

M505 Module Syllabus

Control of Hazardous Substances

Teaching Aims

This course aims to provide candidates with an understanding of how exposure to hazardous substances arises and where they may occur, in the workplace and introduce methods and technologies which are available to control exposures and help reduce risks to health.

Prior Knowledge and Understanding

There are no prerequisites required for this qualification, however, this course would be suitable for technicians and technologists who conduct measurements and testing in workplaces.

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 COSHH Essentials Easy Steps to Control Chemicals, HSE Guidance Note HSG258 controlling Airborne Contaminants at Work and HSE Guidance Note HSG53 Respiratory Protection at Work.

Learning Outcomes

On completion of this module, candidates will be able to demonstrate their understanding of the following:

- **Describe how airborne contaminants are generated by industrial processes, how this would impact on the control strategy, and how control solutions can be optimised**
- **Recognise the range of approaches to risk reduction embodied in the hierarchy of control and select appropriate strategies for implementation**
- **Describe the meaning of “adequate control” in relation to personal exposures**
- **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 conduct the necessary measurements to assess whether a local exhaust ventilation system is effective and operating to the design specification**
- **Recognise the limitations of local exhaust hoods and enclosures and the means to optimise their effectiveness**
- **Describe how personal protective equipment programmes may be used in an effective manner**
- **Recognise the impact that control measures may have on other workplace hazards and understand the need to take a holistic approach to the design of control solutions**

Content

The syllabus is structured into six sections:

	Time Allocation
1 Hazardous Substances Use and Processes	15%
PLEASE NOTE: The nature of specific toxic substances is not included in this module.	
2 Workplace Control Principles	15%
3 Process Design and Principles	15%
4 Ventilation Systems and Performance Assessment	35%
5 Personal Protective Equipment	15%
6 Administrative Elements	5%

Note:

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

1 Hazardous Substances Uses and Processes (15%)

This section will provide candidates with suitable knowledge and training to ensure that the candidate can demonstrate their understanding in the following:

- 1.0.1 Consider the range of properties of airborne contaminants (dusts–aerosols–vapours–gases) and the potential hazards they may present.
- 1.0.2 Using a series of short case studies, provide an overview of the health hazards and risks, and the sources and factors affecting emission of airborne contaminants, in order to develop an understanding of the approach to controlling exposure problems and how to select appropriate control strategies. These should include such processes as in the use of rotary tools (e.g. circular saws, rotary sanders) other directional processes (e.g. paint spraying), and fume yielding processes (e.g. welding and soldering)
- 1.0.3 The principles of containment and control techniques for common process such as weighing and dispensing solids and liquids from containers to process equipment should be considered for a range of materials from low to high hazard.

2 Workplace Control Principles (15%)

This section will provide candidates with suitable knowledge and training to ensure that the candidate can demonstrate their understanding in the following:

2.0.1 Hierarchy of Control:

- Principles of identifying hazards and risks in the workplace.
- Hierarchy of control and its underlying principles - work procedures, process engineering control, ventilation, and PPE. (Practicable programmes may involve a combination of measures)

2.0.2 Achieving Effective Control:

The meaning of adequate control including the use of occupational exposure limits, other published and in-house standards (including those for carcinogens, asthmagens and biological agents).

2.0.3 The role of assessment (by all routes):

- Identify exposures, confirm compliance, and achieve adequate control
- Identify risks at the design stage and in existing facilities to identify risks from normal operations and during non-routine or maintenance activities

2.0.4 The practical application of the hierarchy of control e.g. use of a combination of measures, stepwise approach.

2.0.5 Identifying effective control strategies, adopting the principles of reasonable practicability (including COSHH Essentials / ILO toolbox).

3 Process Design and Principles (15%)

This section will provide candidates with suitable knowledge and training to ensure that the candidate can demonstrate their understanding in the following:

3.0.1 Design of Equipment and Workplace:

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

3.0.2 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 (e.g. reduction of volatile constituents, granulation of dusty powders)

4 Ventilation Systems (35%)

This section will provide candidates with suitable knowledge and training to ensure that the candidate can demonstrate their understanding in the following:

4.0.1 Types of System:

General ventilation systems, Local exhaust ventilation (LEV)

4.0.2 Principles:

- Basic principles of system design- fans, ducts, air cleaners and discharges
- Fan types and their typical applications
- Duct sizing, configuration, and duct materials
- Principles of system balancing
- Facilities for thorough examination, maintenance, examination, and testing.
- Air cleaners -types (gravity and centrifugal collectors, dry fabric, electrostatic, wet methods, absorption types) and their performance

4.0.3 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

4.0.4 Local Exhaust Ventilation (LEV):

- Design Features
- LEV hoods; enclosing hoods, receiving hoods, and capturing hoods.
- Capture velocities, face velocity, transport velocities
- Fletcher and Garrison methods of predicting air flows, velocity contours and effects of flanges
- Application of hoods of all types and use of partial and total enclosures in industrial situations
- Limitations of LEV
- Supply air, (importance of location and direction) Use of treated recycled air
- Safe discharge arrangements. (Treatment before discharge and location of discharge)

4.0.5 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, and testing
- Continued satisfactory performance indication

5 Personal Protective Equipment (15%)

This section will provide candidates with suitable knowledge and training to ensure that the candidate can demonstrate their understanding in the following:

5.0.1 General:

- Types of Personal Protective Equipment (PPE) including Respiratory Protective Equipment (RPE) protective gloves 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

5.0.2 Respiratory Protective Equipment:

- Types of RPE and their limitations e.g. 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. Face fit testing

5.0.3 Chemical Protective Clothing (CPC):

- Types of CPC
- Performance criteria
- Testing effectiveness
- Application, limitations
- Storage arrangements, laundering arrangements, role in prevention of spread of contamination
- Suitability for use and integrity

5.0.4 Gloves and dermal care:

- Basic dermal exposure assessment techniques and principles of dermal exposure risk management
- Types of gloves and their performance data
- Permeation and breakthrough
- Glove selection, maintenance, and training in use

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

Suggested References and Further Reading

- (1) WHO Guidelines on the prevention of toxic exposures
- (2) ACGIH Industrial Ventilation A Manual of Recommended Practice
- (3) ACGIH Guidelines on Selection of Chemical Protective Clothing
- (4) Controlling airborne contaminants at work HSE books HSG258
- (5) Respiratory Protection at Work HSE Books HSG53
- (6) ISO 16900 series standards on Respiratory Protective Devices
- (7) ISO 16602 Protective Clothing for Protection against Chemicals – Classification, labelling and performance requirements
- (8) NIOSH guide to industrial respiratory protection
- (9) NIOSH A guide for assessing the performance of protective clothing
- (10) Controlling Skin Exposure to Chemicals and Wet-Work

Course Length

This course will require at least **45** hours of study time, of which at least **37** hours will be taught (teaching and practical assessments) and **8** hours will be independent (in the candidates' own time).

Examinations and Assessment

Candidates are required to pass all of the following parts (A and B below) to be awarded this qualification.

A Practical Assessment

The practical assessment is conducted by the Tutor during the relevant part of the course for all candidates. This is to ensure that every candidate can demonstrate their individual ability and correct method.

The practical exercises will involve:

- Visualisation of air flows as a means to test control (smoke tubes, smoke generators and dust lamps) on at least two typical ventilation systems
- Measurements in relation to a selection of extract points (e.g. face velocity or capture velocity) using thermal and vane anemometers and show a basic understanding of requirements for a selection of tasks.

Further information about the formative practical assessment is published in the following documents: Practical Evaluation Report which is available from www.bohs.org

B Written Examination

This is an open-book examination comprising of **40 (160 marks)** short-answer questions illustrated by photographs and diagrams as appropriate to be answered in **2** hours. Each question is worth **4** marks.

The examination covers all sections of the syllabus and is overseen by an invigilator.

The pass mark for this examination is 50 %

Certification

Candidates who pass all the parts (A and B) within 12 months will be awarded the: **M505 - Control of Hazardous Substances**