



MC"X"

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.

Maintenance activities in the semiconductor / microelectronics industry have the potential to expose maintenance personnel and process operatives to substances hazardous to health if they are not adequately controlled.

This sheet describes good practice using PPE and administrative controls for maintenance work and covers the points you need to follow to reduce exposure to an adequate level.

It covers frequent routine maintenance and cleaning tasks, often carried out by process operatives as well as major maintenance, repair and decommissioning of equipment carried out by in-house maintenance personnel or contractors.

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

It should be used in conjunction with other MC series data sheets that describe specific semiconductor processes.

10. Plan what you will do in an emergency.

11. For environmental guidelines see MC0.

Maintenance Activities

Control approach x Personal Protection or Control approach y Administrative Control

Hazardous Substances

The substances used in the manufacturing processes are technology dependent and include toxic, corrosive, carcinogenic and asphyxiant materials such as hydrofluoric acid, arsine, chlorosilanes, hydrogen chloride and nitrogen. By-products and residues resulting from the use of these substances may also be present and not directly covered by the supplier's MSDS

The risk of exposure to hazardous substances to personnel involved in maintenance activities may be significantly higher than that during routine operation of equipment. This is because the engineering and containment controls may be negated or bypassed as a necessity of the maintenance work. It is therefore essential that additional controls appropriate to the maintenance task in hand are put in place.

Exposure scenarios

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These are based on 3 foreseeable types of maintenance activity:

Non-intrusive maintenance – operational checks, functional testing, fault finding and many preventative maintenance tasks carried out on equipment in normal operating condition. May be carried out by process operatives or maintenance personnel. Potential for exposure to hazardous substances is unlikely if engineering controls are in place. Note: follow up work to carry out repairs may result in potential to exposure

Routine frequent maintenance and Total Preventative Maintenance (TPM)

– cleaning of equipment parts, replacement of worn items or equipment set-up. May be carried out by process operatives or maintenance personnel. Potential for exposure to hazardous substances is likely as work may require engineering controls such as containment to be negated.

Major Maintenance: Repair of breakdowns, overhaul/replacement of equipment components, break-in to systems containing hazardous substances or equipment decommissioning. Normally carried out by in-house maintenance personnel or external contractors. Potential for exposure to hazardous substances is highly likely as engineering controls will be negated.

Controls

- ✓ All maintenance tasks should be risk assessed to identify the potential for exposure to hazardous substances present and the control measures required.
- ✓ Risk control measures should be proportionate to the exposure risks identified.
- ✓ All maintenance activities should be documented. Frequent, routine or foreseeable tasks should be documented in procedures. Non-routine activity should have a method statement prepared.
- ✓ Carried out by trained, competent personnel
- ✓ A documented handover/hand back procedure should be used between the equipment owner and the person doing the work. This will clearly state who is in control of the equipment during work, the condition of the tool and its services before and after work. On the return of the equipment any limitations on its use will be highlighted.
- ✓ Complex maintenance work, particularly where persons or systems may interact will be done under a Permit to Work or similar system of control.
- ✓ The permit will take account of isolations, flushing, purging, atmospheric testing, gas detection etc. that should be in place prior to, and if required, during the work plus any special PPE/RPE required for the task. Guidance on permits can be found at <http://www.hse.gov.uk/safemaintenance/permits.htm> and the high hazard based publication on Permit-to-work systems is at <http://www.hse.gov.uk/pubns/books/hsg250.htm>
- ✓ Where the maintenance work involves any testing of a statutory nature e.g. LEV, then there should be a place on the documentation to record the finding.
- ✓ The findings and results of such tests/checks should be acknowledged by a senior person and there should be a procedure in place to flag up failures or unusual findings.
- ✓ The tool should be handed back to the owner and a check carried out and acknowledged that the equipment is in a safe condition to run.
- ✓ Depending on the potential for release of contaminants then a system to isolate the area being worked in should be considered.
- ✓ If there will be contaminated parts for cleaning or disposal, either in-house or external, created during the work then appropriate procedures should be in place to handle these.
- ✓ If there are any specialised tools or equipment used during this work that may become contaminated then procedures should be in place to allow safe cleaning or disposal of these.
- ✓ If there is the potential for a substance to escape or spill during the work then emergency procedures should be considered as part of the Permit preparation.
- ✓ At the end of the work the tool or equipment should be handed back to the owner with any information about any residual risks from contamination. A check should then be carried out and acknowledged that the equipment is in a safe condition to run.

Other considerations for intrusive maintenance

- ✓ Where contaminated parts for in-house cleaning or refurbishment are removed during work then a location should be provided to allow this to be carried out without potentially exposing a third party.
- ✓ Depending on the nature of the task Occupational Hygiene monitoring, static, personal or both could be considered to confirm or otherwise the presence of airborne contaminants.

- ✓ Where processes generate residual contamination, a surface contamination monitoring regime could be considered to ascertain if any harmful substances are being deposited on the tool or in services which may be opened during these tasks.
- ✓ Depending on the nature of the potential contaminants, the frequency of the task and the potential exposures then Occupational Health Surveillance for these workers should be considered.

Off site issues

- ✓ It will sometimes be necessary to send equipment or parts off site for repair, reconditioning, cleaning or disposal. There is a potential for contamination of 3rd party workplaces in such circumstances and there must be clear procedures in place detailing any substances used within the equipment and how these risks are controlled.
- ✓ Shipments should be accompanied by pro-forma documentation in a format agreed with the recipient.
- ✓ If components require decontamination prior to return to a supplier or for waste disposal, a declaration of decontamination should be provided detailing the steps taken to achieve this and the results of any testing.
- ✓ Components for disposal that cannot be effectively decontaminated should be securely packaged and consigned for disposal as special waste via an approved waste contractor

Review

- ✓ The documents, procedures and assessments which cover these tasks should be part of a document control process which prompts regular, scheduled reviews
- ✓ The tasks should be included within the scope of the company's internal audits to ensure that they are followed in practice.

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.

Further Information

Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) HSG258 (Second edition) 2011 ISBN978 0 7176 6415 3

Respiratory protective equipment at work: A practical guide HSG53 (Fourth edition) HSE Books 2013 ISBN 978 0 7176 6454 2

Maintenance, examination and testing of local exhaust ventilation HSG54 (Second edition) HSE Books 1998 ISBN 978 0 7176 1485 1

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

Environmental, Health, and Safety Guidelines for Semiconductor Manufacturing Equipment SEMI S2-0712 and *Safety Guidelines for Process liquid heating systems* SEMI S3-1211 Semiconductor Equipment and Materials International (SEMI). Both available to download from Ams.semi.org/ebusiness/standards/semistandard.aspx

Useful links

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit 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.

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.

This document is available at: www.hse.gov.uk/pubns/guidance/ and www.hse.gov.uk/cossh/essentials/.