

IFE Level 3 Diploma in Fire Safety and Fire Science

Unit 2 – Fire Safety (Zone 2)

Examiner Report – March 2017

Introduction

21% of the candidates that sat the examination attained a pass.

Candidates did not appear to have prepared for the examination and many appeared to rely solely on their operational experiences. The examination tests technical understanding of fire safety issues and practices and therefore operational firefighting experience rarely provides sufficient specialist understanding to attain many marks in this context.

Question 1

- a) *Describe briefly what an 'atrium' is, as an architectural concept. (2 marks)*
- b) *Describe the hazards to persons from fire associated with this form of building design. (4 marks)*
- c) *Identify the four systems that can control or manage smoke from a possible fire situation in an atrium and briefly describe the features of each of the four systems. (14 marks)*

Examiner Feedback

This was not a popular option for candidates and was generally answered poorly by those who did attempt it.

Part a) of the question was relatively well answered with most candidates able to provide a reasonable definition. Candidates should be aware that an 'atrium' is an open space within a building that passes through one or more structural floors and is usually provided with a roof that offers natural lighting to illuminate the space. The structural flooring aspect of atria was not acknowledged by any candidate.

Good responses to part b) identified the hazards to persons from a fire and covered smoke logging of the atrium and compromised escape routes.

In responding to part c), candidates were required to demonstrate knowledge of smoke management systems. The systems that should have been explored in responses were smoke clearance, smoke control, smoke exhaust and air pressure differential.

Question 2

- a) *Define what a 'column' is as a structural element of construction. (3 marks)*
- b) *Explain the main structural function of a column in a building. (3 marks)*
- c) *State four factors that affect the fire resistance of a concrete column. (4 marks)*
- d) *Define what a 'beam' is as a structural element of construction. (2 marks)*
- e) *A beam is subjected to a number of external and internal forces. Identify these internal and external forces. (4 marks)*
- f) *Concrete is very poor in terms of its tensile strength. Identify the material that can be used in conjunction with concrete to create beams to overcome this inherent weakness and explain why this material is used. (4 marks)*

Examiner Feedback

This was a popular question but was poorly answered by the majority of candidates who attempted it. The topic area covered (the components of building construction) was a basic subject and one which is often covered in examinations.

In responding to part a), many candidates failed to identify that the answer being sought related to the structural qualities of a column ie a vertical structural member designed to transmit a compressive load in a straight line in the direction of the member.

Part b) related to the function of a column; the function is to carry the weight of the building where a wall would interfere with the design or where a large open space is needed. Simply stating that a column holds up a building did not gain any marks.

Part c) was relatively well answered and most candidates were able to attain at least one mark for their response to this element of the question.

In responding to parts d) and e) of the question, candidates often failed to identify basic information in their responses: ie a beam is a structural element that spans horizontally between two supports and carries loads that act at right angles to the beam. The external forces acting on a beam are the load applied to the beam and the reactions to the loads from the supports; the two internal forces are the bending moments and shear forces. A number of candidates used diagrams to illustrate their answer. However, some failed to label the diagram accurately or to link it back to the question asked; where the diagram did not provide a response to the question asked it was superfluous to requirements and no marks could be awarded.

In responding to part f) of the question many candidates took the opportunity to respond from the perspective of its poor tensile strength when involved in fire and to write about pre and post tensioning. However, this question actually made the statement about its poor tensile strength and instead asked about the material (steel) that is used to overcome the weakness. This error in focus meant that many candidates did not answer the question and lost the opportunity to gain 4 marks.

Question 3

- a) *Describe the ways in which effective management of fire safety control measures contribute to the protection of building occupants. (12 marks)*
- b) *Give two examples of situations where it is appropriate to utilise visual alarm signals and explain why a visual alarm signal is appropriate in each case. (4 marks)*
- c) *Outline four fire safety disadvantages of manual fire warning systems. (4 marks)*

Examiner Feedback

The average mark awarded for this question was 6. Those candidates with a fire safety background were clearly identifiable from their response to this question.

Part a) of the question focussed on people in buildings and the management of their safety from fire. Virtually all candidates failed to identify that preventing a fire from occurring in the first instance was a valid control measure. Other control measures that could have been covered in relation to occupants included: having an awareness of the numbers of persons in the building, their locations in the building and what special risks they might create, what special needs particular occupants may have and the development of PEEPS to aid their safe evacuation. Other safety measures included ensuring that means of escape were always available and free from obstruction, effective staff training, the development of an effective action plan and taking control of an incident until the arrival of the fire service.

Part b) was relatively well answered with most candidates gaining 3 of the 4 marks available. Very few of the candidates were able to identify that visual alarms should be used only to supplement audible alarm signals.

Part c) was again relatively well answered.

Question 4

Sandwich panels are a common building material used in building construction.

- a) *Describe the structure of sandwich panels and explain from a fire safety perspective the problems associated with them. (5 marks)*
- b) *State three elements of construction that sandwich panels might be used for and describe the core material used in each application. (6 marks)*
- c) *Define what is meant by the term 'hot work' and describe the circumstances when it is considered appropriate to adopt a hot work permit procedure. (4 marks)*
- d) *State the critical information that a hot work permit should identify. (5 marks)*

Examiner Feedback

In responding to part a), very few candidates were able to describe the structure of sandwich panels (ie consisting of two metal faces positioned either side of a core of

thermally insulated material firmly bonded together so that the three components act compositely when under load). Responses to part b) were also poor with few candidates able to outline the fire safety problems associated with sandwich panels ie the panel becomes delaminated or damaged exposing the thermal insulation core directly to fire, many of the thermal insulating products in sandwich panels are combustible and the fire load of the panels may in some cases be higher than the contents of the building or compartment. Many of the candidates referred to the production of dense smoke but then failed to mention that the panels were combustible.

Parts c) and d) of the question were often answered well. However, some candidates lost marks as they were not able to outline the circumstances when a hot work permit is required; these circumstances are when the work involves flames or sparks, where flammable materials are close by and when work is to be completed in environments where such activities are not normally carried out.

Question 5

In most buildings the evacuation arrangements as a response to the fire alarm activation are designed around simultaneous evacuation.

- a) Identify and describe the three forms of evacuation arrangement other than simultaneous evacuation. For each particular type, provide an example of the type of building the arrangement will be suitable for. (17 marks)*
- b) The evacuation process can be broken into three parts that take place one after the other ie: Recognition time, Response time and Travel time. Define each of these terms. (3 marks)*

Examiner Feedback

This was a popular option for candidates but was not well answered. Most candidates were able to identify the three forms of evacuation (ie staged, phased and progressive horizontal evacuation) but some candidates confused staged and phased evacuation in the descriptions provided.

In responding to part b), some candidates confused recognition time and response time. Recognition Time is the interval period between the time the warning of a fire is given and the time of the first response to the warning; the Response Time is the interval between the time the first response occurs and the time the first move is made towards the exit. Travel time was well understood but that accounted for only one of the three marks allocated to this question.

Question 6

- a) A sprinkler installation should be based on a system type. Identify five of the main types of automatic sprinkler system and outline the types of premises where these systems would typically be installed. (10 marks)*
- b) Identify three different 'superior' water supply options for a 'low rise' sprinkler system. (3 marks)*

- c) *Explain the purposes and operation of an alarm valve fitted to a typical sprinkler system. (7 marks)*

Examiner Feedback

This was a popular option for candidates and was often answered well with this question showing the highest average mark across all candidates over the whole paper.

Most candidates were able to list the types of automatic system required in part a) but many of the candidates were then unable to match the type of system to the risk the system was intended to protect. This was especially evident in the case of pre-action and re-cycling systems.

In response to part b), candidates were often able to offer a comprehensive list of types of superior water mains. Some candidates referred to 'suction pump' and/or 'booster pump'; this did not attract marks as it was not sufficiently specific – the correct answers were 'two automatic suction pumps from a suction tank' and 'two automatic booster pumps'.

From responses to part c), it was evident that most candidates did not fully understand the purpose of the alarm valve. Nearly all of the candidates focused on raising the alarm but then omitted any reference to the alarm valve preventing the reverse flow of water from the sprinkler system into the alarm system. Even fewer candidates mentioned the activation of the fire pump by a pressure switch when the sprinkler system is activated.

Question 7

- a) *Explain how pressurisation is used to keep escape routes and firefighting access routes clear of smoke. (3 marks)*
- b) *Identify the three pressurisation system options that are available to building designers. (3 marks)*
- c) *Identify and explain the two basic design aspects that have to be considered by the designer when designing an effective pressurisation system for a stairway shaft. (10 marks)*
- d) *Describe the role of a pressurisation system designed for a stairway means of escape route. (4 marks)*

Examiner Feedback

In response to part a), candidates could have referred to either positive or negative pressurisation for keeping escape routes and firefighter access routes into a building clear of smoke. Either system has its merits and was acceptable to gain the marks on offer.

In response to part b), few candidates were able to identify that the three system options available to building designers were: operate only in the event of fire; operate on full capacity whenever the building is occupied; operate at a reduced capacity at normal times with automatic boost to full operation in the event of fire.

In responding to part c), candidates often identified the two design aspects required but very few candidates were able to explain the detail around them.

Responses to part d) were generally poor as candidates often failed to refer to the role of the pressure differential that opposes and overcomes the pressures generated by a fire that cause the movement of heat, smoke and toxic gases. Some candidates were able to identify that a pressurisation system keeps a staircase escape route clear of smoke for an extended period but that only accounted for 1 mark out of the 4 marks that were available for a full answer.

Question 8

Effective management and planning is needed for those with impairments to ensure their safe evacuation from buildings in an emergency.

- a) Explain what is meant by a 'refuge' and describe the features that need to be included in the design of a suitable disabled refuge. (10 marks)*
- b) Describe the features you might consider including when designing escape routes and systems to assist visually impaired people to evacuate a building. (6 marks)*
- c) What is a Personal Emergency Evacuation Plan (PEEP) and what would a plan of this type normally include? (4 marks)*

Examiner Feedback

Most candidates were able to explain what is meant by a 'refuge' but few referenced the fact that persons in a refuge could not be left indefinitely until rescued by the fire service or until the fire was extinguished. Few candidates were able to provide details of the features that should be included in the design of a refuge area eg planning to accommodate wheelchairs, planning to enable communication and ensuring access to evacuation routes. Refuges are increasingly being incorporated into buildings so this aspect should be well understood by fire safety practitioners.

Part b) of the question was often answered well.

Responses to part c), which related to PEEPs, were often poor. PEEPs are bespoke plans for individuals who may not be able to reach an ultimate place of safety unaided or within a satisfactory timescale in an emergency. These plans normally include details of the specific disability, information on the additional measures needed to effect a suitable escape and the additional resources (including people) needed to assist in the escape.