May 2010

Guide to the NEBOSH International Technical Certificate in Oil and Gas Operational Safety

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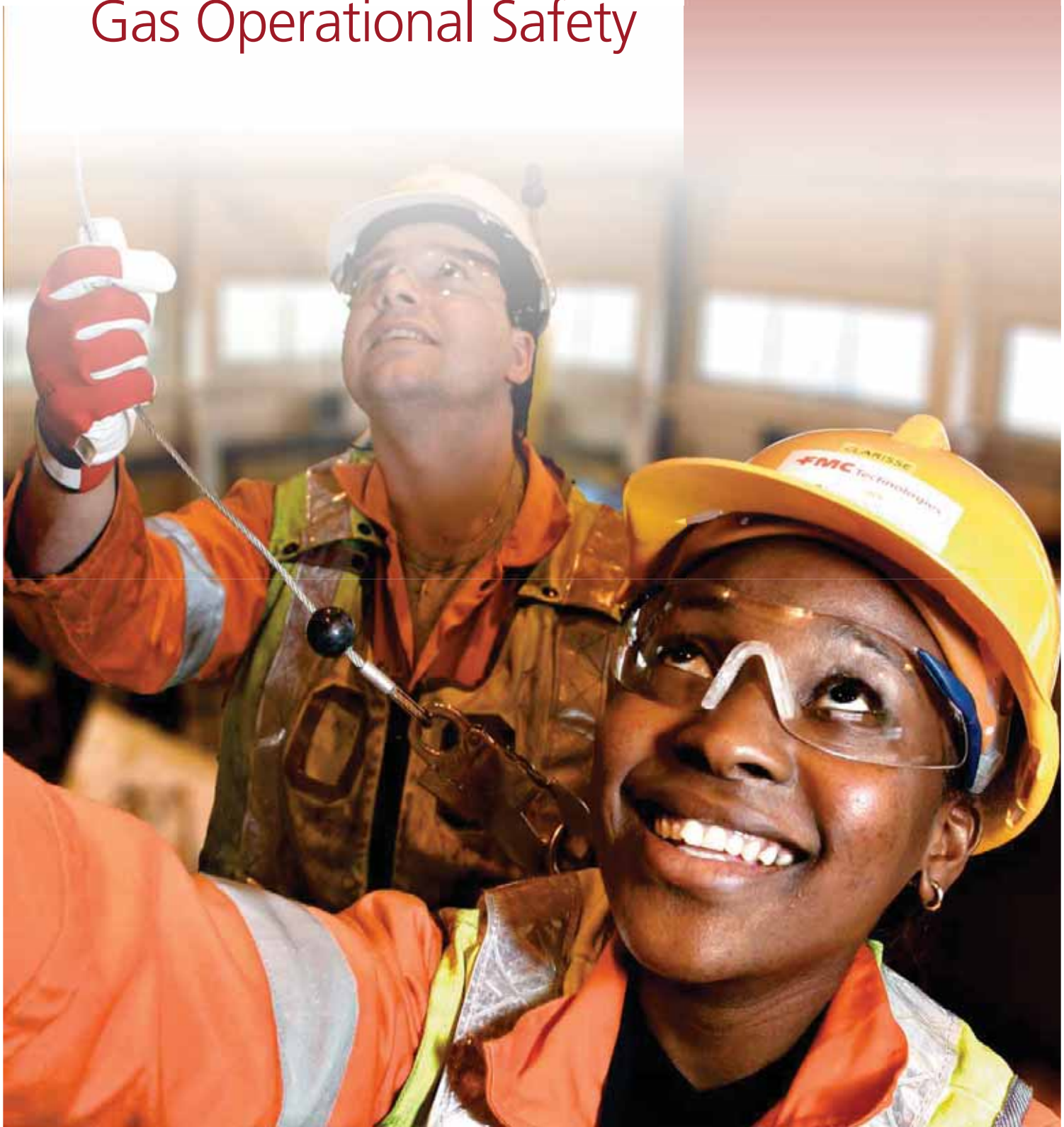

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Guide to the NEBOSH International Technical Certificate in Oil and Gas Operational Safety (May 2010 specification)

Contents

1. Introduction

The NEBOSH International Technical Certificate in Oil and Gas Operational Safety is suitable for supervisors, managers, safety representatives and newly qualified health and safety advisors within the oil and gas industries, both within and outside the UK and is designed to provide a sound breadth of underpinning knowledge that enables them to manage oil and gas operational risks effectively. This qualification builds on the understanding already gained by studying the NEBOSH National or International General Certificate.

1.1 Benefits for employers

The importance of effective health and safety training in the oil and gas industry is highlighted by extensively reported examples of major process safety incidents including the 2010 Deepwater Horizon oil rig explosion in the Gulf of Mexico, the Buncefield oil storage depot explosion (2005), the 1988 Piper Alpha oil platform explosion (both occurring in the UK) and the Gas Plant explosion at Longford, Australia in 1998.

However, even relatively minor occurrences can have serious consequences. The UK Health and Safety Executive (HSE) reported that in 2008/9 there were over 450 dangerous occurrences in the UK offshore oil and gas industry resulting in 30 major injuries and 140 'over 3 day' injuries. The US Bureau of Ocean Energy Management, Regulation and Enforcement reported 522 oil and gas industry incidents in the US in 2009 resulting in 4 fatalities and over 300 injuries.

The International Association of Oil and Gas Producers (OGP) reported 99 fatalities in 2009 and over 1,500 reported injuries resulting in at least one day off work or an average of 28 such injuries every week of the year. Approximately 260 person-years were lost by reporting companies and their contractors as a result of injuries.

In addition to the direct costs of sick pay and absence, employers can find themselves dealing with environmental costs, criminal prosecution, claims for compensation, adverse publicity and harm to both business reputation and profitability. The annual worldwide cost of occupational injury and illness is estimated by the International Labour Organisation (ILO) to be twenty times greater than the total amount of official development assistance provided to developing countries (approximately $50 billion).

The vast majority of occupational injuries, incidents 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.

The NEBOSH International Technical Certificate in Oil and Gas Operational Safety is designed specifically for industry specialists with day-to-day safety responsibilities including managers, supervisors and health and safety advisers. It focuses on operational process safety and is intended to enable candidates to apply and implement effective process safety management across all areas of their operation and throughout the world.

This course can be delivered within an organisation, or employees can attend accredited training courses run throughout the UK by our network of accredited course providers. NEBOSH accredited course providers offer a variety of flexible course formats, so training can be arranged according to employer needs.

1.2 Qualification level and UK accreditation

This qualification *is intended* to be accredited by the Scottish Qualifications Authority (SQA – www.sqa.org.uk) for delivery across the UK and internationally. It is *intended to be* rated at Level 7 in the Scottish Credit and Qualifications Framework (SCQF), higher than NEBOSH National General Certificate standard.

For users in England, Wales and Northern Ireland, this is broadly comparable to a Vocationally-Related Qualification (VRQ) at Level 4 in the Qualifications and Credit Framework (QCF), comparable to Higher National Certificate (HNC) standard.

This means that the **estimated** level of the International Technical Certificate in Oil and Gas Operational Safety is around SCQF Level 7. This qualification/learning programme has not been subject to quality assured processes of credit rating which would establish a definite SCQF level. This qualification/learning programme is therefore not on the SCQF, does not have any awarded SCQF credit points and this estimated level is an approximation only and not the actual level.

For further information on level comparisons please see the qualification regulator's *"Qualifications can cross boundaries"* document available from the SQA website (www.sqa.org.uk).

1.3 Key topics covered

- Health, safety and environmental management in context
- Hydrocarbon process safety
- Fire protection and emergency response
- Logistics, transport operations.

1.4 Course tuition and private study time requirements

Unit IOG1: 34 hours tuition and 20 hours private study **Total: 54 hours**

A programme of study therefore needs to be based around a minimum of **34 taught hours** and approximately **20 hours of private study** for an overall total of **54 hours.**

A full-time block release course would be expected to last for a minimum of one week (five working days) and a part-time day release course would be spread over at least five 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.

Quoted hours *do not* include assessment time, ie, sitting the written examination (see 1.5).

1.5 Entry requirements

NEBOSH does not set specific formal entry requirements for this qualification. However it should be noted that:

The achievement of the NEBOSH International General Certificate in Occupational Health and Safety (IGC) or equivalent prior to undertaking the International Technical Certificate in Oil and Gas Operational Safety course is highly recommended. This qualification is designed as a specialist sector-specific supplement to the NEBOSH International General Certificate in Occupational Health and Safety (IGC) rather than to replace knowledge and understanding of general health and safety gained as part of the IGC. Further information regarding the NEBOSH International General Certificate can be found via our website: www.nebosh.org.uk

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. For example, previous experience in the oil and gas industry and an understanding of related processes is desirable.

1.6 Minimum standard of English required for candidates

The standard of English required by candidates studying for the NEBOSH International Technical Certificate in Oil and Gas Operational Safety 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.

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 **6.0** or higher in IELTS tests in order to be accepted onto a NEBOSH International Technical Certificate in Oil and Gas Operational Safety 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/institutions/faqs.aspx.

1.7 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.

1.8 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.

1.9 Qualification type

NEBOSH qualifications are categorised as 'Other' qualifications by SQA Accreditation in Scotland. These are categorised as 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 combine the testing of knowledge and understanding in written examinations with practical application of learning in the workplace.

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

1.10 Qualification progression

Candidates wishing to further develop their health and safety expertise may consider studying:

- NEBOSH National Diploma in Occupational Health and Safety

This is designed to provide students with the expertise required to undertake a career as a health and safety practitioner and also provides a sound basis for progression to postgraduate study.

Candidates looking to use their expertise overseas may consider:

- NEBOSH International General Certificate in Occupational Health and Safety

This qualification focuses on international standards and management systems rather than UK legislation.

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

1.11 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.

1.12 Examination dates

'Standard' examination dates for this qualification are available in March, June, September and December annually. Accredited course providers may also request 'on-demand' examinations on a date of their choosing for this qualification.

1.13 Specification date

The May 2010 specification for this qualification replaces the previous August 2009 specification for all examinations from (and including) 1 August 2010.

1.14 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.

1.15 Further information for candidates

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

1.16 Further information for accredited course providers

Further information for accredited course providers including policies and procedures can be found in the accredited course providers' section of the NEBOSH website.

2. Qualification structure

2.1 Unit assessment

The International Technical Certificate in Oil and Gas Operational Safety (May 2010 specification) consists of one unit:

Unit IOG1: Management of international oil and gas operational safety

- Unit IOG1 is a taught unit, assessed by a two-hour written examination
- The written examination consists of ten 'short-answer' questions (8 marks each) and one 'long-answer' question (20 marks); all questions are compulsory
- The examination paper covers the whole unit syllabus
- Candidate scripts are marked by external examiners appointed by NEBOSH
- A sample question paper can be found in Section 5.

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 Unit pass standard

The pass standard for the unit may vary according to pre-determined criteria but is normalised to 45%.

2.3 Qualification grades

When candidates have passed the unit a final grade is awarded as follows:

Pass	45 - 54 marks
Credit	55 - 64 marks
Distinction	65 marks or more

2.4 Qualification parchment

Once a candidate has achieved a Pass and the qualification grade awarded they are normally considered to have completed the qualification and a qualification parchment will be issued within 40 working days of the result declaration date.

However, once the result 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 for the purposes of improving a grade
- Submit an Enquiry About Result (EAR) request (see Section 3.3).

2.5 Re-sitting examinations

If a candidate's performance in the unit is lower than a pass, the candidate may re-register at a later date if they so wish.

Candidates who wish to improve the mark from a unit they have successfully passed in order to improve their qualification grading to a credit or distinction, may do so. The candidate must notify NEBOSH in writing if they wish to do this (see section 2.6). There is no limit to the number of re-sits.

Candidates who register for the International Oil and Gas Certificate whilst awaiting a result from a previous sitting of an examination for the same qualification may not seek a refund of the registration fee if they retrospectively claim exemption from any part of the qualification, subsequent to the issue of the awaited 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 a practical examination) 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 moderate 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 of the date of issue of the result to which it relates.

For details see the NEBOSH *"Enquiries About Result (EARs) 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 Technical Certificate in Oil and Gas Operational Safety (May 2010 specification)

Structure

The qualification consists of one unit. Unit IOG1 is divided into five elements.

Unit IOG1: Management of international oil and gas operational safety

4.1 Unit IOG1: Management of international oil and gas operational safety

Element 1: Health, safety and environmental management in context

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. In particular they should be able to:

1.1 Explain the purpose of and procedures for investigating incidents and how the lessons learnt can be used to improve health and safety in the oil and gas industries

1.2 Explain the hazards inherent in oil and gas arising from the extraction, storage, and processing of raw materials and products

1.3 Outline the risk management techniques used in the oil and gas industries

1.4 Explain the purpose and content of an organisation's documented evidence to provide a convincing and valid argument that a system is adequately safe in the oil and gas industries.

Content

1.1 Learning from incidents

- Investigating incidents (including near misses) and effective identification of the root causes and making recommendations for improvement
- The importance of learning lessons from major incidents, management, cultural, and technical failures (ie process failures) that may lead to such incidents.

1.2 Hazards inherent in oil and gas

- Meaning and relevance of:
  - flash point
  - vapour density
  - vapour pressure
  - flammable; highly flammable; extremely flammable
  - upper flammable limit, lower flammable limit and the risk from working within these limits
  - toxicity
  - skin irritant
  - carcinogenic properties
- Properties and hazards of gases – hydrogen, methane, liquid petroleum gas (LPG), liquefied natural gas (LNG), nitrogen, hydrogen sulphide and oxygen
- Properties and hazards of associated products and control measures:

- additives eg, anti-foaming, anti-wetting agents
- micro-biocides
- corrosion preventatives
- refrigerants
- water/steam
- mercaptans
- drilling muds
- sludges (including low specific activity (LSA) sludges).

1.3 Risk management techniques used in the oil and gas industries

- The purposes and uses of risk assessment techniques, qualitative and quantative techniques (and why they differ from 5-steps approach)
- How risk management tools are applied in process safety risk identification and assessment, application in project phases from concept, design, start-up, the concept of ALARP and the management of major incident risks
- Industry related process safety standards, inherent safe and risk based design concepts, engineering codes and good practice.
- The concept of hazard realisation – for example loss of containment leading to ignition, leading to explosion/fire, leading to damage/injury
- The concept of risk control using barrier models (barrier between hazard and hazard realisation)
- Use of modelling such as thermal radiation output, blast zones for risk identification.

1.4 An organisation's documented evidence to provide a convincing and valid argument that a system is adequately safe

- Examples of documented evidence eg, safety cases and safety reports
- Where such documented evidence is used (legal requirement/good practice)
- The purpose of documented evidence such as safety cases and safety reports
- The typical content of documents such as safety cases and safety reports in relation to:
  - identification of all major accident hazards
  - evaluation of all major accident risks and measures taken, or to be taken to control those risks
  - arrangements for audit and audit reports
  - having an adequate safety management system, including the management of contractors and sub-contractors (and major accident prevention policy in the case of safety reports)
  - emergency plan.

Tutor references

The Process Safety Leadership Group final report on Safety and Environmental Standards for Fuel Storage Sites http://www.hse.gov.uk/comah/buncefield/fuel-storage-sites.pdf

U.S. Chemical Safety and Hazard Investigation Board Final Investigation Report No. 2005-01-I-TX March 2007 (Texas City March 23, 2005) at: http://www.csb.gov/completed_investigations/docs/CSBFinalReportBP.pdf

The Report of the BP U.S. refineries independent safety review panel (January 2007) at: http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/SP/STAGING/local_assets/assets/pdfs/Baker_panel_report.pdf

The Buncefield Incident 11 December 2005 The final report of the Major Incident Investigation Board http://www.buncefieldinvestigation.gov.uk/reports/index.htm#final

The Australian Government report into the Longford Disaster

ISO 17776 Petroleum and natural gas industries, Offshore production installations, Guidance on tools and techniques for hazard identification and risk assessment

The Offshore Installations (Safety Case) Regulations 2005

Preparing safety reports: Control of Major Accidents Hazards Regulations 1999. (HSE) HSG190

The Public Enquiry into the Piper Alpha Disaster, Cullen, The Honourable Lord, The Stationery Office, 1990 ISBN: 9780101131025 or

Kletz, T.A., Learning from Accidents, 3rd edition, 2001, Chapter 17. Gulf, ISBN 0-7506-4883-X

Kletz, T A: What Went Wrong? Case Histories of Process Plant Disasters(1998) Gulf, ISBN 0-88415-920-5

Kletz, T A : Still Going Wrong: Case Histories of Process Plant Disasters and How They Could Have Been Avoided (2003) Gulf, ISBN 0-7506-7709-0

Incidents that Define Process Safety John Wiley and Sons, ISBN978 -0-470-12204-4

Step Change in Safety at: http://stepchangeinsafety.net

Energy Institute Guidance on investigating and analysing human and organisational factors aspects of incidents and accidents (May 2008) ISBN 978 085293 521 http://www2.energyinstpubs.org.uk/pdfs/817.pdf

Recommended tuition time not less than 12 hours

Element 2: Hydrocarbon process safety 1

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. In particular they should be able to:

2.1 Explain the principles of assessing and managing contractors, including the roles of parties involved

2.2 Outline the tools, standards, measurement, competency requirements and controls applicable to Process Safety Management (PSM) in the oil and gas industries

2.3 Explain the role and purpose of a permit-to-work system

2.4 Explain the key principles of safe shift handover

2.5 Explain the importance of safe plant operation and maintenance of hydrocarbon containing equipment and processes

2.6 Outline the hazards, risks and controls to ensure safe start up and shut down of hydrocarbon containing equipment and processes.

Content

2.1 Contractor management

- Scale of contractor use
- Contractor management, ownership and site supervision/ representation
- Contractor responsibilities
- Safe handover, understanding the hazards.

2.2 Process Safety Management (PSM)

- The controls available in PSM , including:
  - spacing of operating plant
  - positioning and protection of control rooms and critical equipment, specifically occupied building assessment, temporary refuge (offshore) and the critical safety systems associated with temporary refuge integrity (fire resistance, blast resistance, HVAC, access to evacuation means etc)
- Management of change controls:
  - risk assessment and authorisation of changes by competent persons.

2.3 Role and purpose of a permit-to-work system

- Role and purpose of a permit-to-work system
- The key features of a permit-to-work system
- Types of permit

- Interfaces with adjacent plant
- Interfaces with contractors
- Lock out, tag out and isolation.

2.4 Key principles of safe shift handover

- Placing greater reliance on written communication between handover of 12-hour shifts
- Two-way with both participants taking joint responsibility
- Shift handover should be:
  - high priority and conducted face to face
  - two-way with both participants taking joint responsibility
  - done using verbal and written communication
  - based on analysis of the information needs of incoming staff
  - given as much time as necessary.

2.5 Plant operations and maintenance

- Asset integrity, including inspection, testing, maintenance, corrosion prevention, competency and training
- Risk based maintenance and inspection strategy
- Techniques, principles, and importance of safe operation, standard operation procedures and maintenance
- Control of ignition sources during maintenance and operations
- Cleaning and gas freeing; purging; venting; draining of water, product, oxygen and non-condensables (NCD), and inerting.

2.6 Start up and shut down

- Hazards and controls associated with:
  - safe start up, shut down
  - water and hydrates presence and removal
  - testing, commissioning and hook up.

Tutor references

The Process Safety Leadership Group final report on Safety and Environmental Standards for Fuel Storage Sites http://www.hse.gov.uk/comah/buncefield/fuel-storage-sites.pdf

USA Occupational Safety and Health Administration (OSHA) Process safety management of highly hazardous chemicals (Standards - 29 CFR 1910.119)

Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control - Butterworth-Heinemann Ltd; ISBN – 13: 978-0-7506-7555-0

T. Kletz: What Went Wrong? Case Histories of Process Plant Disasters(1998) Gulf, ISBN 0-88415-920-5

T. Kletz: Still Going Wrong: Case Histories of Process Plant Disasters and How They Could Have Been Avoided (2003) Gulf, ISBN 0-7506-7709-0

BSEN ISO 15544 Petroleum and natural gas industries - Offshore production installations - Requirements and guidelines for emergency response

API Corrosion management

Human factors: Safety critical communications: http://www.hse.gov.uk/humanfactors/comah/safetycritical.htm)

Safe Ups and Downs for Process Units (BP Process Safety Series) The Institution of Chemical Engineers; 2nd Revised edition (30 July 2006) ISBN 978-0852955024

Guidance on permit-to-work systems: A guide for the petroleum, chemical and allied industries (HSE) HSG 250 ISBN 9780717629435

Recommended tuition time not less than 8 hours

Element 3: Hydrocarbon process safety 2

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. In particular they should be able to:

3.1 Outline types of failure modes that may lead to loss of containment from hydrocarbons

3.2 Outline types of failures that may lead to loss of containment from hydrocarbons

3.3 Outline the controls available to maintain safety critical equipment

3.4 Outline the hazards, risks and controls available for safe containment of hydrocarbons offshore and onshore

3.5 Outline the fire hazards, risks and controls relating to hydrocarbons

3.6 Outline the hazards, risks and controls available for operating boilers and furnaces.

Content

3.1 Failure modes

- Creep
- Stress
- Stress corrosion cracking
- Thermal shock
- Brittle fracture
- What is meant by a ‘safe operating envelope’
- Use of knowledge of failure modes in initial design, process and safe-operating procedures
- Failure of the annular rim (bottom rim of storage tank).

3.2 Other types of failures

- Weld failures – the need for regular weld inspection and non-destructive inspection techniques

3.3 Safety critical equipment controls

- Emergency shutdown (ESD) equipment and systems
- Safety integrity levels (SIL) for instrumentation
- Procedures for bypassing ESD – not to bypass without consideration of consequences – testing and logging
- Blow down facilities, flare types
- Closed and open drain headers, sewers, interceptors.

3.4 Safe containment of hydrocarbons

- Hazards and risks including overfilling, effects of vacuum, overloading of foundations and failure modes for tank shells and associated pipe work
- Floating roof tanks (both external and internal roof types), landing the roof, sinking the roof and rim seal fires/failures
- Fixed roof storage tanks, pressure and vacuum hazards
- Bunding of storage tanks including volume and area sizing, construction and valving arrangements
- Filling of tanks, overfilling/alarms/tanker connections
- Pressurised / refrigerated vessels for LPG/LNG/CO2
- Loss of containment and consequences
  - jet fires, pool fires
  - how hydrocarbon vapour clouds are generated and potential consequences
  - BLEVE's, CVCE's and UVCE's
  - pipelines (eg, protection of pipelines, surveying, maintenance, security against arson and illegal tapping)
- Decommissioning of plant and associated facilities (an overview)
- Management of simultaneous operations.

3.5 Fire hazards, risks and controls

- Lightning
- Fire triangle and the potential consequences:
  - explosions
  - thermal radiation
- Electrostatic charges, how they are generated and controlled
- The identification of ignition sources
- Zoning / hazardous area classification, and selection of suitable ignition protected electrical and mechanical equipment and critical control equipment.

3.6 Furnace and boiler operations

- Use of furnace and boiler operations
- Hazards and risks of operating boilers and furnaces in particular those arising from loss of pilot gas supply, over firing, flame impingement firebox over pressure, low tube flow, control of tube metal temperature (TMT).

Tutor references

The Process Safety Leadership Group final report on Safety and Environmental Standards for Fuel Storage Sites http://www.hse.gov.uk/comah/buncefield/fuel-storage-sites.pdf

T. Kletz: What Went Wrong? Case Histories of Process Plant Disasters (1998) Gulf,

SBN 0-88415-920-5

T. Kletz: Still Going Wrong: Case Histories of Process Plant Disasters and How They Could Have Been Avoided (2003) Gulf, ISBN 0-7506-7709-0

API Corrosion management

Safety and environmental standards for fuel storage sites Buncefield Standards Task Group (BSTG) Final report http://www.hse.gov.uk/comah/buncefield/bstgfinalreport.pdf

Energy Institute: Guidance for corrosion management in oil and gas production and processing ref: 978 0 85293 497 5

Energy Institute: Corrosion threats handbook - Upstream oil and gas production plant (A6) Date: Dec 2008 ref: 978 0 85293 496 8

Human factors: Safety critical communications: http://www.hse.gov.uk/humanfactors/comah/safetycritical.htm)

Recommended tuition time not less than 8 hours

Element 4: Fire protection and emergency response

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. In particular they should be able to:

4.1 Outline appropriate control measures to minimise the effects of fire and explosion in the oil and gas industries

4.2 Outline the principles, procedures and resources for effective emergency response.

Content

4.1 Fire and explosion in the oil and gas industries

- Leak and fire detection systems, including spot, line, zone, flame, and heat detection systems
- Passive fire protection, including hydrocarbon and cellulostic passive fire protection of structures and equipment supports, such as bulkheads, vessels, columns, spheres, flare supports
- Active water based fire protection systems, both onshore and offshore, including manual and automatic operation features
- Chemical/foam based extinguishing systems (which system; use of correct media for risk trying to mitigate)
- Inert extinguishing systems
- Examples of fire protection systems and their function for equipment specific types, including; floating roof tanks, process modules, spheres, gas turbines and compressors.

4.2 Emergency response

- Emergency Plan
  - role and importance of Emergency Plan (as part of safety case link to element 1.4)
  - content of Emergency Plan
  - fire and explosion strategy and detailing of it to specific risk based fire protection features
- Alarms – importance of response
- Medical emergency planning, tiered response, medical evacuation procedures and back up resources
- Principles of escape evacuation and rescue from on-shore facilities and offshore platforms, including primary, secondary and tertiary escape devices for offshore
- Roles and operation of fire teams onshore and offshore in upstream and downstream facilities
- Training and drills

- External support agencies and resource liaison, including municipal and offshore
- Liaison with emergency services.

Tutor references

The Process Safety Leadership Group final report on Safety and Environmental Standards for Fuel Storage Sites http://www.hse.gov.uk/comah/buncefield/fuel-storage-sites.pdf

Fire systems integrity assurance (OGP Report No. 6.85/304)

ISO 13702 Petroleum and natural gas industries - Control and mitigation of fires and explosions on offshore production installations -- Requirements and guidelines

API recommended Practice no 2021 Management of Atmospheric Tank Fires

Recommended tuition time not less than 4 hours

Element 5: Logistics and transport operations

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. In particular they should be able to:

5.1 Identify the main hazards of and suitable controls for marine transport in the oil and gas industries

5.2 Identify the main hazards of and suitable controls for land transport in the oil and gas industries.

Content

5.1 Marine transport

- Hazards of vessels and working over water; floating liquefied natural gas (LNG), floating production storage offloading units (FPSO's) floating storage units (FSU's), floating off-loading, supply vessels, drilling rigs, construction barges
- Loading and unloading of vessels at marine terminals
- Control of marine operations, certification of vessels, inspection and approvals
- Roles and responsibilities of marine co-ordinators, masters and crews
- Personnel transfers and boarding arrangements
- Personal protective equipment suitability
- Diver operations.

5.2 Land transport

- Tankers
  - UN 'classification' and transport of hazardous materials
  - protection of plant against vehicles striking plant
  - driver training
  - filling arrangements
- Traffic management
  - on site
  - routes
- Rail.

Tutor references

Oil Companies International Marine Forum Guideline

Guidelines for managing marine risks associated with FPSOs (OGP Report No. 377)

Recommended Tuition time not less than 2 hours

5. Sample question paper

5.1 Unit IOG1: Management of international oil and gas operational safety

THE NATIONAL EXAMINATION BOARD IN OCCUPATIONAL SAFETY AND HEALTH

UNIT IOG1: Management of international oil and gas operational safety

[DATE]
2 hours, 1400 to 1600

Answer both Section 1 and Section 2. Answer **ALL** questions.

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

Start each answer on a new page.

Answers may be illustrated by sketches where appropriate.

This question paper must be returned to the invigilator after the examination.

SECTION 1

You are advised to spend about **half an hour** on this section, which contains **ONE** question.

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1 Many serious accidents or incidents, including the Piper Alpha disaster in 1988, involve root causes associated with shift handover.

An outgoing operator is handing over to an incoming operator at the end of a shift.

(a) **Explain** the key principles of safe shift handover.
Information on specific operational issues is not required in part a. **(10)**

(b) **Outline** the main operational issues communicated at shift handover. **(10)**

SECTION 2

You are advised to spend about **one and a half hours** on this section, which contains **TEN** questions.

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2 (a) **Identify** the hazardous properties of Liquid Petroleum Gas (LPG). **(4)**

(b) **Outline** the risks associated with Liquid Petroleum Gas (LPG). **(4)**

3 Safety cases and safety reports provide documented evidence that an oil and gas installation is safe.

Outline the typical content of these types of documents. **(8)**

4 (a) **Identify THREE** *marine* hazards associated with all types of Floating Platform Storage Offloading Units (FPSO's). **(3)**

(b) **Identify** suitable controls that minimise risk when operating Floating Platform Storage Offloading Units (FPSO's). **(5)**

5 An oil installation contains a vessel that requires protection from fire exposure in the form of active or passive fire protection.

(a) **Identify TWO** examples of *passive* fire protection to protect vessels. **(2)**

(b) **Outline** why the metal legs of the vessel should be protected. **(2)**

(c) **Outline** how a fixed water deluge system could provide fire protection. **(2)**

(d) **Identify TWO** additional examples of *active* fire protection. **(2)**

6 **Outline** the following failure modes that may lead to loss of hydrocarbon containment from storage tanks/vessels or pipelines:

(a) creep; **(2)**

(b) stress corrosion cracking; **(2)**

(c) thermal shock; **(2)**

(d) brittle fracture. **(2)**

7 **Outline FOUR** types of work activity associated with an oil platform that might require a permit-to-work **AND give** a reason in **EACH** case for the requirement. **(8)**

8 A large oil company is proposing to build a new oil and gas installation in the North Sea. The Process Safety Management Team is analysing past incidents and database records from the Oil and Gas Industry.

Excluding active and passive fire protection systems, **outline** physical design features of the platform that would minimise risk to operating personnel in the event of a major incident. **(8)**

9 (a) **Identify TWO** ways in which vapour clouds can be generated. **(2)**

(b) **Outline** how a vapour cloud explosion can be generated. **(4)**

(c) **Identify** the physical consequences of vapour cloud explosions. **(2)**

10 An operator is draining a flammable liquid from process pipework to a metal container. The supervisor is concerned about the possibility of an electrostatic charge forming and stops this operation until a risk assessment is undertaken. During this work activity:

(a) **identify** factors that influence the generation of the electrostatic charge; **(4)**

(b) **outline** practical ways of minimising the formation of an electrostatic charge. **(4)**

11 An employee was seriously injured in an accident at work within an oil and gas installation.

Identify the *documented information* that might be used by the investigating team to determine the causes of this accident. **(8)**

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