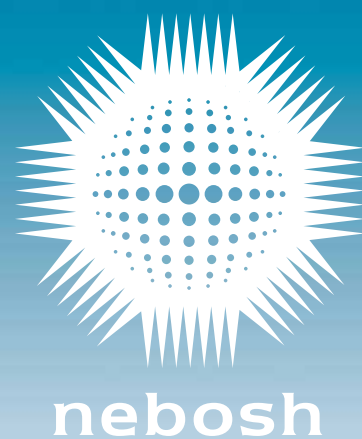


January 2011

Examiners' Report

NEBOSH National Diploma in Occupational Health and Safety - Unit B



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NEBOSH NATIONAL DIPLOMA IN OCCUPATIONAL HEALTH AND SAFETY

Unit B: Hazardous agents in the workplace

JANUARY 2011



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Introduction

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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 the question 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 any degree of understanding. Candidates should prepare themselves for this vocational examination by ensuring their understanding, not rote-learning pre-prepared answers.

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 are failing because they 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.
- 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.

UNIT B – Hazardous agents in the workplace

Section A – all questions compulsory

Question 1 *A small engineering company operates a number of noisy machines which are located in an open plan workshop.*

Following a noise survey the company discovers that their employees are being exposed to noise levels above the Upper Exposure Action Value of 85dB(A) $L_{EP,d}$.

Describe the range of technical control measures that could be introduced to reduce the employees' exposure to noise. (10)

For this question candidates would have been well advised to consider the range of technical control measures that could have been introduced under the general headings of those associated with the source, the transmission and the receiver. Thus, for instance, they could have suggested replacing older and noisier equipment with machines that emitted lower levels of noise; reducing the speed of the machines; mounting the noisy equipment on rubber strips or dampers; applying damping to metal panels on machines; fitting silencers on exhausts and metal ducting and ensuring the machinery was maintained on a regular basis. As for noise transmission, appropriate control measures would include the provision of a noise enclosure of suitable noise attenuating material around the main sources of noise; placing acoustic screens around noisy equipment; and lining the walls and floor of the workshop with acoustically absorbing material. Finally the exposure of noise to employees could be reduced by isolating the more noisy equipment in another area of the workshop and introducing automation and creating a noise haven for the employees. As a very last resort, the additional use of hearing protection might have to be considered.

Despite the requirement in the question for a description of technical control measures, a number of candidates included procedural controls in their answers such as training, or signage denoting hearing protection zones whilst others discussed at length the provision and management of hearing protection.

Question 2 (a) ***Identify the hazard classification system for lasers.*** **(2)**

(b) *Low power lasers are widely used to read bar-code labelled products at checkouts in retail premises.*

Outline:

(i) *the design features;* **(4)**

(ii) *the procedural controls* **(4)**

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

In answer to part (a) of the question, candidates were expected to identify that the classification of lasers is defined in a BS EN standard – BS EN 60825. The classifications are based on accessible emission levels with the power of the lasers measured in milliwatts (mW). There are seven different classifications – 1, 1M, 2, 2M, 3B, 3R, and 4 and marks were awarded to those who additionally identified the direction of increase (Class 1 being the lowest hazard level to Class 4 lasers which pose the greatest hazard). This part of the question was generally well answered with most showing knowledge of the classification system.

For part (b), design features that should be incorporated into laser equipment to ensure its safe operation and maintenance in retail premises include the laser having no greater power than Class 1; the use of embedded or enclosed systems; the fitting of a protective housing; trigger operation on hand held versions; incorporating a key control with interlock to the power source; the use of suitable signage; and the appropriate positioning of the laser, including hand-held equipment, to avoid eye-level exposure.

Procedural controls include strict observance of the manufacturer's guidance and training workers in the safe use of the equipment for example warning them that they should not look directly into the beam; drawing up and introducing a safe system of work for the maintenance and repair of the equipment; ensuring that if the case is to be removed, it requires a special key or tool and that the beam is properly controlled; introducing a procedure for reporting defects and ensuring that any maintenance and repair of the equipment found to be necessary is carried out by a competent person.

In a number of cases, candidates became confused between design features and procedural controls. There was frequent reference to risk assessments and training though this was by name only without any detail being given of what they might involve. Not many candidates mentioned the need for a key control with interlock to the power source.

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- Question 3**
- (a) **Outline** the specific criteria that should be applied when provisionally classifying a biological agent in accordance with the Control of Substances Hazardous to Health Regulations 2002. (4)
- (b) **Outline** the design requirements for a research laboratory that undertakes activities involving a Group 4 biological agent. (6)
-

The answer to part (a) of the question required an outline of the specific criteria that should be applied in the provisional classification of a biological agent. These are set out in Schedule 3 of COSHH 2002 and in ascending order consider the likelihood that the agent will cause human disease; that it may cause a hazard to employees but is unlikely to spread to the community; the severity of the human disease and the possibility of it spreading to the community; and the possibilities available for effective prophylaxis or treatment. Many candidates had difficulty in answering this part of the question and were able to offer only the criterion that it might cause harm. A few candidates believed that a biological agent was a chemical.

Familiarity with the Schedule would also have enabled candidates to provide an acceptable answer to part (b). They were expected to outline design requirements such as the separation of the laboratory from other activities in the same building with access restricted to authorised personnel by means of an airlock; the filtering of input and output air using HEPA with double filtering of output air; the laboratory to be under negative air pressure and to be sealable to permit fumigation; all surfaces in the laboratory to be impervious to water and easy to clean and to be resistant to acids, alkalis, solvents and disinfectants; an observation window to be provided so that occupants may be seen at all times or other means of indicating occupation such as an 'outside' light; the presence of secure storage facilities for the biological agent; and the provision of a safety cabinet or isolator for handling infected material and an incinerator or autoclave for the disposal of waste.

Answers to the second part of the question were to a better standard though some candidates did make reference to glove boxes as opposed to category three cabinets and few did not emphasise that HEPA filters should be fitted on both inlet and exhausted air. Others believed that the type of laboratory described should always be in a separate building and did not consider what precautions should be taken if it was not. Some candidates did not note the command word '*outline*' and made general references to waste and filtered air without giving the additional and necessary detail.

Question 4 *An airborne contaminant has a Workplace Exposure Limit (WEL) of 10ppm, 8-hour time-weighted average (TWA). Engineering controls have been introduced but the airborne concentration of the contaminant in a workshop has been measured at 180ppm, 8-hour TWA.*

The occupational hygienist has selected a piece of respiratory protective equipment (RPE) with an assigned protection factor (APF) of 20, which is to be worn temporarily by all employees in the contaminated area.

- (a) *Using the data above **outline** how the hygienist could have calculated the APF **AND outline** whether the hygienist has made an appropriate selection.* **(4)**
- (b) **Outline** other factors that should be taken into account when selecting appropriate RPE. **(6)**
-

Candidates should have outlined that the APF of a piece of respiratory protective equipment is the concentration of contaminant in the air divided by the maximum allowed concentration in the face piece. In the scenario described, the maximum concentration in the face piece to which an employee should be exposed would be the WEL – 10ppm. Therefore the minimum APF required would be $180/10 = 18$. The chosen piece of equipment has an APF of 20 which is in excess of that required and would lead to an exposure within the face piece of 9 ppm. It is therefore appropriate for use. A higher factor of safety could of course have been obtained by selecting respiratory protective equipment with an even higher APF. Answers to this part of the question were generally to a reasonable standard though some calculations were not always correct and in a few answers the APF was expressed in terms of 'ppm'. Only the better answers suggested the advantage of using a piece of equipment with a higher APF.

For part (b), candidates generally outlined a good range of factors such as the nature of the dust or vapour involved; comfort factors such as the length of time that employees would need to wear the equipment and the type of work to be carried out taking into account its physical nature, the degree of movement required and the restrictions of the working space; whether fit testing would be required, the ease with which the equipment can be put on and the amount of training required; the manufacture of the equipment to an appropriate standard and its cost and durability; the ease of maintenance for example for cleaning and changing filters; its compatibility with other forms of personal protective equipment and importantly the need to consult fully with the workforce on the selection of the equipment.

Question 5 *Employees working in a warehouse handle a large number of boxes and packages every day. In order to assist with this activity the employer has decided to invest in a range of non-powered handling equipment such as trolleys and trucks.*

Outline *what factors the employer should consider when selecting suitable equipment.*

(10)

In selecting the appropriate equipment, the employer would be expected to consider factors such as the results of trials of different types of equipment, the outcome of consultation with employees and the experiences of other users of similar equipment; the consideration of whether the devices could operate in the space available with respect to headroom, width and manoeuvrability and their safe working load with respect to the loads to be carried; the suitability of the devices and particularly the wheels for the ground conditions and whether brakes are fitted; the suitability of the handles and their location which ideally should be between waist and shoulder height and the ease of use; the ease with which the equipment may be folded and stored if required; means for securing the boxes during transport; the requirements for maintenance and for regular inspection; the cost, durability and likely life time of the equipment and the level of training which would need to be given to the employees.

There were a number of candidates who did not read the question with sufficient care and thought that an explanation of Task, Individual, Load, Environment was required. Others did not address the matter of the selection of equipment but concentrated on operating procedures whilst a few ignored the reference to 'non-powered' equipment and wrote of issues connected with the use of fork lift trucks.

Question 6 *A company is considering substituting a solvent it currently uses for one that is thought to be more effective.*

Outline *the factors affecting health that should be considered before a decision is taken to make the change.*

(10)

Before a decision is taken to substitute a solvent currently in use, a company would need to consider factors associated with the proposed replacement such as the information contained on the manufacturer's data sheet with respect for example to its toxicity, the harm that it might cause and its exposure limits; the form of the substance whether liquid or spray, the quantity to be used and the changes that might have to be made in the process times; the possible routes of entry of the solvent to the body; the number of persons likely to be exposed and the level and frequency of exposure taking into account personal susceptibilities and groups especially at risk such as young employees; the control measures that would be required such as the provision of local exhaust ventilation and personal protective equipment; whether specific requirements would be required for the storage of the solvent and what arrangements would have to be made for its safe disposal.

This question was very not well answered with few candidates recognising that it was concerned with information gathering before a decision was reached on whether a change should be made in the solvent used. Consequently much was written on the subject of the provision of respiratory and personal protective equipment, the hierarchy of control and the need for carrying out a risk assessment without giving any further detail on what should be assessed.

Section B – three from five questions to be attempted

- Question 7**
- (a) **Identify** the circumstances when health surveillance would be considered appropriate according to Regulation 11 of the Control of Substances Hazardous to Health Regulations 2002 (COSHH). (2)
 - (b) **Outline** the arrangements and facilities that an organisation should put in place if they are to carry out health surveillance in accordance with the COSHH Regulations. (10)
 - (c) A small engineering company uses metal working fluids which can cause dermatitis and occupational asthma.

Assuming the engineering company has the necessary arrangements and facilities referred to in part (b); **outline** the practical steps this company could take to meet its responsibilities under Regulation 11 of COSHH. (8)

Candidates with knowledge of Regulation 11 of the COSHH Regulations were able to identify circumstances when health surveillance would be considered appropriate such as where employees are exposed to a substance and engaged in a process which are both listed in Schedule 6 of the Regulations; when there is an identifiable disease or health effect associated with exposure to a hazardous substance and a reasonable likelihood that the disease will occur and when there are valid techniques for detecting indications of the disease or health effect which are of low risk to the employee. Few candidates seemed aware of the requirements of Regulation 11 or the contents of Schedule 6. There was often confusion shown between health surveillance and medical surveillance and some candidates were able to offer only examples of substances used where health surveillance might be appropriate.

For part (b), as far as the facilities that an organisation should put in place if they are to carry out health surveillance in accordance with the COSHH Regulations, reference should have been made to the allocation of a suitable room which would ensure privacy, provided with toilet and hand washing facilities and sufficient space to store records. As for procedures that would have to be introduced, they would include the carrying out of medical surveillance for Schedule 6 substances by an appointed doctor on an annual basis; the completion of other health surveillance by a suitably qualified person such as an occupational health nurse or other responsible person under the supervision of a registered medical practitioner; procedures for assuring the integrity of any samples taken and their submission to an accredited laboratory; informing an employee if an adverse health effect or disease is identified during the surveillance; the maintenance of up to date health records which should be confidential, securely kept and retained for a period of forty years; and arrangements for employees to view their own health records.

Answers to this part of the question showed some improvement though there were many candidates who were unable to differentiate between health surveillance and occupational hygiene, some who made general references to medical staff without providing further detail and a few who did not identify the need for ensuring the integrity of samples taken and for using an accredited laboratory. Candidates are recommended to study the detail contained in the COSHH Regulations Approved Code of Practice document, which is essential study material for many elements within Unit B.

For part (c), practical steps that the engineering company could take include the appointment of a responsible person to oversee health surveillance; undertaking regular skin inspections of the employees and at the same time monitoring any breathing problems they might be experiencing; referring those with breathing problems to occupational health staff for medical assessment; training employees to undertake their own skin inspections and advising them to report any problems they might have with skin irritation or breathing; organising and administering the completion of confidential questionnaires for skin and breathing issues and introducing a record keeping system for health surveillance information and carrying out a regular analysis both of this information and of sickness absence data.

The standard of answer was limited with few candidates appearing to recognise that the question required an outline of the practical steps the company might take to meet its responsibilities under Regulation 11. Instead many outlined control measures that should be introduced to prevent exposure to the metal working fluids.

Question 8	(a)	Outline the properties of:	
	(i)	alpha particles;	(4)
	(ii)	x-rays.	(4)
	(b)	Staff working in a dental practice are exposed to x-rays.	
	(i)	Outline the legal requirements for monitoring staff exposure to x-rays.	(6)
	(ii)	Outline how the dental practice can monitor the staff exposure.	(6)

In answer to part (a) of this question, candidates were expected to outline that alpha is a particulate radiation, is naturally occurring and formed as a result of radioactive decay and is continually emitted. Alpha particles can travel only a short distance in air but if they enter the body, they can present an internal radiation hazard. However they can be shielded by paper or skin. An x-ray on the other hand is non-particulate but is electromagnetic radiation, artificially generated normally by the use of electrical energy and emitted when a machine is switched on. X-rays can travel a few metres in air, present an external radiation hazard for an individual in the same room or space and can penetrate much further into the body but can be shielded with lead or concrete. Most candidates were able to outline the properties of alpha particles but were less sure in discussing x-rays.

For part (b), the legal requirements for monitoring staff exposed to x-rays – in the scenario described, the dentist and dental nurses - are contained in the Ionising Radiations Regulations which stipulate that exposure should be kept within specified dose limits with the limits for classified workers and for exposure of different parts of the body set down in the Regulations. If any of the employees are classified workers, ie they are likely to receive a dose in excess of 6 mSv (millisieverts) a year, they must be given medical surveillance and any over exposure investigated and reported to the enforcement authority. The monitoring of staff should be overseen by a radiation protection supervisor. Records of the doses received have to be kept for a period of fifty years or until the person to whom they refer has reached the age of seventy five.

In the dental practice, staff exposure to x-rays over a fixed time period may be monitored by the use of film badges or thermoluminescent dosimeters (TLDs). Both are personal dosimeters which may for example be clipped to a lapel. The badge consists of film in a plastic holder while the TLD is a metallic badge. Following exposure, the film badge is developed and the exposure level determined while the badge is heated causing the emission of light which is measured. In both cases the devices should be processed by an approved dosimetry service. The dental practice would then need to review the data produced to ensure that exposure is kept within the dose limits specified by the Regulations.

Few candidates appeared to have knowledge of the specific legal requirements of the Ionising Radiations Regulations as far as monitoring was concerned. Most did know that film badges could be used to monitor exposure but there was little reference to TLDs, and few details provided on the nature and processing of the badges.

Question 9

Five employees work an 8 hour shift during which they are exposed to a hazardous dust. The employer has asked an occupational hygienist to undertake monitoring of the employees' personal exposure to the hazardous dust.

(a) **Describe** how the hygienist should determine the employees' long term personal exposure to the total inhalable hazardous dust. (10)

(b) *The five employees were each monitored for exposure to total inhalable dust during the same 8 hour shift. Four of the results are roughly equivalent but the fifth is significantly higher.*

Outline the possible reasons for this discrepancy. (10)

In determining the employees' long term personal exposure to the total inhalable hazardous dust, the hygienist would be expected to monitor the exposure throughout the eight hour shift and note both the work undertaken during the monitoring and the time for which the sampling was undertaken. A gravimetric method should be used incorporating a pump, a filter and an appropriate sampling head such as a 7 hole, an IOM or a conical inhalable head with the head being positioned in the breathing zone of the employee. The pump flow rate would be calibrated and noted as would the volume of air in the sample collected, and the filter weighed before and after the sampling to determine any gain in the weight. The concentration of total inhalable dust could then be calculated by dividing the weight gain by the volume of air with the result being expressed in mg/m³.

Many candidates did not appear to understand the use of a standard dust sampling equipment and in particular the type of sampling head that should be used. Some did not identify that the exposure was for the whole shift and discussed fifteen minute exposures which were irrelevant. A few seemed to miss signposts such as 'personal exposure' and 'total inhalable dust' and discussed general dust monitoring such as with a dust lamp.

For part (b), in outlining the reasons for the apparent discrepancy, candidates could have considered those associated with the working environment and the tasks being performed; those resulting from possible failures with the monitoring equipment and those connected with the individual employee. In considering the working environment, there could have been areas in the workplace which were not as well ventilated as others with possible problems with the local exhaust ventilation provided. As for the monitoring equipment for the individual concerned, there could have been errors in the calibration of the pump flow, in the timing of the air measurement, in the selection of the filter and in weighing the filter at the end of the exercise either because of a mis-reading or because different and possibly uncalibrated scales were used for the rogue sample. The individual, too, could have had a part to play if they had been particularly involved in the more dusty operations, had taken fewer or shorter breaks than the other operators and had not taken sufficient care with personal hygiene and had continued to wear dusty overalls for long periods. Finally the possibility of deliberate sabotage could not be discounted.

Answers to this part of the question were to a much better standard with most candidates able to cite the sources of error that might lead to anomalous results. If there was a criticism it was that in some cases there was too little detail given to satisfy an 'outline' question.

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- Question 10**
- (a) *In 2002 the Court of Appeal (COA) made landmark judgments relating to work-related stress. **Identify ONE** of the cases heard at the appeal hearing **AND outline** the practical guidance which the COA established at this hearing in connection with harm that is reasonably foreseeable.* (5)
 - (b) ***Describe** a range of organisational and personal factors that can contribute to the incidence of work-related stress.* (15)
-

Candidates could have selected one of the following cases heard at the Court of Appeal namely *Sutherland v Hatton*, *Barber v Somerset County Council*, *Bishop v Baker Refractories* and *Jones v Sandwell Metropolitan District Council*. The practical guidance on the determination of harm which was reasonably foreseeable which emerged from the hearings referred to the need for consideration to be given to the nature and extent of the work being carried out particularly where the work is intellectually or emotionally demanding for the employee or the workload is greater than normal; to situations where unreasonable demands are being made of the employee and others doing the same job are suffering harmful levels of stress; and to situations where there are abnormal levels of sickness or absenteeism in the same job or department. However employees should inform the employer of their stress and no occupations should be considered to be intrinsically harmful to mental health.

There were few candidates who were able to cite one of the cases referred to in the question or to outline the practical guidance established by the Court of Appeal. There were many references made to the precursor case of *Walker v Northumberland County Council* for which no marks could be awarded.

In answer to part (b), candidates were expected to refer to factors such as: a poor organisational culture where there was lack of management support and encouragement, a lack of consultation with and involvement of the employees, and a lack of control over work planning resulting in work overload or underload, unrealistic deadlines or targets and long hours of work causing an unsatisfactory work/life balance; no positive definition given of the job role or the objectives to be achieved; organisational change bringing with it the threat of redundancy; no formal procedures for raising concerns or grievances with little optimism that if raised, they would be addressed; poor working relationships with managers and/or colleagues involving bullying and harassment; a lack of resources such as the proper tools and equipment to carry out the job and a poor physical environment with an inadequate standard of lighting, temperature and ventilation; excessive competition between colleagues and departments; a feeling of isolation from work colleagues whether physical or psychological; and personal concerns such as bereavement, divorce or child care issues.

There was a good response to this part of the question with a number of candidates usefully using the HSE's management standards as a framework for the provision of a logical and well structured answer.

Question 11 *A facilities manager of a multi-occupancy office block built in the 1970s is concerned about the risks associated with asbestos in the building.*

(a) **Outline** the steps the facilities manager should take to minimise risks associated with any asbestos that may be present in the building. (12)

(b) *An occupant of one of the offices engages a contractor to fit a hand dryer in a toilet which involves drilling through some asbestos insulating board.*

Outline the required steps to be taken by the contractor to carry out this work, in accordance with the Control of Asbestos Regulations 2006. (8)

The facilities manager should initially accept that his/her company is the duty holder who has the responsibility to manage asbestos in the multi-occupancy building and should assume that because of the age of the building that asbestos will be present. He/she should therefore identify all materials in the building that might contain asbestos and arrange for a competent person to undertake a survey using intrusive and destructive sampling to determine the presence or absence of the material. A record would have to be kept of where asbestos containing materials (ACMs) are located and updated following regular reviews of their condition. The information should be made available to all tenants in the block. Finally consideration would need to be given to what action was necessary to deal with the various ACMs whether to remove, repair, enclose or leave in place and an action plan drawn up once the decisions had been made.

There was a general recognition of the need to carry out a survey and for records to be kept. Some candidates used out of date terminology when describing the different types of asbestos survey. There was little reference to the need to employ a competent person to carry out the survey or for the need to draw up a management plan after the survey had been completed. Some candidates assumed that when asbestos was found it should be removed whilst others suggested the completion of a risk assessment.

In answer to part (b), candidates should have noted that the work to be carried out was of short duration and therefore classed as non-licensed. However, precautions would be necessary and whilst the work was being carried out, access to the toilet should be restricted, the door closed and a warning sign displayed. The fixtures and surfaces in the toilet would have to be covered with a polythene sheet fixed with tape, paste or foam used to coat the drill entry point and a hand drill used to make the required hole which should then be lined or sleeved to prevent fibre release. The paste would have to be cleaned off with damp cloths and all waste double bagged and disposed of as asbestos waste. The complete area where the work was carried out and the equipment used would need to be cleaned down with a type H vacuum.

Reference should also have been made to the requirement for the person carrying out the work to have been fully informed of its related hazards and the precautions to be observed including the wearing of personal protective equipment such as disposable overalls and the appropriate respirator.

There were a number of candidates who did not recognise that the work described was 'non-licensed' and described the full procedures for bringing in a licensed contractor and those involved in carrying out the work. Of those who recognised that this was not necessary, a number did not mention the use of paste and a hand drill while some suggested that the type of asbestos would have to be identified perhaps forgetting that this information was provided in the question.



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