

DCM3

COSHH essentials: Working with dichloromethane (DCM) based products

The Control of Substances Hazardous to Health Regulations 2002 (COSHH) require employers to ensure that exposure is prevented or, where this is not reasonably practicable, adequately controlled. This guidance gives practical advice on how this can be achieved by applying the principles of good practice for the control of exposure to substances hazardous to health, as required by COSHH.

It is aimed at people whose responsibilities include the management of substances hazardous to health at work, eg occupational health specialists, anyone undertaking COSHH assessments and supervisors. It is also useful for trade union and employee safety representatives. It will help you carry out COSHH assessments, review existing assessments, deliver training and supervise activities involving substances hazardous to health.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance, you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

See Essential information near the end of this sheet.

Stripping surface coatings from alloy wheels at permanent industrial workplaces

Control approach Engineering control and Respiratory protective equipment (RPE)

What this sheet covers

This sheet describes good practice for the control of exposure to dichloromethane (DCM) vapour when stripping surface coatings from alloy wheels at permanent industrial workplaces.

It covers the key points you need to follow to reduce exposure to DCM vapour to an adequate level. This is achieved by following good control practice (ie follow all points described in this sheet or use equally effective measures), and by reducing DCM exposure to below the relevant workplace exposure limit (WEL). This sheet does not cover other health and safety risks.

Main points

- ✓ DCM is a highly volatile solvent. Small volumes will readily give off large amounts of vapour, even at room temperature. DCM vapour is colourless with a low odour so you may be unaware you are at serious risk.
- ✓ DCM vapour is heavier than air and will therefore tend to accumulate at lower levels in the workplace.
- ✓ Exposure to high concentrations of DCM vapour has caused impaired consciousness and death, eg cleaning debris from stripping tanks.
- ✓ **Stripping solutions can also contain hydrofluoric acid (HF) which can cause serious burns and eye damage.**
- ✓ DCM- and HF-based products are very hazardous so avoid their use whenever reasonably practicable, by using suitable and safer alternative products or methods.
- ✓ **DCM-based products should ONLY be used in well ventilated areas, to prevent the build-up of vapour.** Examples of poorly ventilated areas can include cellars, stairwells and sheeted enclosures.
- ✓ Obtain specialist advice for selecting the right chemical protective gloves and respirator filter. This is because DCM can penetrate through gloves and respirator filters very quickly, therefore they usually only provide protection for a very short time.
- ✓ Avoid working alone. If this cannot be avoided, ensure regular and frequent contact with someone else.
- ✓ Seek competent specialist advice before working with DCM-based products if you are unsure how the task can be done safely.

Hazards

- ✓ Mixtures used for stripping can contain DCM, HF, sodium hydroxide and methanol. Information on the health hazards of the mixture (including any from additive effects of the substances) should be available on the safety data sheet.

- ✓ Breathing in DCM vapour can affect the central nervous system, causing symptoms such as headaches, lethargy, lack of coordination, nausea and impaired consciousness (narcosis).

At high concentrations DCM can cause death.

- ✓ DCM breaks down to carbon monoxide within the body, which reduces the flow of oxygen. This may aggravate symptoms for those with heart and/or lung problems.
- ✓ DCM is suspected of causing cancer.
- ✓ DCM can be absorbed through the skin.
- ✓ DCM can burn the skin, or cause irritation leading to dermatitis.
- ✓ DCM can irritate and burn the eyes.
- ✓ HF can cause severe burns and serious eye damage. Exposure to HF is of particular concern since if it comes into contact with the skin, pain may not be felt immediately.

Caution: HF is very dangerous. Ensure workers understand the steps they need to take if stripping solution containing HF comes into contact with the skin. In case of burns get immediate medical help. Stock calcium gluconate gel. For advice on emergency treatment see Essential information.

- ✓ Sodium hydroxide can cause serious eye and skin damage.
- ✓ Methanol can cause irritation leading to dermatitis.
- ✓ The WELs for DCM, HF, sodium hydroxide and methanol are detailed in HSE publication EH40/2005 (see Essential information).

Access to work area

- ✓ Allow access to authorised and appropriately trained people only.
- ✓ Install forced ventilation if necessary, but make sure that it does not adversely affect the effectiveness of the local exhaust ventilation (LEV) system.
- ✓ Avoid working alone when using DCM-based products. Ensure that an appropriate monitoring and communication system is in place, eg regular and frequent visual or verbal contact or CCTV.
- ✓ Only allow workers to eat and drink in a designated location away from the work area.

Equipment and procedures

Product and Application

- ✓ If using DCM-based products choose stripping mixtures with no HF or sodium hydroxide to reduce the hazardous nature of the mixture. If you must use these mixtures, choose products containing as low a concentration of these substances as possible. Speak to your supplier.
- ✓ Use a pump or siphon to transfer the stripping mixture when filling or emptying the tank.
- ✓ Use lifting equipment to prevent the need to lean over the tank. Use a mechanical hoist wherever possible, or long-handled tools with drip guards, to lower and lift workpieces from the tank, reducing the risk of skin and eye contact.
- ✓ Ensure the stripping tank is made from a suitable material, eg stainless steel. If unsure, consult the product safety data sheet or ask the supplier of your stripping mixture. Do not carry out the stripping process in modified chemical containers, such as intermediate bulk containers (IBCs).

- ✓ The dimensions of the tank should be adequate for the largest workpiece to be dipped so that the lid can be fully closed during the stripping process, and the level of the fluid remains at least 150mm and preferably 300mm below the lip (see Figure 1).
- ✓ Use lids to cover stripping tanks and only remove them to load or retrieve the workpieces being stripped.
- ✓ Avoid excessively long contact times (eg overnight) between alloy wheels and the stripping solution – if sodium hydroxide is present it can react with aluminium, producing heat and increasing the amount of DCM vapour generated.
- ✓ Locate the water rinsing area close to the tank to minimise transfer distances.
- ✓ Jet-washing of workpieces should be done outside in a dedicated area away from the main workplace.
- ✓ Prior to transportation workpieces should be fully dried.

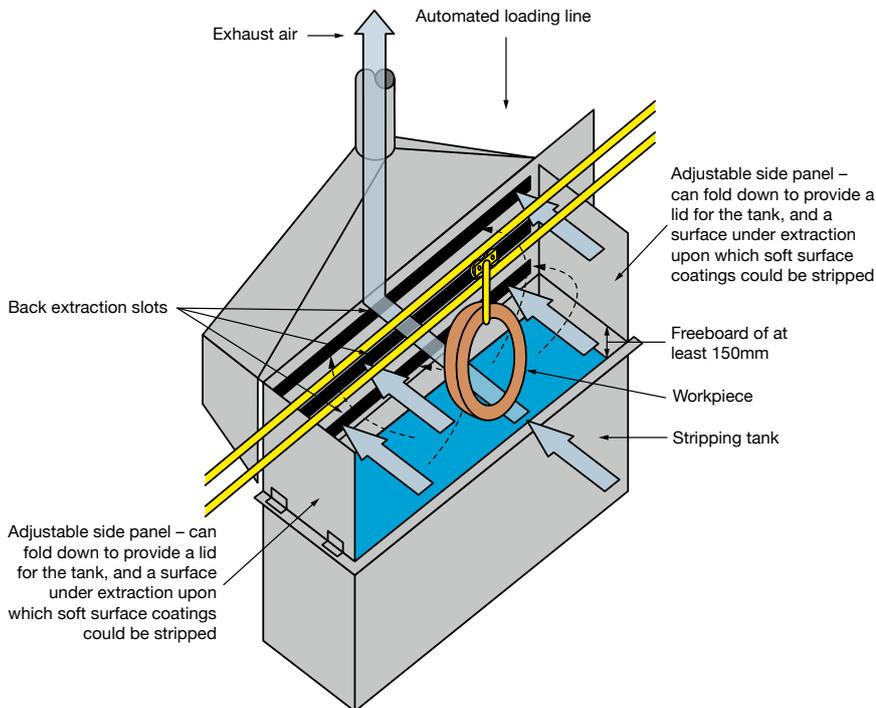


Figure 1 Stripping tank with back slot extraction and automated loading line

Local exhaust ventilation (LEV) and Design

- ✓ Provide a tank with effective LEV, eg back slot extraction (see Figure 1).
- ✓ To effectively control exposure, the rate of airflow into the LEV system will depend on a number of factors:
 - the design of the booth eg the volume and dimensions of the booth and size of booth opening;
 - the location of the extraction; and
 - the type of process and level of vapour generated.
- ✓ Seek competent advice from an LEV designer if you are uncertain (see sheet G406 in Essential information).

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- ✓ Provide an easy way of checking the LEV is working, eg airflow indicator or equivalent.
 - ✓ Where possible, site the work away from doors, windows and walkways to stop draughts interfering with the effectiveness of the extraction.
 - ✓ Do not locate any fans (eg air movers to cool the workers) too close to the LEV since this will make the extraction ineffective.
 - ✓ Always confirm that the LEV is turned on and working prior to commencing work. Check the indicator.
 - ✓ Discharge extracted air to a safe place outside away from doors, windows and air inlets.
 - ✓ Do not use a recirculating LEV system unless the air is thoroughly cleaned before its return to the workroom. Under these circumstances, the system should have continuous monitoring (eg a photoionisation detector) to alarm and to direct contaminated air out of the workplace whenever the filter fails. Select filters that are appropriate, provide adequate residence time to enable DCM vapour to be removed, and do not become saturated too quickly.
 - ✓ Provide adequate clean 'make up air' into the workplace to replace extracted air.

Procedures

- ✓ Have a safe system of work in place for emptying, filling and topping up the tank.
- ✓ Transfer stripping fluids by pump or siphon rather than by pouring.
- ✓ Top up with stripping solutions only, not individual stripper components.
- ✓ Enclose the process as much as possible.
- ✓ Lift the workpiece out of the tank slowly to reduce both the amount of solution dragged out on the workpiece, and any disturbance of the vapour above the tank which could then escape from the extracted area.
- ✓ Ensure that drying and scraping are done under LEV, eg in front of the slot extraction or in a small table top booth.
- ✓ Leave the workpiece suspended above the tank under extraction, while DCM evaporates off it.
- ✓ Rinse workpieces (eg in wash tanks of water or brine) before scraping off any residual softened surface coating with long-handled tools (eg a wire brush). Put any waste into a sealed container for disposal as hazardous waste.
- ✓ Rinse stripped workpieces in clean water before any pressure washing.
- ✓ Keep the stripping mixture clean. Sludge should be filtered (eg by use of a mesh basket within the tank), or removed using a long handled scoop. This should be done under extraction to prevent worker exposure to DCM vapour from both the stripping fluid and wet sludge. Keep the sludge under extraction until dried out.
- ✓ At least once a week, check the stripping fluid using a hydrometer and top it up if necessary. Stripping mixtures that have expired are likely to have an altered composition, and be more flammable, due to the evaporation of DCM leading to an increase in the concentration of other flammable components.

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- ✓ Tools contaminated with DCM residues should only be cleaned in a well-ventilated work area. Doing this in a well-ventilated area outside is also an option.
 - ✓ Plan how you will deal with any emergency situation such as skin contact with HF and large spills in the workplace. See product safety datasheet for further information.
 - ✓ Any emergency procedure should cover measures to mitigate any effects (eg if a worker becomes affected by inhalation or skin/eye contact), and restore the situation to normal (eg controls needed to clean up a large spill). Refer to Public Health England document *Dichloromethane - General information*.

Respiratory protective equipment (RPE)

- ✓ RPE is normally not needed when lifting equipment is used to lower and lift workpieces from the tank.
- ✓ RPE is normally not needed when drying and scraping under extraction.
- ✓ RPE is needed when manually lowering or lifting workpieces, or when manually transferring wet workpieces to another area for scraping and rinsing.
- ✓ RPE is needed when performing cleaning and maintenance tasks, like sludge removal and replacing stripping fluid, and while dealing with spills.
- ✓ Provide constant flow airline breathing apparatus (CFABA). This is because DCM vapour can penetrate through respirator filters very quickly, therefore they usually only provide protection for a very short time. Ensure that the CFABA provided has an assigned protection factor (APF) of at least 20 (see sheet R3).
- ✓ Always check with your equipment supplier that the RPE is suitable for use with DCM and your specific task.
- ✓ Fit testing is required for RPE with a tight-fitting seal.
- ✓ Workers wearing tight-fitting RPE must be clean shaven, trained how to fit it properly and how to look after it (see HSE publication INDG479 in Essential information).
- ✓ Carry out a visual check to confirm that all parts are present, correctly fitted and in good working order. Ensure that the pressure and volume flow rate of the air supply are adequate (see HSE publication HSG53 in Essential information).
- ✓ Visually check the compressed airlines for signs of damage before each use.
- ✓ Replace valves, face seals and worn or damaged parts on respirators.
- ✓ A thorough maintenance, examination and test should be carried out at least once a month. However, if the RPE is used only occasionally, an examination and test should be carried out before use and, in any event, the interval should not exceed three months.
- ✓ Compressed air systems used for the operation of air tools should not be used for breathing purposes **UNLESS** the air has been shown to meet the minimum quality requirements.
- ✓ Ensure that the air supply provided to the CFABA is clean by siting in a clean and safe location (with sufficient ventilation to ensure that emissions are displaced safely).

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- ✓ Keep the CFABA clean and store it in a clean place away from contamination.
 - ✓ Instruct workers on how to check RPE is working properly before every use.
 - ✓ HSE publication L5 details the information that should be kept in order to show the RPE is performing as originally intended – see section entitled *Suitable records*.

Personal protective equipment (PPE)

- ✓ Provide face protection, eg splash protection goggles or face visors, unless any RPE being used fulfils this role.
- ✓ Ask your equipment supplier to advise on suitable coveralls and chemical resistant aprons.
- ✓ Ensure all PPE you provide, including suitable protective gloves, is compatible and resistant to DCM. Be aware that many common types of gloves may not provide adequate protection. Always check with your supplier (see HSE publication HSG262 in Essential information).
- ✓ Ensure workers are trained in the use of gloves, including how to take them off without contaminating themselves, and dispose of the gloves after single use (see HSE video Removing single-use gloves without contaminating your hands in Essential information).
- ✓ Make suitable arrangements for the storage and replacement of PPE. Provide separate storage for clean and contaminated PPE.
- ✓ Coveralls and chemical resistant aprons contaminated with DCM should be stored in a ventilated area until dry.
- ✓ Ensure contaminated overalls are laundered before re-use.
- ✓ Use a contract laundry or a suitable equivalent to wash work clothing. Do not allow workers to launder clothing at home.
- ✓ Inform your laundry service provider that the clothing may be contaminated with hazardous chemicals. Ensure work clothing is fully aired before collection from the workplace.

Personal decontamination and skin care

- ✓ Provide warm water, mild skin cleansers, and soft paper or fabric towels for drying. Avoid abrasive cleansers.
- ✓ Provide pre-work skin creams, which will make it easier to wash dirt from the skin.
- ✓ Provide after-work creams to restore the natural moisture content of the skin.

Caution: 'Barrier creams' are not 'liquid gloves' and do not provide a full barrier.

Maintenance, examination and testing

- ✓ Check all equipment used for the task is in effective working order.
- ✓ Maintain it as advised by the supplier or installer.
- ✓ Check for signs of damage to control equipment before starting work.
- ✓ Establish a plan for regular preventative maintenance.
- ✓ Have equipment thoroughly examined and tested against its performance standard, at suitable intervals.
- ✓ LEV systems require a statutory 'thorough examination and test' (TExT).

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- ✓ Get a competent person to perform the TExT at least every 14 months.
 - ✓ Carry out all actions arising from the TExT.
 - ✓ Your LEV supplier should have provided a user manual that includes how to use the system, how to maintain it, the spares available and a list of things that can go wrong.
 - ✓ For LEV a user manual or log book is helpful in setting out the frequency of checking, maintenance or parts replacement.
 - ✓ For LEV with no user manual or log book, you may need the help of a competent person. They can determine the performance needed for adequate control.
 - ✓ HSE publication L5 details the information that should be kept in order to show the LEV is performing as originally intended – see section entitled *Local exhaust ventilation*.
 - ✓ HSE publication HSG258 provides more detailed information on LEV systems and legal and competency requirements.
 - ✓ Several measures are available to check the effectiveness of controls ranging from simple qualitative (eg use of smoke tubes or a dust lamp) to complex quantitative techniques (eg air sampling), usually for higher risk scenarios (see sheet G409 in Essential information).

Cleaning and housekeeping

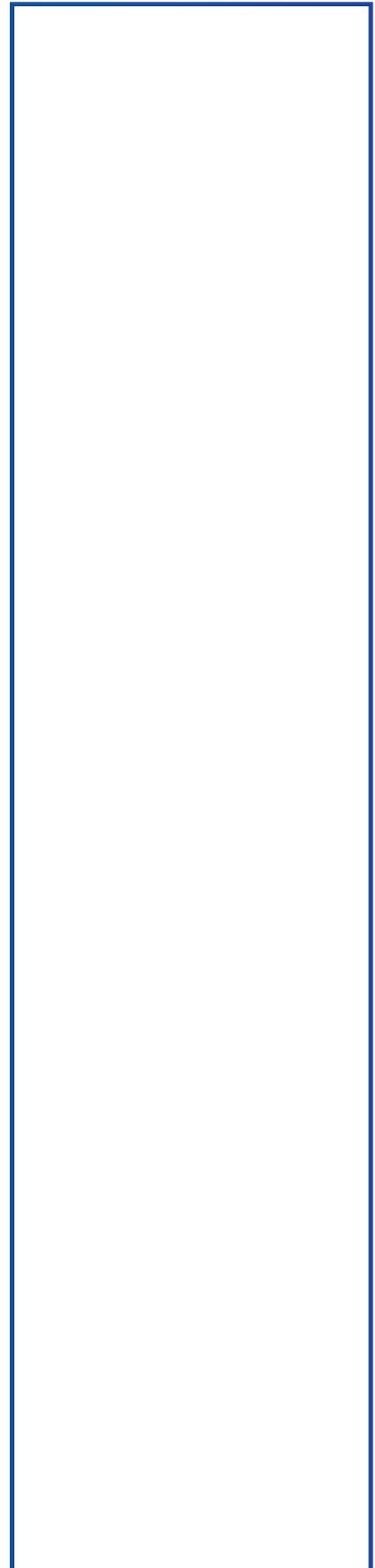
- ✓ Clean work equipment and the work area daily or at the end of the job.
Caution: Never enter or lean into the stripping tank even when cleaning it, as it may create a confined space risk. Remain outside the tank and use equipment such as pumps and long handled tools.
- ✓ Always use RPE and PPE when dealing with any spills of stripping solution.
- ✓ Deal with spills immediately.
- ✓ Dispose of hazardous waste and empty containers safely.

Health surveillance

- ✓ Provide your employees with health surveillance for dermatitis where there is a reasonable likelihood that it may occur in your workplace (see sheet G403 in Essential information).

Training and supervision

- ✓ Tell workers about the hazards associated with their work and how to recognise the early signs of narcosis and dermatitis from exposure to DCM.
- ✓ If the stripping solution contains HF, tell workers about the hazards of HF coming into contact with the skin.
Caution: HF is very dangerous. Ensure workers understand the steps they need to take if stripping solution containing HF comes into contact with the skin. In case of burns get immediate medical help. Stock calcium gluconate gel. For advice on emergency treatment see Essential information.
- ✓ Tell workers who to report any such signs to.



- ✓ Provide workers with training on:
 - working safely with hazardous substances;
 - when and how to use controls, including how to put on and take off gloves correctly;
 - how the LEV system works;
 - how to use the LEV to get the best out of it;
 - how to check that the LEV is working;
 - how to use RPE;
 - how to check that the RPE is working; and
 - what to do if something goes wrong.
- ✓ Provide supervision – ensure that safe work procedures are followed.
- ✓ Involve managers and supervisors in health and safety training.
- ✓ Training records are helpful to demonstrate what information, instruction and training has been provided.

Essential information

Health surveillance for occupational dermatitis COSHH essentials guidance sheet G403 HSE www.hse.gov.uk/pubns/guidance/g403.pdf

New and existing engineering control systems COSHH essentials guidance sheet G406 HSE www.hse.gov.uk/pubns/guidance/g406.pdf

Exposure measurement: Air sampling COSHH essentials guidance sheet HSE G409 www.hse.gov.uk/pubns/guidance/g409.pdf

UK Standard Assigned Protection Factor 20 (APF 20)
COSHH essentials guidance sheet R3 HSE
www.hse.gov.uk/pubns/guidance/rpe3.pdf

Control of substances hazardous to health: The Control of Substances Hazardous to Health Regulations 2002. Approved Code of Practice and guidance L5 (Sixth edition) HSE 2013
<https://www.hse.gov.uk/pubns/books/l5.htm>

Safe Work in Confined Spaces Confined Spaces Regulations 1997 Approved Code of Practice and guidance L101 (Third edition) HSE 2014 www.hse.gov.uk/pubns/books/l101.htm

Respiratory protective equipment at work: A practical guide HSG53 (Fourth edition) HSE 2013 www.hse.gov.uk/pubns/books/hsg53.htm

Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) HSG258 HSE 2017
www.hse.gov.uk/pubns/books/hsg258.htm

Managing skin exposure risks at work HSG262 (Second edition) HSE 2015 www.hse.gov.uk/pubns/books/hsg262.htm

EH40/2005 Workplace exposure limits HSE 2020
www.hse.gov.uk/pubns/books/eh40.htm

Guidance on respiratory protective equipment (RPE) fit testing Leaflet INDG479(rev1) HSE 2019 www.hse.gov.uk/pubns/indg479.htm

Further information

You can find the full COSHH essentials series at www.hse.gov.uk/coshh/essentials/index.htm

Removing single-use gloves without contaminating your hands
Video HSE www.hse.gov.uk/skin/videos/gloves/index.htm

Personal Protective Equipment at Work: Personal Protective Equipment at Work Regulations 1992 Guidance on Regulations L25 (Third edition)
HSE 2015 <https://www.hse.gov.uk/pubns/books/l25.htm>

Restriction on use of Dichloromethane Annex VII to REACH – Conditions of restriction. Entry 59. From European Chemicals Agency (ECHA). <https://echa.europa.eu/documents/10162/0ea58491-bb76-4a47-b1d2-36faa1e0f290>

The REACH Enforcement (Amendment) regulations 2014. SI 2014/2882. <https://www.legislation.gov.uk/uksi/2014/2882/regulation/2>

British Occupational Hygiene Society (BOHS) Directory of Occupational Hygiene Services <https://www.bohs.org/information-guidance/>

For information about health and safety visit <https://books.hse.gov.uk> or <http://www.hse.gov.uk>

You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

To report inconsistencies or inaccuracies in this guidance email: commissioning@wlt.com

Employee checklist

- Do you understand the health hazards associated with your work?
- Are you sure about safe work procedures?
- Are you sure how to use all controls?
- Check that the LEV is turned on and working prior to commencing work.
- Check that any RPE works properly every time you use it.
- Check for signs of leaks, wear and damage to RPE and LEV before every job.
- If you find any problems, tell your supervisor, don't just carry on working.
- Co-operate with health surveillance.
- Use, maintain and store your PPE in accordance with the relevant instructions.
- Do not use gloves that are punctured split cracked or damaged in any way.
- Wash your hands before eating, drinking, smoking, using the lavatory and after work.
- Follow any skin care programme provided.