

January 2013

Examiners' Report

NEBOSH National Diploma in Occupational Health and Safety - Unit C



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NEBOSH NATIONAL DIPLOMA IN OCCUPATIONAL HEALTH AND SAFETY

Unit C: Workplace and work equipment

JANUARY 2013



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Introduction

NEBOSH (The National Examination Board in Occupational Safety and Health) was formed in 1979 as an independent examining board and awarding body with charitable status. We offer a comprehensive range of globally-recognised, vocationally-related qualifications designed to meet the health, safety, environmental and risk management needs of all places of work in both the private and public sectors. Courses leading to NEBOSH qualifications attract around 35,000 candidates annually and are offered by over 500 course providers, with exams taken in over 100 countries around the world. Our qualifications are recognised by the relevant professional membership bodies including the Institution of Occupational Safety and Health (IOSH) and the International Institute of Risk and Safety Management (IIRSM).

NEBOSH is an awarding body to be recognised and regulated by the Scottish Qualifications Authority (SQA).

Where appropriate, NEBOSH follows the latest version of the “GCSE, GCE, *Principal Learning and Project Code of Practice*” published by the regulatory authorities in relation to examination setting and marking. While not obliged to adhere to this code, NEBOSH regards it as best practice to do so.

Candidates’ scripts are marked by a team of Examiners appointed by NEBOSH on the basis of their qualifications and experience. The standard of the qualification is determined by NEBOSH, which is overseen by the NEBOSH Council comprising nominees from, amongst others, the Health and Safety Executive (HSE), the Confederation of British Industry (CBI), the Trades Union Congress (TUC) and the Institution of Occupational Safety and Health (IOSH). Representatives of course providers, from both the public and private sectors, are elected to the NEBOSH Council.

This report on the examination provides information on the performance of candidates which it is hoped will be useful to candidates and tutors in preparation for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content and the application of assessment criteria.

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General comments

Many candidates are well prepared for this unit assessment and provide comprehensive and relevant answers in response to the demands of the question paper. This includes the ability to demonstrate understanding of knowledge by applying it to workplace situations.

There are always some candidates, however, who appear to be unprepared for the unit assessment and who show both a lack of knowledge of the syllabus content and a lack of understanding of how key concepts should be applied to workplace situations.

In order to meet the pass standard for this assessment, acquisition of knowledge and understanding across the syllabus are prerequisites. However, candidates need to demonstrate their knowledge and understanding in answering the questions set. Referral of candidates in this unit is invariably because they are unable to write a full, well-informed answer to one or more of the questions asked.

Some candidates find it difficult to relate their learning to the questions and as a result offer responses reliant on recalled knowledge and conjecture and fail to demonstrate a sufficient degree of understanding. Candidates should prepare themselves for this vocational examination by ensuring their understanding, not rote-learning pre-prepared answers.

Candidates should therefore note that Examiners' Reports are **not** written to provide 'sample answers' but to give examples of what Examiners were expecting and more specifically to highlight areas of under performance.

Common pitfalls

It is recognised that many candidates are well prepared for their assessments. However, recurrent issues, as outlined below, continue to prevent some candidates reaching their full potential in the assessment.

- Many candidates fail to apply the basic principles of examination technique and for some candidates this means the difference between a pass and a referral.
- In some instances, candidates do not attempt all the required questions or are failing to provide complete answers. Candidates are advised to always attempt an answer to a compulsory question, even when the mind goes blank. Applying basic health and safety management principles can generate credit worthy points.
- Some candidates fail to answer the question set and instead provide information that may be relevant to the topic but is irrelevant to the question and cannot therefore be awarded marks.
- Many candidates fail to apply the command words (also known as action verbs, eg describe, outline, etc). Command words are the instructions that guide the candidate on the depth of answer required. If, for instance, a question asks the candidate to 'describe' something, then few marks will be awarded to an answer that is an outline. Similarly the command word 'identify' requires more information than a 'list'.
- Some candidates fail to separate their answers into the different sub-sections of the questions. These candidates could gain marks for the different sections if they clearly indicated which part of the question they were answering (by using the numbering from the question in their answer, for example). Structuring their answers to address the different parts of the question can also help in logically drawing out the points to be made in response.
- Candidates need to plan their time effectively. Some candidates fail to make good use of their time and give excessive detail in some answers leaving insufficient time to address all of the questions.
- Candidates should also be aware that Examiners cannot award marks if handwriting is illegible.
- Candidates should note that it is not necessary to start a new page in their answer booklet for each section of a question.

UNIT C – Workplace and work equipment

Section A – all questions compulsory

Question 1 *Ten artists work alone at their individual home premises making ceramic tiles. They use gas-fuelled firing kilns and 2m high, electric-powered clay mixers, which are located in outbuildings.*

Outline risks associated with this work **AND outline** appropriate controls to reduce these risks.

(10)

This question related to Element C1 of the syllabus and assessed candidates' knowledge of learning outcome C1.6: *Explain the hazards, risks and controls for lone working.*

This question presented few difficulties to well-prepared candidates and many gave good responses. However those who did not convert the hazards identified into outlines of risks and then outline the associated controls could not be awarded the marks. Many candidates outlined many more risks than controls or vice versa. A failure to specify clear inter-relations between the two meant that candidates could not be awarded marks.

Some candidates performed less well because the controls outlined for a particular risk were not appropriate in the context of the question. Some candidates did not appreciate that the dusts likely to be generated in the context of this scenario would not be flammable and hence did not present an explosion risk. Few candidates outlined the suitable required controls for gas safety.

Many candidates did not fully understand the implications of this question. For example, most candidates managed to outline that lone working was the complicating factor in this scenario but then offered solutions to control the risks that were incongruous, eg adoption of a permit-to-work system and regular contact with their supervisor/manager. Some candidates outlined the risks in detail but were superficial in their recommendations for controlling the risks, eg wear suitable protective clothing, have the gas system tested. At Diploma level, the expectation is for answers to be much more definitive and specific.

Some candidates envisaged situations that created heat exhaustion, dust explosions and RPE risks from an activity that could be described as low risk and where sensible precautions would have been adequate.

Question 2 **Outline** specific causes of:

(a) *lateral instability;* (5)

(b) *longitudinal instability* (5)

in counterbalanced forklift trucks.

This question related to Element C7 of the syllabus and assessed candidates' knowledge of learning outcome C7.1: *Describe the main hazards and control measures associated with commonly encountered mobile work equipment.*

This question deals with causative factors in lateral and longitudinal instability. Most candidates performed well but those who confused the two types of instability gained little or no marks. Additionally, some candidates appeared uncertain in that they made no attempt to define which instability they were describing.

Marks were not awarded where candidates stated that longitudinal instability occurred due to going up or down slopes without stating the important fact regarding which way the load was being carried. In a couple of cases, it was obvious that candidates were not comfortable with what a forklift truck was because they were talking about instability being caused because they didn't have their outriggers deployed. Some candidates gave reasons for instability such as changing the counterbalance on the truck. Many candidates did not know the difference between lateral and longitudinal movement.

Question 3 *A rectangular, steel-framed warehouse, measuring 40m x 100m and 18m high, was severely damaged in a storm. One of the long coated steel walls suffered catastrophic failure, which in turn caused the flat roof of the warehouse to collapse and the other coated steel walls to buckle.*

Outline the health and safety issues to be considered when planning the subsequent demolition of the damaged warehouse. (10)

This question related to Element C9 of the syllabus and assessed candidates' knowledge of learning outcome C9.4: *Explain the hazards, precautions and safe working practices associated with demolition.*

Many candidates performed well with a generally good understanding of issues. Maximum marks were awarded in many instances. While most candidates showed a reasonable appreciation of the hazards and controls associated with demolition, few gave a good outline of the CDM requirements – other than to simply mention “CDM control applies”.

It is noteworthy that some candidates wrote extensively about the health effects that may be encountered during the work topics such as sunburn, Weil's Disease, vibration, noise and heat exhaustion all figured, in some cases to the detriment of significant safety issues. It is important that candidates remember that the marks for this question will prioritise Unit C responses over those that are more properly covered by the Unit B syllabus. Better answers clearly outlined the safety issues to be addressed in such a workplace scenario and in use of appropriate plant and equipment.

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- Question 4** *Sparking, caused by electrostatic discharge, is a significant ignition source of flammable atmospheres.*
- (a) **Outline** the mechanism by which electrostatic discharge of static electricity occurs. (6)
- (b) **Outline** a range of control measures to reduce the risk of electrostatic discharge ignition of flammable atmospheres. (4)
-

This question related to Element C2 of the syllabus and assessed candidates' knowledge of learning outcomes C2.1: *Outline the properties of flammable and explosive materials and the mechanisms by which they ignite* and C2.3: *Outline the main principles and practices of fire and explosion prevention and protection.*

This question was not well answered and demonstrated a significant gap in candidates' knowledge. Poor understanding of electrical principles was displayed. Very few candidates could actually describe the mechanism by which discharge of static electricity occurs. The better answers did, at least, give an outline of 'caused by friction' and 'items pulling apart', with some mention of + and – charging and potential difference being created.

After a basic outline, a number of candidates provided further information about tankers and control of flammable atmospheres rather than prevention or control of the static discharge.

For part (b), most candidates outlined equipotential bonding to earth and the use of anti-static clothing/footwear but few could come up with other alternatives.

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- Question 5** *A system to undertake the periodic examination and testing of portable electrical appliances is to be introduced.*
- (a) **Outline** factors that would determine the frequency that the examination and testing should be introduced. (5)
- (b) **Outline** factors, other than the frequency of examination and testing, that should be considered when introducing such a system. (5)
-

This question related to Element C8 of the syllabus and assessed candidates' knowledge of learning outcomes C8.3: *Outline the issues relevant to the installation, use, inspection and maintenance of electrical systems* and C8.5: *Outline the main hazards, risks and controls associated with the use of portable electric equipment.*

Responses to this question were, in the main, adequate. However some candidates restricted the marks available to them by including some answers appropriate to part (a) in part (b).

A number of candidates outlined the major issues ie age, environment, type of risk and amount of use but then failed to develop their answers further. Statements like "who uses the equipment" were given as an answer without any quantification of why you would want to know who uses the equipment ie their competence, ability, etc. In part (b) of the question, some candidates just reprised the same information that they had used in part (a), subsequently attracting little or no extra marks.

Question 6

On 20 December 1984, at Summit Tunnel on the Yorkshire / Lancashire border near Todmorden, a train carrying about 835 tonnes of petrol in 13 rail tanks was derailed due to a defective axle bearing on the fourth tank. Only the locomotive and the first 3 tanks remained on the rails. Petrol leaking from a tanker ignited and set off a series of events that led to an intense fire in the tunnel, which reached temperatures in excess of 1500°C.

(a) **Outline** the effects of the fire on the brick lining of the tunnel with respect to the performance of the material **AND** the structural integrity of the tunnel lining. (6)

(b) **Outline** the means by which the effects of such fires on brick structures might be mitigated. (4)

This question related to Element C2 of the syllabus and assessed candidates' knowledge of learning outcome C2.2: *Outline the behaviour of structural materials, buildings and building contents in a fire.*

Very few candidates actually knew the details of the Summit Tunnel accident and in consequence many answered erroneously and discussed fire in brick buildings. Even fewer candidates actually tried to relate their knowledge of brick performance in fire to the actual case study of the Summit Tunnel fire, but instead outlined what could happen in a tunnel. There were very few complete answers for part (b) either. Most of the examples given in part (b) were unsuited to this type of fire and major civil constructions and suggested that candidates may not have seen a compartmented tunnel. Likewise, the application of intumescent coatings was inappropriate in this situation. Even those candidates who were familiar with the accident were unable to capitalise on this knowledge to the benefit of their answers to part (b).

Most candidates had little or no knowledge of the incident or the outcome and due to this applied a theoretical scenario that in most answer scripts bore no resemblance to the incident. Knowledge of this incident (along with others) is a mandatory syllabus requirement, not qualified by an 'eg' prefix and the performance of materials and the structures formed from them can only truly be understood by application to real-life situations.

Section B – three from five questions to be attempted

Question 7

A non-computerised production line where tubes of toothpaste are filled, capped and packed manually by employees is to be relocated. The relocation will require dismantling the production line and installing it at the new location.

Explain the possible risks associated with the use of the production line arising out of its relocation. (20)

This question related to Element C5 of the syllabus and assessed candidates' knowledge of learning outcome C5.2: *Explain how risks to health and safety arising from the use of work equipment are controlled.*

This question should have presented few difficulties. A familiar scenario based on candidates' own experiences within their workplaces should have provided the necessary

pointers. However, answers were frequently disappointing with generally low marks. A working knowledge of the requirements of PUWER would have helped candidates identify the areas worthy of attention in deciding what might go wrong when you attempt to use a machine that has just been re-assembled following a move from a different location. Many candidates answered with questions and not statements or provided incomplete answers, not saying there was a risk of 'x' caused by or due to 'y'. Many candidates answered with problems not risks and talked about dismantling and not relocation. Many candidates tried to deal with workplace issues rather than the risks associated with the use of the production line in a new location.

Two main issues arose in the question. One of the issues is fundamental to health and safety in that it is the definition of risk. The question clearly stated 'explain the risks associated with the use of the production line arising out of its relocation'. Risk is the product of likelihood and consequence of a hazardous occurrence. What most candidates did in fact was to create a hazard list out of the relocation. The list of hazards is only part of the story and what was needed were the possible consequences to people should the hazardous occurrence manifest itself. Candidates who did not provide a complete answer could not be awarded marks. The other issue that was apparent in this question is that some candidates concentrated on non-health and safety issues that may arise out of the relocation. They discussed product quality, efficiency of the production line and financial consequences but little was said about the health and safety issues for operatives. These candidates therefore limited the marks available to them.

Question 8

An exothermic chemical reaction is controlled from a panel that requires an operator to monitor a digital temperature display and press an emergency dump valve actuator to quench the reaction if a critical temperature is reached. The Health and Safety Executive has raised concern about the adequacy of relying on the operator to take the necessary action at the critical temperature. It is proposed to automate the quench activation by using a temperature detector (A) to trigger a programmable switch (B) that will operate a motorised valve (C). These components are connected in series as shown below in Fig.(i).

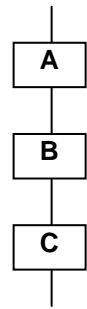


Fig. (i)

A HAZOP study recommends that the reliability of the activation system can be enhanced by parallel doubling of the redundancy of the detector and switch elements to activate the motorised valve. The enhanced arrangement is shown in Fig. (ii)

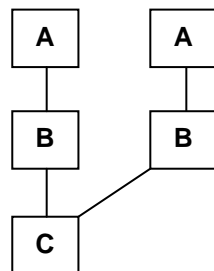


Fig. (ii)

Reliability data for the components is given below:

Component	Reliability
A	0.92
B	0.86
C	0.96

- (a) Using simple reliability theory, **calculate** the reliability of the system shown in Fig. (i). (2)
- (b) **Calculate** the improvement in reliability that would arise from using the parallel detection / switching arrangement shown in Fig. (ii) when compared with the simpler system shown in Fig. (i). (6)
- (c) Component reliability is not the only factor affecting reliable temperature detection. **Outline** factors to be considered when providing temperature detection for an exothermic reaction. (4)

- (d) **Identify** factors that should be taken into account when deciding whether to adopt either of the two automated systems described. (4)
- (e) **Outline** other reaction control measures that might be used as alternatives to the temperature-activated dump valve. (4)

This question related to Elements C4 and C6 of the syllabus and assessed candidates' knowledge of learning outcomes C4.1 *Outline the main physical and chemical characteristics of industrial chemical processes*; and C6.7: *Explain the analysis, assessment and improvement of system failures and system reliability with the use of calculations*.

This was the first occasion where a reliability calculation question has appeared in the Unit C paper. It was unpopular and when attempted, few candidates seemed to understand the consequential use of such calculations. Of those who did attempt it, very few had enough knowledge of chemical reactions to actually coherently explore their way through parts (c), (d) and (e). However, part (e) was better answered overall.

Most candidates who attempted the question were familiar with the initial calculation of reliability but they did less well when calculating the improvement in reliability. Few gained all of the marks that were available. Some candidates did not clearly identify their calculation methodology in order for the Examiner to gain a view into how they were thinking.

In part (c), the designed position of the probe pocket, the absence of insulating deposits and adequate agitation to produce homogeneous system temperature were among the factors that could have been included. For part (d), candidates failed to outline cost benefit analysis and consequence mitigations.

Question 9

Six false fire alarms were generated over a three month period at a warehouse used for the storage of stationery products. During this period the warehouse premises were being expanded. On each occasion, the local Fire and Rescue Authority attended the premises. After the last occasion, the Fire and Rescue Authority inspected the warehouse and discovered that the employees had failed to evacuate on all but the first occasion. They also discovered that neither testing nor maintenance had been carried out on the fire alarm system for five years.

- (a) **Outline** the enforcement action options the Fire and Rescue Authority may take as a result of their inspection findings. (10)
- (b) **Identify** the possible causes of the false alarms. (6)
- (c) **Identify** the actions the warehouse company should take to help ensure their employees respond appropriately to fire alarms. (4)

This question related to Element C3 of the syllabus and assessed candidates' knowledge of learning outcomes C3.1: *Outline the main legal requirements for fire safety in the workplace*; C3.3: *Describe common fire detection and fire alarm systems and procedures*; and C3.6: *Explain the purpose of, and essential requirements for, emergency evacuation procedures*.

The answers to this question were confused and, in the main, inappropriate. The scenario described is not a COMAH situation hence the FRR Order is enforced by the Fire and Rescue Authority with a differing suite of available enforcement actions.

This was a popular question. In part (a), many candidates did not know the correct titles of the notices and outlined only the HSE initiated notices. There were no marks for

information on misnamed notices. Some thought that the Fire and Rescue Authority would recommend prosecution but did not state who that recommendation would have gone to. A number talked of advice and guidance but in its nature, this is not an enforcement option. Many candidates performed well in part (b) although some missed the marks by identifying general maintenance issues rather than focussing on the activities described and how they may affect the alarm system. Almost all candidates were able to gain all the marks available to part (c).

A number of candidates did not stay focussed on the question and therefore produced scripts that were excessively long and vague in nature. When understood, many did not write enough to get high marks. Perhaps the biggest failing in part (a) was not to realise exactly why an Alteration Notice is served, although the understanding of the legal status of the enforcement hierarchy was confused throughout most responses.

-
- Question 10** *A pressurised steam boiler requires an examination. At the same time a repair on an electrically driven pump, associated with the boiler, is needed.*
- (a) **Outline** the meaning of the term 'relevant fluid' as referred to in the Pressure Systems Safety Regulations 2000. (4)
 - (b) **Outline** the typical contents of a written scheme of examination form for the statutory inspection of the boiler. (8)
 - (c) **Identify** the practical measures that should be taken in order to carry out the pump repair safely. (8)
-

This question related to Element C6 and C11 of the syllabus and assessed candidates' knowledge of learning outcomes C6.4: *Explain the principles of control associated with the maintenance of general workplace machinery*; C11.3: *Outline the key features and safety requirements for process pressure systems*; and C11.4: *Outline the likely causes of the failure of pressure systems and the testing and prevention strategies that can be used*.

Of the candidates attempting this question, the lack of knowledge regarding the definition of a 'relevant fluid' proved a frequent problem, even though it is a clear syllabus requirement. For the written scheme of examination, the overall majority outlined an inspection report rather than what the written scheme should show.

Answers to part (c) were better and most candidates managed to achieve good marks in this part with the practical measures for the control of simultaneous, mutually dependent tasks being well-recognised; including competence, workplace safeguards, procedural control by use of PTW and isolation issues being frequently included in answers.

-
- Question 11** ***Outline** the layout and structural design features that should be considered in order to minimise the risks associated with internal transport activities in the premises of a major logistics warehouse company.* (20)
-

This question related to Element C10 of the syllabus and assessed candidates' knowledge of learning outcome C10.1: *Explain the hazards, risks and control measures for safe workplace transport operations*.

Limited answers contained statements of what was needed to be achieved rather than how to do it. A surprisingly large number of candidates, even though they did very well, still went off-course in describing issues other than layout and structural design, and too many went on to design the warehousing and controlling its activities (such as high-vis

PPE and training) rather than the traffic routes. Some appeared not to know what a major logistics company's premises might contain.

Some candidates deviated from the question and gave information relating to the design of fire arrangements within the building, construction materials used and the design of racking systems for which no marks were available in a question about vehicle safety.



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