

MODULE SYLLABUS

M103 - CONTROL OF HAZARDOUS SUBSTANCES

Aim: To provide an introduction to the uses and processes where hazardous substances occur and the methods used to control exposure.

On successful completion of this module the student should be able to:

- describe the hazards from chemicals used in industrial processes and what control methods can be applied to minimise any risk;
- recognise the range of approaches to workplace control and select appropriate strategies for implementation;
- describe the meaning of “adequate control”, particularly in relation to personal exposures and appreciate the philosophy behind the hierarchy of control;
- discuss the importance of design considerations in terms of the workplace, process, and plant, as a means of reducing occupational exposures;
- describe the principal elements of a local exhaust ventilation system, give examples of typical installations and know how to carry out the necessary measurements to see whether a local exhaust ventilation system is effective and operating to the design specification;
- describe how personal protective equipment programmes may be used in an effective manner

Prior Knowledge: Candidates for this course are expected to be aware of the general contents of the Control of Substances to Health [COSHH] regulations, HSE Guidance Note HSG193 (2003) COSHH Essentials Easy Steps to Control Chemicals, HSE Guidance Note HSG258 (2008) Controlling Airborne Contaminants at Work and HSE Guidance Note HSG53. Respiratory Protection at Work

Course Length: It is envisaged that this course will be conducted over 5 days which includes the examination.

This course will require approximately 32 hours’ study time, of which at least 24 hours will be taught (teaching and practical). The additional study time will be required in the candidates’ own time.

Content:	Topic	Time Allocation
	1 Hazardous Substances Uses and Processes	25%
	2 Workplace Control and Principles	10%
	3 Process Design and Principles	10%
	4 Ventilation Systems	35%
	5 Personal Protective Equipment	15%
	6 Administrative Elements	5%

Note: Reference is made in this syllabus to HSE guidance or other documentation. This may not be the most up-to-date relevant publications from HSE/other sources and is intended as guidance for candidates only.

1 Hazardous Substances Uses and Processes (25%)

For each substance/process provide an overview of the health hazards and risks, the sources and factors affecting emission.

1.1 *Mineral Processes*

Silica:

- quarrying and mining
- brick, tile and refractory manufacture
- pottery and ceramic
- sandblasting

Asbestos:

- maintenance and incidental exposure (asbestos disturbance)

MMMF:

- MMMF manufacture
- insulation activities

1.2 *Metal Processes*

- foundries, metal refining and casting
- machining
- plating
- welding
- brazing and soldering

1.3 *Organic Chemical Processes*

Solvents:

- degreasing and dry cleaning (halogenated hydrocarbons)
- paints and their application
- uses of hydrocarbons (benzene, toluene, xylene and n-hexane)

Pesticides

- use of fumigants
- spray techniques
- animal dipping

Plastics and Polymers:

- thermoplastic polymer manufacture
- rubber production
- isocyanate forms and uses

Pharmaceuticals and fine chemicals

- pharmaceutical production
- use in hospitals and veterinary surgeries

1.4 *Biological*

- animal handling
- microbiology laboratories
- farming
- hospitals
- sewage treatment

2 Workplace Control Principles (10%)

2.1 *Hierarchy of Control*

Principles of identifying hazards and risks in the workplace.

Hierarchy of control and its underlying principles.

Work procedure, process engineering control, ventilation and PPE.

Practicable programmes may involve a combination of measures.

2.2 *Achieving Control*

The meaning of adequate control including the use of WELs and other published or in-house standards (including carcinogens, asthmagens and biological standards).

Duties under the COSHH Regulations.

The role of assessment (by all routes):

- Identifying exposures, confirming compliance, achieving adequate control.
- At the design stage and in existing facilities.
- From normal operations and during non-routine or maintenance activities.
- Competency requirements for those who provide advice on the prevention or control of exposure.

Practical application of the hierarchy of control eg. use of a combination of measures, stepwise approach.

Identifying effective control strategies, reasonable practicability (including COSHH Essentials).

Control of emissions relating to control of exposure.

Educational Objectives

The student should be able to understand the complex nature of exposures in the workplace and the type of approach that is required for successful implementation of a control programme. The student should be able to understand how to relate the outcome of a risk assessment to selection of control options.

3 Process Design and Principles (10%)

3.1 *Design of Equipment and Workplace*

General design of equipment and workplace layout and how this influences exposure. The effects of automation and robotics.

3.2 *Prevention, Elimination, Substitution*

Prevention of exposure by good process design, including containment, elimination or substitution of hazardous substances and activities.

Examples of industrial processes where hazards may be minimised by changes to substance or form (eg. solution, granulation of dusty powders) or changes to the process (eg. closed sampling versus open sampling, wet handling and workplace layout).

Educational Objectives

The student should be able to understand the importance of process design and workplace layout in controlling exposure.

4 Ventilation Systems (35%)

4.1 *Types of System*

Eg. general, local

4.2 *Principles*

System Design- fans, ducts, air cleaners.

Fan types and their applications.

Duct sizing, configuration and duct materials.

Balancing.

Facilities for maintenance, examination, testing and conditioning.

Air cleaners -types (gravity and centrifugal collectors, dry fabric, electrostatic, wet methods, absorption types) and performance.

4.3 *General Ventilation Systems*

Use as a means of controlling airborne exposures.

Principles of natural ventilation and infiltration.

Mechanical ventilation, dilution or displacement, including methods of delivery and distribution.

Determination and calculation of ventilation requirements.

Application and limitations of general ventilation.

4.4 *Local Exhaust Ventilation*

Design Features

Enclosure, captor hoods, booths, discharge arrangements.

Capture velocities, face velocity, transport velocities .

Fletcher and Garrison methods of predicting air flows, velocity contours and effects of flanges.

Application of hoods, slots, enclosures to industrial situations.

Measurement and Testing of LEV Systems

Measurement of performance and relation to attainment of control of exposure. Calculations for volume flows from pressure and velocity measurements.

Maintenance examination and test; periodic checks and inspections, thorough examinations, statutory examinations and testing.

Limitations of LEV.

Practical

The student should be able to carry out a test of a typical LEV system, using common pressure and velocity measuring instruments.

Educational Objectives

The student should understand the principles behind the operation of ventilation systems. He/she should be able to carry out measurements to check the effectiveness of the system. The student should also be aware of the limitations of this approach to control and of the crucial importance of the design element at the interface with the worker.

5 Personal Protective Equipment (15%)

5.1 *General*

Types of Personal Protective Equipment (PPE) including Respiratory Protective Equipment (RPE) and chemical protective clothing.

Limitations of use.

Definition of suitability.

Importance of selection, training, maintenance, and proper use in the development of a PPE programme.

Standards and Guidance (general requirements of BS EN 529:2005)

5.2 *Respiratory Protective Equipment*

Types of RPE and their limitations eg. dust respirators; high efficiency, powered, ventilated visors, disposables, ori-nasal, breathing apparatus.

Respirators for organic vapours and inorganic gases.

Selection, use and maintenance of RPE.

5.3 *Chemical Protective Clothing (CPC)*

Types of CPC

Application, limitations.

Storage arrangements, laundering arrangements, role in prevention of spread of contamination.

Suitability for use and integrity.

Educational Objectives

The student should be able to understand the way in which the human element can seriously affect exposures in the workplace and how this can be addressed by application of good design and appropriate instruction and training. The student should also understand the elements of an effective PPE programme.

6 Administrative Elements (5%)

Reducing periods of exposure.

Exclusion of non-essential personnel, personal hygiene arrangements.

Co-ordinated approach to control, training, supervision.

Control of access to hazardous areas.

The role of assessment, measurement, monitoring, and health surveillance in initiating control measures.

Role of written operating procedures, permits to work etc.

Role of occupational hygiene programmes in continuing control.

Educational Objectives

The student should be aware of the importance of an integrated strategy and how management systems are fundamental to the success or failure of a control strategy.

Recommended Documentation

- (1) The Control of Substances Hazardous to Health Regulations 2002 (as amended 2004) ACOP and Guidance(Fifth Edition)
- (2) HSE Guidance Note HSG193 (2003) COSHH Essentials Easy Steps to Control Chemicals
- (3) HSE Guidance Note HSG258 (2008) Controlling Airborne Contaminants at Work
- (4) The Personal Protective Equipment at Workplace Regulations 1992
- (5) Health and Safety (Miscellaneous Amendments) Regulations 2002
- (6) HSE Guidance Note HSG53 (2005) The Selection Use and Maintenance of Respiratory Protective Equipment at Work
- (7) BS EN 529:2005 Respiratory protective devices. Recommendations for selection use, care and maintenance. Guidance documentation