

MC3

COSHH essentials for the microelectronics industry



This information will help employers comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure and protect workers' health.

It is also useful for trade union and safety representatives.

Dry etching involves feeding mixtures of toxic and corrosive gases into a vacuum chamber to remove material such as gallium arsenide and silicon nitride from wafers. The gases are contained in the chamber and extracted under vacuum.

Exposure may occur during removal and servicing of equipment, changing source gas supply cylinders, and routine maintenance tasks.

This sheet describes good practice using containment, with extraction for product removal, and covers the points you need to follow to reduce exposure to an adequate level.

It covers daily and weekly routine tasks of operation and maintenance. It does not cover major maintenance tasks or decommissioning of used equipment.

It is important to follow all the points on the sheet, or use equally effective measures.

Plan and practise what you will do in an emergency.

For environmental guidelines see Mc0.

Dry etch processing

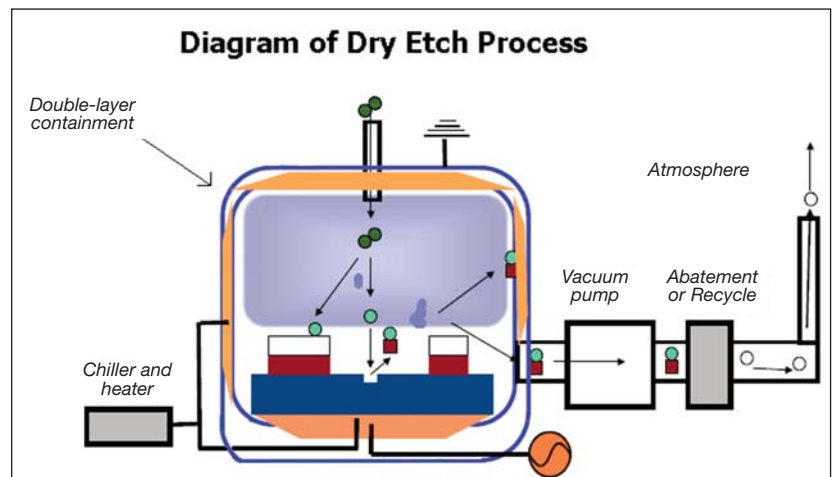
Control approach 3 Containment

Access and premises

- ✓ Restrict access to authorised staff.
- ✓ Keep the workplace exit routes clear.
- ✓ Label the work area, pipework and equipment clearly.

Equipment

- ✓ During general operation, dry etch processing is carried out in a closed system. Equipment typically used is shown in the diagram below.



- ✓ Check the manufacturer's specification for vacuum extraction criteria.
- ✓ Follow the manufacturer's guidance for use.
- ✓ Extract all potential leak points.
- ✓ Can you use less hazardous products, or eliminate the process?
- ✓ When opening a chamber, supplementary extraction is usually needed.
- ✓ Use ductwork material that is compatible with the chemicals being used.
- ✓ Keep extraction ducts short and simple. Avoid long sections of flexible ductwork.
- ✓ Discharge cleaned, extracted air to a safe place outside, away from windows, doors and air inlets.

Maintenance, examination and testing of controls

- ✓ Maintain the equipment, as advised by the supplier, in efficient and effective working order.
- ✓ Calibrate and test gas detection systems and alarms as stated by the manufacturing instructions.
- ✓ Look for signs of damage every time you use the equipment, eg to door and window seals. Repair any damage immediately.

- ✓ At least once a week, check that the extraction system is working properly and check any manometer systems or alarms. Record any adverse findings.
- ✓ Noisy or vibrating fans can indicate a problem.
- ✓ Check secondary containment for potential leaks.
- ✓ You need to know the design performance to know if extraction is working properly. The supplier's literature must give this information.
- ✓ A competent ventilation engineer should examine the system and test its performance at least once every 14 months (see HSE publication HSG54). Keep records of all examinations and tests for at least five years.
- ✓ In-situ chamber cleaning is usually needed. Use permit-to-work procedures, lock off the equipment, apply extraction and use respiratory protective equipment (RPE). See sheet R5 or R6 - see 'Further information'.
- ✓ Provide a monometer or pressure gauge to check the extraction has cleared the enclosure before opening the chamber. Link this to a visual or audible warning alarm.

Training

- ✓ Tell employees about the hazards of the gases that are being used and ensure adequate emergency systems are in place.
- ✓ Include managers and supervisors in health and safety training.

Supervision

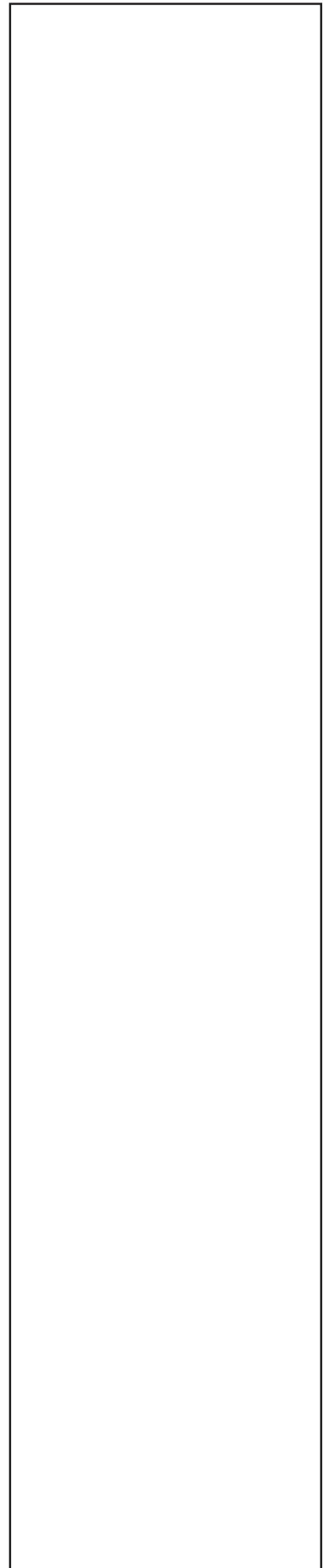
- ✓ Check that the procedures for operating and cleaning are being followed.
- ✓ Ensure safety data sheets are updated and chemical risk assessments are reviewed regularly.

Additional Guidance

- ✓ If skin problems appear consult an occupational health professional.
- ✓ You may need air monitoring to make sure the controls are adequate. See COSHH essentials sheet G409 - see 'Further information'.
- ✓ Always consider elimination, removal or substitution.
- ✓ Review your risk assessment on a regular basis and when any changes take place.
- ✓ Consider additional specialist support for health surveillance.
- ✓ Ensure that the assessor is competent. See Regulation 6 of the COSHH Regulations. See INDG136(rev3) - see 'Further information'.
- ✓ For general information on training, PPE, cleaning, housekeeping and maintenance, please see sheet MC0.

Further information

- *An introduction to local exhaust ventilation HSG37* (Second edition) HSE Books 1993 ISBN 978 0 7176 1001 3
- *Respiratory protective equipment at work: A practical guide HSG53* (Third edition) HSE Books 2005 ISBN 978 0 7176 2904 6
- *Maintenance, examination and testing of local exhaust ventilation HSG54* (Second edition) HSE Books 1998 ISBN 978 0 7176 1485 1
- *Monitoring strategies for toxic substances HSG173* (Second edition) HSE Books 2006 ISBN 978 0 7176 6188 6



- *General ventilation in the workplace: Guidance for employers* HSG202 HSE Books 2000 ISBN 978 0 7176 1793 7
- *COSHH a brief guide to the Regulations: What you need to know about the Control of Substances Hazardous to Health Regulations 2002 (COSHH)* Leaflet INDG136(rev3) HSE Books 2005 www.hse.gov.uk/pubns/indg136.pdf
- *Working safely with solvents: A guide to safe working practices* Leaflet INDG273 HSE Books 1998 (single copy free) www.hse.gov.uk/pubns/indg273.pdf
- *Hydrofluoric acid poisoning: Recommendations on first aid procedures* Leaflet INDG307 HSE Books 1999 (single copy free or priced packs of 25 ISBN 978 0 7176 1751 7) www.hse.gov.uk/pubns/indg307.pdf
- *EH40/2005 Workplace exposure limits: Containing the list of workplace exposure limits for use with the Control of Substances Hazardous to Health Regulations 2002 (as amended)* Environmental Hygiene Guidance Note EH40 HSE Books 2005 ISBN 978 0 7176 2977 0
- *HSE Operational Circular Fit Testing of Respiratory Protective Equipment Facepieces* OC 282/28 www.hse.gov.uk/foi/internalops/index.htm
- Other useful COSHH essentials sheets, available on www.hse.gov.uk/pubns/guidance/index.htm):
 - G409 *Exposure measurement: Air sampling*
 - G300 *Containment*
- The COSHH essentials risk assessment on www.coshh-essentials.org.uk/
- *Environmental, Health, and Safety Guidelines for Semiconductor Manufacturing Equipment* SEMI S2-0706b and *Safety Guidelines for Heated Chemical Baths* SEMI S3-91 Semiconductor Equipment and Materials International (SEMI). Both available to download from <http://dom.semi.org/downloads.nsf/standards?openview> or go to http://wps2a.semi.org/wps/portal/_pagr/103/_pa.103/210 and select the 'search semi standards' link

Useful links

- HSE priced and free publications are available from HSE Books Tel: 01787 881165 Website: www.hsebooks.co.uk.
- For information about health and safety ring HSE's Infoline Tel: 0845 345 0055 Textphone: 0845 408 9577 e-mail: hse.infoline@natbrit.com.
- Contact the British Occupational Hygiene Society (BOHS) on 01332 298101 or at www.bohs.org for lists of qualified hygienists who can help you.
- Look in the Yellow Pages under 'Health and safety consultants' and 'Health authorities and services' for 'occupational health'.
- Also see www.nhsplus.nhs.uk.

Employee checklist

- Are the engineering controls and extraction systems working properly?
- Is the equipment in good condition and working properly?
- Make sure you know what to do if there is a leak or spill.
- Make sure you have the right PPE for the job you are doing, that it's in good condition and that you use and store it properly.
- Do not use gloves that are punctured, split, cracked or otherwise damaged.
- If you find a problem, tell your supervisor. Don't just carry on working.
- Don't smoke in the work area.
- Wash your hands before and after eating, drinking, smoking and using the lavatory.
- Check your skin regularly for dryness or soreness – tell your supervisor if these appear.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory 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 as illustrating good practice.