

# IFE Level 4 Certificate in Fire Science and Fire Safety

## Unit 2: Fire Safety

Unit Reference Number: D/505/5932

### Introduction

This unit focuses on the application of fire safety measures in complex premises and environments. Complex premises and environments include premises with a large number of occupants, premises with longer distances to escape routes and premises used for storage/processes involving high or higher risk materials and processes, public access areas and historic buildings. It covers protection equipment and systems as well as management protocols.

### Learning Outcomes

Candidates who achieve this unit should be able to:

- evaluate risks in complex buildings and environments where traditional fire safety approaches may not be sufficient, having regard to construction, occupancy and layouts
- identify and evaluate options to reduce risks, drawing on extensive knowledge of precautions and protection options including trade-offs and compensatory measures
- determine appropriate solutions, synthesising information from diverse angles
- comment on the design of new buildings as well as existing buildings and alterations to existing buildings.

### Unit Status

This is a mandatory unit for candidates who wish to achieve the Level 4 Certificate in Fire Science and Fire Safety.

## Content

### 1. Fire Safety and Fire Engineering Principles

Assessment Objective	Knowledge, Understanding and Skills
1.1 Explain and apply the fire safety systems which may be used when designing, using or altering complex buildings	<ul style="list-style-type: none"> <li>• Passive fire safety</li> <li>• Active fire safety</li> <li>• Pressurisation</li> <li>• Leakage paths</li> <li>• Automatic suppression systems</li> <li>• Smoke control and air handling</li> <li>• Compartmentation</li> <li>• Fire detection and warning systems</li> </ul>
1.2 Explain the underlying concepts that support fire safety in the built environment	<ul style="list-style-type: none"> <li>• Design fire size</li> <li>• Smoke movement</li> <li>• ASET/RSET and factors that affect different phases of evacuation</li> <li>• Fire resistance</li> </ul>
1.3 Explain how computer modelling can support fire engineering	<ul style="list-style-type: none"> <li>• Fire load</li> <li>• Fire growth</li> <li>• Limits of tenability</li> <li>• <math>t^2</math> growth rate</li> <li>• Design Fire Size</li> <li>• Zone and field models</li> <li>• Use of flow chart to support design process</li> <li>• Fire/smoke modelling, examples of programmes</li> <li>• Pedestrian flow/evacuation modelling</li> </ul>

### 2. Human Behaviour in Emergency Situations

Assessment Objective	Knowledge, Understanding and Skills
2.1 Explain the human behaviour factors that affect safety from fire	<ul style="list-style-type: none"> <li>• Interaction between fire safety systems and human behaviour</li> <li>• The physiological, behavioural and psychological effects on people confronted by a fire situation</li> <li>• How behaviour of people in a fire can adversely affect evacuation and means of escape</li> </ul>
2.2 Explain the special arrangements that may be needed for means of escape for individuals with particular requirements and assess implications in different contexts	<ul style="list-style-type: none"> <li>• Emergency procedures for the safe evacuation of people from a fire situation</li> <li>• Individuals with particular requirements to include the young, the old, the disabled, those with poor health, short term and long-term conditions, cognitive impairment and people from different cultures</li> <li>• Behavioural aspects of people in fire and implications when planning/reviewing means of escape and evacuation procedures</li> </ul>
2.3 Apply learning from significant fires in assessing situations or drawing conclusions	<ul style="list-style-type: none"> <li>• Fires of International note</li> <li>• Identification of patterns and application of learning from previous incidents</li> </ul>

### 3. Fire Protection Equipment

Assessment Objective	Knowledge, Understanding and Skills
3.1 Describe the design features, installation, maintenance and operation of automatic fire detection systems and assess which systems would be appropriate in different situations	<ul style="list-style-type: none"> <li>• Types of system</li> <li>• Success or failure of operation</li> <li>• Automatic Fire Detectors - Radio Systems</li> <li>• Automatic Fire Detection - Detector Circuits</li> <li>• Zones, addressable for complex evacuation strategies, double knock, multi-purpose detectors</li> <li>• Aspirating systems</li> <li>• Control and indicating equipment</li> </ul>
3.2 Describe the design features, installation, maintenance and operation of extinguishing media and assess which systems would be appropriate in different situations	<ul style="list-style-type: none"> <li>• Sprinkler systems: commercial, residential and domestic (life safety)</li> <li>• Other water- based systems, drenchers, foam, water mist</li> <li>• Gaseous systems</li> <li>• Oxygen depletion systems</li> </ul>
3.3 Describe and explain the design features, installation, maintenance and operation of explosion detection and control systems	<ul style="list-style-type: none"> <li>• Explosion detection systems</li> <li>• Explosion venting systems</li> <li>• Explosion suppression systems</li> <li>• Control of flammable atmospheres</li> </ul>
3.4 Describe and explain the design features, installation, maintenance and operation of other protection equipment	<ul style="list-style-type: none"> <li>• Fire curtains</li> <li>• Shutters</li> </ul>

## 4. Building Design

Assessment Objective	Knowledge, Understanding and Skills
4.1 Interpret plans of buildings	<ul style="list-style-type: none"> <li>• Evaluate plans to identify risk and provide fire safety solutions</li> </ul>
4.2 Explain the way in which building materials can be used, comment on their behaviour in fire and assess the implications for fire safety	<ul style="list-style-type: none"> <li>• Applied protection</li> <li>• Modern Methods of Construction</li> <li>• Cross Laminated Timber</li> <li>• Steel frame</li> <li>• Glulam</li> <li>• Large structural timber</li> <li>• Structural Insulated Panels</li> <li>• Modular construction</li> <li>• Fire retardant, intumescent treatments</li> <li>• Upgrading fire resisting doors</li> </ul>
4.3 Describe structures and building design components stating their function and assessing their impact on fire safety	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Glazing</li> <li>• Separating walls</li> <li>• Compartment walls and floors</li> <li>• Junctions formed by elements of structure</li> <li>• Protected shafts and protecting structures</li> <li>• Fire resisting doors and other enclosures</li> <li>• Claddings</li> <li>• Facades</li> <li>• Tunnels</li> </ul>
4.4 Describe heating, ventilation and air conditioning systems that are used in buildings, assess the effects they may have on a fire and explain the fire suppression methods used in these systems	<p>Heating systems</p> <p>Ventilation</p> <p>Air conditioning systems</p> <p>Stairwell pressurisation systems</p> <p>Ventilation and smoke handling systems</p>
4.5 Describe mechanised pedestrian transport systems, their role in the movement of people in buildings and implications for fire safety	<ul style="list-style-type: none"> <li>• Lifts/elevators</li> <li>• Escalators</li> <li>• Travellators</li> </ul>
4.6 Evaluate risks associated with modern construction design and development process	<ul style="list-style-type: none"> <li>• Describe consultation process</li> <li>• Qualitative Design Review</li> <li>• Interaction and compatibility between different materials</li> <li>• Unexpected consequences of inappropriate selection, use, location, orientation and interaction of materials</li> <li>• Impact of quality of construction</li> <li>• Impact of modern methods of construction</li> <li>• During construction and alterations</li> </ul>

## 5 Fire Safety Management, Review and Advice

Assessment Objective	Knowledge, Understanding and Skills
5.1 Explain how to assess fire risks within complex premises and environments	<ul style="list-style-type: none"> <li>• Principles and methods of risk assessment in complex premises and environments</li> <li>• Impact of structure, materials and access</li> <li>• Identification of people who may be at risk</li> <li>• Identification of risks to property and the environment</li> <li>• How to explain risks to members of the public and property owners/managers</li> <li>• Common causes of fire in different occupancies</li> <li>• How to review effectiveness of current measures</li> <li>• How to provide feedback on effectiveness of current measures</li> <li>• Impact of organisational constraints</li> </ul>
5.2 Identify and evaluate methods of improving fire safety in the community and increasing public awareness and perception of general fire safety matters	<ul style="list-style-type: none"> <li>• Strategic thinking</li> <li>• The use of fire statistics to inform decisions on fire safety programmes</li> <li>• Risks in the community and prioritising fire safety programmes</li> <li>• Objectives of fire safety education in the community</li> <li>• Contents of fire safety programmes and their purpose</li> <li>• Methods to engage diverse community members and stakeholders</li> <li>• Methods to evaluate success of programmes</li> </ul>
5.3 Explain and assess the role of management and control of fire safety in large buildings and organisations	<ul style="list-style-type: none"> <li>• Strategic thinking</li> <li>• Level of fire safety knowledge and responsibility at different parts of the organisation</li> <li>• Engaging and training employees in different premises/workplaces and in different roles</li> <li>• Identification of training requirements for people with fire safety responsibility</li> <li>• Importance of testing and reviewing precautions in place and how to do this</li> </ul>