Professional use of paint stripper containing dichloromethane (DCM): arrangements for proper training and competence

Mandatory training for professionals wishing to use a DCM-based paint stripper in the UK

Before purchasing and / or using a DCM-based paint stripper, professionals must attend a mandatory training course. To be considered suitable, the training course must conform with the requirements in the REACH Enforcement Regulations 2008 as amended by the REACH (Enforcement) Amendment Regulations 2014 covering as a minimum:

a) awareness, evaluation and management of risks to health, including information on existing substitutes or processes, which under their conditions of use are less hazardous to the health and safety of workers;

b) the use of adequate ventilation;

c) the use of appropriate personal protective equipment that complies with the Personal Protective Equipment Regulations 2002 in the UK.

In order to help training providers comply with this legal requirement, the Health and Safety Executive (HSE), has produced a suitable training course comprised of the following;

Annex 1 - DCM training course syllabus.

Annex 2 – a case study on the need for adequate ventilation

Annex 3 – further reading and references

Assessment of Competence

After relevant training, a professional user must demonstrate a competent understanding of the material covered in the training course. In order to confirm this, the HSE has developed an online multiple-choice competence assessment available via https://dcm.hsl.gov.uk/ .

The multiple-choice assessment consists of 12 questions, with four questions selected at random. A participant must score above 80% to pass (i.e. answer at least 10 questions correctly). Participants will have three attempts to pass. If after three attempts, the participant has failed he /she must re-do the training course before re-taking the assessment.

Once a user has passed the competence assessment, he/she will be provided with an HSE-issued certificate. Only those professionals who are in possession of this certificate can legally purchase and use DCM-based paint strippers. No alternative evidence of competence and / or training will suffice.

Professionals should not be able to access the competence assessment before undertaking the required training. The assessment should only be accessed through training providers who register with the HSE at https://dcm.hsl.gov.uk/. Training providers must then invigilate trainees to ensure examination conditions are adhered to during the assessment.

Annex 1

DCM TRAINING COURSE SYLLABUS

INTRODUCTION

1. **Why you are here?**
   - 1.1. Derogation No 455/2009/EC and UK Statutory Instrument
     - legal background, requirements for professionals using DCM-based paint strippers
   - 1.2. Competence Assessment
     – multiple-choice questions, pass level, arrangements to do assessment
   - 1.3. Evidence of competence
     – HSE-issued certificate

2. **What you will learn on the course – Principles for safe use of DCM-based paint strippers when alternative methods of paint stripping are not feasible**
   - 2.1. <u>Initial assessment of the job</u>
     - coatings to be removed
     - working environment and whether enclosed or confined
     - need for, and methods of, paint stripping
   - 2.2. <u>Selection and purchase of DCM-based paint stripper</u>
     - alternatives to DCM-based paint stripper
     - restrictions on purchase
   - 2.3. <u>Awareness of hazards of DCM</u>
     - sources of information
     - effects of exposure by inhalation and skin absorption
     - exposure limits and odour threshold
   - 2.4. <u>Assessment of risk of using DCM-based paint stripper</u>
     - assessment of work area, when need to comply with Confined Spaces Regulations
     - storage & handling
     - application process (method, tools & controls)
     - removal of waste

2.5. Use of controls to manage the risk

- hierarchy of control
- extraction / mechanical extract ventilation
- general ventilation
- safe ways of work
- personal protective equipment: respiratory protection, gloves
- seek specialist advice on controls if need to work in a 'confined space'

2.6. Emergency measures

- how to handle spills

3. INITIAL ASSESSMENT OF THE JOB

3.1 Identification of coatings to be removed

- how to identify coatings
- typical substances present in the paints especially if lead, 2-pack or cellulose-based paints

3.2 Working environment

- building / facility layout eg small areas / rooms with limited ventilation (could be confined space and regulated under Confined Spaces Regulation 1997)
- chemical hazards eg asbestos, flammable substance (fire risk)
- working position (at height, awkward)
- restriction of access

3.3 Methods of paint stripping

- avoid stripping eg replace component
- physical methods eg manual grinding, hot gun to burn off
- chemical methods eg paint strippers (DCM-free when reasonably practicable)

4. SELECTION AND PURCHASE OF DCM-BASED PAINT STRIPPER

4.1 Justification for DCM-based paint stripper

- use alternative method or DCM-free paint stripper unless can justify why must be DCM-based
- compare alternative strippers available and suitability for the task

4.2 Restrictions on purchase

- certificate of competence (what expected of purchaser & supplier)

5. AWARENESS OF HAZARDS OF DICHLOROMETHANE

5.1 Sources of Information on DCM-based paint strippers

- Container labelling
- Material Safety Data Sheets - importance of specific sections eg on Storage & Handling, Exposure Controls / Personal Protection, and Toxicological Information/Symptoms
- Product / Technical Data Sheets – information on application and usage rates

Other sources of information on DCM include suppliers and internet websites eg HSE, European Solvents Industry Group (ESIG).

5.1 Effects of exposure by inhalation and skin absorption

- Routes of exposure - inhalation of vapour and absorption of product via skin
  acute danger from inhalation. Symptoms – narcotic effects (lethargy, lack of co-ordination, headache, nausea), short time taken for these to emerge, can lead to unconsciousness and death.
- Explain metabolised to carbon monoxide and binds to haemoglobin in blood preventing oxygen transport round body.
- Include examples of fatality
- de-fatting of skin so causes irritation and skin and/or eye damage
- suspected carcinogen (Cat 2 under CLP)

5.2 Exposure limits & odour threshold

- Odour threshold (about 250 ppm) compared to short-term (15 min) and long-term (8 hr) exposure limits (200 ppm and 100ppm respectively).

6. ASSESSMENT OF RISK

6.1 Basic understanding of risk assessment

- compare hazard and exposure
- exposure dependence upon task details and use information

  how applied for manual processes (e.g. brush, spatula, spray)
  pattern of use (i.e. frequency, duration of use and extent to which worker remains in area whilst paint stripper drying)
  amount of paint stripper used and how much DCM is in it
  presence of additional hazards: e.g. enclosed area, asbestos or work at height

who may be present / harmed (lone working or other workers around, include customers – risk if items still solvent-wet)

- establish risk and identify control measures required.
- record findings
- give practical examples of scenarios and risk assessment outcomes

6.2 Storage and handling

- minimise decanting and transfer distances
- keep containers sealed when not in use

6.3 Application of paint stripper

- methods of application e.g. brush, spatula - avoid spraying
- tools e.g. long-handled tools, drip guards, mechanical lifting equipment
- frequency and duration of application and time in area where DCM is evaporating off

6.4 Types of ventilation present / required

- never work in an area without adequate ventilation
- extract ventilation (industrial air movers to remove contaminated air)
- natural ventilation (open doors/windows)
- inadequate ventilation – don't do the task
- contaminated air must always be discharged to a safe place

6.5 Safe systems of work

- info from method statement from employer, instructions from product supplier etc
- consider need to comply with Confined Spaces Regulations

6.6 Use of PPE

- respiratory protective equipment (RPE): limitations of a respirator, need for air-supplied breathing apparatus
- selection of suitable gloves: limitations of many common chemical-resistant gloves
- other PPE (DCM-resistant coveralls or apron, eye/face protection)

6.7 Removal of DCM-containing waste

- handling removed softened paint by brush, scrape and high pressure water jet
- handling contaminated PPE
- handling spills – safety data sheets

- duty of care, environmental considerations etc.

7. CONTROL MEASURES (PRECAUTIONS)

7.1 Explain how to use and maintain controls generally - *before dealing with specifics for DCM*

- basic understanding of extraction
- basic understanding of RPE
- basic understanding of additional requirements under Confined Spaces Regulations

Note there is further reading for this section in Annex 4 - References

8. COSHH HIERARCHY OF CONTROL (ref *Principles of good control practice* - www.hse.gov.uk/coshh/detail/goodpractice.htm)

Hierarchy of control

This is a hierarchy of control options based on their inherent reliability and effectiveness. The Control of Substances Hazardous to Health COSHH (regulation 7) refers to these options. In order of preference, they are:

- elimination of the hazardous substance (so there is no exposure) -– **only use DCM-based product if there is no suitable alternative**
- modification of the substance, process and/or workplace (to reduce potential exposure);
- applying controls to the process, such as enclosures and extraction (to control exposure);
- ways of working which reduce exposure; and lastly
- use of suitable personal protective equipment (PPE) worn by individuals eg. RPE

Effective control measures usually consist of a mixture of process and/or workplace modifications, applied controls, methods of working and may include PPE.

PPE is the last resort / final control option:

- used when adequate control of exposure cannot be achieved by other means, in combination with other controls
- tends to be less effective and reliable than other control options, because it relies on the individual's behaviour, only protects the individual, and can fail to danger without warning

8.1 Elimination

- can the task be performed without removing the paint eg patch painting, replace rather than strip components

8.2 Substitution

- use alternative DCM-free paint strippers (they may have other hazards)
- use non–chemical paint removal processes e.g. hot gun, sanding
- only if no suitable alternative is available should you use a DCM-based paint stripper and you must be able to justify the need to use it.

9. Use of Engineering Controls – need for effective ventilation

9.1 Extract ventilation (industrial air movers)

- for small-scale work on non-industrial sites.
- must be positioned appropriately to remove DCM (heavier than air) and discharge to safe area.
- should not just recirculate the air containing DCM

9.2 Natural ventilation

- use of windows / doors etc to increase airflow
- work outdoors if possible

9.3 **See Case study on Ventilation (Annex 2)**

10. Safe Ways of Working

- follow instructions from manufacturers / suppliers and own / company risk assessment on application rates, controls/precautions required etc
- close containers and remove when not in use
- minimise time of exposure to DCM-based stripper during application & drying
- stay at distance from DCM where possible eg use long-handled tools
- keep environment cool to reduce rate of DCM evaporation
- ensure additional appropriate procedures in place if working in an enclosed/confined space

11. Respiratory Protective equipment (RPE) and Personal Protective equipment (PPE)

11.1 General considerations on PPE

- Comply with provision of *suitable PPE* (see COSHH Regs 2002), and be CE-marked*****
- always check with manufacturer/supplier that PPE suitable for your task and use of DCM
- PPE may need changing regularly - masks and gloves have limited resistance to DCM

***** The UKCA (UK Conformity Assessed) marking came into effect on 1 January 2021 following EU Exit. However, to allow businesses time to adjust to the new requirements use of existing CE marking is valid until 1 January 2022.

11.2 Specific PPE to prevent skin exposure

- Wear suitable coveralls (ideally disposable) that protect the arms. Re-usable coveralls are to be cleaned/laundered before re-use.
- No gloves considered suitable for long-term hand immersion in DCM
- DCM-resistant gloves can provide splash resistance
- Use suitable goggles or face shield (unless full face RPE) to protect face

RPE to prevent inhalation of DCM

11.3 Adequate and suitable RPE is required to prevent inhalation of DCM

- type of RPE depends on nature and duration of the task

- for most normal tasks air-supplied breathing apparatus is required
  - -must have adequate and clean air supply
  - tight-fitting masks will need face fit testing
  - apparatus and air supply must be regularly checked and maintained

- for very short-term, single use, RPE can be a tight-fitting mask with AX filters, unpowered and face fit tested. Filters last about 30 minutes if exposure is low ie about 100ppm (below the odour threshold).

- all those wearing tight-fitting masks as RPE must undergo a fit test to ensure that the mask fits them - because people's faces are of different shapes and sizes. If the mask does not fit, it will **not** protect the wearer. Workers need to be clean shaven as facial hair will prevent a good seal between the wearer's face.

12.Welfare

12.1 Hygiene Facilities

- requirements for toilets, washing facilities, separate eating/drinking area etc.
- storage for employees' clothing, uncontaminated PPE and RPE prior to use
- ventilated area in which to allow DCM to evaporate off PPE
- means to clean contaminated PPE if re-usable and store to prevent damage

13.MONITORING

11.1 Environmental Monitoring

- local atmospheric monitoring
- reasons why, solvent emissions limits
- how differs compared to worker exposure monitoring

14. Worker Exposure Monitoring

14.1 Air monitoring –

- personal – effectiveness of controls, comparison to WEL/STEL
- background monitoring – use of tubes, real-time devices

14.2 Biological monitoring

- usually carboxyhaemoglobin in blood, or carbon monoxide in exhaled breath, but direct measurements of DCM in blood or urine possible.

15. HANDLING EMERGENCIES (IN NORMAL WORK AREAS, NOT CONFINED SPACES)

15.1 How do I deal with spills - deal with them immediately

- small spills - absorbent material eg vermiculite, safe disposal of contaminated material
- large spills - formal written procedure (including evacuation), supplier can advise, adequate and suitable emergency PPE and RPE available, all trained

15.2 Avoiding DCM catches fire?

- If DCM catches fire it produces corrosive and toxic vapour
- no sources of ignition, no smoking rule in the workplace

15.3 Worker becoming lethargic / lacking coordination / unconscious

- risk so no lone working - frequent checks / CCTV
- leave area immediately

Annex 2

Ventilation Case study

The facts of this case relate directly to the death of a worker caused by exposure to Dichloromethane (DCM)-based paint stripper. As a result of this fatality, young children no longer have a father, and the company that employed him has been heavily fined and is struggling to remain in business putting the jobs of others at risk.

1. Ben (not his real name) was killed after using a DCM-based paint stripper in a bathroom with a small window. He was using the DCM-based product to strip lead paint from skirting boards. Ben had worked with solvents before, but no-one had told him that DCM could be particularly hazardous, and no risk assessment had been done for this specific task to identify what control measures were required.

   A risk assessment would have shown that the bathroom was a confined space (CS) and that he should not have been working with DCM in this space unless he had had CS training. CS training includes the need to:
   - use extraction to remove the contaminated air and a supply of clean air to replace it
   - use breathing apparatus (BA);
   - have a real time personal monitor to alert the wearer if the DCM level exceeds the workplace exposure limit; and
   - have a buddy system i.e. a trained person with BA to be outside the CS to rescue the worker if required.

   If you are not trained and competent to work in a CS then the paint would need to be removed by a DCM-free paint stripper (which is less hazardous), or by a different method or by using a specialist company who are competent to work in a CS.

If asked to work with DCM:

- **consider alternative methods of removing paint that are less hazardous**
- **make sure the task has been risk assessed and do not work in a CS unless you have had CS training and are competent to do so**
- **you should be aware of the hazards, and symptoms, from exposure to DCM**

2. Ben applied 200 ml of DCM-based paint stripper (less than 2/3 of a can of soft drink) to the skirting boards, which had a total area of 1.2m^2, using a paint brush. He stayed in the bathroom doing other work when the paint was softening and was overcome by DCM vapour and passed out. Once Ben had passed out he continued to breathe in high concentrations of DCM vapour that ultimately led to his death.

   The evaporation of very small amounts of DCM can lead to very high, fatal, levels of DCM in the air. When exposed to DCM, workers can develop headaches, become drowsy and disorientated and then lose consciousness.

If working with DCM-based paint stripper (in a non-confined space)

- **use the minimum product required for the smallest area that needs stripping**
- **use a long-handled brush to apply the product where practicable (worker further from the product). Avoid spraying as it increases DCM in the air**
- **keep containers closed when not in use**
- **leave the work area whilst the DCM-based stripper is softening the paint**
- **be aware DCM causes drowsiness - if you feel unwell leave the area immediately**

3. Ben did not use any mechanical extract ventilation i.e. no extraction to remove the contaminated air from the bathroom, nor any mechanical ventilation to help supply clean air into the bathroom and move the contaminated air towards the extraction.

   The use of extraction and mechanical ventilation to control the level of DCM in the air is needed to create a good flow of air through the work area, and should be set up before work with DCM commences. It may also be needed for external work if that area is partially enclosed eg under sheeted scaffolding, in a pit.

   It is important to adequately control the level of DCM in the air you inhale:

   - **use effective extraction to remove DCM from the work area air**
   - **ensure contaminated air is discharged to a safe place away from the work area**
   - **have an adequate supply of replacement clean air e.g. by use of an industrial air mover and ducting**

4. The bathroom had a small window, which was open; however, Ben kept the door to the bathroom shut, in line with company policy, to limit the nuisance smell of DCM for the householder who was in the flat. The natural dilution of DCM with air was therefore minimal.

   Even if both the bathroom door and the external door to the property had been open the natural ventilation would not have been adequate to reduce the DCM vapour levels below the short term exposure limit (STEL) of 200 ppm. The levels would still have been 4 times the STEL.

   When using DCM-based paint strippers:

   - **limit access to the work area so other workers and customers do not enter it**
   - **ensure the property is unoccupied by residents and others during paint removal and remains so until all the vapour has been removed**
   - **use natural ventilation, but do not rely on it alone, to adequately control the level of DCM in the air**

5. Ben did wear a respirator (mask) with the correct vapour filter (i.e. AX filter) to prevent inhalation of the DCM vapour. However, he was unaware that he should have been clean shaven and face fit tested for the respirator and that the filter had a very short life-time.

An AX filter has a maximum life-time of about 30 minutes if the concentration of DCM in the air does not exceed 100 ppm, and much less if the DCM concentration is higher and / or respirator is powered. After the incident expert tests proved that the high levels of DCM vapour in the bathroom (over 4000 ppm) would have 'broken through' the correct vapour filter in less than a minute, even assuming the respirator was correctly selected and worn. It was therefore concluded that a suitably fitted face mask with the correct vapour filter would not have prevented Ben's death.

The use of an AX filter to prevent inhalation of DCM

- **is only suitable for very short tasks, in well-ventilated areas where the DCM air levels are relatively low**
- **is dependent on the respirator being face fit tested and the worker being clean shaven**

References

1. Control of substances hazardous to health (Sixth edition). The Control of Substances Hazardous to Health Regulations 2002 (as amended). Approved Code of Practice and guidance L5 (Sixth edition) HSE Books 2013, ISBN 0978 0 7176 6588 2. Also available at www.hse.gov.uk/pubns/books/L5.htm

2. EH40/2005 (4th Edition) Workplace exposure limits – Containing the list of workplace exposure limits for use with the Control of Substances Hazardous to Health Regulations 2002 (as amended). HSE Books 2020, 978 0 7176 6733 8. Also available at http://www.hse.gov.uk/pubns/books/eh40.htm

3. HSE webpage for biological monitoring: http://www.hse.gov.uk/pubns/indg245.htm

4. Biological Monitoring in the Workplace – A guide to its practical application to chemical exposure HSG167 (Second Edition) HSE Books 1997, ISBN 0978 0 7176 1279 6. Also available at http://www.hse.gov.uk/pubns/priced/hsg167.pdf

5. For information on safety data sheets see www.hse.gov.uk/coshh/basics/datasheets.htm

6. Commission Regulation (EU) 276/2010) including the requirements stipulated in REACH Annex XVII, entry 59, dichloromethane http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:086:0007:0012:EN:PDF

7. Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) HSG258 (Third Edition) HSE Books 2017, ISBN 978 07176 6613 3 Also available at www.hse.gov.uk/pubns/books/HSG258.htm

8. Personal Protective Equipment at Work Regulations 1992 (as amended): Guidance on Regulations L25 (Third Edition) HSE 2015 ISBN. 978 0 7176 6597 6. Also available at http://www.hse.gov.uk/pubns/books/l25.htm

9. Respiratory protective equipment at work: A practical guide HSG53 (Fourth edition) HSE Books 2013 ISBN 978 0 7176 6454 2. Also available at www.hse.gov.uk/pubns/books/HSG53.htm

10. Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and guidance (Second Edition) L24 HSE Books 2013, ISBN 978 0 717 66583 9. Also available at http://www.hse.gov.uk/pubns/books/l24.htm

11. REACH Enforcement (Amendment) Regulations 2014 https://www.hse.gov.uk/reach/regime.htm

12. Guidance on respiratory protective equipment (RPE) fit testing (March 2019) INDG479 (rev1) ISBN 97807 17667062 or see *Fit test basics HSE web guidance* https://www.hse.gov.uk/respiratory-protective-equipment/fit-testing-basics.htm

13. Working safely with solvents: A guide to safe working practices INDG273 (Revision 1) HSE Books 2014, ISBN 978 0 7176 6632 4. Also available at https://www.hse.gov.uk/pubns/indg273.htm

CONTROL MEASURES (PRECAUTIONS) – Section 7, further reading

- basic understanding of extraction (ref HSG258 Controlling airborne contaminants at work https://www.hse.gov.uk/pubns/priced/hsg258.pdf)
- basic understanding of RPE (ref INDG479 *Guidance on respiratory protective equipment (RPE) fit testing and HSG53 respiratory Protective Equipment at Work https://www.hse.gov.uk/pubns/priced/hsg53.pdf*)
- basic understanding of gloves and glove selection *(https://www.hse.gov.uk/skin/employ/gloves.htm ; HSG262 Managing skin exposure risks at work https://www.hse.gov.uk/pubns/priced/hsg262.pdf)*
- basic understanding of additional requirements under Confined Spaces Regulations (ref INDG258 Confined Spaces. A brief guide to working safely https://www.hse.gov.uk/pubns/indg258.pdf)