**NEBOSH**

# KNOW – WORKPLACE HEALTH AND SAFETY PRINCIPLES (INTERNATIONAL)

## UNIT DI1:

**For: NEBOSH Level 6 International Diploma for Occupational Health and Safety Management Professionals**

## PAPER 1 OF 2

### Guidance to learners

There are **two** question papers for this assessment. This paper **(Paper 1 of 2)** contains questions based on a fictitious scenario (100 available marks).

All the tasks and activities in all parts of the assessment are mandatory.

You will have 4 weeks (20 working days) to complete **both papers** of the assessment.

Please refer to your registration confirmation email for the upload deadline.

Please note that NEBOSH will be unable to accept your assessment once the deadline has passed.

You **must** use the answer template for **Paper 1**.

This assessment is not invigilated, and you are free to use any learning resources to which you have access, eg your course notes, or the HSE website, etc.

By submitting this completed assessment for marking, you are declaring it is entirely your own work. Knowingly claiming work to be your own when it is someone else's work is malpractice, which carries severe penalties. This means that you must **not** collaborate with or copy work from others. Neither should you 'cut and paste' blocks of text from the Internet or other sources.

## Scenario-based questions

The assessment begins with a scenario to set the scene. You will then need to complete a series of tasks based on this scenario. Each task will consist of one or more questions. Your responses to **most** of these tasks should wholly, or partly, draw on relevant information from the scenario. The task will clearly state the extent to which this is required.

The marks available are shown in brackets to the right of each question, or part of each question. This will help guide you to the amount of information required in your response. In general, one mark is given for each correct technical point that is clearly demonstrated. Avoid writing too little as this will make it difficult for the Examiner to award marks. Single word answers or lists are unlikely to gain marks as this would not normally be enough to show understanding or a connection with the scenario.

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Please attempt **ALL** tasks.

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### SCENARIO

RailStart (RS) is a private organisation overseen by the Government. It looks after track and signalling for the railway network in four regions across the country. These are the North, East, South, and West. RS must make sure that rail tracks are properly maintained, and that signalling meets the highest safety standards in these regions.

RS has four operational offices across the country. They employ a range of workers, from technicians and customer service operatives to project engineers. RS also works with contractors, selected from a pre-approved contractors' database.

#### The TrainDetect system

A new train safety system, called TrainDetect, has been developed which alerts train drivers to the presence of another train ahead of them on the same track. The system works by sensing the variations in voltage across the tracks when a train is present and when it is not. This mirrors the way that modern signalling works, and therefore requires minor changes to the existing infrastructure.

RS are looking to incorporate the new TrainDetect system into their existing signalling infrastructure. However, it will require the replacement of the existing wiring with new wiring. This is fortunate for RS as much of the network's existing wiring is decades-old and has become unreliable.

Therefore, RS commits to a project to replace all the wiring on the network and to install the TrainDetect system across all four regions.

As there is no single contractor with enough resources to carry out this work in the required timeframe, RS must work with multiple contractors across the country. Each contractor will work within a tightly defined, and pre-agreed, area of the network.

#### South region

One area of RS's rail network has eight mainline approaches into a large city in the South region. It includes a particularly busy commuter route. The last train station on this route is a large, 20-platform station where multiple railway tracks converge, before taking various routes into and around the city. During the busiest times, a train arrives and departs at the station every minute.

On the approach to this station there is a visual light signal 300 metres south of the platforms. This is the last signal before the trains reach the platforms. It provides signallers with the opportunity to halt trains before they enter the station. Signalling for the South region, as with many other areas of the train network, takes place centrally, from a location over 50km away. Although the signal box (a small building containing levers and control equipment to operate railway signals) is only 100 metres north of the visual light signal, this particular box has been unoccupied for several decades. It is in a

poor state of repair. The electrical wires and switches inside this signal box were installed in the 1950's and contain many components made of substances that are now classed as a health hazard.

The signal box has been repeatedly vandalised by people who have accessed the railway by breaking through fencing. Although RS has replaced the fencing many times, it has always used the same inexpensive type of fence. RS has not checked the fence condition for a long time. Warning signage has fallen off and broken. One of the consequences of the vandalism is that the lighting inside this signal box no longer works.

Five years previously, a youth broke through the fencing and was nearly struck by a train. Subsequently, RS was the subject of enforcement action.

**The contractor**

Contritum is a multi-discipline contractor with 10 years' experience in railway work. The organisation has doubled in size in the last three years. It has a reputation for aggressively pursuing railway work and getting the work done on time or even earlier. The director of RS has recently attended some entertainment events as a guest of the Board of Contritum.

At a recent event, the RS director discussed the TrainDetect project with the managing director of Contritum. The RS director was told that all Contritum workers are very experienced, producing quality work, and they have worked with Contritum for a long time. Based on accident data, the managing director of Contritum boasted that the organisation has a low number of recorded accidents *compared* to others in this industry.

Impressed by their apparent strong health and safety values, the RS director decides to meet with the managing director of Contritum again. During this meeting they look at Contritum's general risk assessment, method statements and site inspections for previous rail works. The RS director particularly likes the fact that Contritum use their own on-site supervisors to conduct their site safety inspections. The inspection results always seem to be to a high standard. The RS director thinks that this will save them time and resources because they will not have to conduct their own regular site inspections.

After the meeting, the RS director decides that Contritum are the contractor of choice for the TrainDetect work for the South region. They also award Contritum the maintenance contract for the region. This includes maintenance on level crossings, replacing lighting at stations, and repairing trackside fencing where it has been damaged or has rotted.

Although Contritum are currently working on other projects and they have never worked on such a large-scale project before, they still accept the work for the South region.

**The project**

Work on the TrainDetect installation is being managed from the Contritum office by a project management team. This team consists of a senior engineer, an electrical engineer and three support workers. Between them they manage the installation of the TrainDetect system across the entire South region with as many as 10 teams of engineers working on-site simultaneously.

One of the teams consists of four site engineers overseen by an on-site supervisor. Three of these engineers have been with the organisation for 10 years and have seen its rapid growth. They are all in their late twenties and have been trained almost exclusively by Contritum. The fourth engineer (Engineer D), in their early fifties, joined the organisation three months ago. RS are unaware of any new recruits at Contritum. The amount of existing work that Contritum has, means that all workers have been continually asked to work overtime.

As the TrainDetect project is keeping everyone so busy, Engineer D has not been able to complete their induction training; however, they have done similar work for other organisations in the past. They have worked in a variety of trades, finally choosing to work in electrical engineering two years'

ago. As they tell their friends, *"It is not like other trades, it is mainly working indoors in the warm, so it is much better."*

**The work**

Three weeks into the project, some of the engineers have highlighted issues with their ability to physically access the relays (an electrically-operated switch) in the signal boxes. This is due to the age of the equipment and where it is positioned.

The old wiring is also proving difficult to remove, as it has become very brittle and is coated in thick dust; because of this, the senior engineer has decided that old wiring can be left in place, but should be properly insulated where it is exposed. A recent on-site inspection revealed that some old wiring left in place was not properly insulated. However, Contritum do not inform RS of these issues as they do not want to risk losing any work.

During this time, Contritum have noticed that RS does not seem to be aware of how frequently fencing is being damaged and replaced. As Contritum are always paid for the work, they do not tell RS that far stronger and more secure fencing options are available.

Four months into the project and the team have continuously worked six-day weeks. Some of the work must be carried out at night to minimise disruption to the train services into the city. The on-site supervisor and the team of four engineers begin their sixth consecutive night of work on the commuter line. The on-site supervisor is given the work plan from the project management team who only work during the day.

Tonight's work involves some complicated rewiring at the signals and points (moveable sections on the track line), as well as a more straightforward task of rewiring equipment in the signal box.

The on-site supervisor is concerned, as the signal box task needs to be completed in one night and Engineer D has never done this particular task before. However, the on-site supervisor has not found anything wrong with Engineer D's work so far, so they believe it will be safe. As the project management team are not working, the on-site supervisor is unable to change the work plan. Because there is so much work each night, the on-site supervisor is focused on checking more complicated work.

**Engineer D**

Once on site, Engineer D can see the lights of the large train station only 200 metres away. They confirm that the track is closed to trains. The on-site supervisor explains to Engineer D what needs to be done first in the signal box. All the wires to the relays on the lower shelves need to be replaced with the new wire. This will then be fed out through a duct to the signals and points along the track. Having explained this, the supervisor then takes the other three engineers to the various locations where the rest of the night's work needs to be completed.

Engineer D enters the signal box and finds that the lights do not work. Undeterred, they wear a head torch to carry out the work. However, in the tight spaces behind the relays, they find that the head torch becomes restrictive. Although the rule is to always wear a head torch during night work, they decide to take off the head torch and use it as a hand torch. While working, Engineer D hears shouting and laughing nearby; in the distance they hear a police siren. Even though they are in the middle of rewiring, they go outside to see what is happening.

In the dim light they see someone climb through the broken fence towards the railway. They are clearly not wearing any reflective clothing. The person trips on the railway tracks, falls to the ground, and yells out in pain. Engineer D moves towards the injured person to help, and notices two police officers approaching. The police determine that the injured person has broken their ankle. The police arrest the person and call for an ambulance.

Engineer D speaks to the police and helps guide the paramedics to the injured person. An hour later, Engineer D returns to their work, upset by the event. They are now behind schedule with their work

so they try to catch up. Despite the delay, cramped conditions, and accumulated dust everywhere in the signal box, Engineer D finishes all the rewiring on time. They are glad to finish work for the week and are looking forward to a day off. The on-site supervisor enters the signal box and asks if everything has been done. Engineer D explains about the earlier interruption and the on-site supervisor remarks, *"Oh, people are always getting on to the railway tracks. I will have to report it again."* The on-site supervisor accepts Engineer D's assurance that everything has been completed. They decide not to check the work because the railway lines are due to be open again soon.

**The train crash**

At 06:10, an early morning train approaches the signal box, where the work had been completed the night before. The train stops as the signal is set to red. At 06:12, a second train crashes into the stationary one ahead of it. Some carriages derail and the stationary train is shunted 50 metres along the track. The TrainDetect system has failed to alert the signalling centre or the train drivers that the trains are too close to each other on the same track.

The station workers see the dust rising from the crash site and immediately call the emergency services. Many people are injured on both trains.

On investigation, the TrainDetect system failure is traced back to one of the old wires that should have been removed by Engineer D. The wire was not bent back on itself and insulated, as per the job specification, causing a fault in the TrainDetect system.

## Task 1: Role of health and safety in accident investigation

**1** (a) What is the role of health and safety legislation in the workplace? **(10)**

(b) The regional health and safety competent authority has investigated the events leading up to the person accessing the railway and becoming injured. On the basis of their findings, they decide to prosecute both Contritum and RS using the principles of the '*Enforcement Policy Statement*' (EPS) produced by the British Health and Safety Executive (HSE).

Based on the following EPS principles, what will the competent authority have considered when deciding on this enforcement action?

(i) Proportionality. **(9)**

(ii) Targeting. **(6)**

***Note:*** *You should support your answers to (b)(i) and (b)(ii), where applicable, using relevant information from the scenario.*

## Task 2: Contractor management

**2** (a) Comment on what was negative about the RS director's approach to contractor selection. **(9)**

***Note:*** *You should support your answer, where applicable, using relevant information from the scenario.*

(b) Comment on what was negative about the co-ordination between RS and Contritum. **(9)**

***Note:*** *You should support your answer, where applicable, using relevant information from the scenario.*

## Task 3: Accident frequency

**3** The table below shows Contritum's accident history over the past 3 years.

| Year | 2021 | 2022 | 2023 |
|---|---|---|---|
| **Number of workers** | 1000 | 1500 | 2000 |
| **Number of accidents** | 90 | 150 | 225 |
| **Number of hours worked** | 2000000 | 3000000 | 4000000 |
| **Days lost due to accidents** | 155 | 225 | 560 |

(a) **Calculate** the accident frequency rate for **EACH** of the 3 years. **(3)**

*Show your calculations at **EACH** step.*

(b) Based on the information in the table and the calculated accident rate, what conclusions can be drawn? **(6)**

(c) What are the possible limitations of the data in this table? **(6)**

## Task 4: Human factors (HSG48)

**4** (a) Leading up to the train crash, the on-site supervisor and Engineer D committed health and safety violations.

Identify the *situational* violations made by **EACH** of these individuals. **(4)**

***Note:** Your answer must be based on the scenario only.*

(b) What *organisational* factors at Contritum could have contributed to the train crash? **(8)**

***Note:** Your answer must be based on the scenario only.*

(c) What *individual* factors of Engineer D could have contributed to the train crash? **(5)**

***Note:** Your answer must be based on the scenario only.*

## Task 5: Organisational change

**5** Contritum is planning to reduce its worker numbers due to lower demand in railway work after the train crash. This change will increase responsibilities for the remaining workers.

Using the key principles of managing organisational change, how should Contritum manage this change? **(17)**

## Task 6: Health and safety performance review

**6** What *leading* performance indicators should Contritum *prioritise* in their next health and safety management review? **(8)**

*You must justify **EACH** of the prioritisations.*

***Note:** Your answers must be based on the scenario only.*