

# IFE Level 4 Certificate in Fire Science and Fire Safety

## Unit 2 – Fire Safety

### Examiner Report – March 2020

#### Introduction

45% of the candidates who sat the examination achieved a Pass. Candidates generally performed best on question 3 and least well on questions 5 and 6.

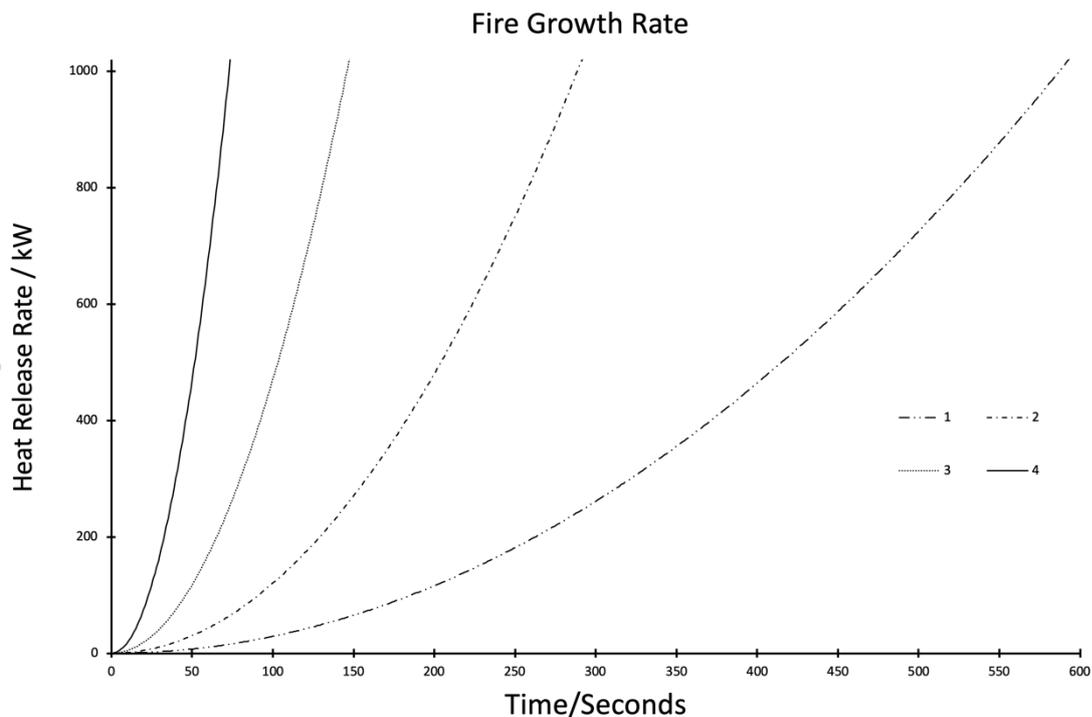
#### Question 1

The  $t^2$  equation shown below is a comparatively simple model for expressing different fire growth rates from different materials.

$$\dot{Q} = \alpha \times t^2$$

Where:

$\dot{Q}$  = Heat Release Rate      kW  
 $\alpha$  = Fire Growth Parameter      kW/s<sup>2</sup>  
 $t^2$  = Time squared      seconds



- a) Referring to the graph above and using the table provided as a separate answer sheet in this examination paper, complete the table to show for each curve the growth rate name, the time to 1 MW and an example of the type of material that would produce this type of curve. Ensure that your candidate number is shown on the separate answer sheet and ensure that the answer sheet is enclosed in your answer book. (12 marks)
- b) Explain how the  $t^2$  equation (as shown above) can be used when designing for fire safety and how this compares with “real world” fires. (8 marks)

### **Examiner Feedback**

This question was not a popular option for candidates but those candidates that attempted it often performed well. The average mark attained by candidates was 9.

Fire modelling is becoming increasingly common in fire engineering so it is important that fire safety practitioners have an appreciation of the subject. The  $t^2$  equation is one of the simplest models, but it is exactly that: a model. In the real world, complex fuel packages do not follow the curves precisely and some fuels (such as some upholstered furniture) are faster than “Ultra Fast”. However, the model is useful for helping calculate ASET and suppression system design. The same fuel substance can have different growth rates depending on configuration, e.g. a solid wood beam will grow much more slowly than plywood.

There were many good responses to part a) with candidates calculating the exact times using information provided in the question. Candidates who explained that the curves are an approximation that is rarely found in the real world were able to score marks for part b).

### **Question 2**

*Explain your considerations when developing a comprehensive fire safety strategy specifically for heritage buildings. (20 marks)*

### **Examiner Feedback**

This was a popular option for candidates but in general was not well answered with the average mark attained for this question being 6. Many candidates relied on basic and generic fire safety measures without explaining how they could be applied to heritage buildings.

Candidates who secured high marks recognised that most, if not all, fire safety legislation is about protecting life so a different approach is required in heritage buildings. Life safety is still paramount but additional measures may be required especially if the building and contents are “National Treasures”. Some guidance documents have been published specifically for heritage buildings and assets.

Examples of point that would have secured marks include:

- wiring and some electrical artefacts may be part of historical interest but bring extra risk
- good understanding of division of the building is needed (which is likely to be lower than modern standards) and an awareness of all voids required. High quality wall cavity barriers, floor cavity barriers and fire stopping is required to maintain fire compartmentation.

- fire alarm systems need to be appropriate – Aspirating/VESDA/cameras/beam detectors may be appropriate as such systems may need to be minimally invasive.
- fire safety signage needs to be sympathetic to the fabric of the building
- any upgrading of fire precautions need to be sympathetic to the fabric of building – e.g. intumescent paints to upgrade existing doors to fire doors.
- staff training must be specific to heritage e.g. manual/vocal alert may be quicker than automatic system, raise alarm at slightest hint of potential fire
- emergency evacuation procedures. Depending on premises there may be large numbers of public – simultaneous or zoned? Effective assembly points away from oncoming fire service resources.
- site and building plans with prioritised list of items to recover first, procedures for salvage, emergency first aid conservation.

### **Question 3**

- a) *Define the term “active fire safety protection measures” and, using examples, explain how these measures contribute to fire safety, how they assist firefighting operations and how their performance may change over time. (10 marks)*
- b) *Define the term “passive fire safety protection measures” and, using examples, explain how these measures contribute to fire safety, how they assist firefighting operations and how their performance may change over time. (10 marks)*

### **Examiner Feedback**

This question was a very popular option for candidates. The question addressed fundamental fire safety knowledge and most candidates answered it very well. The average mark attained for this question was 11.

### **Question 4**

*Explain how the “pre-movement time” of an evacuation can be affected by human characteristics and behaviour. (20 marks)*

### **Examiner Feedback**

This question was also a popular option for candidates. It was generally answered well and the average mark attained was 8.

The concept of ASET RSET is fundamental to understanding escape. This question was about a very small part of RSET: the pre-movement time which consists of the Recognition Phase and Response Phase, both of which occur before positive movement to an exit. Most answers were good when considering the Response Phase with candidates exploring issues such as recognising false alarm fatigue, collecting personal belongings and completing other activities before evacuating. Comments about wayfinding were outside the scope of the question.

Few candidates discussed the Recognition Phase: i.e. becoming aware of an alarm cue (sound, sight, smell, etc) above the background level and recognising that as a prompt to evacuate. Not all fires are discovered by an automatic system.

### **Question 5**

*Describe the physical and procedural measures that can reduce and control the risk of industrial explosions (not terrorism). (20 marks)*

#### **Examiner Feedback**

This question was about preventing and controlling industrial explosions. It was not a popular option for candidates and those that did answer it often secured only low marks.

Many candidates appeared to rely on operational experience and general fire safety principles; this was insufficient to secure high marks.

The first principle is to eliminate the risk, perhaps by changing the process. Secondly, reduce the risk by control and management systems such as preventing accumulation of an explosive mixture and preventing ignition sources. If there is still a residual risk, then there is a need to consider isolation, venting and suppression. Explosion suppression systems must act much faster than sprinklers to be effective.

### **Question 6**

*You have been asked to advise a local nightclub that will host a high profile international performer for the first time. The show is famous for spectacular effects including stage pyrotechnics. Demand for tickets is expected to exceed capacity.*

*Explain the advice that you would give to the organisers to help them to manage the event safely. (20 marks)*

#### **Examiner Feedback**

This question was another popular option but unfortunately few candidates scored high marks.

The question was set in the context of an event using pyrotechnics in a nightclub. Pyrotechnics have been responsible for some of the most devastating fatal fires in nightclubs causing thousands of deaths around the world. The performer's crew should have expertise and would have performed the show many times. However, consideration is needed as to whether or not it would be safe in this specific venue or whether either the show or venue would need adapting in any way. Planning needed to cover issues that could arise that the staff of the venue needed to be aware of and trained to manage.

Many candidates failed to consider the pyrotechnics aspect; instead, they provided generic statements about being aware of the effect of alcohol, good housekeeping and keeping exits clear (which is what the club should be doing every time it opened) without assessing the specific implications of managing the actual event safely.

## **Question 7**

*Consider a multi-occupied office building. Explain the factors and practical difficulties relevant to evacuating people who need assistance from the perspective of:*

a) *building management* (10 marks)

b) *the people who need assistance.* (10 marks)

### **Examiner Feedback**

This question provided candidates with the opportunity to consider evacuation of people who need assistance from the two different perspectives. It was a popular option for candidates but responses were often limited in their considerations and sometimes demonstrated understanding of only one of the two perspectives.

In relation to part a), good responses included points such as the following:

- the need to liaise with the responsible person for each occupancy as well as undertaking “whole building” management
- recognition and consideration of needs other than mobility
- as it is a multi-occupied building, it is important that one occupier does not compromise system for whole building
- refuges are part of building fabric but needs evolve eg wheelchairs may be bigger, especially very specialised/motorised types
- need to manage communications links with all refuges
- guard against the tendency to overplay the safety issue to the detriment of the independence and dignity of disabled person.
- may also be visitors with unknown disabilities and needs - GEEP- Generic Emergency Evacuation Plan
- the level of effort required of a disabled person may not be acceptable for a practice or false alarm. Procedures should allow for simulation in the case of fire drills.

In responding to part b) good responses included point such as:

- the need for good communication and training/awareness of the plan
- fear and isolation in an emergency – may not trust the building plan
- a refuge is not somewhere to be left to wait for FRS to rescue
- importance of being treated with respect and dignity
- some disabled people are put at a great risk when carry-down procedures of any kind are used. It is therefore necessary for the evacuation policy to include a method of reducing or removing the need to escape for a false alarm.
- what issues arise if it is an unfamiliar building?
- separation from medical needs (left at desk, in room) or if evacuated by carry down chair will be separated from own wheelchair - what happens at the bottom?

### **Question 8**

*A developer wishes to convert an existing large dwelling house into a 20-bed care home for the elderly. You have been asked to advise on the fire safety provisions.*

*A plan showing the existing layout is enclosed as a separate sheet in the examination paper.*

*Referring to the plan, describe your advice in relation to fire safety issues relevant to the means of escape and the associated fire resistance. (20 marks)*

### **Examiner Feedback**

This was not a popular question.

Candidates who performed well explained issues and discussed solutions to resolve these issues ie

- excessive travel distances
- no door to the kitchen
- inner rooms
- cupboards on escape routes
- need to protect escape routes and support progressive horizontal evacuation by dividing the building into fire compartments

The question did not ask about fire warning systems, fire extinguishers, staff training or other generic fire safety measures but these were included by some candidates. As these points did not address the question, no marks were awarded.

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