

Guide to the NEBOSH International Diploma in Occupational Health and Safety (August 2011 specification)

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1. Introduction

The NEBOSH International Diploma is the qualification for aspiring health and safety professionals, building directly upon the foundation of knowledge provided by the NEBOSH International General Certificate. The Diploma is designed to provide students with the expertise required to undertake a career as a safety and health practitioner and also provides a sound basis for progression to postgraduate study.

The NEBOSH National Diploma is the flagship NEBOSH qualification and is the first UK vocational qualification to be developed specifically for health and safety professionals. Since its introduction in 1988, the National Diploma has become established as the most popular professional qualification for safety and health practitioners in the UK, with over 10,000 candidates having achieved the qualification.

The International Diploma is modelled on the NEBOSH National Diploma in Occupational Health and Safety. The key difference between the two qualifications is in the applicability of legal requirements. Rather than be guided by a specifically UK framework, the International Diploma takes a risk management approach based on best practice and international standards, such as International Labour Organisation (ILO) codes of practice, with special reference to the model proposed in the ILO's "Guidelines on Occupational Safety and Health Management Systems" (ILO-OSH 2001). Local laws and cultural factors form part of the study programme where relevant and appropriate.

1.1 Benefits for employers

Despite the increasing global recognition of the importance of health and safety at work, accidents and work-related ill-health continue to affect all types of workplaces and occupations. The ILO estimates that 6,300 people die daily as a result of occupational accidents or work-related diseases - more than 2.3 million deaths worldwide per year. At least 10% of these deaths are due to the 337 million accidents at work that occur annually. There are an estimated 500 –2000 non-fatal injuries for every fatal injury (including 160 million cases of work-related disease), many of which result in lost earnings, lost jobs and permanent disability and poverty.

In addition to the direct costs of sick pay and absence, employers can find themselves dealing with criminal prosecution, claims for compensation, adverse publicity and harm to both business reputation and profitability. In the UK alone, the estimated annual cost of occupational injury and illness in 2005/6 is £3 billion to UK employers and £13 billion to the British economy. In 2003, the ILO estimated the cost to the global economy at an estimated \$1.25 trillion (\$1,250,000 million).

The vast majority of workplace injuries, accidents and ill-health are avoidable by good health and safety management. By saving money, improving productivity and raising workforce morale, effective health and safety management should be recognised as an essential element of a successful management strategy.

Management of health and safety in the workplace makes sound business sense. Qualified health and safety professionals are an asset to their organisations, reducing costs by preventing accidents and ill health of workers, without incurring unnecessary expense by over-reacting to trivial risks.

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Courses leading to the NEBOSH International Diploma may be taken in a variety of formats and at a pace to fit around the needs of the business. Its unitised structure recognises success as the student progresses. Its practical approach promotes the application of the knowledge acquired on the course to problem solving in the student's own workplace.

1.2 Designatory letters

Holders of the NEBOSH International Diploma in Occupational Health and Safety may use the designatory letters 'IDipNEBOSH' after their name.

1.3 Professional membership

The qualification meets the academic requirements to apply for Graduate Membership (Grad IOSH) of Institution of Occupational Safety and Health (IOSH – www.iosh.co.uk). This is the first step to becoming a Chartered Health and Safety Practitioner as a Chartered Member of IOSH (CMIOSH).

Holders of the NEBOSH International Diploma in Occupational Health and Safety *and* either the NEBOSH National or International Certificate in Construction Health and Safety meet the headline entrance criteria requirements for Registered Construction Safety Practitioner (RMaPS) membership of the Association for Project Safety (APS).

The International Diploma is also accepted by the International Institute of Risk and Safety Management (IIRSM) as meeting the academic requirements for Full membership (MIIRSM).

1.4 Qualification level and UK accreditation

The NEBOSH International Diploma in Occupational Health and Safety is accredited and credit rated by the Scottish Qualifications Authority (SQA - www.sqa.org.uk). It is rated within the Scottish Credit and Qualifications Framework (SCQF - www.scqf.org.uk) at SCQF Level 10 with 47 SCQF credit points.

For users in England, Wales and Northern Ireland, this is comparable to a Vocationally-Related Qualification (VRQ) at Level 6 within the National Qualifications Framework (NQF) and Qualifications and Credit Framework (QCF), or Honours Degree standard.

For further information regarding UK qualification levels, please refer to the “*Qualifications can cross boundaries*” comparison chart issued by the UK regulators, available at the SQA website (www.sqa.org.uk).

1.5 Key topics covered

- Managing health and safety
- Hazardous agents in the workplace
- Workplace and work equipment safety
- Practical application of health and safety theory

1.6 Course tuition and private study time requirements

Preparatory content:

Unit IA: 79 hours tuition and 75 hours private study	Total: 154 hours
Unit IB: 71 hours tuition and 50 hours private study	Total: 121 hours
Unit IC: 75 hours tuition and 50 hours private study	Total: 125 hours
Unit ID: 6 hours tuition and 50 hours private study	Total: 56 hours

A programme of study therefore needs to be based around a minimum of **231 taught hours** and approximately **225 hours of private study** for an overall total of **456 Hours**.

A full-time block release course would be expected to last for a minimum of six weeks (thirty-five working days) and a part-time day release course would be spread over at least thirty weeks. For candidates studying by open or distance learning, the tuition hours should be added to the recommended private study hours to give the minimum number of hours that this mode of study will require.

Tuition time should normally be allocated proportionate to the tuition time for each element but may require adjustment to reflect the needs of a particular student group.

Quoted hours *do not* include assessment time, ie, sitting written examinations (see 1.6).

1.7 Entry requirements

The NEBOSH International Diploma syllabus assumes that candidates will have knowledge of health and safety equivalent to that provided by the NEBOSH International General Certificate (IGC).

The achievement of the International General Certificate or direct equivalent prior to undertaking the International Diploma course is highly recommended, given the demands of this level of study, the time commitment required and the complementary nature of the NEBOSH IGC and International Diploma. Further information on the NEBOSH International General Certificate can be found via our website www.nebosh.org.uk.

However, it should be noted that currently the assessments are offered, and must be answered, in English only. The qualification includes a requirement to write an extended assignment based on the candidate's own workplace, which must also be in English. Candidates should discuss this with the accredited course provider before undertaking the qualification.

Students must satisfy any entry requirements specified by the course provider. Acceptance on to the programme may be based on the admission tutor's judgement on the student's ability to benefit from the programme.

1.8 Minimum standard of English required for candidates

The standard of English required by candidates studying for the NEBOSH International Diploma must be such that they can both understand and articulate the concepts contained in the syllabus. It is important to stress that the onus is on accredited course providers to determine their candidates' standards of proficiency in English.

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NEBOSH recommends to accredited course providers that candidates undertaking this qualification should reach a minimum standard of English *equivalent* to an International English Language Testing System score of **7.0** or higher in IELTS tests in order to be accepted onto an International Diploma programme.

For further information please see the latest version of the IELTS Handbook or consult the IELTS website: http://www.ielts.org/institutions/test_format_and_results.aspx.

Candidates wishing to assess their own language expertise may consult the IELTS website for information on taking the test: <http://www.ielts.org/faqs.aspx>.

1.9 Legislation

The syllabus refers to international conventions and recommendations. Where this qualification is delivered overseas, accredited course providers may refer to examples of local legislation as part of the course programme but examination questions will not refer to specific legislation, but will refer to International conventions, recommendations and good practice as indicated in the syllabus.

1.10 Legislative updates

Relevant new international conventions and recommendations will become examinable in detail six months after their date of introduction. However, candidates will be expected to be essentially up-to-date at the time of the examination and, whilst a detailed knowledge will not be expected, reference to new or impending international conventions and recommendations, where relevant to an examination question, will be given credit.

Please note, NEBOSH will not ask questions related to international conventions and recommendations that have been repealed, revoked or otherwise superseded.

NB: Accredited course providers are expected to ensure their course notes remain current with regard to new international conventions and recommendations.

1.11 National Occupational Standards (NOS) and best practice

The syllabus is mapped to the relevant National Occupational Standard (NOS):

- NOS for Health and Safety (Practitioner units) published by Proskills Standards Setting Organisation (SSO) (www.proskills.co.uk).

The mapping of the syllabus units to each NOS can be found on pages 13-16.

1.12 Qualification type

NEBOSH offers Vocationally-Related Qualifications (VRQs) in England, Wales and Northern Ireland.

VRQs provide the knowledge and practical skills required for particular job roles through a structured study-based training programme that combines the testing of knowledge and understanding in written examinations with practical application of learning in the workplace.

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VRQs are a popular type of qualification because they are nationally recognised, flexible and offer routes for progression to employment or further study.

In Scotland, VRQs are known as 'Other accredited qualifications'.

1.13 Qualification progression

Students who have achieved the NEBOSH International Diploma may be considering further health and safety study. A number of universities offer MSc programs which accept the NEBOSH International Diploma as a full or partial entry requirement. Some MSc courses may require additional qualifications/expertise such as a degree, further significant work experience or expect students to complete specific modules e.g. in environmental management.

Further information can be found on our website: www.nebosh.org.uk/qualifications

1.14 Programmes offered by NEBOSH-accredited course providers

Accredited course providers can be located using the 'Where to study' tab on our website: www.nebosh.org.uk

NB: Candidates are advised to check up-to-date information on course dates with accredited course providers directly.

1.15 Examination dates

'Standard' examination dates for this qualification are available in January and July annually. Unit ID assignment dates are available in February, May, August and November annually.

'On-demand' examinations are *not* available to course providers for this qualification.

1.16 Specification date

The August 2011 specification for this qualification replaces the previous July 2008 specification for all examinations from (and including) 1 July 2012.

1.17 Syllabus development and review

The syllabus has been developed by NEBOSH following extensive consultation with key stakeholders, notably accredited course providers, professional bodies, employers, standards setting organisations, enforcement bodies and subject experts.

NEBOSH would like to take this opportunity to thank all those who participated in the development, piloting and implementation of this qualification.

1.18 Further information for candidates

Further information for candidates including a syllabus summary, qualification overview leaflet and a sample examiner's report can be found via the NEBOSH website (www.nebosh.org.uk). Examiners' reports and past question papers may be purchased from the NEBOSH online shop.

1.19 Further information for accredited course providers

Further information for accredited course providers including policies and procedures and guidance regarding the Unit ID assignment can be found on the NEBOSH website.

2. Qualification structure

2.1 Unit assessment

The International Diploma in Occupational Health and Safety is divided into four units. All units are mandatory and there are no optional units. Candidates may choose to take one, two, three or all four units at the same time or at different times.

Unit IA: International management of health and safety

- Unit IA is a taught unit, assessed by one three-hour written question papers
- Each question paper consists of eleven questions split into Section A and B
- Section A includes six 'short-answer' questions (10 marks each) – all questions are compulsory
- Section B includes five 'long-answer' questions (20 marks each) – candidates choose and answer three questions only
- Each examination question paper covers the whole unit syllabus with at least one question per unit element
- Candidate scripts are marked by external examiners appointed by NEBOSH
- A sample examination question paper can be found in Section 5.

Unit IB: International control of hazardous agents in the workplace

- Unit IB is a taught unit, assessed by one three-hour question paper
- Each question paper consists of eleven questions split into Section A and B
- Section A includes six 'short-answer' questions (10 marks each) – all questions are compulsory
- Section B includes five 'long-answer' questions (20 marks each) – candidates choose and answer three questions only
- Each examination question paper covers the whole unit syllabus with at least one question per unit element
- Candidate scripts are marked by external examiners appointed by NEBOSH
- A sample examination question paper can be found in Section 5.

Unit IC: International workplace and work equipment safety

- Unit IC is a taught unit, assessed by one three-hour question paper
- Each question paper consists of eleven questions split into Section A and B
- Section A includes six 'short-answer' questions (10 marks each) – all questions are compulsory
- Section B includes five 'long-answer' questions (20 marks each) – candidates choose and answer three questions only

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- Each examination question paper covers the whole unit syllabus with at least one question per unit element
- Candidate scripts are marked by external examiners appointed by NEBOSH
- A sample examination question paper can be found in Section 5.

Unit ID: Application of international health and safety theory and practice

- Unit ID consists of a written assignment set by NEBOSH
- Approximately 8,000 words in length
- Submission dates for Diploma assignments are in February, May, August and November each year
- Candidate scripts are marked by external examiners appointed by NEBOSH.

NEBOSH applies best practise in relation to assessment setting and marking. NEBOSH uses external assessment for written examinations and assignments: scripts are sent to NEBOSH and undergo rigorous marking, checking and results determination processes to ensure accuracy and consistency.

2.2 Achieving the qualification

- The enrolment period for the International Diploma is **five years**
- Students must pass **all four units** within their enrolment period (normally five years), to achieve the qualification
- Students who have reached the end of the enrolment period but still wish to complete outstanding units, may apply for a single one year enrolment extension. These are considered by NEBOSH on a case-by-case basis. Successful applications for the enrolment extension will incur a fee.

To qualify for the NEBOSH International Diploma a candidate must:

- Enrol as a course member with an accredited course provider and, through the course provider, with NEBOSH. Enrolment with NEBOSH (with payment of the appropriate fee) should normally be made at the beginning of the programme of study
- Register with NEBOSH through a course provider as a candidate for the relevant question paper (with payment of the appropriate fee)
- Register with NEBOSH through a course provider as a candidate for the assignment unit (with payment of the appropriate fee)
- Fulfil all other requirements as may be made from time to time by the accredited course provider and/or NEBOSH

2.4 Unit pass standard

The pass standard for each unit may vary according to pre-determined criteria but is normalised to 45% for the written papers (Units IA, IB and IC) and 50% for the assignment unit (Unit ID).

2.5 Unit certificates

Candidates who are successful in an individual unit will be issued with a unit certificate, normally within 40 working days of the issue of the result notification. Units are not graded and the unit certificates will show a 'Pass' only.

2.6 Qualification grades

When candidates have been awarded a unit certificate for all four units (ie, have achieved a Pass in units IA, IB, IC and ID), the marks are added together and a final grade is awarded as follows:

Pass	185 – 239 marks
Credit	240 – 279 marks
Distinction	280 marks or more

2.7 Qualification parchments

Once a candidate has achieved a Pass in all four units and the overall qualification grade awarded they are normally considered to have completed the qualification and an overall qualification parchment will be issued, within 40 working days of the result declaration date for the fourth successfully completed unit.

However, once the result of the fourth successfully completed unit has been issued the candidate has **20 working days** from the date of issue of that result to either:

- Inform NEBOSH in writing of their intention to re-sit a successful unit for the purposes of improving a grade
- Submit an Enquiry About Result (EAR) request (see Section 3.3).

2.8 Re-sitting examinations

If a candidate's performance in any unit is lower than a pass, a candidate may re-sit just the unit/s in which they have been unsuccessful providing that they re-sit within the 5-year enrolment period and pay the appropriate registration fee.

Candidates may re-take units at any time within their enrolment period; this includes where a candidate wishes to re-take unit/s to improve their qualification grade. Once all four units have been successfully completed, candidates will need to inform NEBOSH of their intention to re-take **within 20 working days of the date of issue for the fourth unit result**. There is no limit to the number of re-sits within the enrolment period.

If a re-sit results in a lower mark than a previous result for that unit, the highest mark will be used when calculating the qualification grade.

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For the Unit ID assignment, there is no limit to the number of submissions within the enrolment period. If a candidate gains lower than the pass mark in the assignment, they may revise and submit the assignment again. However, they must re-register for the assignment in order to do so. Please note that no feedback will be given on the referred assignment and each additional submission will incur a fee. Marks awarded for subsequent submissions will not be capped.

Candidates who register for any unit of the International Diploma whilst awaiting a result from a previous sitting of an examination may not seek a refund of the registration fee if they retrospectively claim exemption for that any successful unit under these circumstances, except in the case of an Enquiry About Result.

3. Policies

3.1 Requests for access arrangements/reasonable adjustments

Access arrangements and reasonable adjustments are modifications which are approved in advance of an assessment to allow attainment to be demonstrated by candidates with either a permanent or long-term disability or learning difficulty, or temporary disability, illness or indisposition.

Requests for access arrangements or reasonable adjustments must be made to NEBOSH by accredited course providers at least one month before the assessment.

For further details see the NEBOSH *“Policy and procedures for access arrangements, reasonable adjustments and special consideration”* available from the NEBOSH website (www.nebosh.org.uk).

3.2 Requests for special consideration

Special consideration is a procedure that may result in an adjustment to the marks of candidates who have not been able to demonstrate attainment because of temporary illness, injury, indisposition or an unforeseen incident at the time of the assessment.

Candidates who feel disadvantaged due to illness, distraction or any other reason during the assessment must report this to the invigilator (or the accredited course provider in the case of the assignment) before leaving the examination room and request that their written statement, together with the invigilator’s comments on the statement, be sent by the accredited course provider to NEBOSH.

Requests for special consideration must be made to NEBOSH by the accredited course provider as soon as possible and no more than seven working days after the assessment.

For further details see the NEBOSH *“Policy and procedures on reasonable adjustments and special consideration”* available from the NEBOSH website (www.nebosh.org.uk).

3.3 Enquiries about results and appeals

NEBOSH applies detailed and thorough procedures to review and check assessment results before they are issued. It thereby ensures that the declared results are a fair and equitable reflection of the standard of performance by candidates.

There are, however, procedures for candidates or accredited course providers to enquire about results that do not meet their reasonable expectations. An ‘enquiry about result’ (EAR) must be made in writing within one month the date of issue of the result to which it relates.

For details see the NEBOSH *“Enquiries and appeals policy and procedures”* document available from the NEBOSH website (www.nebosh.org.uk).

3.4 Malpractice

Malpractice is defined as any deliberate activity, neglect, default or other practice by candidates and/or accredited course providers that compromises the integrity of the assessment process, and/or the validity of certificates. Malpractice may include a range of issues from collusion or use of unauthorised material by candidates, to the failure to maintain appropriate records or systems by accredited course providers, to the deliberate falsification of records in order to claim certificates. Failure by an accredited course provider to deal with identified issues may in itself constitute malpractice.

For further details see the NEBOSH *“Malpractice policy and procedures”* document available from the NEBOSH website (www.nebosh.org.uk).

4. Syllabus - NEBOSH International Diploma in Occupational Health and Safety (August 2011 specification)

Structure

The qualification is divided into four units. Unit IA is further divided into eight elements and Units IB and IC into eleven elements each.

The matrix below indicates how the syllabus elements map to the relevant National Occupational Standards (See also section 1.11):

- National Occupational Standards (NOS) for Health and Safety (Practitioner units) published by Proskills Standards Setting Organisation (SSO) (www.proskills.co.uk).

Unit IA: International management of health and safety

Element Number	Element Title	Recommended hours	Relevant Proskills units and elements	Page
1	Principles of health and safety management	8	<i>HSP 1, 3, 5, 11</i>	17
2	Loss causation and incident investigation	5	<i>HSP 4, 8, 10</i>	21
3	Measuring and reviewing health and safety performance	6	<i>HSP 4-5,7-11</i>	23
4	Identifying hazards, assessing and evaluating risks	12	<i>HSP 4-8</i>	25
5	Risk control	8	<i>HSP 4-6, 8, 13</i>	27
6	Organisational factors	12	<i>HSP 1-5, 11</i>	29
7	Human factors	12	<i>HSP 1- 5</i>	32
8	Regulating health and safety	16	<i>HSP 1, 6-9, 12</i>	35
	Minimum unit tuition time	79		
	Recommended private study time	75		

Unit IB: International control of hazardous agents in the workplace

Element Number	Element Title	Recommended hours	Relevant Proskills units and elements	Page
1	Principles of toxicology and epidemiology	8	<i>HSP 4-6, 8, 13</i>	37
2	Hazardous substances and other chemicals – assessment of risk	5	<i>HSP 4, 6</i>	40
3	Hazardous substances and other chemicals – engineering controls and personal protective equipment	4	<i>HSP 5-7, 13</i>	42
4	Monitoring and measuring	6	<i>HSP 5, 7-9</i>	44
5	Biological agents	7	<i>HSP 5-9</i>	47
6	Physical agents 1 – noise and vibration	10	<i>HSP 5-9</i>	49
7	Physical agents 2 - radiation	9	<i>HSP 5-8</i>	53
8	Psycho-social agents	5	<i>HSP 2, 5-9, 13</i>	56
9	Musculoskeletal risks and controls	4	<i>HSP 5-9</i>	58
10	Work environment risks and controls	5	<i>HSP 5-10, 13</i>	60
11	Managing occupational health	8	<i>HSP 2-3, 5-9, 11, 13</i>	63
	Minimum unit tuition time	71		
	Recommended private study time	50		

Unit IC: International workplace and work equipment safety

Element Number	Element Title	Recommended hours	Relevant Proskills units and elements	Page
1	General workplace issues	7	<i>HSP 5-6</i>	65
2	Principles of fire and explosion	6	<i>HSP 5-6, 13</i>	68
3	Workplace fire risk assessment	6	<i>HSP 4-6, 10</i>	71
4	Storage, handling and processing of dangerous substances	7	<i>HSP 4-5, 9-10</i>	73
5	Work equipment (general)	9	<i>HSP 4-9, 13</i>	76
6	Work equipment (workplace machinery)	11	<i>HSP 4-9, 13</i>	78
7	Work equipment (mobile, lifting and access)	6	<i>HSP 4-9, 13</i>	81
8	Electrical safety	7	<i>HSP 4-9, 13</i>	84
9	Construction hazards and controls	7	<i>HSP 4-7, 10</i>	87
10	Workplace transport and driving for work	4	<i>HSP 1, 3-9</i>	89
11	Pressure system hazards and controls	5	<i>HSP 5, 7-9</i>	91
	Minimum unit tuition time	75		
	Recommended private study time	50		

Unit ID: Application of international health and safety theory and practice

Element Number	Element Title	Recommended hours	Relevant Proskills units and elements	Page
1	Application of health and safety theory and practice	6	<i>HSP 1-13</i>	93
	Minimum unit tuition time	6		
	Recommended private study time	50		
	<i>Minimum total tuition time</i>	231		
	<i>Recommended total private study time</i>	225		
	Total overall hours	456		

4.1: Unit IA: International management of health and safety

Overall learning outcome

On completion of this unit, candidates will be able to demonstrate their understanding of the domain knowledge covered through:

1. The application of knowledge to familiar and unfamiliar situations; and
2. The critical analysis and evaluation of information presented in both quantitative and qualitative forms.

In addition each element has specific learning outcomes.

Element IA1: Principles of health and safety management

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA1.1 Explain the moral, legal and economic reasons for a health and safety management system
- IA1.2 Outline the societal factors which influence health and safety standards and priorities
- IA1.3 Explain the principles and content of effective health and safety, quality, environmental, and integrated management systems with reference to recognised models and standards
- IA1.4 Outline the role and responsibilities of the health and safety practitioner.

Content

IA1.1 Reasons for managing health and safety

- Moral:
 - concept of reasonable care
 - unacceptability of putting health and safety of people at risk
 - society's attitude to moral obligations
 - accident/incident and ill-health statistics
 - higher-risk industries
 - effect of size of organisation on accident/incident rates

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- Legal:
 - the preventive (by enforcement notices)
 - punitive (through criminal sanctions)
 - compensatory effects of law
 - principle of self-regulation
- Economic:
 - costs associated with incidents and their impact on society and the organisation
 - insured and un-insured costs
 - financial benefits of positive health and safety management.

IA1.2 Societal factors which influence health and safety standards and priorities

- Factors:
 - economic climate, government policy and initiatives
 - industry/business risk profile
 - globalisation of business
 - migrant workers
 - level of sickness absence
 - societal expectations of equality eg, adjustments for workers with disabilities
- Principle of 'corporate social responsibility'.

IA1.3 Principles and content of effective management systems

- The meaning of 'hazard', 'risk', 'danger'
- Key elements of an effective health and safety management system
- The principles and benefits of risk management on a global perspective
- Organisational models for health and safety management, specifically:
 - ILO-OSH-2001 Guidelines on Occupational Health and Safety Management Systems. ILO, 2001
 - OHSAS 18001 Occupational Health and Management Systems: Specification. British Standards Institution, 2007
- Benefits and limitations of integration of quality, environmental, and health and safety management systems
- The key typical components in a range of effective health and safety management systems:
 - management commitment
 - policy
 - organising
 - planning and implementing
 - performance review
 - audit
 - continual improvement
- Total quality management and environmental management systems:
 - ISO 9000 series
 - ISO 14000 series

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- The arguments for and against integration of management systems
- The reasons for the introduction of formal health and safety management systems, including the appropriate allocation of resources and responsibilities, setting and monitoring performance standards and the establishment of systems for feedback and implementation of corrective action in order to minimise loss (with reference to Element IA6)
- The role of the health and safety policy in relation to a health and safety management system and as a vehicle for the communication of health and safety information
- The requirements for a written health and safety policy and for recording arrangements in relevant standards
- The general principles and objectives of a health and safety policy document
- The implementation, benefits and limitations of the introduction of common health and safety management principles, standards and systems in organisations operating on a world-wide basis (with reference to Element IA6)
- Influence of corporate responsibility and business ethics on health and safety management (with reference to Element IA6)
- The role of health and safety in global corporate social responsibility (CSR) guidelines and standards (United Nations Global Compact; SA8000; Global Reporting Initiative).

IA1.4 Role and responsibilities of the health and safety practitioner

- The role of health and safety practitioners in the development, design, implementation, evaluation and maintenance of health and safety management systems
- Role of the health and safety practitioner in influencing involvement and conduct at all levels of an organisation
- Meaning of the term 'competence' and the requirements for continuing professional development for health and safety practitioners to maintain competence
- The need for health and safety practitioners to evaluate and develop their own practice
- The need for health and safety practitioners to consult with others if appropriate, eg, when working outside of their competence
- Meaning of the term 'ethics'
- Practical application of ethical principles (eg, honesty, respect, integrity) that underpin professional health and safety practitioner codes of conduct
- Dealing with conflicts of interest.

Tutor references

International Labour Standards, *Occupational Safety and Health Convention, C155*, International Labour Organisation, Geneva, 1981

International Labour Standards, *Occupational Safety and Health Recommendation R164*, International Labour Organisation, Geneva, 1981

ISO 9001 Quality management systems - Requirements

ISO 14000 series Environmental management systems – Requirements

OHSAS 18001 Occupational Health and Safety Management Systems: Specification

OHSAS 18002 Occupational health and safety management systems — Guidelines for the implementation of OHSAS 18001

ILO-OSH-2001 Guidelines on Occupational Health and Safety Management Systems. ILO, 2001

Recommended tuition time not less than 8 hours

Element IA2: Loss causation and incident investigation

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA2.1 Explain the theories of loss causation
- IA2.2 Explain the quantitative analysis of accident/incident and ill health data, limitations of their application, and their presentation in numerical and graphical form
- IA2.3 Explain the external and the internal reporting and recording systems for loss events (injuries, ill-health, dangerous occurrences) and near-misses
- IA2.4 Explain loss and near miss investigations; the requirements, benefits, the procedures, the documentation, and the involvement of and communication with relevant staff and representatives.

Content

IA2.1 Theories of loss causation

- Accident/incident ratio studies, their use and their limitations
- Domino and multi-causality theories, immediate and underlying causes
- Latent and active failures – Reason’s model of accident causation.

IA2.2 Quantitative analysis of accident and ill-health data

- Methods of calculating loss rates from raw data: accident/incident frequency rate, accident incidence rate, accident severity rate, ill-health prevalence rate
- The application and limitations of simple statistical and epidemiological analyses in the identification of patterns and trends
- Presenting and interpreting loss event data in graphical and numerical format, using examples of histograms, pie charts and line graphs
- Principles of statistical variability, validity and the use of distributions (eg, sampling a population, errors in data).

IA2.3 Reporting and recording of loss events (injuries, ill-health and dangerous occurrences) and near misses

- Reporting requirements and procedures; internal reporting and recording systems with reference to the ILO Code of Practice: Recording and Notification of Occupational Accidents and Diseases (1996).

IA2.4 Loss and near miss investigations

- Implied legal requirements
- Purposes of investigation including:
 - discovery of underlying causes
 - prevention of recurrence
 - legal liability
 - data gathering
 - identification of trends
- Investigation procedures and methodologies to include:
 - accident/incident/near miss report forms
 - gathering of relevant information
 - interviewing witnesses
 - analysis of information
 - involvement of managers, supervisors, employees' representatives and others in the investigation process
- Communications with a particular focus on remedial actions and lessons learnt
- Root cause analysis methods such as fault tree analysis as investigative tools (reference Element IA4).

Tutor references

International Labour Standards, Occupational Safety and Health Convention, C155, International Labour Organisation, Geneva, 1981

International Labour Standards, Occupational Safety and Health Recommendation R164, International Labour Organisation, Geneva, 1981

International Labour Office, Recording and Notification of Occupational Accidents and Diseases An ILO Code of Practice, ILO, Geneva, 1996. ISBN 922109451

Health and Safety Executive, 'Investigating accidents and incidents - a workbook for employers, unions, safety representatives and safety professionals' (HSG245), HSE Books ISBN 978 0 7176 28272 8

Recommended tuition time not less than 5 hours

Element IA3: Measuring and reviewing health and safety performance

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA3.1 Explain the purpose of performance measurement in relation to health and safety objectives and arrangements
- IA3.2 Explain the need for, and the objectives and limitations of, health and safety monitoring systems
- IA3.3 Describe the variety of monitoring and measurement techniques
- IA3.4 Explain the requirements for reviewing health and safety performance.

Content

IA3.1 Purpose of performance measurement

- The assessment of the effectiveness and appropriateness of health and safety objectives and arrangements, including control measures
- The making of recommendations for review of current health and safety management systems.

IA3.2 Monitoring systems

- Need for a range of both active and reactive measures to determine whether health and safety objectives have been met
- Objectives of active monitoring – to check that health and safety plans have been implemented and to monitor the extent of compliance with the organisation's systems/procedures and legislative/technical standards
- Objectives of reactive monitoring – to analyse data relating to accidents, ill-health and other loss causing events
- Limitations of placing reliance on accident/incident and ill-health data
- The distinction between, and applicability of, active/reactive, objective/subjective and qualitative/quantitative performance measures.

IA3.3 Monitoring and measurement techniques

- The range of measures available in order to evaluate the health and safety performance of an organisation and how these can be utilised to review the effectiveness of the health and safety management system
- Role and purpose of health and safety audits, workplace inspections, safety tours, safety sampling, and safety surveys
- The key elements and features of health and safety audits, workplace inspections, safety tours, safety sampling, and safety surveys
- In-house and proprietary audit systems and processes; the use of computer technology to assist in data storage and analysis and the production of reports
- Comparison of previous performance data with that of similar organisations/industry sectors and with national performance data. Use and potential benefits of benchmarking.

IA3.4 Reviewing health and safety performance

- Need for formal and informal reviews of performance
- Process of review
- Inputs to a review process – internal performance data, health and safety objectives, organisational arrangements and change, external standards and expectations
- Outputs from a review process – actions and improvement plans, stakeholder reports, performance targets.

Tutor references

Step Change in Safety. Leading performance indicators – Guidance for effective use. Undated.

<http://www.stepchangeinsafety.net/knowledgecentre/publications/publication.cfm/publicationid/26>

Health and Safety Executive. Developing process safety indicators: a step-by-step guide for chemical and major hazard industries. HSG254. Sudbury: HSE Books, 2006.

www.hse.gov.uk/pubns/books/hsg254.htm.

American Institute of Chemical Engineers. CCPS recommendations for process safety leading and lagging indicators. New York: AIChE, 2008.

www.aiche.org/uploadedFiles/CCPS/Metrics/CCPS_metrics%205.16.08.pdf –includes definitions for standard ‘process safety metrics’, for performance comparisons between different sites and organisations.

Health and Safety Executive Corporate Health & Safety Performance Index (CHaSPI):

<http://www.chaspi.info-exchange.com>

Health and Safety Executive. Health and Safety Performance Indicator (HSPI). 2005. - similar to CHaSPI, but for organisations with fewer than 250 employees:

<http://online.businesslink.gov.uk/bdotg/action/haspi>

Institute of Occupational Safety and Health (IOSH) Reporting performance. Guidance on including health and safety performance in annual reports:

http://www.iosh.co.uk/information_and_resources/guidance_and_tools.aspx#Managing

Recommended tuition time not less than 6 hours

Element IA4: Identifying hazards, assessing and evaluating risks

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA4.1 Describe how to use internal and external sources of information in the identification of hazards and the assessment of risk
- IA4.2 Outline a range of hazard identification techniques
- IA4.3 Explain how to assess and evaluate risk and to implement a risk assessment programme
- IA4.4 Explain the principles and techniques of failure tracing methodologies with the use of calculations.

Content

IA4.1 Sources of information in the identification of hazards and the assessment of risk

- Accident/incident and ill-health data and rates – incidence, frequency, severity, prevalence
- External information sources (eg, relevant governmental agencies (OSHA/HSE), European Safety Agency, International Labour Organisation - ILO, World Health Organisation - WHO, professional and trade bodies)
- Internal information sources – collection, provision, analysis and use of damage, injury, and ill-health data, near-miss information and maintenance records
- Uses and limitations of external and internal information sources.

IA4.2 Hazard identification techniques

- Use of observation, task analysis, checklists and failure tracing techniques such as hazard and operability studies (reference IA4.4)
- Importance of worker input.

IA4.3 Assessment and evaluation of risk

- Key steps in a risk assessment process including ensuring suitable and sufficient coverage of risks, identifying hazards, persons at risk, factors affecting probability and severity, risk evaluation and required risk control standards, formulation of actions, prioritisation of actions and recording requirements
- Temporary situations
- Differences between, and principles of, qualitative, semi-quantitative and quantitative assessments

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- Organisational arrangements for implementing and maintaining an effective risk assessment programme including procedures, recording protocols, training, competence, responsibilities, authorisation and follow-up of actions, monitoring and review
- Acceptability/tolerability of risk.

IA4.4 Failure tracing methodologies

- Principles and techniques of the following failure tracing methods in the assessment of risk:
 - hazard and operability studies
 - fault tree analysis
 - event tree analysis.

Tutor references

International Labour Standards, *Prevention of Major Industrial Accidents Convention*, [C174](#), International Labour Organisation, Geneva, 1993

International Labour Office, [Prevention of Major Industrial Accidents, an ILO Code of Practice](#), ILO, Geneva, 1991. ISBN 9221071014

Chapter 1: General provisions

Chapter 2: Components of a major hazard control system

Chapter 3: General duties

Chapter 4: Prerequisites for a major hazard control system

Chapter 5: Analysis of hazards and risks

Chapter 6: Control of the causes of major industrial accidents

Reducing risks, protecting people (R2P2). HSE Books, ISBN 0 7176 2151 0

Recommended tuition time not less than 12 hours

Element IA5: Risk Control

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA5.1 Outline common risk management strategies
- IA5.2 Outline factors to be taken into account when selecting risk controls
- IA5.3 Explain the development, main features and operation of safe systems of work and permit-to-work systems.

Content

IA5.1 Common risk management strategies

- The concepts of avoidance, reduction, transfer and retention with/without knowledge within a health and safety management programme, with relevant examples (eg, redesign of tasks, automation of process, insurance policies, use of specialist contractors)
- Factors to be considered in the selection of an optimum solution based on relevant risk data.

IA5.2 Factors to be taken into account when selecting risk controls

- The general principles of prevention
- Categories of control measure:
 - technical, eg, design, fencing, ventilation
 - procedural, eg systems of work, maintenance
 - behavioural, eg information and training
- General hierarchy of control measures – form and justification
- Factors affecting choice of control measures – long term/short term, applicability, practicability, cost, effectiveness of control, legal requirements and associated standards, competence of personnel and training needs relevant to preferred controls
- Cost-benefit analysis in relation to risk control decisions (organisational, design, planning, operational).

IA5.3 Safe systems of work and permit-to-work systems

- Safe systems of work: meaning; legal and practical requirements; components (people, equipment, materials, environment); development and implementation
- The use of risk assessment in the development of safe systems of work and safe operating procedures
- Permit-to-work systems – essential features, general application, operation and monitoring.

Relevant Standards

International Labour Standards, Occupational Safety and Health Convention, C155, International Labour Organisation, Geneva, 1981

International Labour Standards, Occupational Safety and Health Recommendation R164, International Labour Organisation, Geneva, 1981

Tutor references

Guidance on permit-to-work systems. A guide for the petroleum, chemical and allied industries HSG250 HSE Books ISBN 9780717629435

Recommended tuition time not less than 8 hours

Element IA6: Organisational factors

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA6.1 Explain the internal and external influences on health and safety in an organisation
- IA6.2 Outline the different types of organisation, their structure, function and the concept of the organisation as a system
- IA6.3 Identify the various categories of third parties in a workplace, the relevant duties, responsibilities and controls
- IA6.4 Explain the role, influences on and procedures for formal and informal consultation with workers in the workplace
- IA6.5 Outline the development of a health and safety management information system, the relevant duties and the data it should contain
- IA6.6 Explain health and safety culture and climate
- IA6.7 Outline the factors which can both positively and negatively affect health and safety culture and climate.

Content

IA6.1 Internal and external influences

- Internal influences on health and safety within an organisation – eg, finance, production targets, trade unions/labour unions, organisational goals and culture
- External influences on health and safety within an organisation – eg, legislation, enforcement agencies, courts/tribunals, contracts, clients/contractors, trade unions, insurance companies, public opinion.

IA6.2 Types of organisations

- The concept of the organisation as a system
- Organisational structures and functions – including formal and informal; large or small; organisation charts, role of management
- Potential conflict between organisational goals and those of the individual
- The integration of the goals of the organisation with the needs of the individual – authority, responsibility, accountability.

IA6.3 Third party control

- Identification of third parties: contractors, visitors, trespassers and members of the public
- Reasons for ensuring that third parties are covered by health and safety management systems

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- Basic duties owed to and by third parties
- Internal rules and procedures concerned with the selection, appointment and control of contractors
- Responsibilities for control of risk associated with contractors on site
- Reasons for providing information relating to hazards/risks to third parties.

IA6.4 Consultation with workers

- The role of consultation within the workplace with reference to principles laid down in ILO Occupational Safety and Health Convention (C155), Article 20 and ILO Occupational Safety and Health Recommendation (R164)
- Formal consultation:
 - functions of worker representatives on health and safety
 - functions of a safety committee
- Informal consultation:
 - discussion groups, safety circles, departmental meetings
- The role of the health and safety practitioner in the consultative process
- Behavioural aspects associated with consultation – peer group pressures, dangers of tokenism, potential areas of conflict
- Development of positive consultative processes, contributions of worker representatives/safety committee members.

IA6.5 Health and safety management information system

- The development of a health and safety management information system within the workplace
- Types of data within a health and safety management information system: eg, loss event data, cost data, suppliers' data, results of audits/inspections
- Requirements and practical arrangements for providing health and safety information:
 - internally to workers, temporary workers, contractors, etc
 - externally to customers, suppliers, enforcement authorities, employment agencies, members of the public and others
- Duties and practical arrangements for providing health and safety information:
 - internally to workers, temporary workers, contractors, etc
 - externally to customers, suppliers, enforcement authorities, employment agencies, members of the public and others.

IA6.6 Health and safety culture and climate

- Meaning of health and safety culture and health and safety climate
- The impact of organisational cultural factors and associated values on individual behaviour
- Indicators of culture

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- Correlation between health and safety culture/climate and health and safety performance; subjective and objective nature of culture and climate
- Measurement of the culture and climate (eg, safety climate assessment tools, perception surveys, findings of incident investigations, effectiveness of communication, evidence of commitment by personnel at all levels in the organisation).

IA6.7 Factors affecting health and safety culture and climate

- Factors that may promote a positive health and safety culture or climate (eg, management commitment and leadership, high business profile to health and safety, provision of information, involvement and consultation, training, promotion of ownership, setting and meeting targets)
- Factors that may promote a negative health and safety culture or climate (eg, organisational change, lack of confidence in organisation's objectives and methods, uncertainty, management decisions that prejudice mutual trust or lead to 'mixed signals' regarding commitment)
- Effecting change: planning and communication, strong leadership, the need for a gradualist (step-by-step) approach, direct and indirect action to promote change (including cultural benefits from risk assessment), strong worker engagement, training and performance measurements, and importance of feedback
- Problems and pitfalls (eg, attempts to change culture too rapidly, adopting too broad an approach, absence of trust in communications, resistance to change).

Tutor references

International Labour Standards, Occupational Safety and Health Convention, C155, International Labour Organisation, Geneva, 1981

International Labour Standards, Occupational Safety and Health Recommendation R164, International Labour Organisation, Geneva, 1981

Recommended tuition time not less than 12 hours

Element IA7: Human factors

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA7.1 Outline psychological and sociological factors which may give rise to specific patterns of safe and unsafe behaviour in the working environment
- IA7.2 Explain the nature of the perception of risk and its relationship to performance in the workplace
- IA7.3 Explain the classification of human failure
- IA7.4 Explain appropriate methods of improving individual human reliability in the workplace
- IA7.5 Explain how organisational factors could contribute to improving human reliability
- IA7.6 Explain how job factors could contribute to improving human reliability
- IA7.7 Outline the principles, conditions and typical content of behavioural change programmes designed to improve safe behaviour in the workplace.

Content

IA7.1 Human psychology, sociology and behaviour

- Meaning of the terms : psychology and sociology
- The influence on human behaviour of personality, attitude, aptitude and motivation
- Key theories of human motivation: FW Taylor, Mayo (Hawthorne experiments), Maslow (hierarchy of needs), McClelland, Herzberg, McGregor and their relevance to health and safety
- Effects on behaviour at work of experience, social and cultural background, education and training
- On-line and off-line processing; knowledge, rule and skill-based behaviour (Rasmussen)
- Individual decision-making/problem-solving processes (Rasmussen and Reason).

IA7.2 Perception of risk

- Human sensory receptors and their reaction to stimuli, sensory defects and basic screening techniques
- Process of perception of danger, perceptual set and perceptual distortion
- Errors in perception caused by physical stressors
- Perception and the assessment of risk, perception and the limitations of human performance, filtering and selectivity as factors for perception
- Perception and sensory inputs, principles of the Hale & Hale model
- Individual behaviour in the face of danger, principles of the Hale & Glendon model.

IA7.3 Human failure classification

- HSG48 classification of human failure
- Contribution of human failure to serious incidents, eg, Seveso, Chernobyl, Three-Mile Island, Bhopal, Buncefield, Piper Alpha, Texas City.

IA7.4 Improving individual human reliability in the workplace

- Motivation and reinforcement; workplace incentive schemes; job satisfaction and appraisal schemes; selection of individuals – matching skills and aptitudes; training and competence assessment; fitness for work and health surveillance; support for ill-health and stress.

IA7.5 Organisational factors

- The effect of weaknesses in the safety management system on the probability of human failure, eg, inadequacies in the setting of standards, policy, planning, information responsibilities or monitoring
- The influence of safety culture on behaviour and the effect of peer group pressure and norms
- The influence of formal and informal groups within an organisation
- Organisational communication mechanisms and their impact on human failure probability, eg, shift handover communication, organisational communication routes and their complexity, reliability and degree of formality
- Procedures for resolving conflict and introducing change.

IA7.6 Job factors

- Effect of job factors on the probability of human error (eg, task complexity, patterns of employment, payment systems, shift work)
- Application of task analysis
- The role of ergonomics in job design:
 - influence of process and equipment design on human reliability
 - the worker and the workstation as a system

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- elementary physiology and anthropometry
- the degradation of human performance resulting from poorly designed workstations
- Ergonomically designed control systems in relation to human reliability – eg, examples of applications: production process control panels, crane cab controls, aircraft cockpit, CNC lathe, etc
- The relationship between physical stressors and human reliability
- The effects of fatigue and stress on human reliability.

IA7.7 Behavioural change programmes

- Principles of behavioural change programmes
- Organisational conditions needed for success in behavioural change programmes
- Examples of typical behavioural change programme contents.

Tutor references

Behavioural safety; Kicking bad habits (06.1) : IOSH

Reducing error and influencing behaviour (HSG48). HSE Books ISBN 9780717624522

Recommended tuition time not less than 12 hours

Element IA8: Regulating health and safety

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IA8.1 Describe comparative governmental and socio-legal, regulatory and corporate models
- IA8.2 Explain the role and limitations of the International Labour Organisation in a global health and safety setting
- IA8.3 Explain the role non-governmental bodies and self-regulation has in securing common health and safety standards in a global economy.

Content

IA8.1 Comparative governmental and socio-legal and corporate models

- The role, function and limitations of legislation as a means of promoting positive health and safety outcomes
- The nature, benefits and limitations of 'goal-setting' and 'prescriptive' legal models:
 - legal hierarchy of state and federal laws and their application to health and safety law
- Loss events in terms of failures in the duty of care to protect individuals and the compensatory mechanisms that may be available to them
 - compensatory schemes that allow individuals to seek restitution for damages i.e. no fault liability and fault liability claims
 - punitive damages – general, special and non-economic damages
- Mechanisms that may be used to enforce health and safety legislation e.g. criminal action; the use of enforcement powers such as notices, corporate probation, adverse publicity orders; and the typical role and function of enforcement agencies
- Laws of contract:
 - definition of contract to include the terms written, verbal, express and implied
 - the principles of typical laws of contract and their application to health and safety; the relationships between producer and vendor, vendor and consumer, client and contractor, contracts of employment and the binding nature of contracts.

IA8.2 Role and limitations of the International Labour Organisation in a global health and safety setting

- Role and status of ratified International conventions, recommendations, codes of practice in relation to health and safety:
 - bodies of the UN including:
 - ILO role and International Labour Conference
 - ILO conventions
 - ILO recommendations/codes and how they are produced
- The roles and responsibilities of 'International governments', 'enterprises' and 'workers' as given in C155 Occupational Health and Safety Convention 1981 and in the publication R164 Occupational Safety and Health Recommendation, 1981
- How International conventions can be used as a basis for setting International systems of health and safety legislation.

IA8.3 The role of non-governmental bodies and health and safety standards

- Relevant influential parties (employer bodies; trade associations; trade unions; professional groups (eg, IOSH); pressure groups, public etc, and their role in regulating health and safety performance
- The importance of the media in a global economy and their role in changing attitudes to health and safety
- The benefits of schemes which promote co-operation on health and safety between different companies eg, supplier auditing, good neighbour schemes
- The effects on business of adverse stakeholder reaction to health or safety concerns e.g. Perrier mineral water contamination incident in 1990 etc
- The origins and meaning of 'self-regulation'
- The role and function of corporate governance in a system of self-regulation
- How internal rules and procedures regulate health and safety performance
- How non-conformity to an accredited health and safety standard can be used as a form of enforcement on a self-regulatory model with reference to Element IA1.

Tutor references

International Labour Conference, Provisional Record 20A, *Convention Concerning the Promotional Framework for Occupational Safety and Health*, International Labour Organisation, Geneva, 2006, Article 4: International system

International Labour Standards, *Occupational Safety and Health Convention, C155*, International Labour Organisation, Geneva, 1981

International Labour Standards, *Occupational Safety and Health Recommendation R164*, International Labour Organisation, Geneva, 1981

Recommended tuition time not less than 16 hours.

4.2 Unit IB: International control of hazardous agents in the workplace

Overall learning outcome

On completion of this unit, candidates will be able to demonstrate their understanding of the domain knowledge covered through:

1. The application of knowledge to familiar and unfamiliar situations; and
2. The critical analysis and evaluation of information presented in both quantitative and qualitative forms.

In addition each element has specific learning outcomes.

Element IB1: Principles of chemical control, toxicology and epidemiology

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB1.1 Outline the principles of control of chemicals
- IB1.2 Outline human anatomical systems and sensory organs
- IB1.3 Describe the main effects and routes of attack of chemicals on the human body
- IB1.4 Explain the health effects of chemicals used in the workplace
- IB1.5 Explain the principles of epidemiology and the principles of deriving and applying toxicological data to the identification of work related ill-health.

Content

IB1.1 Principles of control of chemicals

- Overview of the principles aimed at controlling the use of chemicals in the workplace as contained within: ILO Chemicals Convention (C170) and Recommendation (R177); ILO Asbestos Convention (C162) and Recommendation (R172).

IB1.2 Human anatomical systems and sensory organs

- The human anatomical systems: respiratory, digestive, circulatory, nervous and the special sensory organs (skin, eyes).

IB1.3 Main effects and routes of attack of chemicals

- The main routes (eyes, nose, mouth, skin) and methods of entry (inhalation, ingestion, skin pervasion, injection, aspiration) of substances into the human body
- The influence of physical form (dust, fibre, mist, liquid, gas etc) and properties (eg, solubility) on entry routes available to substances
- Distinction between inhalable and respirable dust
- The body's defensive responses (innate and adaptive), with particular reference to the respiratory system.

IB1.4 Health effects of chemicals used in the workplace

- The purpose and process of classification of dangerous chemicals with reference to Chapter 1.3.2 of the Globally Harmonised System (GHS)
- In relation to attack by substances, the concepts of target organs, target systems, local and systemic effects
- Health hazard classes (meaning of terms, with reference to chapter 3 of GHS) – acute toxicity, skin corrosion, skin irritation, serious eye damage, eye irritation, respiratory sensitisation, skin sensitisation, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ toxicity (single and repeated exposure), aspiration hazard
- Specific workplace examples of hazardous substances to include: trichloroethylene, asbestos, isocyanates, siliceous dusts, lead (and compounds), sulphuric acid, sodium hydroxide, chromium compounds, hard wood dust
- Dermatitis and workplace examples of typical causative agents
- Attempts at developing internationally accepted reviews of effects of chemicals on human health to aid harmonisation of classifications and risk estimation. eg, Concise International Chemical Assessment Documents from the International Programme on Chemical Safety (IPCS) (WHO/ILO/UNEP)
- Examples of regionally harmonised classifications (e.g. annex VI of The EU's CLP Regulation (EC 1272/2008), in relation to harmonised GHS classifications).

IB1.5 Principles of epidemiology and the principles of deriving and applying toxicological data

- Chemical hazard data sources (ref IB1.4, earlier for classification, but also for hazard communication, later) eg, epidemiology, vertebrate animal tests, in vitro methods, structure activity relationships (qualitative or quantitative), information from structurally-related compounds (grouping or read-across) (ref: GHS Chapter 1.3.2 and Article 13 of REACH (EC 1907/2006)):
 - human epidemiological investigations: The use and limitations of case control studies and cohort studies (retrospective and prospective). Application of epidemiological techniques to health surveillance of a workplace
 - vertebrate animal testing: distinction between acute and chronic testing and their value and limitations; the meaning and significance of the concepts of 'dose-response relationship', NOAEL, LD50, LC50

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- alternatives to vertebrate animal testing, with reference to the Ames test (Reverse mutation assay), Qualitative/Quantitative Structure Activity Relationship models (QSAR, for example EC funded CAESAR project www.caesar-project.eu), 'read-across' and grouping
- Communication of chemical hazards to users, in respect of the typical content (format and types of data) of labels and Safety Data Sheets (Ref GHS Chapters 1.4 and 1.5).

Tutor references

International Labour Standards, Chemical Safety Convention, C170, International Labour Organisation, Geneva, 1990

International Labour Standards, Chemical Safety Recommendation, R177, International Labour Organisation, Geneva, 1990

ILO Asbestos Convention (C162) and Recommendation (R172), International Labour Organisation, Geneva 1986

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064

The International Programme of Chemical Safety (IPCS), INCHEM Health and Safety Guides (Series), World Health Organisation, 2005.

Globally Harmonized System of Classification and Labelling of Chemicals, Third revised edition, 2009. Available from:

http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html

EC Caesar project: www.caesar-project.eu

Recommended tuition time not less than 8 hours

Element IB2: Hazardous substances and other chemicals – assessment of risk

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB2.1 Outline the factors to consider when assessing risks from chemicals which are hazardous to health
- IB2.2 Explain elimination of risk or control measures for chemicals which are hazardous to health
- IB2.3 Explain the specific requirements for asbestos.

Content

IB2.1 Assessing risks

- Risk assessment procedure and factors to take into account (with reference to chapter 6.2 of ILO CoP on the Safety of the Use of Chemicals at Work and Chapter 4.2 of ILO CoP Ambient factors in the Workplace):
 - assessment of risk:
 - the hazardous properties of the chemical(s), including health effects and the likely routes of exposure (eg, what is likely to get into the air and be inhaled (volatility (liquids) or dustiness (solids) or come into contact with skin/eyes or be swallowed); effect of mixtures
 - quantity (amounts/concentration) in use i.e. level of exposure
 - operating conditions and processes used (eg, nature of the task, methods used, high temperature)
 - range of uses of the chemicals (eg, production, handling)
 - variety of tasks, especially where exposure is likely to be unusually high (eg maintenance, cleaning and accidental release)
 - consequences and likelihood of failure of existing control measures
 - other relevant factors (eg, duration/frequency of exposure, frequency of exposure, individual susceptibilities (eg, atopic persons, women of child bearing capacity, age, sensitisation)
 - appraisal of control measures:
 - estimation of risk (and potential for elimination), taking account of:
 - effectiveness of existing engineering controls and systems of work (including disposal)
 - exposure monitoring and limits, health surveillance results or other applicable exposure standards/data
 - PPE as a last resort
 - action programme (with reference to IB2.2) to reduce risk to acceptable levels
 - review of assessment – to take place when reason to suspect it is no longer valid or where significant change to the work to which the assessment relates has occurred.

IB2.2 Elimination of risk or control measures

- With reference to chapters 6.4 and 6.5 of ILO CoP, 'Safety of the Use of Chemicals at Work' and chapter 4.3 of ILO CoP 'Ambient Factors in the Workplace'
 - Elimination:
 - ceasing use
 - substitution for less hazardous chemical or use of the same chemical but in a different form (eg, paste, solution rather than dusty powder)
 - alternative process
 - control:
 - good design and installation practice (total enclosure; segregation of process from workers; modify the process or work system so that it emits less of the hazardous substance (eg, painting vs spraying); local exhaust ventilation with or without partial enclosure (detail of extraction systems covered in element IB4); general ventilation)
 - work systems and practices (minimise the numbers of workers exposed; restrict access; reduce exposure duration; regular cleaning of contaminated surfaces; use/maintenance of engineering controls; safe/secure storage, internal transport and disposal)
 - personal protection (provide PPE; prohibit eating, drinking, smoking in contaminated areas; facilities for washing, changing, storage, laundering; signs and notices; emergency arrangements).

IB2.3 Asbestos

- Application of control measures for the specific case of asbestos (with reference to Chapters 5-11 of ILO CoP 'Safety in the Use of Asbestos') (eg, preventative methods, design and installation, LEV, personal protection, cleaning of premises and plant, disposal of asbestos waste).

Tutor references

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064

International Labour Office, Safety in the Use of Asbestos, an ILO Code of Practice, ILO, 1984. ISBN 9221038726

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, 2001. ISBN 922111628X

Recommended tuition time not less than 5 hours

Element IB3: Hazardous chemicals – engineering controls and personal protective equipment

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB3.1 Explain the purpose and operation of local exhaust ventilation and dilution ventilation including assessing and maintaining effectiveness
- IB3.2 Explain the various types of personal protective equipment (PPE) available for use with hazardous chemicals, their effectiveness, and the factors to consider in their selection.

Content

IB3.1 Ventilation

- Use and limitations of dilution ventilation
- Local exhaust ventilation (LEV) systems – design and use; factors that determine effectiveness (inlets, ducting, fan, air cleaning device/filter/scrubber, exhaust/outlet)
- Assessing performance of LEV
 - qualitative eg condition of suction inlet, dust deposits, use of smoke tubes and dust lamps (Tyndall beam)
 - quantitative measurements: methods and equipment for measuring capture velocities, face velocities, transport velocities, static pressures and emissions to atmosphere
 - consideration of environmental issues (atmospheric emissions)
- Periodic thorough examination and test of LEV and the typical content of a record of examination/test (with reference to section 11 of ILO CoP, 'Safety in the Use of Chemicals at Work').

IB3.2 Personal protective equipment

- Respiratory protective equipment (RPE):
 - types of respirators and breathing apparatus and their applications and limitations
 - selection of RPE:
 - atmosphere/substance-related factors: consideration of likely oxygen deficiency (i.e. BA vs respirator); level of protection required (significance of assigned protection factors); type of filter required (for respirators)
 - task and work area related factors eg, work rate, duration; extremes of temperature and/or humidity; criticality of clear vision, communications and mobility; space constraints; tools used; presence of explosive atmospheres
 - wearer related factors e.g. fit/comfort/acceptability issues due to beards, face-marking, spectacles, compatibility with other protective equipment or head coverings; medical conditions

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- quality related factors - conformity with relevant standards
- face fit testing:
 - storage and maintenance of RPE
- Skin and eye protection:
 - types of skin and eye protection and their applications and limitations
 - selection
 - substance-related factors eg, chemical compatibility, level of protection required
 - task-related factors eg, duration (ref breakthrough time), need for dexterity vs durability; need for gloves vs gauntlets
 - wearer-related factors eg, fit/comfort, compatibility, acceptability
 - quality-related factors – conformity with relevant standards
- The need for training in the correct use, maintenance and storage of PPE.

Tutor references

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064

Section 7: Design and Installation (esp 7.2-7.3 in respect of ventilation systems)

Section 9: Personal Protection

Section 11: Maintenance of engineering control measures (in relation to LEV)

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, 2001. ISBN 922111628X

Fit Testing Of Respiratory Protective Equipment Facepieces HSE Information Document HSE 282/28, http://www.hse.gov.uk/foi/internalops/fod/oc/200-299/282_28.pdf

Recommended tuition time not less than 4 hours

Element IB4: Monitoring and measuring

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB4.1 Explain occupational exposure limits for airborne harmful substances, the basis upon which they are established, and their application to the workplace
- IB4.2 Outline the strategies, methods and equipment for the sampling and measurement of airborne harmful substances
- IB4.3 Outline the principles of biological monitoring.

Content

IB4.1 Occupational exposure limits for airborne harmful substances

- The meaning of Exposure Limits for airborne harmful substances (with reference to meanings given within Glossary Annex of ILO CoP Occupational exposure to airborne substances harmful to health and also Annex of ILO CoP Ambient Factors in the Workplace)
- The basis for setting exposure limits (with reference to section 3 of ILO CoP Occupational exposure to airborne substances harmful to health)
 - consideration of dose-response and dose-effect relationship in the light of data on: substance properties, expected use and likely exposure scenarios, results of animal experiments; results of medical examinations of exposed workers; epidemiology etc
 - interpretation of data and extrapolation to give exposure limits- considerations and application of safety factors
- The significance in occupational health and hygiene practice of short term and long term exposure limits (STEL, LTEL) and time-weighted average (TWA) values
- International examples of exposure limits (such as Threshold Limit Values (TLVs), Workplace Exposure Limits (WELs); Permissible Exposure Limits (PELs)) with reference to specific substances, including lead and asbestos.

IB4.2 Strategies, methods and equipment for the sampling and measurement of airborne harmful substances

- The role of the occupational hygienist; competence of hygienist
- The need to interpret a hygienist's report, ensuring the strategy and methods are suitable and that results are valid, reliable, representative and correctly evaluated relative to any exposure standards

- Monitoring strategy (with reference to UK guidance document HSG173):
 - initial appraisal
 - basic survey
 - detailed survey
 - reappraisal
 - routine monitoring and factors that determine its necessity and frequency
 - the importance of use of standard methods (eg, MDHS series, NIOSH Manual of Analytical Methods series, ISO standards)
- Direct reading instruments (give immediate or near immediate reading); advantages and disadvantages; example of stain tube (colorimetric) detectors
- General equipment and methodology for *personal* sampling of solid particulates (fibres; respirable and/or inhalable dusts)
 - sampling heads (cowl, protected, cyclone)
 - pump (calibrated)
 - measurement principles: dusts (gravimetric, physical and chemical analysis), fibres (microscopy)
- General equipment and methodology for *personal* sampling of vapours
 - active devices (eg, liquid or solid sorbents and pumps)
 - passive devices
 - measurement principles (chemical and physical analysis techniques such as spectroscopy and chromatography)
- Calculation of 8 hour equivalent TWA exposures from gathered data (eg, sample mass, pump flow rate and flow time); comparison with LTEL and evaluation of significance in terms of further action needed.

IB4.3 Biological monitoring

- Biological monitoring (a specific form of medical surveillance, with reference to section 4 of ILO CoP 'Occupational exposure to airborne substances harmful to health'):
 - basic principles (with workplace examples)
 - circumstances where it is especially applicable
 - the role of biological limits
 - relative advantages and disadvantages when compared to airborne monitoring.

Tutor references

HSG173 Monitoring Strategies for Toxic substances. HSE, 2006. ISBN 9780717661886

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064 - Section 12: Monitoring in the Workplace

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, 2001. ISBN 922111628X

International Labour Office, Occupational exposure to airborne substances harmful to health, ILO, 1980, ISBN 9221024423

International Labour Office, Safety in the Use of Asbestos, an ILO Code of Practice ILO, 1984, ISBN 9221038726

Health & Safety Executive, Workplace Exposure Limits, EH40/2005, HSE Books, 2005. ISBN: 9780717629770

American Conference of Governmental Industrial Hygienists, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7th Edition, (ACGIH), 2001. ISBN 9781882417438

Recommended tuition time not less than 6 hours

Element IB5: Biological agents

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB5.1 Explain the types and properties of biological agents found at work
- IB5.2 Explain the assessment and control of risk from exposure to biological agents at work.

Content

IB5.1 Types and properties of biological agents

- General meaning of 'biological agent' (eg, that used by ILO in Fact Sheet 3 of Manual 4 of Health, Safety and Environment – a series of trades union education manuals for agricultural workers)
- Main types of biological agent (fungi, bacteria, viruses) and sources (human, animal and environmental); with examples in each case
- Special properties of biological agents (rapid mutation, incubation period, infectious, rapid multiplication).

IB5.2 Assessment and control of risk

- Distinction between intentional work (eg, in laboratories) vs. opportunistic infection (eg, farming, sewers, refuse collection)
- Selected diseases caused by biological agents (together with occupational contexts, occurrence, symptoms, treatment and control):
 - zoonoses (meaning, with examples including malaria)
 - cryptosporidiosis
 - farmer's lung (and other diseases of this type – psittacosis)
 - hepatitis
 - AIDS/HIV
 - legionellosis
 - leptospirosis
 - malaria
 - snake bites
 - contaminated water
 - ill-health caused by E. coli
 - ill-health caused by MRSA
 - ill-health caused by C.diff
 - emerging health issues, eg, norovirus, pandemic flu
- Factors to take into account in risk assessment of laboratory work (Ref: WHO Laboratory Biosafety manual):
 - Risk Group (1,2,3,4) and the role (with examples) of national/regional lists of approved classifications (e.g. UK's approved list of biological agents)

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- pathogenicity of the agent and infectious dose
 - potential exposure outcome
 - routes of infection
 - stability of the agent in the environment
 - concentration and amounts
 - presence of a suitable host (human or animal)
 - data available (e.g. from animal studies)
 - nature of activity (e.g. aerosol formation, genetic manipulations)
 - local availability of prophylaxis/treatment
- General Biosafety Levels Control approach for non-animal laboratory work (with reference to WHO Laboratory Biosafety manual, chapters 1-5) :
 - biosafety levels (1,2,3,4), meaning and Relationship to Risk Group
 - examples of typical workplaces at each level
 - laboratory design, equipment and working practices required for each biosafety level, covering:
 - access
 - personal protection
 - procedures
 - working areas
 - biosafety management
 - laboratory design and facilities
 - laboratory equipment
 - health and medical surveillance
 - training
 - waste handling.

Tutor references

International Labour Standards, List of Occupational Disease Recommendations, R194, International Labour Organisation, Geneva, 200 - Annex, section 1.3: Biological agents

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, 2001. ISBN 922111628X

International Labour Office, HIV/AIDS and the World of Work, an ILO Code of Practice, ILO, 2002. ISBN 9221116336

Health, Safety and Environment – a series of trades union education manuals for agricultural workers, ILO 2004 http://www.ilo.org/safework/info/instr/lang--en/docName--WCMS_110199/index.htm

World Health Organisation, Laboratory BioSafety Manual, Third Edition, WHO, 2004.(free download from WHO website)

Advisory Committee on Dangerous Pathogens, The Approved List of biological agents (available as an online publication only on the HSE website at <http://www.hse.gov.uk/pubns/misc208.pdf>.)

Recommended tuition time not less than 7 hours

Element IB6: Physical agents 1 – noise and vibration

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB6.1 Explain the basic physical concepts relevant to noise
- IB6.2 Explain the effects of noise on the individual and the use of audiometry
- IB6.3 Explain the measurement and assessment of noise exposure
- IB6.4 Explain the principles of controlling noise and noise exposure
- IB6.5 Explain the basic physical concepts relevant to vibration
- IB6.6 Explain the effects of vibration on the individual
- IB6.7 Explain the measurement and assessment of vibration exposure
- IB6.8 Explain the principles of controlling vibration and vibration exposure.

Content

IB6.1 Basic physical concepts relevant to noise

- The general meaning of 'noise' (ref: article 3 of ILO C148, Working Environment Convention 1977)
- The basic concepts of sound:
 - nature (progressive longitudinal wave, transmitted through displacement of medium through which it travels)
 - wave properties - wavelength, amplitude, frequency/pitch
 - concepts of sound pressure, sound intensity
 - the decibel (dB) scale and its logarithmic nature (with workplace examples at different sound levels)
 - human auditory frequency sensitivity and the significance of A-weighting 'dB(A)' and C weighting 'dB(C)', in relation to occupational noise exposure
- Concepts of addition of multiple incoherent sounds (equal and unequal)
- Concept of equivalent noise dose.

IB6.2 Effects of noise on the individual

- The physiology of the ear in relation to the mechanism of hearing
- The physical and psychological effects on the individual; types of hearing loss with reference to their significance in the workplace, the acute and chronic physiological effects of exposure to high noise levels
- Health surveillance (ref: section 9.4 of ILO CoP, 'Ambient Factors in the Workplace')
 - circumstances when it may be required
 - types (pre-employment, periodic etc)

- use of audiometry to measure hearing and hearing loss; method, interpretation and use of results (interpretation of audiograms), advantages and disadvantages of audiometry programmes, including legal implications.

IB6.3 Measurement and assessment of noise exposure

- Instrumentation used for the measurement of noise:
 - types (ref relevant International standards, such as ISO)
 - basic operation, including calibration, determination of L_{Aeq} and $L_{EP,d}$, and frequency (octave band) analysis
- Noise risk assessment to consider (ref section 9.2, ILO CoP, 'Ambient Factors in the Workplace'):
 - risk of hearing impairment, impairment of communications, nervous fatigue
 - identification of sources, tasks
 - exposure limits
 - expected noise emission levels from equipment
 - need for measurements to eg, quantify, characterise noise and assess effectiveness of existing controls.
- The methodology of undertaking personal noise exposure assessments (including noise surveys):
 - planning (who, how, where, how often)
 - choice of instrumentation
 - measurements to be taken
 - use of noise calculators to determine mixed exposures (reference UK HSE's online calculator)
 - interpretation and evaluation of results, including comparison with legal limits (with national/regional examples of such limits).

IB6.4 Controlling noise and noise exposure

- The hierarchy of noise control:
 - eliminate/control at source (substitution, workplace layout (eg, relocation of all noisy equipment), re-design of equipment/task, maintenance, purchasing policy)
 - control along transmission path
 - behaviour of sound at interfaces – transmission, reflection, absorption
 - sound reduction indices and absorption coefficients and their use in materials selection
 - techniques of damping, isolation, diffusion, barriers, acoustic enclosures, distance
 - control exposure at the receiver (acoustic havens, hearing protection zones, and PPE, limiting exposure time, role of health surveillance (audiometry, referenced earlier)
- The selection, maintenance and use of appropriate hearing protection:
 - types of hearing protection
 - use of octave band analysis to aid selection
 - SNR (single number rating) and HML (high, medium, low) methods
 - problems of over-protection.

IB6.5 Basic physical concepts relevant to vibration

- Meaning of 'Vibration' (ref: article 3 of ILO C148, Working Environment Convention 1977)
- The basic concepts of displacement, velocity, amplitude, frequency and acceleration for oscillating particles in relation to:
 - occupational vibration exposure, with examples of machinery and their typical emission levels
 - comfort levels
 - concept of equivalent vibration dose.

IB6.6 Effects of vibration on the individual

- The groups of workers at risk from, and the physiological and ill-health effects of, exposure to:
 - whole body vibration (WBV)
 - hand-arm vibration (HAV), including aggravating factors (eg low temperatures, smoking) and the use of the Stockholm scale to indicate severity.

IB6.7 Measurement and assessment of vibration exposure

- Vibration risk assessment to consider (ref section 10.2, ILO CoP, 'Ambient Factors in the Workplace'):
 - identification of sources, tasks
 - exposure limits
 - expected vibration emission levels from equipment
 - need for measurements to eg, quantify, characterise vibration and assess effectiveness of existing controls
 - potential for elimination; adequacy of training; use of supports
 - exposure to cold, nature of the vibration (WBV, HAV etc)
- The estimation and measurement of vibration exposure:
 - use of manufacturers' data to estimate workers' exposure to vibration
 - workplace measurements for both WBV and HAV exposure; instrumentation (the accelerometer)
- Concept of exposure standards for vibration (with reference to national/regional examples)
- Use of vibration calculators to determine simple and mixed equivalent exposure.

IB6.8 Controlling vibration and vibration exposure

- Practical control measures to prevent or minimise exposure to both whole body vibration and hand arm vibration, including:
 - automation
 - change of work method
 - improved/alternative equipment
 - purchasing policy
 - maintenance
 - job rotation
 - instruction/training
 - health surveillance
 - PPE.

Tutor references

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, Geneva, 2001. ISBN 922111628X

Chapter 9: Noise

Chapter 10: Vibration

C148 Working Environment (Air Pollution, Noise and Vibration) Convention, International Labour Organisation, 1977

R156 Working Environment (Air Pollution, Noise and Vibration) Recommendation, International Labour Organisation, 1977

HSE: <http://www.hse.gov.uk/noise/calculator.htm>

HSE: <http://www.hse.gov.uk/vibration/hav/vibrationcalc.htm>

HSE: <http://www.hse.gov.uk/vibration/wbv/calculator.htm>

Recommended tuition time not less than 10 hours

Element IB7: Physical agents 2 – radiation

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB7.1 Outline the nature of the different types of ionising and non-ionising radiation
- IB7.2 Explain the effects of exposure to non-ionising radiation, its assessment and control, including for the special case of optical lasers
- IB7.3 Explain the effects of exposure to ionising radiation, its measurement and control.

Content

IB7.1 Types of ionising and non-ionising radiation

- The electromagnetic spectrum:
 - scope, with examples of origins and sources (occupational and natural), covering Gamma-ray, X-ray, optical (i.e. ultraviolet (UV), visible, infra-red (IR)) and radiofrequency (ie, microwaves, radio waves)
 - nature (progressive transverse wave)
 - electromagnetic (EM) wave properties - wavelength, frequency, energy
- Particulate radiation (alpha, beta, neutrons), with examples of origins and sources (occupational and natural)
- Distinction between ionising and non-ionising radiation
- Role of the International Commission on Radiological Protection (ICRP) and the International Commission on Non-Ionising Radiation Protection (ICNIRP).

IB7.2 Non-ionising radiation

- For optical (UV, visible, IR) and radiofrequency (microwave, radio waves) radiation types:
 - the physiological effects of exposure, both acute and chronic
 - concept of exposure limits, with national/regional examples (e.g. SAR limits)
 - units and methods of measurement, power density
- Optical lasers
 - typical laser sources in workplaces (eg, leisure, entertainment, retail, manufacturing, healthcare, research, etc)
 - the particular properties of laser radiation
 - hazard classifications of lasers (IEC/EN 60825-1)
 - concepts of exposure limits
 - physiological effects of exposure to laser radiation

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- Radiation risk assessment to consider (ref: section 7.2, International Labour Office, 'Ambient Factors in the Workplace' an ILO Code of Practice)
 - sources of non-ionising radiation both generated in workplaces (eg, leisure, manufacturing, healthcare, research, telecommunications etc) and naturally occurring (eg outdoor work)
 - comparison of measured exposure levels with exposure limits
 - potential for misuse or misunderstanding of safety precautions
 - special considerations for lasers used outdoors
- Practical control measures to prevent or minimise exposure to non-ionising radiation (including lasers) both generated in workplaces and naturally occurring including:
 - design
 - siting
 - direction control
 - reduction of stray fields/beams
 - screening
 - enclosures
 - distance
 - safe systems of work
 - instructions
 - training
 - PPE
 - specialist advise
 - application to specific examples eg, lasers.

IB7.3 Ionising radiation

- Routes of exposure for ionising radiation:
 - external (with reference to penetrating power of the different types of ionising radiation)
 - internal (inhalation, ingestion, injection absorption for unsealed sources)
- Units and concepts of radioactivity – activity, absorbed dose, equivalent dose, effective dose
- Effects of exposure to each type of radiation (alpha, beta, gamma, X-radiation, neutrons):
 - somatic (early/acute, late/chronic)
 - genetic/hereditary
 - dose-response and dose-effect – distinction between deterministic (non-stochastic) and stochastic effects
- Methods of measuring/detecting ionising radiation, with reference to how these might be used in the workplace:
 - ionisation chambers (Geiger-Muller tube), scintillation detectors
 - use of film badges, thermo-luminescent dosimeters, approved dosimetry services
- Assessment of ionising radiation risks (reference : section 5.2, International Labour Office, 'Ambient Factors in the Workplace' an ILO Code of Practice)

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- Radiation protection to cover (reference to chapters 3-7, International Labour Office, Radiation Protection of Workers (Ionising Radiations), an ILO Code of Practice):
 - concepts of notification, registration and licensing of radiation work from Competent Authority
 - classification of workers and areas
 - dose limitation (limits for normal and abnormal exposures, including emergency planning)
 - competent advice eg, radiation protection officer
 - radiation surveillance (workplace and individual)
 - health surveillance
 - control:
 - design features:
 - building design, ventilation etc
 - control of external radiation (source activity, shielding, distance, time)
 - control of internal radiation (prevention of inhalation, ingestion, injection, absorption)
 - operational procedures (eg, designation of 'controlled areas', local rules, training)
 - protective devices and equipment
 - record keeping.

Tutor references

International Labour Office, Radiation Protection of Workers (Ionising Radiations), an ILO Code of Practice, International Labour Organisation, Geneva, 1987. ISBN: 9221059960

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, Geneva, 2001. ISBN 922111628X

Chapter 5: Ionising Radiation

Chapter 6: Electric and Magnetic Fields

Chapter 7: Optical

British Standards Institution, BS EN 60825-1 Safety of Laser Products. Equipment Classification, Requirements and User's Guide, BSI,

ILO, safety in the use of radiofrequency dielectric heaters and sealers, an ILO Code of Practice, International Labour Organisation, Geneva, 1998. ISBN 9221103331

ILO, The use of Lasers in the workplace, an ILO Code of Practice, International Labour Organisation, Geneva, 1993. ISBN 9221082601

ILO, Visual Display Units: Radiation Protection Guidance, an ILO Code of Practice, International Labour Organisation, Geneva 1994. ISBN 9221082628

Recommended tuition time not less than 9 hours

Element IB8: Psycho-social agents

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB8.1 Explain the scope, effects and causes of work-related stress
- IB8.2 Explain the identification and control of workplace stress with reference to relevant standards
- IB8.3 Explain the scope, effects and causes of work-related violence/aggression
- IB8.4 Explain the identification and control of work-related violence/aggression with reference to relevant standards.

Content

IB8.1 Scope, effects and causes of work-related stress

- The meaning of work-related stress
- Physical and psychological effects of work-related stress
- Primary sources/risk factors for work-related stress (with reference to the UK HSE Stress Management standards (www.hse.gov.uk/stress/standards))
 - demands
 - control
 - support
 - relationships
 - role
 - change.

IB8.2 Identification and control of work-related stress

- With reference to the UK HSE's stress management standards:
 - identification and assessment of work-related stress at individual and organisational level (eg, discussions, absence data, interviews, surveys, questionnaires, etc)
 - practical control measures to reduce and manage work-related stress (including counselling and return to work policies).

IB8.3 Scope, effects and causes of work-related violence/aggression

- Meaning of work-related violence/aggression (with reference to section 1.3 of Workplace Violence in Services Sectors and Measures to Combat This Phenomenon, ILO Code of Practice and section 1.3 of ILO (and others) International Framework Guidelines for Addressing Workplace Violence in the Health Sector)
- Physical and psychological effects of violence and aggression
- Identification and assessment of risks of work-related violence/aggression (eg, use of staff surveys, incident reporting and risk assessment)
- Factors likely to increase the risk of work-related violence, eg, people working with public, caring/teaching professions, working with psychiatric clients or alcohol/drug impaired people, working alone, home visiting, handling money/valuables, inspection and enforcement duties, retail and licensed trade, cultural, ethnic and tribal issues.

IB8.4 Identification and control of work-related violence/aggression

- Identification of practical control measures to reduce and manage work-related violence/aggression including using physical, organisational and behavioural controls:
 - cash free systems, layout of public areas and design of fixtures and fittings
 - use of cameras, protective screens, and security-coded doors
 - communication systems, passing on information on risks from individual clients (violent marker flags), recording of staff whereabouts and recognition when staff are overdue, use of mobile communications equipment phones, radios, GPS
 - staff training: recognition of situations where violence could result, interpersonal skills to defuse aggression, use of language and body language; guidance to staff on dealing with an incident; support for staff post-incident including training in counselling for managers.

Tutor references

UK HSE Stress management standards (HSG218), available from www.hse.gov.uk/stress/standards/

International Labour Office, Workplace Violence in Services Sectors and Measures to Combat This Phenomenon, ILO Code of Practice, International Labour Organisation, Geneva, 2003.

International Labour Office/International Council of Nurses/World Health Organisation/Public Services International Framework Guidelines for Addressing Workplace Violence in the Health Sector. Geneva, International Labour Office, 2002 ISBN 9221134466

Recommended tuition time not less than 5 hours

Element IB9: Musculoskeletal risks and controls

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IB9.1 Outline types, causes and relevant workplace examples of injuries and ill-health conditions associated with repetitive physical activities, manual handling and poor posture
- IB9.2 Explain the assessment and control of risks from repetitive activities, manual handling and poor posture.

Content

IB9.1 Types, causes and relevant workplace examples

- Basic understanding of the human musculoskeletal system including, bones, tendons, ligaments, nerves and muscles
- Types of injury and ill-health conditions resulting from repetitive physical activities, manual handling and poor posture, including; Work Related Upper Limb Disorders, musculoskeletal injury and discomfort, back pain, eye and eyesight effects, fatigue, stress, sprains/strains, fractures, lacerations
- Examples of jobs and workplace situations that give rise to risks of these injuries and ill-health conditions, eg, production/assembly lines, working in restricted work spaces, use of computers/laptops, manual handling of objects and people.

IB9.2 Assessing and controlling risks from repetitive activities, manual handling and poor posture

- Consideration of: task, load, force, working environment, equipment, individual capability when assessing risks associated with repetitive physical activities, manual handling and poor posture
- Methods of assessing the risks associated with jobs/tasks involving repetitive physical activities, manual handling and poor posture
- Use of specific assessment tools: HSE Manual Handling Assessment Tool (MAC), HSE Art Tool (assessment tool for repetitive tasks of the upper limbs), NIOSH Manual Material Handling (MMH) Checklist, Rapid Upper Limb Assessment (RULA), Quick Exposure Checklist (QEC)
- Practical control measures to avoid or minimise the risk associated with repetitive physical activities, manual handling and poor posture including: elimination, automation, alternative work methods/job design, ergonomic design of tools/equipment/workstations and workplaces, job rotation, work routine, eye and eyesight testing, training and information, efficient movement principles, personal considerations.

Tutor references

UK Royal College of General Practitioners, NHS Executive (2002) *The Back Book* (Second edition). The Stationery Office

Mckeown, C. & Twiss, M. (2004) *Workplace ergonomics: a practical guide* (Second edition) Wigston: Institution of Occupational Safety and Health Services Ltd.

UK HSE MAC tool: <http://www.hse.gov.uk/msd/mac/>

Assessment of Repetitive Tasks of the upper limbs (the ART tool). Guidance for health and safety practitioners, consultants, ergonomists and large organisations. UK HSE INDG 438: <http://www.hse.gov.uk/pubns/indg438.pdf> and

<http://www.hse.gov.uk/msd/uld/art/index.htm>

NIOSH Manual Material Handling (MMH) Checklist: <http://www.dir.ca.gov/dosh/etools/08-004/tool2.pdf>

Rapid Upper Limb Assessment (RULA): <http://www.rula.co.uk>

Recommended tuition time not less than 4 hours

Element IB10: Work environment risks and controls

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

IB10.1 Explain the need for, and factors involved in, the provision and maintenance of thermal comfort in the work environment

IB10.2 Explain the need for adequate and appropriate lighting in the workplace, units of measurement of light and the assessment of lighting levels in the workplace

IB10.3 Explain the need for welfare facilities and arrangements in fixed and temporary workplaces

IB10.4 Explain the provision for first aid in the workplace.

Content

IB10.1 The need for, and factors involved in, the provision and maintenance of thermal comfort in the work environment

- The meaning of thermal comfort and the need to provide a reasonable working temperature, as far as possible
- The effects of working in high and low temperatures and humidity
- Typical work situations likely to lead to thermal discomfort
- The environmental parameters affecting thermal comfort (air temperature, radiant temperature, relative humidity, air velocity) and how to measure them (thermometers; dry bulb, wet bulb, globe, kata, anemometers, psychrometers, integrated electronic instruments including heat stress monitors)
- Other parameters affecting thermal comfort: metabolic rate, clothing, sweat rate, duration of exposure
- Heat balance equation $M = K \pm C \pm R \pm E$
- Measuring thermal comfort using predicted mean vote (PMV) and percentage people dissatisfied (PPD) index and use of ISO 7730 and ISO 10551 standards
- The assessment of heat stress, role of heat indices, difference between empirical, direct and rational indices: (eg effective temperature (ET), corrected effective temperature (CET), heat stress index (HSI), predicted 4-hour sweat rate (P4SR), wind chill index (WCI))
- Use of the heat stress index WBGT (as per EN 27243), equation used to calculate units, metabolic rate class, comparison to reference values, conclusions on heat stress risk, acclimatisation
- Practical control measures to minimise the risks when working in extreme thermal environment:
 - control heat source

- control other environmental parameters
- separation
- workplace design
- job design
- clothing/PPE
- health surveillance
- training.

IB10.2 Adequate and appropriate lighting in the workplace, units of measurement of light and the assessment of lighting levels in the workplace

- The necessity for lighting in workplaces
- Adequate and appropriate lighting and levels for the work; natural and artificial lighting
- The impact of lighting levels on safety issues – incorrect perception, failure to see clearly, stroboscopic effects, colour assessment, effect on attitudes
- Effects of brightness contrast – disabling and discomfort glare, tissue damage from light exposure, visual fatigue
- Instrumentation, units and measurement of light, assessment of lighting levels and standards; distinction between minimum lighting levels required for safety and higher levels often implemented taking account of e.g. amenity, productivity, cost-effectiveness.

IB10.3 Welfare facilities and arrangements in fixed and temporary workplaces

- Provision of toilet, washing and changing facilities
- Storage of clothing
- Facilities for eating, rest rooms
- Facilities for pregnant women and nursing mothers, together with the practical arrangements
- Provision of facilities for smokers
- The need to take account of people with disabilities.

IB10.4 Provision for first aid in the workplace

- The basis of provision (eg, numbers of workers, workplace risks, proximity of emergency services).
- Typical arrangements eg, people, equipment and training.

Tutor references

International Labour Standards, Welfare Facilities Recommendation, R102 International Labour Organisation, Geneva, 1956

International Labour Office, Ambient Factors in the Workplace, an ILO Code of Practice, ILO, Geneva, 2001. ISBN 922111628X Chapter 8: Thermal

International Labour Standards, Occupational Health Services Convention, C161, International Labour Organisation, Geneva, 1985 Occupational Health Services at the Workplace, Dr V Forastieri, ILO

Recommended tuition time not less than 5 hours

Element IB11: Managing occupational health

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

IB11.1 Outline the nature of occupational health

IB11.2 Outline the principles and benefits of vocational rehabilitation including the role of outside support agencies

IB11.3 Outline the management of occupational health (including the practical and legal aspects).

Content

B11.1 Nature of occupational health

- Categories of occupational health hazard – chemical, physical, biological, psycho-social, ergonomic
- Internal and external sources of information on occupational ill-health
- The links between occupational health and general/public health (including arrangements to deal with epidemics).

B11.2 Principles and benefits of vocational rehabilitation including the role of outside support agencies

- Meaning of vocational rehabilitation
- Benefits of vocational rehabilitation within the context of the worker and the employer
- The basic principles of the bio-psychosocial model and how it relates to the health of individuals.

B11.3 Managing occupational health

- The concept of monitoring health
- The meaning of occupational health (with reference to the definition used by the International Labour Organisation)
- The role, function and benefits of occupational health services
- The make-up and functions of a typical occupational health service: occupational health physician, occupational health nurse, occupational health technician

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- Typical services offered by an occupational health service:
 - health promotion, eg, advice on work related health, lifestyle (diet, exercise, smoking etc)
 - health assessment, eg, fitness for work, pre-placement/employment, return to work, job-related medical screening, pregnant workers
 - advice to management, eg, input to risk assessments, no-smoking policy, absence management etc
 - treatment services, eg, first aid, counselling, physiotherapy, other rehabilitation services
 - medical and health surveillance
- Occupational competence within occupational health
- Distinction between general health assessment and health surveillance
- Liaison with other disciplines in the assessment and management of fitness for work with specific reference to; existing health problems, discrimination, influence of drugs and alcohol, including testing on the grounds of health (or disability)
- The need to keep health records and medical records including issues of confidentiality, sharing of information with the individual and others
- The collection and use of sickness absence and ill-health data to develop occupational policy and targets/strategy.

Tutor references

International Labour Conference, Provisional Record 20A, Convention Concerning the Promotional Framework for Occupational Safety and Health, International Labour Organisation, Geneva, 2006 Article 4: International system

International Labour Standards, Occupational Health Services Convention, C161, International Labour Organisation, Geneva, 1985

Occupational Health Services at the Workplace, Dr V Forastieri, ILO

Chartered Institute of Personnel and Development: Absence Guidance:
<http://www.cipd.co.uk/hr-resources/a-z/default.aspx>

Chartered Institute of Personnel and Development: Absence management Tools 1-4:
<http://www.cipd.co.uk/hr-resources/a-z/default.aspx>

Institution of Occupational Safety and Health: A Healthy Return - A Good Practice Guide to Rehabilitating People at Work

The Guides Newsletter. Chicago, American Medical Association, 2008; May/June: 1-13

Recommended tuition time not less than 8 hours

4.3 Unit IC: International workplace and work equipment safety

Overall learning outcome

On completion of this unit, candidates will be able to demonstrate their understanding of the domain knowledge covered through:

1. The application of knowledge to familiar and unfamiliar situations; and
2. The critical analysis and evaluation of information presented in both quantitative and qualitative forms.

In addition each element has specific learning outcomes.

Element IC1: General workplace issues

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC1.1 Explain the need for, and factors involved in, the provision and maintenance of a safe working environment, with specific reference to access and egress, pedestrians, and slips, trips and falls
- IC1.2 Explain how safety signs are used in the workplace
- IC1.3 Explain the assessment of risk and safe working practices associated with work in confined spaces
- IC1.4 Outline the main issues associated with maintaining structural safety of workplaces
- IC1.5 Explain the hazards, risks, and controls when working at heights
- IC1.6 Explain the hazards, risks and controls for lone working.

Content

IC1.1 Safe working environment

- Practical considerations in the provision and maintenance of safe places of work and safe means of access and egress
- The design of surfaces to reduce slipping
- Wet Coefficient of Friction (CoF), slip resistant testing of footwear and surfaces:
 - different CoF between one surface and another
 - effects of contamination on surfaces in terms of CoF
 - methods for cleaning floors and the appropriate footwear to wear whilst cleaning
 - importance of good housekeeping.

IC1.2 Safety signs

- Common safety signs and their categorisation
- Use, location and compliance issues.

IC1.3 Confined spaces

- Conditions that constitute a confined space
- Examples of where confined space entry may occur in the workplace: eg pits in garages, vehicle production tracks, trunking ducts, watercourses
- Factors to be considered when assessing risk: need for safe access; provision and maintenance of safe atmospheres; the task, materials and equipment; persons at risk; reliability of safeguards
- Factors to be considered in designing safe working practices: operating procedures and emergency arrangements; and training for work in confined spaces
- Flammable atmospheres; how they arise and where they are found. Control measures for entering flammable atmospheres, including purging to keep flammable atmospheres below Lower Explosion Limits (LEL).

IC1.4 Structural safety of workplaces

- Causes of damage to the structure of buildings: adverse weather conditions; overloading of structures; hot and corrosive atmospheres; vibration; alteration to structural members; subsidence; deterioration of building materials; excavations; and unauthorised modifications to buildings
- Failure modes: possible causes of structural failures such as poor design, substandard construction, cutting roof beams; puncturing holes through floors; removal of internal walls etc can lead to collapse.

IC1.5 Working at height

- The main hazards and risks, alternatives, precautions and safe working procedures for working at height in general workplaces including rescue measures
- Hierarchy of control measures:
 - avoid working at height
 - use an existing safe place of work
 - provide work equipment to prevent falls (including MEWPS)
 - mitigate distance and consequences of a fall
 - instruction and training and/or other means.

IC1.6 Lone working

- The main hazards and risks, alternatives, precautions and safe working procedures for lone working
- Particular problems facing lone workers: medical conditions, training, supervision, emergency procedures, lifting objects that are too heavy for one person, more than one person needed to operate essential controls or transport.

Tutor references

Confined Spaces Regulations 1997. Approved code of practice, regulations and guidance.
HSE Books L101 ISBN 9780717662333

International Labour Organisation Encyclopaedia of Occupational Health and Safety, chapter
58 – ‘confined spaces’:

<http://www.ilo.org/legacy/english/protection/safework/encyclopaedia/index.htm>

Recommended tuition time not less than 7 hours

Element IC2: Principles of fire and explosion

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC2.1 Outline the properties of flammable and explosive materials and the mechanisms by which they ignite
- IC2.2 Outline the behaviour of structural materials, buildings and building contents in a fire
- IC2.3 Outline the main principles and practices of fire and explosion prevention and protection
- IC2.4 Outline the contribution of typical mechanical and systems failures to major accidents.

Content

IC2.1 Properties of flammable and explosive materials and the mechanisms by which they ignite

- Properties of solids, liquids and gases
- Meaning of: flash point, fire point, auto-ignition temperature, vapour density, relative density, limits of flammability, critical temperature, maximum explosion pressure, and rate of pressure rise; with examples of the importance of these properties in relation to the initiation and propagation of fire and explosion
- The fire triangle
- Ignition sources (eg naked flame, hot surfaces, arcing, sparking, smoking, electrostatic discharge)
- Mechanisms of explosions, mechanisms of fire-spread including:
 - how an explosion/fire occurs
 - the stages of combustion: induction, ignition, growth, steady state and decay
 - mechanisms of uncontrolled vapour cloud explosions, confined vapour cloud explosions and boiling liquid expanding vapour explosions
- The effects of atomisation/particle size and oxygen content on the likelihood and severity of fire/explosion
- How failure of control measures coupled with the physico-chemical properties of flammable materials can bring about an explosion
- Oxidisation
- Confined vapour cloud explosions, unconfined vapour cloud explosions, boiling liquid expanding vapour explosions. Examples of actual incidents, causes and effects:
 - unconfined vapour cloud explosion (eg, Buncefield, 2005; Flixborough, 1974)
 - boiling liquid expanding vapour explosion (BLEVE) (eg, Mexico City, 1984)
 - confined vapour cloud explosion (eg, Hickson and Welch, 1992)

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- Control of vapour phase explosions; structural protection, plant design and process control, segregation and storage of materials, hazardous area zoning, inerting, explosion relief
- Control of amount of material, prevention of release, control of ignition sources, sensing of vapour between Lower Exposure Limit (LEL) and Upper Exposure Limit (UEL)
- Dust explosions:
 - examples of industries/plant with potential dust explosion hazards (eg, food industry, LEV)
 - mechanisms of dust explosions including the importance of combustible solid particle size, dispersal, explosive concentrations, ignition, energy, temperature and humidity
 - primary and secondary explosion
- Examples of actual incidents, causes and effects (e.g. General Foods, Banbury, 1981; Imperial Sugar, Georgia USA, 2008) and the processes involved.

IC2.2 Behaviour of structural materials, buildings and building contents in a fire

- The behaviour of building structures and materials in fire: fire properties of common building materials and structural elements (eg, steel, concrete, wood); level of fire resistance
- The behaviour of common building contents in fire (eg, paper-based, fabrics, plastics)
- Examples of actual incidents: fuels involved in the Channel Tunnel fire, 2008; Buncefield, 2005; Windsor Tower fire (Madrid), 2005; Summit Tunnel fire, 1984, The Kader Toy Factory Fire 1993.

IC2.3 Fire and explosion prevention and protection

- Structural protection (eg, openings and voids, compartmentation)
- Key features of plant design and process control
- Segregation and storage of flammable, combustible and incompatible materials
- Hazardous area zoning, exclusion of ignition sources
- Inerting
- Methods of explosion relief: venting, explosion panels, bursting discs, suppression (eg, inerting).

IC2.4 Major accidents

The contribution of typical mechanical and systems failures to major accidents, eg, Piper Alpha, Seveso, Chernobyl, Three-Mile Island, Bhopal, Imperial Sugar Company, Port Wentworth, Georgia, 2008 etc.

Tutor references

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064 Section 6: Operational control measures; Section 7: Design and installation

ILO Encyclopaedia Chapter 39 Case study (Kader Toy Factory fire)

Chemical Safety Board America Investigation Reports: <http://www.csb.gov/investigations>

Recommended tuition time not less than 6 hours

Element IC3: Workplace fire risk assessment

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC3.1 Explain the processes involved in the identification of hazards and the assessment of risk from fire
- IC3.2 Describe common fire detection and alarm systems and procedures
- IC3.3 Outline the factors to be considered when selecting fixed and portable fire-fighting equipment for the various types of fire
- IC3.4 Outline the factors to be considered in the provision and maintenance of means of escape
- IC3.5 Explain the purpose of, and essential requirements for, emergency evacuation procedures.

Content

IC3.1 Identification of hazards and the assessment of risk from fire

- Fire hazards and assessment of risk
- Five steps to fire risk assessment:
 - identify fire hazards; how could a fire start, what could burn (eg, common flammable solids, liquids and gases)
 - identify people at risk; including those especially at risk
 - evaluate, remove, reduce (eg, control of ignition, fuel and oxygen sources), and protect from risk
 - record, plan, inform, instruct and train
 - review.

IC3.2 Fire detection and alarm systems and procedures

- Common fire detection and alarm systems and procedures:
 - factors in design and application of fire detection and alarm systems
 - principal components of alarm systems; detection and signalling
 - manual and automatic systems.

IC3.3 Fixed and portable fire-fighting equipment

- Factors in design and application of fixed fire-fighting systems and equipment:
 - classification of fires
 - portable fire fighting equipment
 - extinguishing media and mode of action
 - siting, maintenance and training requirements
 - environment, including fire water runoff.

IC3.4 Means of escape

- Factors to be considered in the provision and maintenance of a means of escape
- General requirements for travel distances, stairs, passageways and doors, emergency lighting, exit and directional signs.

IC3.5 Emergency evacuation procedures

- Purposes of and essential requirements for, evacuation procedures and drills, alarm evacuation and roll call
- Provision of Fire Marshalls and their role
- Personal Emergency Evacuation Plans (PEEPs).

Tutor References

UK Department for Communities and Local Government practical fire safety guidance, which can be found at: <http://www.communities.gov.uk>

Fire Safety Guidance booklet 'Are you aware of your responsibilities?' - Scottish Executive (Safer Scotland) downloadable publication - http://www.firelawscotland.org/files/Summary_Guide_Full.pdf

Scottish Government's Police and Community Safety Directorate sector specific guidance, which can be found at <http://www.infoscotland.com/firelaw>

PAS 79:2007, Fire Risk Assessment. Guidance and a Recommended Methodology, British Standards Institute (BSI)

ATEX Guidelines: 3rd Edition, June 2009 (updated May 2011)
http://ec.europa.eu/enterprise/sectors/mechanical/files/atex/guide/atexguidelines_june2009_en.pdf

CFPA-E Guideline No 1:2002 – Internal fire protection control http://www.cfpa-e.org/files/PDF/Guidelines/Ratified%20Guidelines/Guideline_No_1_2002.pdf

CFPA-E Guideline No 23:2010 F – Securing the operational readiness of fire control systems http://www.cfpa-e.org/files/PDF/Guidelines/Ratified%20Guidelines/CFPA_E_Guideline_No_23_2010_F.pdf

CFPA-E Guideline No 13:2006 – Fire protection documentation http://www.cfpa-e.org/files/PDF/Guidelines/Ratified%20Guidelines/Guideline_No_13_2006.pdf

CFPA-E Guideline No 5:2003 – Guidance signs, emergency lighting and general lighting
http://www.cfpa-e.org/files/PDF/Guidelines/Ratified%20Guidelines/Guideline_No_5_2003.pdf

ICC International Fire Code – ISBN 978 1609 8304 65

NFPA 1: Fire Code – 2012 Edition

Recommended tuition time not less than 6 hours

Element IC4: Storage, handling and processing of dangerous substances

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC4.1 Outline the main physical and chemical characteristics of industrial chemical processes
- IC4.2 Outline the main principles of the safe storage, handling and transport of dangerous substances
- IC4.3 Outline the main principles of the design and use of electrical systems and equipment in adverse or hazardous environments
- IC4.4 Explain the need for emergency planning and the typical organisational arrangements needed for emergencies.

Content

IC4.1 Industrial chemical processes

- Effects of temperature, pressure and catalysts on rates of chemical reactions
- Heat of reaction in terms of endothermic, exothermic and runaway reactions
- Examples of endothermic reaction (eg, photosynthesis; reacting ethanoic acid with sodium carbonate) example of exothermic reaction (eg, burning of propane in oxygen, polymerisation); example of runaway reaction (eg, Bhopal, 1984)
- Methods of control of temperature and pressure.

IC4.2 Storage, handling and transport of dangerous substances

- Dangerous substances and hazardous substances with reference to the definitions contained in appropriate legislation (eg, Globally Harmonized System of Classification and Labelling of Chemicals)
- Hazards presented and assessment of risk
- Storage methods and quantities - bulk, intermediate, drum storage, specific locations. Storage of incompatible materials and their segregation requirements and access
- Leakage and spillage containment – bunding, filling and transfer and problems encountered during filling and transfer with examples (Texas City Refinery, 2005, Buncefield, 2005)

- Storage and handling of dangerous substances:
 - flow through pipelines
 - principles in filling and emptying containers
 - principles in dispensing, spraying and disposal of flammable liquids
 - dangers of electricity in hazardous areas
- Transport of dangerous substances:
 - key safety principles in loading and unloading of tankers and tank containers
 - labelling of vehicles and packaging of substances
 - driver training.

IC4.3 Hazardous environments

- Principles of: resistance to mechanical damage, protection against solid bodies, objects and dusts, protection against liquids and gases
- Wet environments – including corrosion and degradation of installation and damage to electrical systems
- Principles of selection of electrical equipment for use in flammable atmospheres
- Classification of hazardous areas, zoning
- Use of permits-to-work
- Principles of pressurisation and purging
- Intrinsically safe equipment, flameproof equipment, type 'N' equipment, type 'e' equipment.

IC4.4 Emergency planning

- The need for emergency preparedness within an organisation; eg, personal injury, explosive device, fire, loss of containment etc with reference to ILO Convention C174 Prevention of Major Industrial Accidents (1993) and the ILO Code on the Prevention of Major Industrial Accidents (1991).Consequence minimisation via emergency procedures; eg, first-aid/medical, fire evacuation, spill containment
- The need for the development of emergency plans in order to reduce the impact on the organisation, including post-incident recovery
- The role of external emergency services and local authorities in emergency planning and control
- The need to develop and prepare an emergency plan, including the content of both on-site and off-site plans for major emergency scenarios in order to meet regulatory requirements
- The need for ongoing monitoring and maintenance of emergency plans.

Tutor references

United Nations, Recommendations on the Transport of Dangerous Goods: Model Regulations, 14th edition, UN Publications, 2005. ISBN: 9211391067

International Labour Office, Safety in the Use of Chemicals at Work, an ILO Code of Practice, ILO, 1993. ISBN: 9221080064

Globally Harmonized System of Classification and Labelling of Chemicals, Third revised edition, 2009. Available from:
http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html

International Labour Standards, Prevention of Major Industrial Accidents Convention, C174, International Labour Organisation, Geneva, 1993

International Labour Office, Prevention of Major Industrial Accidents, an ILO Code of Practice, ILO, Geneva, 1991. ISBN 9221071014

Recommended tuition time not less than 7 hours

Element IC5: Work equipment (general)

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC5.1 Outline the criterion for the selection of suitable work equipment for particular tasks and processes to eliminate or reduce risks
- IC5.2 Explain how risks to health and safety arising from the use of work equipment are controlled
- IC5.3 Explain safe working procedures for the maintenance, inspection and testing of work equipment according to the risks posed
- IC5.4 Explain the role of competence, training, information and supervision in the control of risks arising from the installation, operation, maintenance and use of work equipment.

Content

IC5.1 Selection of suitable equipment

- Suitability of work equipment for the required task, process and environment
- Suitability of the design, construction and adaptation of work equipment
- Suitability of work equipment for its intended location of use
- The means by which all forms of energy used or produced and all substances used or produced can be supplied and/or removed in a safe manner
- Ergonomic, anthropometric and human reliability considerations in use of work equipment including: the layout and operation of controls and emergency controls; and reducing the need for access (automation, remote systems)
- The importance of size of openings; height of barriers; and distance from danger.

IC5.2 Risk assessment and use

- The need for conducting risk assessments in the use of work equipment
- The risks associated with the use of work equipment arising from its initial integrity, the location where it will be used, and the purpose for which it will be used
- The risks associated with the use of work equipment arising from its: incorrect installation or re-installation; deterioration; or, of exceptional circumstances which could affect the safe operation of work equipment
- The risk control hierarchy relating to work equipment: eliminating the risks; taking 'hardware' (physical) measures (such as the provision of guards); taking appropriate 'software' measures (such as following safe systems of work and the provision of information, instruction and training).

IC5.3 Maintenance, inspection and testing

- The hazards and precautions associated with the maintenance of work equipment
- The three maintenance management strategies of: planned preventive; condition based; and breakdown
- Factors to be considered in developing a planned maintenance programme for safety-critical components
- The need for the maintenance of work equipment, including hired work equipment
- The factors to be considered in determining inspection regimes having regard to the type of equipment; where it is used; and how it is used
- The need for functional testing of safety-related parts, including interlocks, protection devices, controls and emergency controls.

IC5.4 Competence, training, information and supervision

- The difference between training and competence
- Circumstances when training is likely to be required including: induction; changes in work activities; introduction of new technology or new equipment; changes in systems of work; refresher training due to declining skills
- Groups of people having specific training needs including supervisors, young and vulnerable persons
- The relationship between competence and supervision (external and self-supervision)
- The circumstances where there are specific training needs for certain hazardous types of work equipment (including chainsaws, woodworking machines, power presses, abrasive wheels, etc).

Tutor references

International Labour Standards, Guarding of Machinery Convention, C119, International Labour Organisation, Geneva, 1963

NB ILO Draft code of practice on safety in the use of machinery - Draft Meeting of Experts on the Code of Practice on Safety in the use of Machinery (Geneva, 29 November–7 December 2011) http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_164653.pdf

Recommended tuition time not less than 9 hours

Element IC6: Work equipment (workplace machinery)

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC6.1 Describe the principles of safety integration and the considerations required in a general workplace machinery risk assessment
- IC6.2 Describe, with examples, the principal generic mechanical and non-mechanical hazards of general workplace machinery
- IC6.3 Describe protective devices found on general workplace machinery
- IC6.4 Explain the principles of control associated with the maintenance of general workplace machinery
- IC6.5 Describe the requirements for information and warnings on general workplace machinery
- IC6.6 Explain the key safety characteristics of general workplace machinery control systems
- IC6.7 Explain the analysis, assessment and improvement of system failures and system reliability with the use of calculations.

Content

IC6.1 Safety integration and machinery risk assessment

- Role and application of standards relating to machinery
- C119 Guarding of Machinery Convention and International Standards EN ISO 12100 and ISO/TR 14121
- The principles of safety integration:
 - machinery must be designed and constructed to be fit for purpose and to eliminate or reduce risks throughout the lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping
 - the principles to be applied in order to eliminate or reduce risks as far as possible; take necessary protective measures where risk cannot be eliminated; and inform users of any residual risks
 - when designing and constructing machinery and when drafting the instructions: use and foreseeable misuse must be considered
 - take account of operator constraints due to necessary or foreseeable use of personal protective equipment
 - machinery must be supplied with all the essentials to enable it to be adjusted, maintained and used safely
- The factors to be considered when assessing risk: persons at risk, severity of possible injury, probability of injury, need for access, duration of exposure, reliability of safeguards, operating procedures and personnel

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- Purpose of CE marking and the relevance of the CE mark; selection and integration of work equipment in the workplace
- Conformity assessments, the use of harmonised standards, the technical file and the declaration of conformity.

IC6.2 Generic hazards

- Common machinery hazards in a range of general workplaces: drills (radial arm, pedestal), circular saws, guillotines, paper shredders, photocopiers, disc sanders, abrasive wheels, lathes, automatic doors and gates, mechanical and hydraulic presses, portable power tools, CNC machines, robotics
- The types of generic machinery hazards:
 - mechanical hazards: crushing, shearing, cutting/severing, entanglement, drawing-in/trapping, impact, stabbing/puncture/ejection, friction/abrasion, high pressure fluid injection
 - non-mechanical hazards: noise, vibration, electricity, high/low temperature, radiation, hazardous substances
- The typical causes of failures, with examples – excessive stress, abnormal external loading, metal fatigue, ductile failure, brittle fracture, buckling and corrosive failure (Brent Cross, 1964; Markham Colliery, 1973; Littlebrook D, 1978; Ramsgate Walkway Collapse, 1994), Alexander L. Kielland (metal fatigue), Swimming pool roof collapse, Uster, Switzerland, 1985, stress corrosion cracking
- The principles of operation, advantages, disadvantages and application of non-destructive testing techniques, specifically dye penetrant, acoustic, ultrasonic, radiography (gamma and x-ray), eddy current, magnetic particle.

IC6.3 Protective devices

- The main types of safeguarding devices: characteristics, key features, limitations and typical applications of fixed enclosed guards, fixed distance guards, interlocked guards, automatic guards, trip devices, adjustable/self-adjusting guards, two-hand controls, mechanical restraints, jigs and push-sticks.

IC6.4 Maintenance

- The means by which machinery is safely set, cleaned and maintained including: safe systems of work; permits; isolation; procedures for working at unguarded machinery
- The means by which machines are isolated from all energy sources.

IC6.5 Information and warnings

- The scope of information for the safe use and operation of machinery, specifically: the conditions under which the machinery may be used; foreseeable abnormal situations and the action to be taken; and any conclusions to be drawn from experience in usage
- The means by which information and instructions regarding the operation and use of machinery must be understandable to those concerned.

IC6.6 Machinery control systems

- The key safety characteristics of machinery control systems to include:
 - making allowance for the failures, faults and constraints to be expected in the planned circumstances of use; does not create any increased risk to health or safety; faults or damage to the control system or the loss of energy supply must not result in additional risk to health or safety; does not impede the operation of any stop/energy stop controls
 - controls for starting or making a significant change in operating conditions including any change in speed, pressure or other operating condition
 - stop controls readily accessible and leads to a safe condition
 - emergency stop controls provided and to be readily accessible
 - position and marking of controls to be visible and identifiable
 - consideration of ergonomic principles.

IC6.7 Systems failures and system reliability

- Meaning of the term 'system'
- Principles of system failure analysis – holistic and reductionist approaches and application to actual examples
- Use of calculation in the assessment of system reliability: parallel, series and mixed systems, common mode failures, principles of human reliability analysis
- Methods for improving system reliability: use of reliable components, quality assurance, parallel redundancy; standby systems, minimising failures to danger; planned preventive maintenance; minimising human error.

Tutor references

International Labour Standards, *Guarding of Machinery Convention, C119*, International Labour Organisation, Geneva, 1963

NB ILO Draft code of practice on safety in the use of machinery - Draft Meeting of Experts on the Code of Practice on Safety in the use of Machinery (Geneva, 29 November–7 December 2011) http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_164653.pdf

[Transposed Harmonized Standards British/European/International](#)

EN ISO 12100-:2010 Safety of machinery -- General principles for design -- Risk assessment and risk reduction

ISO/TR 14121-2:2007 Safety of machinery. Risk assessment. Practical guidance and examples of methods (*soon to be replaced by ISO/TR 14121-2:2010*)

Recommended tuition time not less than 11 hours

Element IC7: Work equipment (mobile, lifting and access)

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC7.1 Describe the main hazards and control measures associated with commonly encountered mobile work equipment
- IC7.2 Describe the main hazards and control measures associated with commonly encountered lifting equipment
- IC7.3 Describe the main hazards and control measures associated with commonly encountered access equipment and equipment for working at height.

Content

IC7.1 Mobile work equipment: hazards and control measures

Hazards

- The applications of different types of mobile work equipment (self-propelled, towed, attached, pedestrian-controlled and remotely-controlled) - to include lift trucks (counterbalance, reach, rough terrain, telescopic materials handlers, side loading trucks, pedestrian controlled trucks), agricultural tractors and works vehicles
- The hazards associated with mobile work equipment (rollover, overturning, suitability for carrying passengers, unauthorised start-up, safe operating station/platform, overrun of speed, contact with wheels and tracks, falls of objects, moving parts/drive shafts/power take-offs, over-heating)
- The hazards associated with the energising (electrical, LPG, diesel) of mobile work equipment

Control measures

- The control measures to be used in the use of mobile work equipment (self-propelled, towed, attached, pedestrian-controlled and remotely-controlled), including safe layout of areas where mobile equipment is used and the protection of pedestrians
- The use of lift trucks to move people – conditions and equipment necessary, other attachments used on lift trucks
- The importance of roll-over protection, falling objects protection, speed control systems (stopping and emergency braking), guards, barriers and restraining systems, means of fire fighting, vision aids (plane, angled and curved mirrors, Fresnel lenses, radar, CCTV)
- The requirements for the training of lift truck operators (basic, specific job training and familiarisation).

IC7.2 Lifting equipment: hazards and control measures

Hazards

- The applications and different types of lifting equipment including cranes (mobile cranes, tower cranes, overhead cranes) and hoists
- The hazards associated with cranes and lifting operations
- The main hazards associated with the use of: hoists (gin wheel, construction site platform hoist) and lifts (passenger and goods, vehicle inspection)

Control measures

- The control measures for the use of: cranes (selection, siting, and stability of cranes); hoists and lifts; integrity of lifting equipment; competence of personnel; maintenance, inspection; and statutory examinations.

IC7.3 Access and work at height equipment: hazards and control measures

Hazards:

- The applications and different types of access and work at height equipment including self-propelled, trailer and truck-mounted hydraulic lifts (MEWPs), booms, scissor lifts, loaders and mobile work platforms
- The hazards arising from lack of mechanical strength of the carrier or lack of loading control and control devices; hazards to persons on or in the carrier (movements of the carrier, persons falling from the carrier, objects falling on the carrier); exceeding safe working load/persons permitted

Control measures:

- The control measures for use of access and work at height equipment: space and strength corresponding to the maximum number of persons and maximum working load; fitted with a suspension or supporting system; controlled by persons in the carrier; emergency stop devices; hold-to-run controls; prevention of tilting if there is a risk of the occupants falling; trapdoors open in a direction that eliminates any risk of falling; protective roof if risk of falling objects endanger persons, marked with maximum number of persons and maximum working load.

Tutor references

International Labour Standards, Guarding of Machinery Convention, C119, International Labour Organisation, Geneva, 1963

NB ILO Draft code of practice on safety in the use of machinery - Draft Meeting of Experts on the Code of Practice on Safety in the use of Machinery (Geneva, 29 November–7 December 2011) http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_164653.pdf

Transposed Harmonized Standards British/European/International

EN ISO 12100:2010 Safety of machinery -- General principles for design -- Risk assessment and risk reduction

ISO/TR 14121-2:2007 Safety of machinery. Risk assessment. Practical guidance and examples of methods (*soon to be replaced by ISO/TR 14121-2:2010*)

Recommended tuition time not less than 6 hours

Element IC8: Electrical safety

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC8.1 Outline the basic principles of electricity
- IC8.2 Outline the dangers of electricity
- IC8.3 Outline the issues relevant to the installation, use, inspection and maintenance of electrical systems
- IC8.4 Outline the main principles for safe working in the vicinity of high voltage systems
- IC8.5 Outline the main hazards, risks and controls associated with the use of portable electrical equipment.

Content

IC8.1 Basic principles of electricity

- Differences between Low and High Voltage
- Potential difference, current, resistance, impedance, Ohm's law
- Basic electrical circuitry
- Earthing principles
- Significance of direct and alternating currents.

IC8.2 Dangers of electricity

- Effects of electric shock on the body: pain, burns, muscular contraction, respiratory failure, heart fibrillation, cardiac arrest
- Factors influencing the severity of the effects of electric shock on the body: voltage, frequency, duration, impedance/ resistance, current path, direct and indirect shock
- Common causes of fires: overloading of conductors: overheating, ignition of flammable vapour, ignition of combustible material, breakdown of insulation
- Electric arcs: molten metal splash and radiation
- Circumstances giving rise to the generation of static electricity
- Hazards and controls for static electricity.

IC8.3 Installation, use and inspection of electrical systems

- Importance of:
 - strength and capability of electrical equipment
 - insulation, protection and placing of conductors
 - reducing the risk of shock
 - excess current protection
 - cutting off supply and isolation
 - working space, access and lighting
- Control measures:
 - selection and suitability of equipment
 - protective systems: fuses, reduced voltage systems, isolation, residual current devices, double insulation, earth free zones
- Inspection and maintenance strategy: user checks, formal visual inspections, combined inspection and tests, records of maintenance and tests, frequency of inspection and testing, competent persons
- Importance of schemes of maintenance, schedules, plans and records
- Safe systems of work on installations made dead
- Safe systems of work and criteria of acceptability for live working
- Use of permits-to-work
- Meaning of 'competent person'.

IC8.4 Safe working in the vicinity of high voltage systems

- Common high voltage systems and prevention of danger
- Competent and authorised persons role related to system modifications
- Safe systems of work, permit-to-work procedures
- Safe working near overhead power lines, underground cables – hazards and precautions
- High voltage glove working and live line overhead working.

IC8.5 Portable electrical equipment

- Conditions and practices likely to lead to accidents, including unsuitable equipment, inadequate maintenance, use of defective apparatus
- Electrical risks from important portable appliances, eg, portable generators, arc/mig/tig welding
- Control measures, including portable appliance inspection and testing
- Aspects of supply, eg, height of cables.

Tutor references

BS 7671:2008 Requirements for Electrical Installations. IEE Wiring Regulations. Seventeenth edition

Electricity at work: Safe working practices HSG85, HSE Books ISBN 9780717621644

Maintaining portable and transportable electrical equipment, HSG107, HSE Books ISBN: 9780717628056

Avoidance of danger from overhead electric powerlines, GS6, HSE Books ISBN: 9780717613489

Recommended tuition time not less than 7 hours

Element IC9: Construction hazards and controls

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

- IC9.1 Describe the scope and nature of construction activities
- IC9.2 Outline the principle duties and specific responsibilities for the effective management of health and safety on construction sites
- IC9.3 Explain the hazards associated with working at heights from fixed work or temporary platforms and the necessary precautions and safe working practices
- IC9.4 Explain the hazards, precautions and safe working practices associated with demolition work
- IC9.5 Explain the hazards associated with excavation work and the necessary precautions and safe working practices.

Content

IC9.1 Scope and nature of construction activities

- Types of work: building works, renovation; alteration; maintenance of existing premises (occupied or unoccupied); civil engineering; works of engineering construction; and demolition
- Range of activities, including: site clearance; demolition; dismantling; excavation; loading, unloading and storage of materials; site movements; fabrication; decoration; cleaning; installation, removal and maintenance of services (electricity, water, gas); landscaping
- Particular construction issues relating to the: transitory nature of workers; temporary nature of construction activities and the constantly changing workplace; time pressures from clients; weather conditions; levels of numeracy and literacy of workers; local or foreign language workers.

IC9.2 Management of health and safety on construction sites

- Respective roles and responsibilities of clients, designers, co-ordinator, principal contractors and contractors
- Planning, co-ordination and notification
- Health and safety plan; health and safety file
- Relevance of site layout; access and egress; protection of the public
- Use of method statements and permits-to-work.

IC9.3 Working at height from fixed or temporary platforms

- The hazards associated with working at heights
- The safe use of temporary (immobile) access equipment including ladders, trestles, scaffolds – simple independent and tower scaffolds
- The erection, use and dismantling of scaffolds and falsework
- The hazards associated with falling materials and appropriate precautionary measures
- Safe methods for roof work - precautions during work on fragile roofs, edge protection for flat and sloping roofs
- The means of temporary access types and safety features of cradles, boatswains' chairs, rope access and positioning systems
- The use, application, selection and precautions in use of personal and collective fall arrest devices (safety nets, airbags, belts and harnesses).

IC9.4 Demolition work

- The main techniques in demolition of buildings and the associated hazards and safe working practices with reference to:
 - falling materials; premature collapse of buildings, materials of construction
 - planning, structural surveys and surveys for hazardous substances, provision of working places and means of access/egress, use of method statements and permits-to-work, security of site boundaries and protection of the public.

IC9.5 Excavations

- Hazards and controls associated with excavation work:
 - collapse; access; falls of persons, objects and vehicles; use of transport; flooding
 - buried services: types and consequences of damage
 - need for temporary shoring (drag boxes, piling)
 - methods for checking for buried services and the precautions to be observed
 - use of 3600 excavators
- The requirements for inspections and examinations of excavations.

Tutor references

International Labour Standards, Safety and Health in Construction, R175 International Labour Organisation, Geneva, 1988

International Labour Office, Safety and Health in Construction, an ILO Code of Practice, International Labour Organisation, Geneva, 1992. ISBN: 9221071049

Recommended tuition time not less than 7 hours

Element IC10: Workplace transport and driving for work

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

IC10.1 Explain the hazards, risks and control measures for safe workplace transport operations

IC10.2 Outline the factors associated with driving at work that increase the risk of an incident and the control measures to reduce work-related driving risks.

Content

IC10.1 Hazards, risks and control measures for safe workplace transport operations

- Typical hazards leading to loss of control; overturning of vehicles; collisions with other vehicles, pedestrians and fixed objects
- Non-movement related hazards, ie, loading, unloading and securing loads; sheeting; coupling; vehicle maintenance work
- Conditions and environments in which each hazard may arise
- Control measures for safe workplace transport operations:
 - suitability and sufficiency of traffic routes; management of vehicle movements; environmental considerations (visibility, gradients, changes of level, surface conditions); maintenance of vehicles; driver protection and restraint systems; segregating of pedestrians and vehicles and measures to be taken when segregation is not practicable; protective measures for people and structures (barriers, marking signs, warnings of vehicle approach and reversing); site rules; selection and training of drivers; management systems for assuring driver competence including local codes of practice.

IC10.2 Driving at work

- Extent of work related road injuries and fatalities
- Factors associated with driving at work that increase the risk of being involved in a road traffic incident (distance, driving hours, work schedules, stress due to traffic and weather conditions etc)
- Managing work-related road risk:
 - policy covers work-related road risk
 - systems to manage work-related road risk
 - selection and management of fleet
 - monitoring performance to ensure policy is effective eg collection of information, reporting of work-related road incidents by workers
 - organisation and structure.
- Risk assessment

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- Evaluating the risks:
 - the driver (competency, fitness and health, training)
 - the vehicle (suitability, condition, safety equipment, safety critical information, ergonomic considerations)
 - the journey (routes, scheduling, sufficient time, weather conditions).
 - control measures to reduce work related driving risks
 - eg, checking drivers' licences and documentation; driver training; vehicle checks; journey planning.

Tutor references

Workplace transport safety – An employers' guide (HSG136) HSE Books,
ISBN 0-71766754-7

Driving at work, Managing work-related road safety, HSE INDG382

Recommended tuition time not less than 4 hours

Element IC11: Pressure system hazards and controls

Learning outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations and the critical analysis and evaluation of information presented in both quantitative and qualitative forms. In particular they should be able to:

IC11.1 Outline the principles of operation of liquefied gas storage; refrigeration systems; and heating systems

IC11.2 Outline the key features and safety requirements for 'simple' unfired pressure systems

IC11.3 Outline the key features and safety requirements for process pressure systems

IC11.4 Outline, the likely causes of the failure of pressure systems, and the testing and prevention strategies that can be used.

Content

IC11.1 Principles

- Meaning of pressure, positive pressure and negative pressure
- The hazards of steam; the mechanism of a steam explosion (eg Corus Blast Furnace, 2001)
- Properties of liquid petroleum gas; advantages and disadvantages of storage in spheres vs. torpedoes
- The operation of basic steam heating system
- The liquefaction of gases for bulk storage under pressure/refrigeration; the operation of a closed circuit refrigeration cycle.

IC11.2 Simple unfired pressure systems

- Meaning of "vessel"; unfired; contents; shape, construction and materials; gauge pressure; operating conditions; transportable gas containers
- The essential safety requirements; pressurised components; steel and aluminium vessels; non-pressurised components
- Types of inspection, frequencies and statutory basis for examination of simple pressure systems.

IC11.3 Pressure systems

- Meaning of 'relevant fluids', the scope of what constitutes a 'pressure system'; steam at any pressure
- The key components and safety features of pressure systems; temperature, pressure, level indicators; pressure relief valves; fuel cut-off; bursting discs; level replenishment; water treatment.

IC11.4 Failure of pressure systems

- The hazards of over pressure and over temperature in pressure systems
- The mechanisms of mechanical failure that lead to a loss of containment: excessive stress; abnormal external loading; overpressure; overheating; mechanical fatigue and shock; thermal fatigue and shock; brittle fracture; creep; hydrogen attack; corrosive failure with reference to case studies; examples of pressure system failures
- Prevention strategy: design and construction, repair and modification, information and marking, safe operating limits, written scheme of examination, maintenance and record keeping, competent persons.

Tutor references

Safety of pressure systems, L122 HSE Books, ISBN: 9780717617678

Written schemes of examination, INDG178, HSE, <http://www.hse.gov.uk/pubns/indg178.pdf>

Recommended tuition time not less than 5 hours

4.2 Unit ID: Application of international health and safety theory and practice

Learning outcomes

On completion of this element, candidates should be able to:

- Demonstrate the ability to apply the knowledge and understanding gained from their studies of elements of Units IA, IB and IC in a practical environment
- Carry out a detailed review of the health and safety performance of a workplace or organisation
- Critically analyse and evaluate information gathered during the review
- Produce a justified action plan to improve performance.

Content

This unit contains no additional syllabus content. However, completion of study for units IA, IB and IC is recommended in order to undertake the Unit ID assignment. Candidates should refer to the separate Unit ID Guidance which is available to download from the Students section of the website, or from their accredited course provider.

4.2.1 Purpose and aim

The aim of the assignment is to produce an overall review of the health and safety management system of an organisation and indicate, using risk assessment, the priorities for the organisation for the future.

The focus of the Unit ID assignment should be the application of the knowledge and understanding developed in Units IA, IB and IC to a real workplace situation. It provides opportunities for the candidate to carry out research appropriate to a qualification that is comparable to degree-level. Candidates are required to demonstrate the ability to carry out a range of activities that would be expected of a health and safety practitioner.

The report should be organised in sections which match those set out in the assignment mark scheme. The sections are:

- Executive Summary
- Introduction
- Review of the Health and Safety Management System
- Hazard Identification
- Risk Assessment
- Conclusions
- Recommendations
- Action Plan
- References / Bibliography
- Appendices.

4.2.2 Marking

The Unit ID assignment is marked by appropriately qualified Examiners appointed by NEBOSH. Candidates must achieve the pass standard (50%) in Unit ID in order to satisfy the criteria for the qualification.

4.2.3 Assessment location

The Unit ID assignment must be carried out in the candidate's own workplace. Where the candidate does not have access to a suitable workplace, the accredited course provider should be consulted to help in making arrangements for the candidate to carry out the assignment at suitable premises.

Candidates do not require supervision when carrying out the practical application, but the candidate must sign a declaration that Unit ID is their own work.

Candidates and employers should be aware that the status of the report undertaken to fulfil the requirements of Unit ID is **for educational purposes only**. It *does not* constitute an assessment for the purposes of any legislation or regulations.

4.2.4 Submission of completed work

Assignment reports should be submitted before the set submission date in either March or September.

The actual dates will be published by NEBOSH annually. Candidates intending to submit an assignment must register through their accredited course provider using the appropriate form and paying the appropriate fee. On registration candidates will receive a submission form which must accompany the assignment report.

Assignments must be submitted directly to NEBOSH. They should be sent by Royal Mail Special Delivery or a courier service that provides a track-back facility (this is a next day guaranteed delivery service). Failure to use such a service close to the closing date may result in arrival after the closing date and rejection of the assignment.

Candidates are strongly advised to keep a copy of their assignment report.

No refund of fees will be made in cases where assignments are rejected or where candidates register but fail to submit.

4.2.5 Further information

Further detailed information regarding Unit ID including forms and mark schemes can be found in a separate guidance document for candidates and accredited course providers available from the NEBOSH website (www.nebosh.org.uk): "Unit ID Assignment guidance and information for candidates"

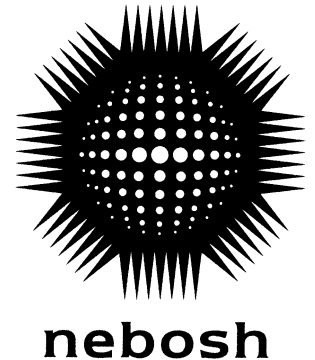
5. Sample examination question papers

5.1 Unit IA: International management health and safety

THE NATIONAL EXAMINATION BOARD IN
OCCUPATIONAL SAFETY AND HEALTH

NEBOSH INTERNATIONAL DIPLOMA IN
OCCUPATIONAL HEALTH AND SAFETY

Unit IA: INTERNATIONAL MANAGEMENT OF HEALTH AND
SAFETY



[DATE]

3 hours, 0930 to 1230

10 minutes reading time is allowed before the start of this examination. You may not write anything during this period.

Answer both Section A and Section B

SECTION A

This section contains six questions. Answer **ALL SIX** questions.

All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **15 minutes** on each question.

Start each answer on a new page.

- 1 (a) **Giving** reasons in **EACH** case, **identify FIVE** persons` who could be interviewed to provide information for an investigation into a workplace accident. (5)
- (b) **Outline** the issues to consider when *preparing* the accident investigation interviews for workers from within the organisation. (5)
- 2 **Outline** ways in which a health and safety practitioner could *evaluate* and *develop* their own competence. (10)

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- 3** **Outline**, with appropriate examples, the key features of the following risk management concepts:
- (a) risk avoidance; (2)
 - (b) risk reduction; (2)
 - (c) risk transfer; (3)
 - (d) risk retention. (3)
- 4** (a) **Outline** the *site operator* requirements for emergency planning and procedures within the International Labour Organisation Convention C174 'Prevention of Major Industrial Accidents' 1993. (6)
- (b) As part of the on-site emergency planning process, a large manufacturing site intends to provide information to the external emergency services.
- Outline** the types of information that the site should consider providing to the *ambulance* service. (4)
- 5** **Outline**, with examples, the benefits and limitations of:
- (a) prescriptive legislation; (5)
 - (b) goal setting legislation. (5)
- 6** (a) **Give** the meaning of the term '*motivation*'. (2)
- (b) **Outline**, with an example in **EACH** case, how workers can be motivated to behave in a positive way. (8)

SECTION B

This section contains five questions. Answer **THREE** questions only.

All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **30 minutes** on each question.

Start each answer on a new page.

- 7 (a) **Outline** the principles, application and limitations of Event Tree Analysis as a risk assessment technique. (6)

- (b) A mainframe computer suite has a protective system to limit the effects of fire. The system comprises a smoke detector connected by a power supply to a mechanism for releasing extinguishing gas. It has been estimated that a fire will occur once every 5 years ($f=0.2/\text{year}$). Reliability data for the system components are as follows:

Component	Reliability
Detector	0.90
Power supply	0.99
Extinguishing gas release mechanism	0.95

- (i) **Construct** an event tree for the above scenario to **calculate** the frequency of an uncontrolled fire in the computer suite. (10)
- (ii) **Suggest** ways in which the reliability of the system could be improved. (4)

- 8 (a) **Explain** the objectives of:
- (i) active health and safety monitoring; (5)
 - (ii) reactive health and safety monitoring. (5)
- (b) **Outline FIVE** *active* health and safety monitoring methods. (5)
- (c) **Outline FIVE** *reactive* health and safety monitoring methods. (5)

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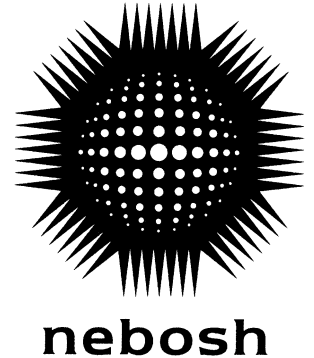
- 9 (a) In relation to the improvement of health and safety within companies, **describe** what is meant by:
- (i) corporate probation; (2)
 - (ii) adverse publicity orders; (2)
 - (iii) punitive damages. (3)
- (b) **Outline** how the International Labour Organisation can influence health and safety standards in different countries. (7)
- (c) **Outline** how legislation may improve health and safety. (6)
-
- 10 (a) **Outline** the meaning of 'skill based', 'rule based' **AND** 'knowledge based' behaviour. (6)
- (b) With reference to practical examples or actual incidents, **explain** how **EACH** of these types of operating behaviour can cause human error **AND**, in **EACH** case, **explain** how human error can be prevented. (14)
-
- 11 (a) **Give** the meaning of the term '*health and safety culture*'. (2)
- (b) **Outline** the role of an organisation in the development of a positive health and safety culture. (12)
- (c) **Identify** ways of measuring the effectiveness of a health and safety culture. (6)

5.2 Unit IB: International control of hazardous agents in the workplace

THE INTERNATIONAL EXAMINATION BOARD IN
OCCUPATIONAL SAFETY AND HEALTH

NEBOSH INTERNATIONAL DIPLOMA IN
OCCUPATIONAL HEALTH AND SAFETY

UNIT IB: INTERNATIONAL CONTROL OF WORKPLACE
HAZARDS



[DATE]

3 hours, 0930 to 1230

10 minutes reading time is allowed before the start of this examination. You may not write anything during this period.

Answer both Section A and Section B

SECTION A

This section contains six questions. Answer **ALL SIX** questions.

All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **15 minutes** on each question.

Start each answer on a new page.

- 1** Workers in a chemical plant are provided with gloves to protect against the possible effects of the chemicals. In recent months, there has been an increase in the number of hand and lower arm skin complaints amongst these workers.
- Outline** possible reasons for this increase in skin complaints. **(10)**
- 2** (a) **Identify** the way in which lasers are classified according to their hazard. **(2)**
- (b) Low power lasers are widely used to read bar-code labelled products at checkouts in retail premises.
- Outline:**
- (ii) the design features; **(4)**
- (ii) the procedural controls **(4)**

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that should be in place for the safe operation and maintenance of the equipment.

- 3** (a) **Outline** the following toxicological terms:
- (i) LD₅₀; (2)
 - (ii) LC₅₀. (2)
- (b) (i) **Outline** the toxicity test known as the fixed dose procedure. (4)
- (ii) **Outline** the possible reasons why the fixed dose procedure has replaced previous methods that estimated LD₅₀. (2)
- 4** Workers on a food production line have to pick up rectangles of pasta from a delivery conveyor and place them into trays on a separate conveyor. This involves 8 hour shifts and is carried out standing in front of the conveyors.
- Following complaints from a number of workers about pains in their arms and shoulders, you have been asked to carry out an ergonomic assessment for this operation.
- (a) **Outline** the ergonomic risk factors to be taken into account when making such an assessment **AND outline** how these may be contributing to the problems experienced by the workers in this situation. (5)
- (b) Total automation of the process is not possible. **Outline** other control measures that could be taken to reduce the ill-health effects being experienced by the workers. (5)
- 5** (a) **Outline** why it is important to measure transport (duct) velocity when assessing the efficiency of a local exhaust ventilation (LEV) system. (2)
- (b) **Outline** the methods that can be used to measure transport velocity in an LEV system. (5)
- (c) **Identify** other measurements that can be used to determine if the LEV system is working as designed. (3)

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- 6 (a) **Outline** the health effects associated with the Human immunodeficiency virus (HIV). (3)
- (b) **Outline** control measures to protect against occupational exposure to the virus. (7)
-

SECTION B

This section contains five questions. Answer **THREE** questions only.

All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **30 minutes** on each question.

Start each answer on a new page.

- 7 A small motor vehicle repair workshop uses paints known to contain isocyanates.
- (a) **Outline** the health effects from exposure to isocyanates. (3)
- (b) **Outline** the factors to consider when assessing the risks arising from using these paints. (7)
- (c) **Outline** the practical measures to control exposure to the isocyanates when spray painting the vehicles in the workshop. (10)
- 8 You are a health and safety advisor to a bus operating company. You have been asked to prepare a company policy on drug misuse. **Outline** key points the policy should include. (20)
- 9 (a) **Explain** the meaning of the term 'toxicity'. (2)
- (b) **Describe** the physical characteristics of asbestos and **give TWO** occupational examples where it is likely to be encountered. (4)
- (c) **Outline** the diseases caused by exposure to asbestos **AND** their signs and symptoms. (7)
- (d) **Outline** the equipment and method that should be used to determine the level of asbestos fibres in the air in the workplace.

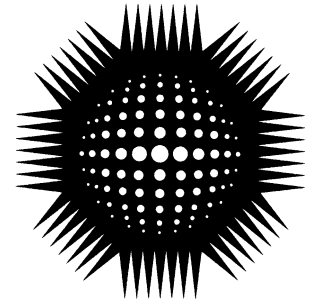
- 10** A distribution company employs 300 workers as drivers, warehouse operatives and office staff, processing telephone and internet orders.
- (a) **Identify** the possible functions of this company's occupational health department:
- (i) when recruiting new workers; **(4)**
 - (ii) when a worker returns to work after ill-health. **(5)**
- (b) **Outline** *other* ways in which the occupational health department can assist the management team to improve health and safety within this organisation. **(11)**
- (You do not need to consider those functions you have already addressed in part a).**
-
- 11** A motorcycle courier is exposed to high levels of noise and vibration as he rides his motorcycle. The vibration originates in the engine and wheels and is transmitted to the rider through the vehicle seat, handlebars and foot pegs. The high noise level arises mainly from wind turbulence around the rider's crash helmet.
- (a) **Outline** the ill-health symptoms related to noise and vibration that the rider is likely to experience from prolonged and repeated riding. **(4)**
- (b) **Outline** how you might assess:
- (i) the noise level experienced by the rider; **(4)**
 - (ii) the level of vibration experienced by the rider. **(4)**
- (c) **Outline** the range of practical measures that can be taken to reduce the risk of ill-health effects to the driver. **(8)**

5.3 Unit IC: International workplace and work equipment safety

THE NATIONAL EXAMINATION BOARD IN
OCCUPATIONAL SAFETY AND HEALTH

NEBOSH INTERNATIONAL DIPLOMA IN
OCCUPATIONAL HEALTH AND SAFETY

UNIT IC: INTERNATIONAL WORKPLACE AND WORK
EQUIPMENT SAFETY



nebosh

[DATE]

3 hours, 0930 to 1230

10 minutes reading time is allowed before the start of this examination. You may not write anything during this period.

Answer both Section A and Section B

SECTION A

This section contains six questions. Answer **ALL SIX** questions.

All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **15 minutes** on each question.

Start each answer on a new page.

- 1 A sewage drain has collapsed and it is necessary to inspect the damage prior to its repair. The inspection requires entry into a confined space 10 metres deep.

Outline the possible risks to those entering the sewer. **(10)**

- 2 **Outline** what should be considered when preparing a scheme for the systematic examination, testing and maintenance of portable electrical appliances. **(10)**

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- 3** Members of the public have been injured when collecting baggage from a baggage conveyor at an airport.
- (a) **Identify** typical *mechanical* hazards when the conveyor is in use. **(4)**
 - (b) **Outline** the control measures that should be in place to reduce the risk of injury from the *mechanical* hazards. **(4)**
- 4**
- (a) **Outline** the purpose of non-destructive testing (NDT) on items of plant. **(2)**
 - (b) **Outline** the principles, benefits and limitations of the following NDT techniques:
 - (i) dye penetrant; **(4)**
 - (ii) radiography. **(4)**
- 5** A motor vehicle repair workshop has installed a new electrically powered, compressed air system.
- Outline** the factors to be considered in developing a suitable planned preventative maintenance programme. **(10)**
- 6** A diesel engine is being used to power a machine in a potentially flammable atmosphere.
- (a) **Identify** the sources of ignition from the diesel engine. **(4)**
 - (b) **Outline** the protection that should be applied to the engine to minimise the risk of an explosion. **(6)**

SECTION B

This section contains five questions. Answer **THREE** questions only.

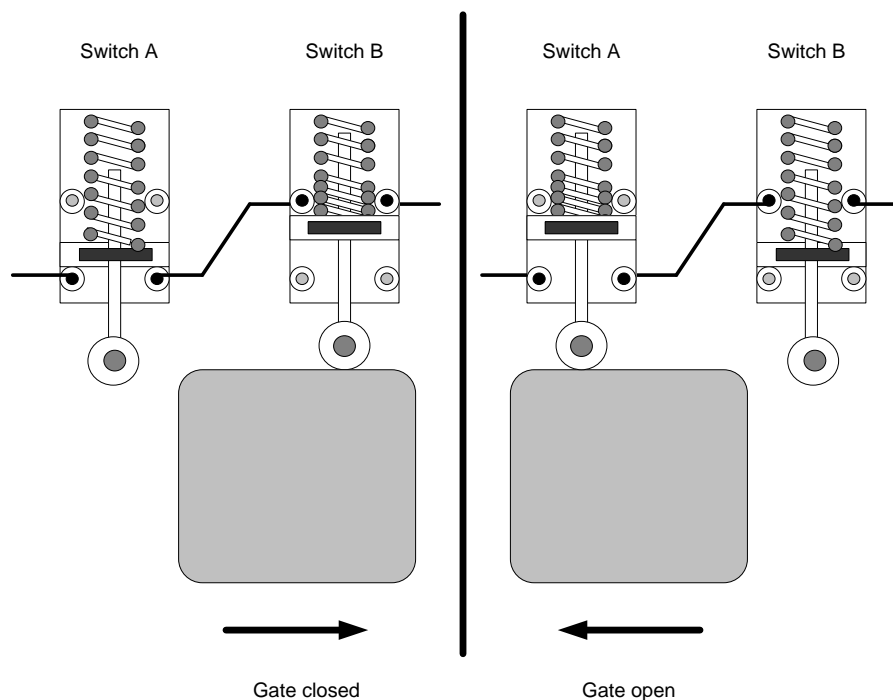
All questions carry equal marks.

The maximum marks for each question, or part of a question, are shown in brackets.

You are advised to spend about **30 minutes** on each question.

Start each answer on a new page.

- 7 For a large supermarket with restaurant facilities:
- (a) **outline** the automatic fire protection systems that should be in place; (6)
 - (b) **outline** the factors to be considered when developing a safe means of escape for the supermarket. (14)
- 8 An external lift on a construction site has an interlocked guard to prevent the lift operating when the gate is open. With reference to the diagram:
- (a) **identify** the two types of switch shown (Switch A **AND** Switch B); (2)
 - (b) **identify** the functional components associated with **BOTH** switches; (4)
 - (c) **outline** the normal sequence of operation for the electrically-operated, cam-activated switch assembly when the gate opens and closes; (6)
 - (d) **outline** ways in which electrically-operated, cam-activated switches may fail to operate as intended. (8)



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- 9** A small company manufactures products using electro-chemical processes. The company has poor general standards of health and safety, made worse by the presence of conductive and corrosive fluids and humid, corrosive atmospheres.
- (a) **Describe** the types of fault that may be found under such conditions in a fixed electrical system. **(10)**
- (b) **Outline** the technical information a competent electrician would require before conducting an inspection of a fixed electrical system. **(10)**
- 10** The International Labour Organisation's Standard R175 and its associated Code of Practice sets out general principles for 'Safety and Health in Construction'.
- Minor repairs need to be carried out to the sloping roof of a large two-storey property. A scaffold is to be erected in order to gain access to the work area.
- Using the guidance in R175, **outline** the precautions necessary for carrying out the repairs. **(20)**
- 11** **Outline** the factors to consider with respect to the design, construction and use of a storeroom that is to be used for the storage of bulk stocks of palletised containers **(20)**