

Level 3 Certificate in Fire Science, Operations, Fire Safety and Management (All Examinations)

Examiner Report on March 2019 Examinations

Introduction

Candidates generally performed best on the Operations paper and least well on the Fire Engineering Science paper. This reflected performance in previous examination sessions.

Fire Engineering Science (L3C1)

General

40% of candidates were successful in achieving a pass in this examination.

Multiple Choice Questions

Few candidates answered 10 or more of the 15 multiple choice questions correctly.

In relation to the mathematics section of the syllabus, candidates performed particularly well on the question asking for the calculation of a percentage and most were able to calculate the capacity of a rectangular tank correctly. However, candidates were less successful in calculating the capacity of a circular tank and many candidates made errors in calculating the capacity of a length of hose. As in previous examinations, candidates often made errors in working with different units of measurement (eg the length of hose was given in metres but the diameter was given in millimetres). Candidates are advised to pay particular attention of the use of different units.

Questions relating to the section of the syllabus focussed on heat were often answered poorly. Many candidates failed to recognise that conduction may occur in solids, liquids and gases and errors were often made in identifying that in liquids an increase in temperature results in an increase in volume and a decrease in density.

In relation to hydraulics, few candidates were able to calculate water power correctly.

The questions on chemistry and electricity were usually answered well.

Short Written Answer Questions

There were many poor scripts and few candidates secured high marks for this section of the paper. Candidates should be aware that questions may be drawn from across the full range of items identified in the syllabus and that, at level 3, a depth of understanding is required. Many candidates appeared to lack preparation for the examination.

In order to attain marks, candidates need to present information that is precise and complete. Candidates often appeared to be guessing at answers rather than drawing on relevant knowledge and understanding and the responses presented often omitted key information or contained basic errors. It was common for responses to lack the sharp focus and precision required for this subject.

As in previous papers, candidates often performed least well on the questions testing knowledge and understanding relevant to electricity.

Density: Candidates were required to define the terms “density” and “relative density”. Few candidates provided correct definitions and many candidates appeared to describe density in general rather than scientific terms. Candidates should be aware that density is defined as the mass per unit volume of a substance. As many candidates were unclear about the nature of density, they were then unable to carry out the calculation of density required by part b) of the question. Those candidates that did tackle the calculation in part b) often failed to recognise the need to convert information into appropriate units and therefore provided inaccurate answers.

Speed, Velocity and Acceleration: This question was not answered well as candidates often seemed to guess at the definitions. Most candidates secured a mark for describing speed but few were able to identify the difference between speed and velocity ie speed is the rate of change of distance only whereas velocity is speed in a given direction.

Few candidates were able to define acceleration or state the units used. Correct answers identified that acceleration is the rate of change of velocity and that the units for acceleration are commonly written as $m/s/s$ or m/s^2 or ms^{-2}

Operation of temperature measuring devices: Candidates were asked to outline the operation of thermistors and infra-red measuring devices and to give examples of their use. Few candidates appeared to have understanding of these devices and many candidates either omitted the question or appeared to make up their responses.

Factors be overcome when pumping/lifting from open water: This question was generally answered well with most candidates able to secure at least half of the marks available. Some candidates did not focus on the question in their responses and instead of writing about factors to be overcome when pumping/lifting from open water (eg overcoming pressure lost as water is forced through the strainer and changes direction) listed general issues that could interrupt water flow.

Difference between flaming and smouldering combustion: This examination tests fire engineering and science so it was disappointing that few candidates were able to articulate the difference between flaming and smouldering combustion. Candidates should be aware that flaming combustion takes place in the gas or vapour phase of a fuel and this above the surface whereas smouldering combustion is surface burning which has a lower rate of heat release, no visible flame and the potential to make the transition to flaming after sufficient energy has been produced or when airflow speeds up the combustion rate.

Extinguishing fire: This question focussed on the way that smothering and cooling methods can be used in extinguishing fire. Nearly all candidates secured at least half of the marks available for this question. Candidates who provided full explanations were able to secure all of the marks available.

Electrical circuit protection: This question was usually answered well with most candidates able to identify two reason for providing protection and two examples of how protection can be provided.

Electricity: The definitions of “current” and “volt” were often good. However, as in previous examinations, there were many errors in carrying out the calculation which required a calculation of Power. Many candidates failed to realise that the formula needed was $P=RI^2$ and therefore there were many incorrect answers.

Fire Operations (L3C2)

General

Standards were good with 88% of candidates achieving a Pass.

Multiple Choice Questions

There were many good responses to this part of the examination and it was common for candidates to secure 10 or more of the 15 marks available.

As in previous examinations, the main area of weakness for most candidates appeared to be the operation of equipment. Errors were often made in relation to positive displacement pumps, impellers and delivery hose.

Short Written Answer Questions

There were many good responses to this element of the question with some candidates demonstrating good understanding across the range of syllabus topics.

Some candidates mis-read questions and this affected the relevance of the response that they provided. This was particularly the case in relation to the questions on pre-planning (where candidates often failed to address the pre-planning context) and the question on hazards and control measures relevant to a water rescue (where candidates failed to appreciate that they needed to identify both hazards and control measures).

Pre-planning for a possible fire at a museum: As in previous examinations, many candidates missed the fact that this question was focussed on pre-planning. Instead of explaining the issues that they would consider when planning, they wrote at length about how they would tackle a fire in a museum – as the question was not about tackling a fire, these candidates failed to attain marks. Some candidates focussed only on the need to salvage valuable painting and wrote at length about different salvage options – although a mark was usually awarded for recognition of the need to be aware of and follow a salvage plan, the approach meant that other issues that would have scored marks were omitted.

Points that candidates could have covered that would have scored marks included:

- Layout – potential spread and people/artefacts that would be affected
- Type of materials in the museum and implications for firefighting techniques and equipment
- Fire protection already in place and any risks to be aware of eg Carbon dioxide installations.
- Access to the site – ease of access for firefighters and equipment
- Pre-agreements re the treatment of valuable items – importance of salvage and preservation

Sectorisation and the responsibilities of the sector commander: Most candidates attained at least half of the marks available for this question. Candidates were usually able to explain what is meant by sectorisation but few were able to present three responsibilities of a sector commander. Few candidates identified that the sector commander is responsible for delivering the objectives set by the Incident Commander for the sector and few recognised that the sector commander manages resources in the sector.

Identifying and preserving evidence at the scene of a fire: Most candidates were able to secure at least half of the marks available for this question although most responses referenced only the need to minimise personnel in the area and to take photographs. Many other points could have been presented that would have secured marks such as:

- Ensuring that crews take everything that they brought with them away when they leave
- Asking crew members to check their shoes to ensure that no evidence is being taken away
- Identification and contact details for any witnesses.
- Recording the situation of the building on arrival
- Noting the effect of any media used to extinguish the fire.

Signs associated with flashover: this question required technical understanding of flashovers. Whilst some candidates attained high marks, many others appeared to have only limited understanding of the situation and therefore secured few, if any marks. Candidates should be aware that common signs of flashovers include:

- High heat conditions of flaming combustion overhead
- The existence of ghosting tongues of flame
- A lack of water droplets falling back to the floor following short burst fog patterns being directed at the ceiling
- A sudden lowering of the smoke layer
- The sound of breaking glass as windows or glazing being to fail from exposure to heat, possibly causing a visible rise in the smoke layer
- A change in smoke issuing from a window (seen from the exterior) with increasing velocity as if issuing under pressure and a darkening of smoke colour towards black
- The sudden appearance of light-coloured smoke (pyrolysis) flow low level items being subjected to high heat flux from the gas layer

Rescues from water: This question was in two parts with candidates required to identify three hazards associated with rescues from water and to state three examples of control measures that they would put in place to mitigate the risks. Some candidates presented only a brief list of hazards without adding the control measures whilst others presented only control measures without the hazards; this meant that many candidates often attained only three of the six marks available. A surprising number of candidates were unable to identify three hazards and/or three control measures. Candidates often referenced the fact that rescuers could be caught in the force of the water and the hazards related to debris, entrapment and animals but few appeared to be aware of the biological hazards or associated control measures.

Fires in basements: this question was often answered well and many candidates attained full marks for identification of relevant factors to be taken into account when tackling the fire.

Firefighting foams and the environment: Many candidates did not demonstrate understanding of the way in which firefighting foams can affect the environment. Marks were available for points that recognised that firefighting foams can lead to the de-oxygenation of water, can be toxic to aquatic

life, can present risks to drinking water supplies and that some compounds in them do not break down in the environment and can accumulate in plants and animals.

Use of thermal camera: many candidates attained full marks for identifying situations where thermal cameras may be used.

Factors to be taken into account when siting pumps at a fire: There were many points that could have been presented in response to this question but few candidates secured all three of the marks available. Examples of points that would have secured marks are as follows:

- Hard standing for the appliance and water run-off
- Access to open water or mains supply
- Not parking over hydrants
- Access for further on coming firefighting appliances and other services
- Upwind and clear of the smoke
- Not impeding firefighting access to building
- Pump exhaust away from building openings

Fire Safety (L3C3)

General

68% of candidates achieved a Pass.

Multiple Choice Questions

Candidates generally performed best on questions which addressed elements of structure and fire safety practice.

Questions testing technical understanding of the principles and operation of fixed installations and detection systems were less well answered. Few candidates recognised that the type of automatic fire detector that responds to radiant energy in the form of infra-red radiation, ultra violet radiation and visible light is a flame detector. Errors were also made in recognising the principles that heat detectors operate on and in identifying the three different types of fixed foam installations.

Short Written Answer Questions

Candidates generally performed well on this part of the examination and some candidates secured a high proportion of the marks available. Candidates generally performed best on the questions relating to fire doors, manually-powered alarm systems, fire drills and considerations related to the establishment of protected areas for progressive horizontal evacuation.

The main issue for candidates when responding to questions was the failure to provide sufficient detail to secure higher marks. Candidates were often able to secure some of the marks available but, as they were unable to provide more than minimal information about subjects, they were unable to capitalise on all of the marks available.

Steel: Candidates were asked to describe the way that structural steel behaves in fire. Candidates often referred to the way that steel became weakened but few went on to explain that weakened steel would collapse.

Part b) asked candidates to explain how intumescent coatings could contribute to the loadbearing capacity of a steel frame. Few candidates provided a good answer to this question as few appeared to understand how intumescent coatings work. Candidates should be aware that intumescent coatings swell when heated, producing an insulating char which affords protection to the surface to which the coating is applied. This effectively insulates the underlying steel substrate from the rapid temperature increase that would otherwise occur in a fire and the coating therefore extends the load-bearing.

Fire Doors: The question asked candidates to describe the function and features of a fire door. Most candidates secured at least half of the marks available. Some candidates were unable to identify three relevant features; examples of features which could have been identified include:

- Smoke seal fitted – prevents smoke/toxic fumes from escaping
- Glazing has same fire resistance to prevent glass cracking
- Self-closing device
- Sign indicating keep shut or locked
- Close fitting to frame – 3mm gap acceptable
- Fitted with 3 metal hinges
- Matched with recommended door frame
- Intumescent door strip
- Appropriate ironmongery

Sprinkler heads: Most candidates were able to provide minimal information about the glass bulb type of sprinkler head in that they recognised that the glass bulb would break when the liquid it contained reached a specific level and that this would activate the release of water. Few candidates provided more than this minimal information. Additional detail in relation to the operation of this type of sprinkler head would have secured additional marks eg:

- the glass reservoir holds a heat-sensitive liquid.
- this glass bulb holds the water valve/pip cap in place.
- adjusting the composition of the liquid can adjust the temperature at which the bulb operates

Carbon dioxide installations: Most candidates were able to identify the situations where this type of installation would be appropriate and were able to identify risks. Few candidates were able to identify situations where the installation would not be effective ie anywhere that isn't confined space or anything with its own oxygen supply such as nitrates or reactive metals such as sodium, potassium, magnesium.

Limitations of manually-powered alarm systems: Many candidates were able to describe two relevant limitations and thereby secure both of the marks available for the question.

Reducing false alarms: This question was generally answered well and many candidates were able to identify at least two (the question asked for four) appropriate actions to reduce false alarms. Candidates often referenced maintenance, selection of system and selection of siting. Other points that could have been covered included protection against electromagnetic interference, monitoring

performance monitoring of newly commissioned systems and isolation of systems during building work to prevent accidental activation.

Reason for carrying out fire drills: This question was generally answered well and many candidates were able to identify at least three (the question asked for five) relevant points. Few candidates identified the use of fire drills as a means to assess the speed and efficiency with which a building can be evacuated – most concentrated on familiarising occupants with the sound of the alarm, exit routes and procedures.

Protected areas used for horizontal progression: Candidates who understood the purpose of protected areas in this context were able to secure a high proportion of the marks available for this question. Marks were available for consideration of issues such as the number of people to be evacuated, the degree of any mobility impairment, the number of staff available to assist and the fire protection arrangements.

Management and Administration (L3C4)

General

67% of candidates passed the examination.

Candidates generally performed better on the multiple choice questions than on the short written-answer questions.

Multiple Choice Questions

Most candidates performed well on the multiple choice element of the paper and nearly all candidates achieved 10 marks or more.

Most candidates appeared to have some understanding of all areas of the syllabus. Surprisingly, few candidates recognised that the characteristics and skills required to carry out a specific job are set out in a person specification.

Short Written Answer Questions

Responses to this section of the paper were often patchy. Candidates often performed well on the questions related to poor performance and health and safety in the workplace but many candidates appeared to lack understanding in relation to functional management structures, development of training programmes and live training exercises.

Functional Management Structure: Few candidates understood the concept of functional management. Candidates should be aware that a functional management structure is a structure where an organisation is grouped into units on the basis of work carried out by staff eg fire safety, HR, marketing, finance etc.

As most candidates were unable to explain what is meant by functional management, they were unable to provide examples of either advantages (eg specialists employed in the department enables consistency and efficiency) or disadvantages (eg this can lead to silo working and/or lack of wider appreciation of the working/aims of other parts of the organisation). Those candidates who were

able to explain what is meant by functional management structure were often able to provide an example of a disadvantage (usually quoting silo working) but few could give an example of an advantage.

Responsibilities of employees in relation to health and safety: Candidates were asked to provide five examples of responsibilities of employees in relation to health and safety. A few candidates wrote about responsibilities of employers rather than employees and therefore were unable to score any marks but the majority of candidates provided a response that secured at least two marks and many secured either four or five marks. Some candidates provided multiple variants on the same point eg instead of providing one responsibility referencing the need to report hazards, they provided a list of five different hazards as five separate points – this approach secured only one mark.

Examples of the types of points that would have secured marks are as follows:

- Take reasonable care to protect the health and safety of themselves and of other people in the workplace
- Make sure they do not engage in improper behaviour that will endanger themselves or others
- Make sure they are not under the influence of drink or drugs in the workplace
- Undergo any reasonable medical or other assessment if requested to do so by the employer
- Report any defects in the place of work or equipment which might be a danger to health and safety
- Report accidents/near misses

Advantages and Disadvantages of the democratic management style: This question was often answered poorly with the majority of candidates failing to appreciate the nature of democratic management ie managers invite feedback and take on views but the final decision rests with the manager. Many candidates assumed that decisions were made by employees voting – this assumption led to incorrect assessments of advantages and disadvantages eg it was common for candidates to state that bad decisions were implemented due to majority voting for them.

Candidates often described the management style rather than providing actual advantages or disadvantages eg they explained that employees were able to provide input but failed to explain why this was an advantage – very few candidates explained that being able to input to decisions made employees feel valued and therefore increased motivation/commitment.

Advantages that could have been provided included:

- More input from team members brings more ideas and adds creativity/options into the process which may not have been there without employee engagement
- Engagement in discussion increases job satisfaction because staff feel involved and that their input is valued – increases motivation/sense of responsibility
- Team members know “what’s going on” and why decisions are made which makes them feel valued and more able to carry out their role due to understanding
- Engagement in decision-making increases employee experience/skills which makes them more able to contribute/more motivated

Disadvantages that could have been provided included:

- Participation takes time, so this style can lead to things happening more slowly than an autocratic approach
- Some staff may view this style of leadership as “weak” and it may have negative impact on the respect for leaders
- Can increase conflict and/or demotivate if individuals feel that their views are ignored

Poor performance: This question was usually answered well with most candidates able to explain why poor performance of the part of an employee should not be ignored. Most candidates secured at least half of the marks available and many scored all of them. Candidates were generally able to explain the link to productivity, the impact on colleagues, the potential for poor performance to escalate/spread around the team and the importance of getting to the bottom of the cause of poor performance in order to address it (eg via training). Few candidates referenced the fact that the failure to address poor performance signalled poor management and that this would be noticed by team members.

Requirements for an effective disciplinary procedure: Many candidates described the stages of a disciplinary process rather than focussing on the factors that affected the effectiveness of a disciplinary procedure – having a staged process in place is one of these factors so only one mark was awarded for awareness of the need for a staged process. Candidates who attained high marks referred to other factors in addition to the staged process such as:

- The disciplinary system should be published and made available to everyone so that all individuals are aware of the company requirements and the processes that will be followed if there are infringements to the rules.
- Individuals should show the standards of performance that they are expected to achieve.
- All staff should have confidence that the system will be implemented and followed as set out in the procedure
- Timely – carried out within an appropriate and clear timescale
- The procedure should respect confidentiality

Importance of effective budgeting system: There were six marks available for this question. Few candidates secured all six marks but most candidates attained at least two or three marks as they were able to reference issues such as prioritising resources, managing spending efficiently by removing/reducing any potential over-spends and ensuring that the business stayed viable. Examples of additional points that could have been made included the need to ensure that day to day operations were provided for, that funds were allocated to departments appropriately and that there was appropriate accountability in the system.

Factors to take into account when developing objectives for a training course: few candidates provided a good response to this question. Most candidates failed to recognise that the question was testing understanding of considerations when developing a course and determining aims and outcomes for the course.

Those candidates that did attain marks often identified that a key factor was the starting point of the learners that would be on the course (as their previous knowledge/what they needed to learn would affect the nature of content and the realistic outcomes for the course). Other factors that could have been considered included the employer/business requirement (as this would influence content and what needed to be achieved) and the length of time available for the training course (as this would set boundaries on how much could be covered by the course and could be achieved by the learners).

Some candidates wrote at length about the benefits of training and different types of training and did not consider the factors relevant to shaping the development and objectives for a training course.

Live training exercises: Candidates who were familiar with the nature of live training exercises were often able to attain most, if not all, of the marks available. However, some candidates did not appear to know what was meant by a live training exercise and this meant that their responses did not address the specific context and they were unable to secure marks. Some candidates appeared to mix up live

training exercises with healthy living and wrote about healthy lifestyles and physical training programmes.

Marks were available for points that referenced issues such as:

- providing an assessment of performance in a realistic environment
- opportunity to test/validate plans
- opportunity to train on a scenario not previously experienced, opportunity to develop skill using equipment
- opportunity to build team spirit with internal and external colleagues.

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