Yes/No			

## Control Guidance Sheet for Control Approach 1 (C1)

### Scope

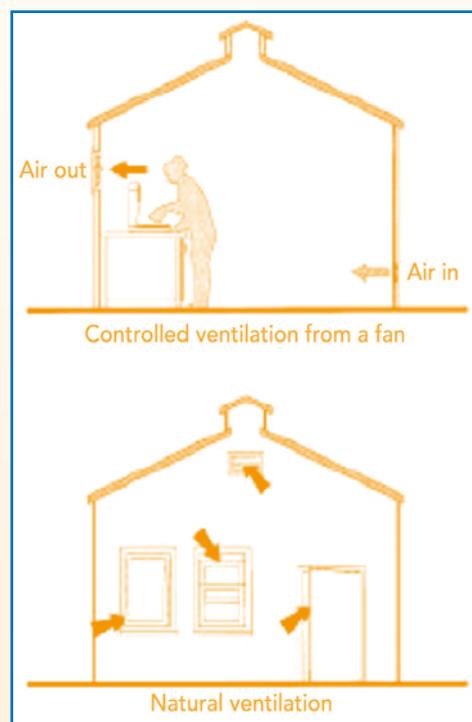
This control sheet is part of the tool and should be used when the tool identifies that a control approach 1 solution is needed. The sheet gives good practice advice on the application of general ventilation to the workplace and includes working in the open outside of a building. General ventilation is suitable for a range of small, medium and large scale tasks involving solids and liquids. It is important all the points are followed. Some chemicals are flammable or corrosive and your controls must be suitable for those hazards too. Look at the material safety data sheet (MSDS) for more information. This sheet identifies the minimum standards you need to apply to protect your health. It should not be used to justify a lower standard of control than that which may be required for process control or control of other risks.

### Access

- Keep unnecessary people away from the workplace. Ensure that no one is working close by downwind.

### Design and Equipment

- Ensure that there is unrestricted access to fresh air. This can be done by working outdoors. It may need doors and windows open, or it may need air to be supplied or removed by a powered fan.
- If you work in a factory building, you will normally require a wall mounted fan to remove the dirty air and louvers or ceiling vents to allow fresh, clean air in to the workroom to replace it. It may sometimes be more effective for the fan to blow clean air towards the worker rather than suck dirty air from the room.
- Do not release dirty air near to the clean air intake.
- Ensure, where possible that clean air flows past the worker then past the work area. In the open, use the wind to take dirty air away from you.
- For factories, ensure that the size or number of fans is sufficient to remove the dirty air from the workplace. A minimum of 5 air changes an hour is recommended.



### **Examination, Testing and Maintenance**

- Keep any fans or extractors in good working order.
- Every day, check that the fans are working when they are switched on. A ribbon strip attached to the exhaust side of the fan cage can be used as an indicator that the fan is working.

### **Cleaning and Housekeeping**

- Clean the work equipment and work area daily.
- Spills are the major cause of dust or vapour in the workplace. Clean up all spills immediately.
- Don't clean up dusts with a brush or compressed air. Use a damp cloth or vacuum.
- Put lids on containers immediately after use.
- Store containers in a safe place where they won't get damaged.
- Store volatile liquids out of direct sunlight.

### **Personal Protective Equipment (PPE)**

- Chemicals in hazard group S can damage the skin or eyes, or enter the body through the skin and harm you. Sheet S<sub>k</sub> give good advice on how to keep the materials off your skin.
- Check the MSDS or ask your supplier to find out what PPE is needed.
- Look after your PPE. When not in use, keep it clean and store it in a clean, safe place.
- Change it at recommended intervals or when it is damaged.

### **Training and Supervision**

- Tell your workers about any harmful properties of the chemicals they are working with and PPE provided.
- Teach them to handle chemicals safely. Check controls are working and ensure that they know what to do if something goes wrong.
- Have a system to check that the precautions you have put in place are being followed.

## Control Guidance Sheet for Control Approach 2 (C2)

### Scope

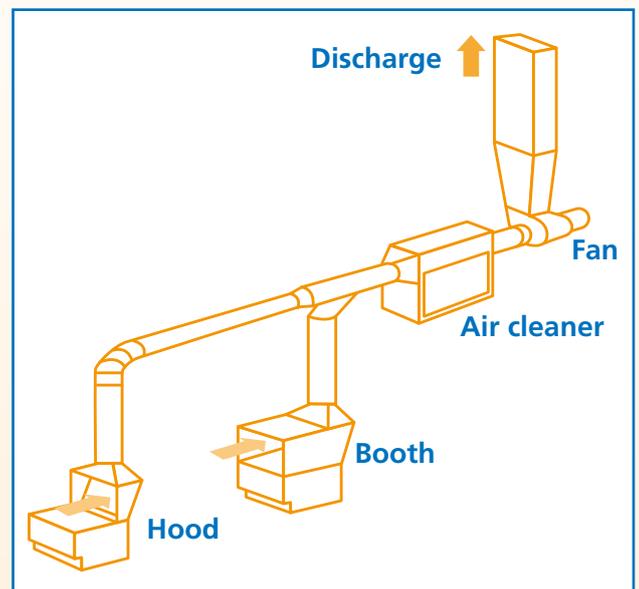
This control sheet is part of the tool and should be used when the tool identifies that a control approach 2 solution is needed. The sheet gives good practice advice on the application of local exhaust ventilation, which is the commonest form of engineering control. Local exhaust ventilation can be applied to a range of small, medium and large-scale tasks involving solids and liquids. This sheet identifies the minimum standards you need to apply to protect your health. It should not be used to justify a lower standard of control than that which may be required for process control or control of other risks. Air cleaning equipment may be necessary before discharging exhaust air to the atmosphere. Some chemicals are flammable or corrosive and your controls must be suitable for those hazards too. Look at the material safety data sheet (MSDS) for more information.

### Access

- Keep unnecessary people away from the work area. Ensure that no one is working close by downwind.

### Design and Equipment

- Apply local exhaust ventilation (LEV) at the source of the exposure. There should be sufficient airflow to capture the dust or vapour before it disperses into the workplace. For dusts, airflows above 1m/sec will generally be needed, for vapours airflows above 0.5 m/sec will generally be needed. The airflow should be measured at the origin of the dust or vapour.
- Enclose the source of dust or vapour as much as possible to help stop it spreading.
- Don't allow the worker to get between the source of exposure and the LEV, or they will be in the path of the contaminated air.
- Where possible, locate the work away from doors and windows to stop draughts interfering with the LEV and spreading the dusts or vapours.
- Keep extraction ducts short and simple and avoid long sections of flexible duct.
- Provide an easy way of checking the LEV is working such as a ribbon strip attached to the intake side.
- Discharge extracted air to a safe place away from doors, windows and air inlets.



## **Examination, Testing and Maintenance**

- Check that the extraction system is working every day when it is switched on.
- Visually check the ducting frequently for signs of damage and repair when necessary.
- Have the system thoroughly examined and tested at least once a year.
- Maintain the equipment as advised by the supplier/installer, in effective and efficient working order.
- Do not use the equipment if you have any suspicion that it is not working properly.

## **Cleaning and Housekeeping**

- Only keep the amount of material in the workplace that will be used that day.
- Clean the work equipment and work area daily.
- Spills are the major cause of dust or vapour in the workplace. Clean up all spills immediately.
- Don't clean up dusts with a brush or compressed air. Use a damp cloth or vacuum.
- Put lids on containers immediately after use.
- Store containers in a safe place where they won't get damaged.
- Store volatile liquids out of direct sunlight.

## **Personal Protective Equipment (PPE)**

- Chemicals in hazards group 5 can damage the skin or eyes, or enter the body through the skin and harm you. Sheet Sk gives good advice on how to keep the materials off your skin.
- Check the MSDS or ask your supplier to find out what PPE is needed.
- Look after your PPE. When not in use, keep it clean and store it in a clean, safe place.
- Change your PPE at recommended intervals or when it is damaged.

## **Training and Supervision**

- Tell your workers about the harmful nature of the chemicals they are working with and PPE provided.
- Teach them to handle chemicals safely. Check controls are working and what to do if something goes wrong.
- Have a system to check that the precautions you have put in place are being followed.

## Control Guidance Sheet for Control Approach 3 (C3)

### Scope

This control sheet is part of the tool and should be used when the tool identifies that a control approach 3 solution is needed. The sheet gives good practice advice on containment and describes the key points you have to follow to reduce exposure to an adequate level. It is important that all the points are followed. Containment can be applied to a range of small, medium and large scale tasks involving solids and liquids. Some chemicals are flammable or corrosive and your controls must be suitable for those hazards too. Look at the material safety data sheet (MSDS) for more information. This sheet identifies the minimum standards you need to apply to protect your health. It should not be used to justify a lower standard of control than that which may be required for process control or control of other risks.

### Access

- The work area and equipment should be clearly marked.
- Control entry to the work area. Only essential workers who have been trained should be allowed into hazardous work areas.

### Design and Equipment

- Material handling should take place in a closed system that separates the worker from the hazardous material by a solid barrier.
- Limited breaches of the closed system are permitted under controlled conditions i.e. where exposure times are only a few minutes and the quantity of material handled is small.
- Design the closed system for ease of maintenance.
- Where possible, keep the equipment under negative pressure to reduce leakage.
- Vent any exhaust air to a safe place away from doors, windows, walkways and air inlets.

- Provide a sump or separate drainage system to prevent leaks and spills from contaminating communal drains or waterways.

### **Examination, Testing and Maintenance**

- Ensure all equipment used is maintained in good repair and efficient working order. Have the system thoroughly examined and tested at least once a year.
- Adopt a “permit-to-work” system for all maintenance work.
- Document and follow any special procedures that are needed before the system is opened or entered, e.g. purging or washing.
- Don’t enter any vessel until it is safe to do so. Check for hazardous or flammable chemicals and sufficient oxygen (between 19.5% and 22%). Note that entry or the work may give rise to a hazardous situation; e.g. disturbing sludge, welding may deplete oxygen.
- Check all the equipment frequently for signs of damage and repair when necessary.

### **Cleaning and Housekeeping**

- Clean the work equipment and work area daily.
- Spills are the major cause of dust or vapour in the workplace. Clean up all spills immediately.
- Don’t clean up dusts with a brush or compressed air. Use a damp cloth or vacuum.
- Put lids on containers immediately after use.
- Store containers in a safe place where they won’t get damaged.
- Store volatile liquids out of direct sunlight.

### **Personal Protective Equipment (PPE)**

- Chemicals in hazard group S can damage the skin or eyes, or enter the body through the skin and harm you. Sheet Sk gives good advice on how to keep the materials off your skin.

- Check the MSDS or ask your supplier to find out what PPE is needed.
- Respiratory Protective Equipment (RPE) should not be needed for routine tasks, but may be necessary for cleaning and maintenance activities and when dealing with spills.
- Be aware that some maintenance tasks may involve entry into confined spaces where approved-type RPE may be needed when there is not enough pure air to breathe.
- Look after your PPE. When not in use, keep it clean and store it in a clean, safe place.
- Change it at recommended intervals or when it is damaged.

## **Training and Supervision**

- Tell your workers about any harmful properties of the chemicals they are working with and PPE provided.
- Teach them to handle chemicals safely. Check controls are working and ensure that they know what to do if something goes wrong.
- Have a system to check that the precautions you have put in place are being followed.

## Control Guidance Sheet for Control Approach 4 (C4)

### Scope

This control sheet is part of the tool and should be used when the tool identifies that a control approach 4 solution is needed.

### Background

Control approach 4 means that you have a process where you need more specific and specialist advice than this tool can provide. This advice may come from a more detailed guidance document such as that produced by a well-established occupational hygiene organization, or you may need to involve an expert in the handling of that substance or process. This tool identifies control approach 4 if:-

- You are handling chemicals assigned to hazard group E. These have the potential to cause very serious health effects such as cancer or asthma and a safe level of exposure is difficult to establish. Different types of control will be required for different chemicals in this group;
- You are handling large quantities of chemicals that can easily become airborne and cause serious health effects. All aspects of handling these substances need to be assessed in a level of detail beyond that provided by this tool.

Whichever of these reasons apply, it is important that you look at your process to see if you can use a safer alternative material. If this is not possible, it is important that you seek further advice on the degree of control required.

## Control Guidance Sheet for Chemicals Causing Harm Via Skin or Eyes (Sk)

### Scope

This control sheet is part of the tool and should be used when the tool identifies the need for skin protection. This sheet gives general advice on how to eliminate or minimize the amount of material getting on the skin (Group S chemicals) and how to select suitable personal protective equipment (PPE).

### Contact with Skin and Eyes

Group S covers chemicals that can damage the skin and/or eyes, or enter the body through the skin and cause harm. This may be in addition to causing harm by being breathed in. Contact with skin and eyes can be a particularly problematic type of exposure, and controls in addition to those in control guidance sheets 1 - 4 may be needed.

You need to consider how group S chemicals can come into contact with the skin and eyes. This can occur:

- When the skin comes into direct contact with a liquid or solid;
- When dust or vapours/spray particles settle on the skin. The dust or vapour may be generated as part of the work activity or may be incidental to it.
- By touching dirty surfaces;
- By touching or removing dirty clothing;
- By splashing or swallowing.
- Once contamination has got onto the hands, it may be spread to other parts of the body by rubbing or scratching.

### Control measures

If you are using a chemical in hazard group S and it is likely to get onto your worker's skin or eyes, you need to consider not using it, or replacing it with one that does not fall into group S. But remember to check any replacement material is not in a higher inhalation hazard group.

If you can't avoid exposure this way, by substitution, you will need to reduce likely contact with the skin or eyes. There is a range of options you can use:

- Can the chemical be contained more? For example, a control approach 2 solution will provide more containment and less exposure than a control approach 1 solution.

- Can you modify the process to minimize handling operations or use remote handling?
- Can you segregate clean and dirty areas, and put a barrier between them? This will help to stop the spread of contamination.
- Can you provide smooth, impermeable surfaces that are easy to clean?

Once these questions have been answered and any process modifications made, it is important that the work area is cleaned regularly, and rigorous procedures are put in place to deal with spillages. Good washing facilities also need to be provided. Workers should wash their hands before and after eating, drinking and using the lavatory.

### Personal protective equipment (PPE)

In situations where contact with chemicals in hazard group 5 is unavoidable, the use of PPE may be appropriate. However, PPE has a number of limitations:

- It has to be selected carefully.
- It may limit mobility or communication;
- Its continued effectiveness depends on proper maintenance, training and adherence to good working practices.
- It should only be considered if other measures are impracticable.

### Types of PPE

There are five types of clothing that may be required:

- Chemical protective gloves;
- Coveralls;
- Protective footwear;
- Face or eye shields;
- Respiratory protective equipment (RPE)



Your PPE supplier should normally be able to tell you the type of protective material to select. Not all materials give protection against all chemicals. Some chemicals pass through protective materials over a period of time. It is important that you also ask your supplier how frequently the PPE needs to be changed. Ensure that the equipment is changed when necessary. Remember to train your workers and make sure they follow the instructions.

## General precautions

- Check PPE for damage both before and after use.
- Clean and maintain all PPE regularly. Use disposable PPE only once and dispose of it safely after use. Wash cotton type overalls on a regular basis. Wash overalls at work or at a specialist laundry. They should not be taken home and washed with the 'family' wash.
- Store protective clothing in a clean cupboard or locker. Store clean and dirty clothing separately.
- Provide a good standard of personal washing facilities.

## Chemical protective gloves

- The gloves must be sufficiently robust not to tear or cut while undertaking the work activity.
- Leather or stitched working gloves are not suitable for working with chemicals.
- Make sure workers don't touch the outside of a contaminated glove with a naked hand when putting gloves on or taking gloves off.

## Coveralls

- The material selected should be resistant to the penetration of liquids, dusts or granules as appropriate.
- For corrosive materials such as acids, an impervious apron gives good protection.
- Coveralls should normally be worn over boots rather than be tucked in. Gloves should normally be worn over the sleeves to help stop contamination getting on the inside of the PPE.

## Protective footwear

- Protective footwear may be necessary for safety reasons as well as for protection against chemicals. Toecap protection, heat protection and a metal sole plate may be needed.
- Ensure protective footwear complies with the appropriate standard. When there is a risk of liquid coming into contact with the lower leg, long rubber boots should be worn.

## Eye and face protection

- When handling open containers of corrosive liquids, full-face shields should be worn.
- Chemical splash goggles may be more practicable when wearing a respirator.

## Respiratory protective equipment (RPE)

- The selection of respiratory protective equipment needs careful attention and please refers to control guidance sheet Rpe for further information.

## Control Guidance Sheet for Selection and Use of Respiratory Protective Equipment (Rpe)

### Scope

This control sheet is part of the tool and should be used when the tool identifies that respiratory protective equipment may be required. This sheet gives general advice on the selection and use of RPE.

### Respiratory protective Equipment (RPE)

- RPE is specially designed equipment that is worn over the mouth and nose (or sometimes a larger part of the body such as the head) to help protect against breathing in harmful substances such as dusts, fumes and gases. There are two main types:
  - Respirators work by filtering the air as you breathe it in. They should not be worn in oxygen deficient areas or areas where the filtered air may still be dangerous. The acceptable concentration of oxygen is 19.5 - 22%.
  - Breathing apparatus supplies breathable air from an independent source to the wearer.

### Selection of RPE

- RPE should be suitable for the substance being used, the task and the wearer. When possible you should ask your safety equipment supplier for help.
- Only use properly designed RPE. Look for compliance with a recognized standard such as an American, Australian, European, especially for local standard.

### Suitability for chemical

- You must select RPE with a filter designed to protect you against the chemical you are exposed to. For example, a dust filter will not protect against the solvent vapour from paint. A solvent vapour filter will not protect against the acid gases from a plating bath.
- You will have to be especially careful when selecting filters to protect you against gases and vapours as some of them only work for a small range of chemicals.

### Suitability for task

- You must ensure that the RPE is able to reduce the contamination in the air you breathe to a safe level. The amount of work the filter has to do is called its protection factor. A filter with a protection factor of 10 is able to reduce the concentration of hazardous material in the air you breathe to one tenth of the concentration outside of the RPE. Different types of RPE have different protection factors.

- Filters will only work for a limited time. You will need to check with the supplier or in the instructions to find out how long you can wear the RPE before the filter needs changing.
- Only wear disposable RPE once.

### **Suitability for wearer**

- Several types of RPE, especially those that only fit onto the front of your face need to make good contact with your skin to work. If you have a beard or are not clean-shaven they will not work and you may have to use another type of RPE such as one that covers all of your head.
- If you wear glasses or need to wear hearing protection or a hard hat, you should check that they do not interfere or get between the RPE and your skin.
- Different people will need different sizes or shapes of masks to work efficiently for them. To check that an RPE mask fits, put it on, cover the filter and breathe in. The mask should suck down and stay there for ten seconds whilst you hold your breath. If it doesn't, check it is fitted correctly and try again. If it still doesn't, try another size.
- If you need to wear RPE for a job, keep it on all the time. Even if you only take it off for a few seconds to speak, it will seriously reduce the protection it provides.

### **Maintenance**

- If your RPE has a replaceable filter, ensure that it is changed regularly before its workable life runs out.
- Reusable RPE requires cleaning with warm soapy water after each use.
- Check straps, face piece and seals for signs of deterioration. Replace if there are signs of damage or hardening.

### **Storage**

- Store your RPE in a clean location where it won't get damaged.
- Store rubber based RPE out of direct sunlight as it will shorten its usable life.

### **Training**

Ensure that you are taught or shown:

- How to fit the RPE correctly
- How to check for a face seal
- How often to change the filter
- How to check, maintain and store your RPE

## Further information

- **Industrial Ventilation: A Manual of Recommended Practice.** American Conference of Governmental Industrial Hygienists. ISBN 1882417429
- **Handbook of Occupational Hygiene.** Croner Publications. ISBN 0903393506
- **HSE Guidance Notes, Environmental Hygiene (EH) series.** HSE Books. ISBN various.
- **The ILO International Occupational Safety and Health Information Centre (CIS).** <http://www.ilo.org/cis>
- **The International Chemical Safety Cards (ICSC) of the International Programme on Chemical Safety (IPCS).** <http://www.who.int/ipcs> and <http://www.ilo.org/safework>
- **Draft Guidelines for International Chemical Control Toolkit, International Labour Office.** [http://www.ilo.org/public/english/protection/safework/ctrl\\_banding/toolkit/main\\_guide.pdf](http://www.ilo.org/public/english/protection/safework/ctrl_banding/toolkit/main_guide.pdf)
- **The Globally Harmonized System for the Classification and Labelling of Chemicals (GHS).** <http://www.unece.org/trans/danger/publi/ghs/ghs.html>





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