

IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management

Qualification Specification

Qualification Number: 500/5922/1

About the Institution of Fire Engineers (IFE)

The IFE is the professional institution for those working in the fire sector.

The IFE is a registered charity working for societal benefit. Founded in 1918, the IFE's mission is to promote, encourage and improve the science, practice and professionalism of fire engineering with the overall aim of protecting and saving lives. Members of the IFE share a commitment to ensuring that the fire profession remains relevant and valued, protecting people, property and the environment from fire.

The IFE Awarding Organisation

The IFE's awarding organisation is non-profitmaking.

The aim of the of the awarding organisation is to encourage those who work in the sector to engage with, and develop, the critical understanding needed to operate effectively and safely and to best professional standards so that they can protect and save lives. In doing this, the awarding organisation contributes to three of the IFE's (six) over-arching strategic priorities ie:

- ◆ Facilitate awareness of fire issues and developments through the communication of ideas, knowledge, information
- ◆ Foster professionalism by establishing and maintaining pathways and recognised standards of fire professionalism and competency.
- ◆ Increase knowledge in the science, practice and professionalism of fire engineering.

All of the IFE's qualifications are designed for those working in the fire sector and to meet the above priorities. Qualifications and their associated assessments (examinations and practical activities/assignments) provided by the IFE are designed, assessed and quality assured by experts with extensive experience of working within the fire sector.

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IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management

Introduction

The IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management has been developed by the Institution of Fire Engineers (IFE), representatives of Fire and Rescue Services and other fire professionals. The content and structure of the qualification has been established to reflect best professional practice.

Aims of the Qualification

The IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management has been designed to enable individuals to demonstrate a wide range of critical knowledge and understanding relevant to fire science, managing fire/rescue situations and determining measures for protection against fire.

IFE Membership

Achievement of this qualification will enable individuals to meet the academic requirement for membership of the Institution of Fire Engineers at Technician grade (TIFireE).

Target Audience

The qualification will meet the needs of:

- ◆ those employed in fire and rescue service roles across the world, particularly those who are either already in Crew Manager roles or those who wish to develop and demonstrate knowledge and understanding relevant to the role of Crew Manager in preparation for promotion to this role;
- ◆ those operating in specialist fire and rescue contexts, such as aviation or fire prevention/fire safety roles, who need to develop and apply a wide range of knowledge and understanding in their role;
- ◆ other fire professionals who wish to demonstrate their knowledge and understanding of fire-related subjects;
- ◆ individuals throughout the world wishing to achieve membership of the IFE at Technician grade (TIFireE).

Qualification Structure

In order to achieve the IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management candidates must achieve four mandatory units as follows:

- ◆ Unit 1: Fire Engineering Science
- ◆ Unit 2: Fire Operations
- ◆ Unit 3: Fire Safety
- ◆ Unit 4: Management and Administration in Fire and Rescue Services

Qualification Content

The content of the qualification is set out in the four units presented below. These sections provide information on the range of topics that must be studied to achieve each unit including the way in which candidates need to show their understanding (Assessment Criteria) and the scope/range/contents in which they can be tested (Knowledge, Understanding and Skills).

The syllabus content is very broad and deep and therefore not all topics can be tested in all examinations. Candidates are advised to prepare for the examination by covering all topics so that they are able to provide comprehensive responses.

Assessment

Each unit is assessed separately by a one-hour examination. The examinations are closed-book and provide a summative assessment of the full range of learning specified in the unit content.

There are 50 marks available in each examination. The examination will take the form of six questions and candidates should attempt all questions in the examination. All examination questions require a written response. The marks allocated to each question are shown on the examination paper.

Examinations are designed to ensure that all sections of the unit content are tested in each examination and to provide candidates with the opportunity to demonstrate their knowledge and understanding across the content specified in the unit.

Examinations are provided in English only.

In order to achieve a pass, candidates will be required to attain at least 50% of the 50 marks available to them via the six questions (ie 25 marks). Candidates who answer fewer than six questions will be able to achieve a pass as long as they achieve the minimum pass mark of 25.

Sample examination papers are available on the IFE's website. Candidates will also be able to refer the examiner reports on previous examinations. Reports for the last three years are available on the IFE website - <https://www.ife.org.uk/Qualifications/Past-Papers-and-Exam-Reports> Please note that the feedback on multiple choice questions is no longer relevant but all feedback on written response answers remains completely relevant.

Certification

Unit Achievement

Each unit is assessed separately. In order to achieve a unit, candidates must obtain at least 50% of the marks available in the relevant examination.

Achievement is not graded. Successful candidates are awarded a Unit Certificate which recognises that candidates have passed the unit examination.

Where candidates achieve more than one unit at the same examination session, but have not achieved the four units required for a full qualification, all of the units achieved at that session (ie all examinations passed) will be listed on a single Unit Certificate.

Achievement of the IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management

In order to achieve the IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management, candidates must achieve a Pass in all four mandatory units/examinations. The qualification certificate is not graded – successful candidates will be awarded a Pass Certificate.

Candidates do not need to pass all four examinations at the same examination session. However, in order to achieve the full IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management qualification, candidates must achieve all four units within five years.

Entry Requirements

There are no formal entry requirements and candidates are not required to achieve other qualifications prior to undertaking this qualification. However, candidates are advised that this specification provides progression from the Level 2 Certificate in Fire Science, Operations and Safety; therefore, candidates who have previously achieved an IFE qualification at Level 2 will be able to build upon relevant knowledge and understanding.

Candidates will need to be able to communicate effectively in writing in order to respond to the written answer questions.

In addition, candidates are advised that mathematical skills will be required in order to complete the Fire Engineering Science unit (unit 1) examination.

Qualification Level

This qualification has been designed to enable candidates to demonstrate that they have attained skills and knowledge at Level 3. Other types of qualifications that are set at Level 3 include A level, AS level, international Baccalaureate diploma, level 3 diploma and level 3 NVQ.

The qualifications regulator, Ofqual, has provided the following descriptors to illustrate the knowledge and understanding expected from those who hold qualifications at Level 3.

Level 3 Knowledge descriptor

The holder (of the qualification):

- has factual, procedural and theoretical knowledge and understanding of a subject or field of work to complete tasks and address problems that while well -defined, may be complex and non-routine.
- can interpret and evaluate relevant information and ideas.
- is aware of the nature of the area of study or work.
- is aware of different perspectives or approaches within the area of study or work

Candidates are advised to bear these descriptors in mind in preparing for examinations and when presenting responses during examinations.

Progression

Candidates who are successful in achieving the IFE Level 3 Certificate in Fire Science, Operations, Fire Safety and Management will have developed knowledge and understanding that will prepare them to undertake further study. Candidates may wish to extend their knowledge and understanding at Level 3 and progress to the IFE Level 3 Diploma in Fire Science and Fire Safety. Alternatively, candidates may wish to progress to the IFE Level 4 Diploma in Fire Science and Fire Safety or to other qualifications at Level 4.

Candidates may also choose to specialise in specific areas and to progress to specialist qualifications eg the IFE Level 3 Certificate in Passive Fire Protection or the IFE Level 3 Certificate in Fire Service Operations and Incident Command.

Qualification Learning Time

The length of time needed to complete this qualification will vary depending upon the starting point (ie previous knowledge and experience) for each individual.

Research suggests that most candidates should spend around 60 hours preparing for each unit although some candidates may wish to allocate a higher proportion of their preparation time to one or more units depending on their pre-existing knowledge eg candidates often allocate more time to fire engineering science.

Total qualification time is therefore 244 hours comprising:

- ◆ 240 hours (over 4 units) of learning eg self-study/course training. Study may be self-study (please see the section on recommended reading below) and may include relevant employer training programmes.
- ◆ 4 hours (over 4 separate examinations of one hour each) of assessment.

Most candidates prepare for IFE examinations via self-study or by drawing on training provided by their employer that covers aspects of the syllabus. Candidates are advised to cross-map their study/training against the content of the unit to ensure that all parts of the unit have been covered. Recommended reading materials are listed below.

Reasonable Adjustments

The IFE permits reasonable adjustments to be made where candidates have disabilities (including medical conditions and learning disabilities such as Dyslexia). The IFE's policy on reasonable adjustment aims to enable candidates with disabilities and other difficulties to access the IFE qualifications without compromising the assessment process or the validity of the certificate.

The policy, which includes the types of arrangements that may be made (eg additional time, use of technology) and the procedure for applying for reasonable adjustments, is published on the IFE's website - <https://www.ife.org.uk/Qualification-FAQs>. The IFE will consider all requests for reasonable adjustments. All requests for reasonable adjustments must be submitted to the IFE as all decisions on reasonable adjustments rest with the IFE.

Recommended Reading

Candidates should be aware that this reading list is advisory rather than definitive.

Candidates should use the content of the units as their guide in deciding what reading materials they need to help them prepare for the examination – please see Content section below. The IFE recommends that all candidates should read widely in order to extend the depth and breadth of their knowledge and understanding.

The IFE has applied the following criteria in determining which resources should be included on this recommended reading list:

- ◆ the resource provides information which will be of benefit to the candidate in their professional life, providing depth and breadth of understanding;
- ◆ the resource contains some information that will be relevant to part of the unit;
- ◆ the resource is recognised by industry professionals as providing valuable information.

Candidates preparing for the examinations are advised to refer to the list below:

Title, Author and Publisher	Unit			
	1	2	3	4
Elementary Fire Engineering Handbook (IFE 50) by George Almond, Version issued 2017, available via IFE online shop.	✓	✓	✓	
Formula Booklet, by Richard Fowler http://www.ife.org.uk/Preparing-for-Examinations	✓			
Fire Dynamics for Firefighters by Ben Walker (Pavilion Publishing)	✓	✓		
Foundation for Hazardous Materials, Section 1* https://www.ukfrs.com/guidance/knowledge-base	✓			
The Foundation for Incident Command* https://www.ukfrs.com/guidance/knowledge-base		✓		
Foundation for Breathing Apparatus* https://www.ukfrs.com/guidance/knowledge-base		✓		
NFCC Guidance: Reduction of False Alarms and Unwanted Fire Signals https://www.nationalfirechiefs.org.uk/write/MediaUploads/NFCC_Guidance_publications/Protection/Unwanted_fire_alarms/CFOA_Guideline_for_the_Reduction_Brochure_June_20			✓	
Fire Safety Risk Assessment - Sleeping Accommodation (Section 4 and Appendix D Glossary of terms), UK Gov https://www.gov.uk/government/publications/fire-safety-risk-assessment-sleeping-accommodation			✓	



Fire safety risk assessment: means of escape for disabled people https://www.gov.uk/government/publications/ UK Gov			✓	
Management and Administration, by Glenys Southworth http://www.ife.org.uk/Preparing-for-Examinations				✓

* National Operational Guidance Programme

Candidates may also refer to the sample examination and examiner reports (short answer questions sections) on previous examinations which are available on the IFE's website - <https://www.ife.org.uk/Qualifications/Past-Papers-and-Exam-Reports>.

Booking Examinations and Additional Information on Examination Arrangements

All four unit examinations are available in March and in October each year.

Individuals who wish to sit examinations may book examinations either through their examination centre (eg Fire and Rescue Service, IFE Branch) or they may book directly through the IFE. Where appropriate, the IFE will direct individuals to approach their employer or branch contact.

Information on the examination timetable and other relevant dates (such as the last date for booking examinations) for March examinations, together with the booking form, the list of venues available to candidates, the terms and conditions for candidates and additional information on examination arrangements is provided on the IFE website on 1 September each year. A separate page for each March examination session is provided on the IFE website.

Information on the examination timetable and other relevant dates (such as the last date for booking examinations) for October examinations, together with the booking form, the list of venues available to candidates, the terms and conditions for candidates and additional information on examination arrangements is provided on the IFE website on 1 May each year. A separate page for each October examination session is provided on the IFE website.

Detailed guidance for candidates on examination arrangements is provided in the *Rules and Information for Candidates* booklet. This booklet sets out the rules to be followed by candidates and also the dates for publication of results and the timetable for candidates to query examination results.

Complaints and Appeals

Procedures for making a complaint or lodging an appeal are available on the IFE website - <https://www.ife.org.uk/Qualification-FAQs>



Further Information

Further information on examination conditions is available in the IFE booklet, *Rules and Information for Candidates Taking IFE Examinations*. This booklet can be downloaded from the IFE's website.



Unit 1: Fire Engineering Science

Introduction

This unit provides candidates with the opportunity to develop and demonstrate their understanding of fire engineering science. The content of the unit has been designed to reflect the technical knowledge that fire professionals need in order to understand the behaviour of fire including the chemistry of fire and the mechanics that underpin protecting against fire and also firefighting and rescue tactics and equipment.

Learning Outcomes

Candidates who achieve this unit should be able to:

- ◆ carry out mathematical calculations accurately
- ◆ understand and apply the chemistry of fire
- ◆ understand and apply the principles of hydraulics
- ◆ understand and apply the principles of electricity

Unit Status

This is a mandatory unit.

Content

1. Mathematics

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Demonstrate an understanding of basic mathematical terms and solve problems relative to fire engineering	<ul style="list-style-type: none"> • The four processes - addition, subtraction, multiplication and division in respect of fractions, decimals, percentages, ratios, proportions and statistics • Transposition of formulae
1.2 Demonstrate an understanding of basic geometry	<ul style="list-style-type: none"> • Two dimensional shapes - square, rectangle, quadrilateral, parallelogram, rhombus, trapezium, triangle, circle • Three dimensional objects - cube, cuboid, pyramid, prism, cylinder, cone, sphere
1.3 Undertake calculations in respect of various geometrical shapes and objects	<ul style="list-style-type: none"> • Area and perimeter of a regular and irregular shapes • Volume and capacity of rectangular and circular tanks • Volume and capacity of hose and pipeline
1.4 Demonstrate an understanding of elementary trigonometry and undertake calculations	<ul style="list-style-type: none"> • Pythagoras' theorem • The terms - opposite, adjacent, hypotenuse • Angles, including right, acute, obtuse, straight, reflex



2. Mechanics

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Define and describe the physical properties of matter and apply understanding in carrying out calculations and comparisons	<ul style="list-style-type: none"> • Matter • Physical state of matter – solid, liquid, gas, plasma • Mass • Density • Relative density (specific gravity) • Vapour density • Liquids of different density • Gases of different density • Melting, boiling and evaporation • Solubility and miscibility • Viscosity
2.2 Demonstrate an understanding of basic mechanical terms and applications and apply understanding in carrying out calculations	<ul style="list-style-type: none"> • Newton's Laws of Motion • Motion, including gravity, speed, velocity and acceleration • Momentum and Force, including Torque • Energy • Work, Power and Mechanical Energy, including Potential Energy and Kinetic Energy • Friction and stopping distances • Simple machines eg. lever and pulley systems • Mechanical Advantage, Velocity Ratio and Efficiency

3. Heat and Temperature

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Define and explain basic terms and their relationships	<ul style="list-style-type: none"> • Heat • Temperature • Relationship between heat and temperature
3.2 Demonstrate an understanding of how temperature is measured	<ul style="list-style-type: none"> • Methods of measuring temperature including: <ul style="list-style-type: none"> ○ Liquid thermometers ○ The air or gas thermometer ○ Using solids to measure temperature ○ Thermocouples ○ Electrical resistance ○ Thermistors ○ Comparison by brightness ○ Infra red • Thermometric scales: <ul style="list-style-type: none"> ○ The Celsius or Centigrade scale ○ The Fahrenheit scale ○ The Kelvin or Absolute scale



3.3 Define and use the units of heat	<ul style="list-style-type: none"> • The Joule (J) • The calorie • The British thermal unit (Btu)
3.4 Define and explain the terms used in the context of heat transfer	<ul style="list-style-type: none"> • Specific heat • Change of state and latent heat • Latent heat of vaporisation • The effect of change of pressure on the boiling point and latent heat • Latent heat of fusion • Cooling by evaporation
3.5 Describe and explain processes of heat transmission	<ul style="list-style-type: none"> • Conduction • Convection • Radiation
3.6 Describe and explain the principles of thermal expansion	<ul style="list-style-type: none"> • Solids <ul style="list-style-type: none"> ○ The coefficient of linear expansion ○ Nickel-iron alloy (Invar) ○ Expansion in metal structures ○ Thermostats ○ The coefficient of superficial and cubical expansion of solids • Liquids <ul style="list-style-type: none"> ○ Cubical expansion ○ The effect of expansion on density • Gases (Liquefaction) <ul style="list-style-type: none"> ○ Critical temperature and pressure ○ Liquefied gases in cylinders • Sublimation
3.7 Define the Gas Laws and undertake calculations involving them	<ul style="list-style-type: none"> • Boyle's Law • Charles's Law • Law of Pressures • The General Gas Law

4. Hydraulics

Assessment Criteria	Knowledge, Understanding and Skills
4.1 Describe the properties of water and explain its reaction to pressure and energy.	<ul style="list-style-type: none"> • Properties of water • Principal characteristics of pressure • Relationship between pressure and head for water • Loss of pressure due to friction • Energy changes in water streams • Water power and efficiency • Jet reaction • Water hammer



	<ul style="list-style-type: none"> • Undertake calculations involving water power, efficiency and jet reaction
4.2 Explain how pressure and flow is measured with instruments	<ul style="list-style-type: none"> • Water gauges (Manometers) • Pressure and compound gauges • Flow gauges
4.3 Describe the effect of atmospheric pressure on suction lift and the practical limitations and potential problems that can occur on the fireground	<ul style="list-style-type: none"> • Atmospheric pressure • Suction lift • Siphons
4.4 Describe how water flows through hose, pipelines and nozzles and undertake the relevant calculations	<ul style="list-style-type: none"> • The conditions required to enable water to flow in hose or pipelines • Quantity of water flowing • Velocity of water • Discharge through nozzles

5. Chemistry

Assessment Criteria	Knowledge, Understanding and Skills
5.1 Define and use basic chemical terms and explain structures and reactions in different contexts.	<ul style="list-style-type: none"> • Atom (protons, neutrons and electrons) • Molecules • Elements • Compounds • Mixture • Radicals • Atomic mass • Molecular mass • Valency • Reactivity • Metal • Non-metal • Organic chemistry
5.2 Explain the structure and composition of simple chemical formulae and equations	<ul style="list-style-type: none"> • Use symbols to write formulae • Nomenclature • Interpret formulae



<p>5.3 Describe and explain the chemistry of combustion</p>	<ul style="list-style-type: none"> • The components of the fire tetrahedron • Exothermic reactions • Types of flames and practical examples: <ul style="list-style-type: none"> ○ Premixed ○ Diffusion • Laminar and turbulent flow • Flash point • Fire point • Flammable limit range • Stages of fire development • Ignition: <ul style="list-style-type: none"> ○ Spontaneous ignition temperature/auto ignition temperature (AIT) ○ Self-heating and spontaneous combustion • Difference between flaming and smouldering combustion • Toxic products of combustion • Classes of fire: <ul style="list-style-type: none"> ○ Ordinary combustibles - paper, plastic, wood, fabric, etc. ○ Flammable liquids - fuel, oil, kerosene ○ Electrical equipment/Fires involving energised electrical equipment ○ Flammable metals - magnesium, aluminium, etc. ○ Cooking related e.g. grease, lard, etc.
<p>5.4 Explain and apply the principles of chemistry to the extinction of fire</p>	<ul style="list-style-type: none"> • Starvation • Smothering • Cooling
<p>5.5 Explain the chemistry and applications of the primary fire extinguishing media and methods</p>	<ul style="list-style-type: none"> • Water • Foam • Vaporising liquids • Carbon dioxide and inert gases • Dry chemical powders • Blanketing • Beating out

6. Electricity

Assessment Criteria	Knowledge, Understanding and Skills
<p>6.1 Define and use electrical terms, symbols and units and undertake calculations involving them</p>	<ul style="list-style-type: none"> • Ampères • Volts (Electromotive Force - EMF) • Ohms • Joule • Watts



	<ul style="list-style-type: none"> • Power
6.2 Define, understand and use Ohm's Law	<ul style="list-style-type: none"> • Principles of Ohm's Law • Ohm's Law calculations
6.3 Describe the types of electrical supply and current flow in a circuit	<ul style="list-style-type: none"> • Direct Current (dc) and Alternating Current (ac) • Simple circuitry <ul style="list-style-type: none"> ○ Series ○ Parallel • Resistance in a circuit
6.4 Describe the purpose of electrical transformers	<ul style="list-style-type: none"> • Step up • Step down
6.5 Explain the nature and dangers of static electricity	<ul style="list-style-type: none"> • Causes of static electricity • Attraction and repulsion • Examples of dangerous conditions
6.6 Explain the purpose and significance of conductors and insulators	<ul style="list-style-type: none"> • Good and poor conductors • Insulators for different purposes • Types of insulating materials
6.7 Explain the purpose and operation of protective devices to electrical circuits	<ul style="list-style-type: none"> • Short circuits • Earthing devices • Fuses • Circuit Breakers <ul style="list-style-type: none"> ○ Miniature Circuit Breakers (MCB) ○ Residual Current Circuit Breakers (RCCB)
6.8 Identify potentially dangerous electrical loading conditions and explain the measures that can be taken to prevent them.	<ul style="list-style-type: none"> • Electrical causes of fire • Prevention of electrical causes of fire

Unit 2: Fire Operations

Introduction

This unit focuses on the strategies and activities required to successfully resolve diverse fire and rescue operational scenarios.

Learning Outcomes

Candidates who achieve this unit should be able to:

- ◆ Identify and explain the factors to be taken into account when pre-planning for incidents
- ◆ understand and apply the principles underpinning incident command
- ◆ understand the issues and strategies to be employed when carrying out firefighting or rescue operations in diverse contexts
- ◆ understand the operation and deployment of firefighting equipment

Unit Status

This is a mandatory unit.

Content

1. Incident Command

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Describe the process, considerations and value of pre-planning for emergencies	<ul style="list-style-type: none"> • Generic risk assessment plans • Site specific plans • Safe systems of work • The availability of trained personnel and resources • Risks to emergency and non-emergency service personnel, the community, environment, heritage and economy • Securing water supplies and other resources • The involvement of other agencies • Access • Key site personnel and responsible persons
1.2 Explain the key principles of Incident Command	<ul style="list-style-type: none"> • Roles and responsibilities: <ul style="list-style-type: none"> ○ Command ○ Communications • Situational awareness • Structuring an incident: <ul style="list-style-type: none"> ○ Span of control ○ Sectorisation ○ Cordons



	<ul style="list-style-type: none"> • Identification of hazards and risks • Risk assessments at an incident: <ul style="list-style-type: none"> ○ The Firefighter Safety Maxim ○ Risk concepts (Hazard and Risk) ○ Dynamic risk assessment ○ Analytical assessment ○ Personal or individual assessment • Risk reduction: <ul style="list-style-type: none"> ○ Eliminate the risk ○ Reduce the risk ○ Isolate the risk ○ Control the risk ○ Personal Protective Equipment (PPE) ○ Discipline • Tactical control: <ul style="list-style-type: none"> ○ Offensive ○ Defensive ○ No overall mode ○ Emergency evacuation and tactical withdrawal ○ Firefighter emergency • Safety officers • Multi-agency incidents
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2. Firefighting – Principles and Considerations

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Explain the phases of fire growth and the potential hazards	<ul style="list-style-type: none"> • Fire Load • Phases of fire growth: <ul style="list-style-type: none"> ○ Incipient phase ○ Growth phase ○ Fully developed phase ○ Decay phase • Flashover – including signs and symptoms • Backdraft – including signs and symptoms • Fire gas explosion – including signs and symptoms • Ways in which fire can spread detected and undetected both internally and externally
2.2 Describe operational procedures and considerations when responding to an incident	<ul style="list-style-type: none"> • Initial response to a fire • Assessing the incident • Safety considerations • Environmental considerations • Speed of intervention • Methods of entry • Locating the fire • Selecting the correct firefighting method • Application techniques



	<ul style="list-style-type: none"> • Cutting away • Damping down and turning over • Siting of bridgeheads • Assessing resource requirements
2.3 Explain the purpose and use of ventilation and the main techniques that can be adopted at a fire	<ul style="list-style-type: none"> • Tactical ventilation • Uncontrolled ventilation phenomena (wind driven, Coandă, Piston, Trench, Stack) • Dust explosions • Principles and benefits of ventilation •
2.4 Explain the potential damage fires and firefighting can have on the environment	<ul style="list-style-type: none"> • Potential damage to lakes, water course, drainage systems, sensitive and fragile habitats • Pollution caused by fire run-off water, firefighting foam, smoke plumes, polluting materials
2.5 Describe the value and aims of salvage operations pre, during and after firefighting operations	<ul style="list-style-type: none"> • Salvage procedures and considerations • Active prevention of avoidable damage • Mitigating the effects of fire and firefighting operations • Subsequent restoration and protection relevant to the premises

3. Firefighting and Rescue Contexts

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Describe and explain the general principles and methodologies used for search and rescue at incidents	<ul style="list-style-type: none"> • Casualty and manual handling • Rescues involving individuals with particular issues eg disability, bariatric (obese), age • Rescues from the built environment, to include: <ul style="list-style-type: none"> ○ Entry into and searching of buildings and collapsed structures ○ Release of trapped persons from machinery, lifts, escalators ○ Rescues from sub surface and confined spaces, to include entry into and searching of tunnels and shafts, vat, silo, sewer, trench, pit, chimney • Rescues from transportation incidents, to include extrication of persons from vehicles, trains, aircraft, ships and boats • Rescues from height, to include working at height or with ropes • Rescues from water and unstable ground • Rescues from incidents involving hazardous materials



<p>3.2 Describe the appropriate method of attack and procedures for dealing with fires in different contexts.</p>	<ul style="list-style-type: none"> • Impact of fire on structures and signs of building collapse • Incidents in the built environment involving fires in: <ul style="list-style-type: none"> ○ Buildings under construction and demolition or derelict ○ High rise properties or buildings with atriums, basements and tunnels ○ Roofs ○ Leisure facilities, camp sites and temporary structures ○ Commercial premises and industrial/petrochemical processes ○ Hospitals, health care and educational establishments ○ Prisons and places of lawful detention ○ Places of research and laboratories. ○ Historical buildings and premises containing valuable artefacts including Heritage buildings, museums and galleries ○ Waste, recycling and renewable energy sites • Fires involving transportation by road, rail, air and waterways, to include: <ul style="list-style-type: none"> ○ Modes of transportation, ie vehicles rolling stock, aircraft and vessels ○ Infrastructure, such as roads, terminals, stations, docks, marinas, etc. • Wildfires to include rural areas such as forests, heath land, wildland, crops, bush etc. • Farms, farm buildings, processes and equipment
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4. Water Supplies, Appliances, Equipment

Assessment Criteria	Knowledge, Understanding and Skills
<p>4.1 Describe the provision of water supply systems for firefighting purposes</p>	<ul style="list-style-type: none"> • Water distribution systems • The purpose of a ring main • The causes of poor flow in mains • Hydrant installations
<p>4.2 Describe the various methods of supplying water to the fireground and the practical considerations that need to be taken into account</p>	<ul style="list-style-type: none"> • Water carrying • Water relay and water shuttle • Use of hose laying appliances • High Volume Pumping Units



<p>4.3 Describe the operation and use of pumps and primers and their respective advantages and disadvantages</p>	<ul style="list-style-type: none"> • The three categories of pumps: • Positive displacement, <ul style="list-style-type: none"> ○ Force ○ Lift ○ Bucket and Plunger ○ Rotary • Centrifugal <ul style="list-style-type: none"> ○ Single stage ○ Multi stage ○ Regenerative • Ejector • The following primers: <ul style="list-style-type: none"> ○ Reciprocating ○ Water ring ○ Exhaust gas ejector • Testing and maintenance procedures to be adopted
<p>4.4 Describe the purpose and operation of pump cooling systems</p>	<ul style="list-style-type: none"> • For vehicle mounted pumps (closed circuit system) • For portable pumps (indirect closed circuit system)
<p>4.5 Describe good practice with pump operation and the distribution of water on the fire ground</p>	<ul style="list-style-type: none"> • General principles involved in siting pumping appliances at an incident • Working from: <ul style="list-style-type: none"> ○ a hydrant ○ open water • Identification and rectification of problems • Estimating required pump pressures
<p>4.6 Describe the various types of instrumentation (gauges) used in the pump bays of modern pumping appliances and explain their purpose</p>	<ul style="list-style-type: none"> • Water contents • Pressure • Compound • Flow • Tachometer • Engine coolant temperature • Oil pressure
<p>4.7 Describe the construction and main characteristics of good firefighting delivery and hard suction hose and explain the factors for consideration when using them</p>	<ul style="list-style-type: none"> • Hose pressure and tests • Storage and care of hose • Deterioration of hose • Hard suction hose • Hose couplings and fittings
<p>4.8 Describe the various types and uses of branches, nozzles, monitors and breechings and explain the factors for consideration when using them</p>	<ul style="list-style-type: none"> • Branches without control facilities • Branches with control facilities • Hose reel branches • Ground monitors • Ultra high pressure systems • Dividing and collecting breechings
<p>4.9 Describe the construction, use and maintenance of fire and rescue</p>	<ul style="list-style-type: none"> • Rope construction • Categories of rope and uses



<p>service ropes and lines and explain the factors for consideration when using them</p>	<ul style="list-style-type: none"> • Causes of deterioration • Storage and maintenance
<p>4.10 Describe the components and operation and performance of the main types of portable fire extinguishers and explain the factors for consideration when using them</p>	<ul style="list-style-type: none"> • Performance requirements • Information display • Types of extinguishers: <ul style="list-style-type: none"> • Water • Foam • Dry powder • Carbon dioxide (CO₂) • Wet chemical
<p>4.11 Describe the properties of good finished foam and the concentrate groups and explain the factors for consideration when using foam</p>	<ul style="list-style-type: none"> • The main properties of finished foam • Types of concentrate: <ul style="list-style-type: none"> Protein based <ul style="list-style-type: none"> ○ Protein (P) ○ Fluoroprotein (FP) ○ Film-forming fluoroprotein (FFFP) ○ Alcohol resistant (AR-FFFP) Synthetic based <ul style="list-style-type: none"> ○ Synthetic detergent (SYNDET) ○ Aqueous film forming foam (AFFF) ○ Alcohol resistant (AR-AFFF) ○ Fluorine free foam (FF & AR-FF) ○ Class A foam ○ Training foam
<p>4.12 Describe the purpose and use of basic foam making equipment</p>	<ul style="list-style-type: none"> Foam making equipment; <ul style="list-style-type: none"> ○ LX handheld foam making branches ○ LX foam generators ○ LX foam monitors ○ Compressed Air Foam Systems (CAFS) ○ MX handheld foam making branches ○ MX foam pourers ○ HX foam generators • Induction and injection equipment: <ul style="list-style-type: none"> • In line inductors • Round the pump proportioners ○ Bulk supply systems ○ Terms used in connection with foam
<p>4.13 Explain the operational responsibilities and procedures to be followed when using breathing apparatus (BA) at an incident</p>	<ul style="list-style-type: none"> • Responsibilities and roles of personnel involved • Breathing apparatus entry control procedures • Procedural rules to be followed by breathing apparatus wearers • Search and rescue procedures in structures • Communications • Standby and relief arrangements • Emergency arrangements • Testing and maintenance procedures to be adopted



	<ul style="list-style-type: none"> • purpose and use of breathing apparatus ancillary equipment: <ul style="list-style-type: none"> ○ Entry Control board ○ Entry Control tally ○ Personal line ○ Guide lines and identification tallies ○ Communications equipment
4.14 Describe the design and use of portable ladders and aerial appliances and explain the factors for consideration when using them	<ul style="list-style-type: none"> • The principal parts of portable ladders • Turntable ladders • Hydraulic Platforms • Aerial ladder platforms • Working platforms • Testing and maintenance procedures to be adopted
4.15 Describe the detection, identification and monitoring equipment used in relation to hazardous materials	<ul style="list-style-type: none"> • Radiation measuring equipment • Personal protective equipment • Decontamination equipment • Principles of clothing design to give total environmental protection by being 'gas tight', or limited protection against splashing by harmful chemicals • Testing and maintenance procedures to be adopted
4.16 Describe the performance requirements and use of thermal imaging cameras	<ul style="list-style-type: none"> • Use of cameras and drones • Advantages and limitations of thermal imaging cameras

5. Closing down an incident and post-incident actions

Assessment Criteria	Knowledge, Understanding and Skills
5. 1 Explain how to close down the operational phase of an incident	<ul style="list-style-type: none"> • Measures to hand over control of an incident to the appropriate person, agency or authority • Actions to identify and mitigate hazards and associated risks within operational restraints
5.2 Explain the principles, content and the value of debriefs and how to apply these principles in different contexts	<ul style="list-style-type: none"> • Types of Debrief • Purpose • Content
5.3 Describe the requirements for scene preservation when required for further investigations	<ul style="list-style-type: none"> • How to identify and preserve potential evidence identified at the incident to support a subsequent investigation • Purpose of investigation • Scene control measures to:



	<ul style="list-style-type: none">○ ensure maximum preservation of evidence○ minimise the risk of scene contamination● Contemporaneous notes● Principles that underpin the collation and analysis of evidence● Preparation of materials for handover to a specialist investigator
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Unit 3: Fire Safety

Introduction

This unit focuses on fire safety issues in relation to the built environment, covering methods of construction and methods for detecting and protecting buildings and people from fire.

Learning Outcomes

Candidates who achieve this unit should be able to:

- ◆ understand the basic methods of building construction and the implications of different structures and materials in case of fire
- ◆ analyse fire resistance in relation to buildings and building materials
- ◆ understand and explain the operation of fire protection equipment
- ◆ explain and apply the principles of fire safety

Unit Status

This is a mandatory unit.

Content

1. Building Construction and Fire Resistance

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Explain the principal types of building construction and explain how this affects behaviour in fire	<ul style="list-style-type: none"> • Solid or traditional • Structural steel frame • Reinforced concrete • Precast reinforced concrete • Composite • Modular • Lift slab • Portal frame • Prefabricated methods eg. Structural Insulated Panels (SIPS) and Cross Laminated Timber (CLT) • Sandwich panels • Building boards, building slabs and insulating materials • Fire retardant/fire resisting materials that can be applied • External cladding
1.2 Describe the elements of structure within a building, their function and the factors affecting	<ul style="list-style-type: none"> • Beams • Columns • Floors



fire resistance	<ul style="list-style-type: none"> • Roofs • Stairs and stairways • Walls (load bearing and non-load bearing) • Demountable partitions • Windows • Compartmentation • Fire resisting partitions • Active fire barrier systems • Firefighting shafts and stairwells
1.3 Define the terms 'fire door' and 'doorset' and explain their functions	<ul style="list-style-type: none"> • Fire Door • Doorset • Locations of fire doors
1.4 Describe the features and the components of a fire doorset or assembly and explain the factors affecting fire resistance	<ul style="list-style-type: none"> • Door leaf • Door frame • Door ironmongery • Air transfer grills • Intumescent seals • Smoke seals • Glazing apertures • Signage
1.5 Understand factors that affect the fire resistance of a building and components within the building	<ul style="list-style-type: none"> • Stability/ Loadbearing capacity • Integrity • Insulation

2. Building Materials and Systems and Fire Resistance

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Describe the materials used in buildings, their usual behaviour in fire and the methods used to improve fire resistance	<ul style="list-style-type: none"> • Timber • Masonry • Building blocks • Building slabs • Steel, aluminium and other metals • Cement • Concrete (reinforced and pre-stressed) • Stone • Building boards • Glass • Insulating boards and materials • Paint • Photovoltaic panels • Plastics •
2.2 Describe the basic types of services likely to be found in	<ul style="list-style-type: none"> • Natural ventilation • Mechanical ventilation



modern buildings, explain the implications in fire and relevant methods to improve fire resistance	<ul style="list-style-type: none"> • Air conditioning systems • Fume extraction plants • Mechanical conveyors and chutes • Machinery drives • Heating systems • Fire stopping and cavity barriers • Ductwork • Dampers
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3. Fixed installations

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Describe the function, water supplies and main components of various types of automatic sprinkler systems	<ul style="list-style-type: none"> • Wet • Dry • Alternate • Pre-action • Deluge • Life safety • Re-cycling
3.2 Describe the function and operation of other fixed installations using water	<ul style="list-style-type: none"> • Drenchers • Water spray projector systems • Water mist systems • Rising mains (Wet and Dry) • Hose reels • Private hydrants
3.3 Describe the function and operation of fixed installations <u>not</u> using water	<ul style="list-style-type: none"> • Carbon Dioxide (CO₂) • Powder systems • Inert gas • Foam installations
3.4 Explain the basic principles underlying smoke control and ventilation systems	<ul style="list-style-type: none"> • Smoke ventilation • Smoke and heat exhaust ventilation systems (SHEVS) • Smoke and heat control systems • Ventilation in multi storey buildings • Pressurisation

4. Fire Warning and Detection Systems

Assessment Criteria	Knowledge, Understanding and Skills
4.1 Describe the types of fire alarm systems	<ul style="list-style-type: none"> • Manual systems (including types of call points) • Automatic systems
4.2 Explain the basic principles of Automatic Fire Detection (AFD) and describe the types of	<ul style="list-style-type: none"> • Definition of a detector • Smoke detectors: <ul style="list-style-type: none"> ○ Ionisation



detectors and systems	<ul style="list-style-type: none"> ○ Optical ○ Multi sensor or combined ● Heat detectors ● Other types of detectors: <ul style="list-style-type: none"> ○ Video ○ Linear beam ○ Flame ○ Aspirating
4.3 Describe the operation and control of basic fire alarm systems	<ul style="list-style-type: none"> ● Zones ● Power supplies ● Restricted alarms ● Phased evacuation ● Types of alarm signals ● Control and indicating equipment ● Faults ● Silencing and resetting alarms
4.4 Describe the types and operation of alarms and their siting	<ul style="list-style-type: none"> ● Battery operated ● Mains operated ● Wireless linked ● Ionisation ● Optical ● Heat ● Combined smoke and heat ● Combined smoke and carbon monoxide ● For the deaf
4.5 Describe how false alarms of fire can occur and their impact	<ul style="list-style-type: none"> ● The impact of false alarms ● Methods of reducing false alarms and unwanted fire signals

5. Fire Safety Practice

Assessment Criteria	Knowledge, Understanding and Skills
5.1 Define and explain the basic principles of means of escape in case of fire	<ul style="list-style-type: none"> ● Means of escape ● Occupancy ● Construction ● Evacuation time ● Travel distance ● Escape route ● Places of safety (Reasonable and Total) ● Management control ● Responsible person ● Compartmentation
5.2 Explain the factors that affect behaviour when faced with a threat of fire in a building	<ul style="list-style-type: none"> ● Knowledge of the building layout ● Regularity of the alarm being heard (eg history of false alarms/tests)



	<ul style="list-style-type: none"> • Fire drill discipline • Physical state (eg sleeping, under the influence of medication/alcohol/drugs etc) • Whether physically or mentally impaired • Friends or family in the ability • Whether senses recognise danger eg sight, smell etc • Advice from trusted sources
5.3 Explain the special arrangements that may be needed for people who are especially at risk	<ul style="list-style-type: none"> • How the wellbeing of people can affect evacuation e.g. mobility, disability, health, age. • Pre-planning arrangements for ensuring the safety of people who are at special risk - personal emergency evacuation plan (PEEP) • Facilities including refuges
5.4 Describe the importance of a fire safety risk assessment and explain the principles underpinning the process	<ul style="list-style-type: none"> • The significance of a fire safety risk assessment • The terms 'hazard' and 'risk' in relation to fire safety <p>The key elements of a good fire safety management system:</p> <ul style="list-style-type: none"> ○ Identify the risks ○ Identify the people at risk ○ Evaluate, remove, reduce and protect from risk ○ Record, plan, inform, instruct and train ○ Review
5.5 Describe the responsibilities of the owners of properties for fire safety arrangements and the steps that they can take to ensure that fire safety provisions are maintained	<ul style="list-style-type: none"> • Fire risk assessment • Testing and maintenance of measures • Monitoring of activities that might affect performance of fire measures eg amendments to buildings that could breach essential fire compartmentation • Use of signage (including locations) • Use of emergency lighting (including locations)

Unit 4: Management and Administration in Fire and Rescue Services

Introduction

This unit focuses on the importance of effective management and administration skills. It covers organisation structure, leadership and management, performance management, organisation systems and training and development.

Learning Outcomes

Candidates who achieve this unit should be able to:

- ◆ understand the structure of organisations and the links between different parts of the organisation
- ◆ identify and evaluate factors affecting the performance of individuals, teams and organisations
- ◆ understand how to manage and motivate teams
- ◆ understand health and safety issues
- ◆ apply management and administration practices to fire and rescue service contexts

Unit Status

This is a mandatory unit.

Content

1. Elements of Organisation - Organisation Structure and Performance

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Explain the principles of organisational structure and assess the implications for organisation performance	<ul style="list-style-type: none"> • Organisational structure • Characteristics of an effective structure • Potential results of an inappropriate structure • Presentation of structures/organograms • Chain of command • Responsibilities and reporting relationships • Functional management/departments • Different types of business and implications for structure
1.2 Describe roles and responsibilities within an organisation, explain relationships between roles and assess the implications for	<ul style="list-style-type: none"> • Responsibilities of top level managers, middle managers, first line supervisors and front line staff • Purpose and content of job descriptions and person specifications



<p>organisation performance</p>	<ul style="list-style-type: none"> • Define and describe the relationship between task needs, group needs and individual needs • Importance of performance management at organisation and individual level • Importance of team work and team building • Managing relations with other teams and departments
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2. Elements of Organisation - Planning, Risk Management and Health and Safety

Assessment Criteria	Knowledge, Understanding and Skills
<p>2.1 Explain the importance of planning and describe the ways in which organisations use different types of plan</p>	<ul style="list-style-type: none"> • Types of plans to include: <ul style="list-style-type: none"> ○ Strategic Plan ○ Business Plan ○ Project Plan ○ Team/Department Plan • SWOT and PESTLE analysis and use of these tools in the development and management of plans • Features of effective plans • Prioritising • Role of managers in developing plans and delivering outcomes
<p>2.2 Explain the importance of operational risk management and describe the ways in which organisations manage risk</p>	<ul style="list-style-type: none"> • Identifying risk • Managing risk • Risk Register
<p>2.3 Explain the importance of health and safety at work and explain how organisations manage health and safety issues</p>	<ul style="list-style-type: none"> • Duties of employers with regard to health and safety • Duties of employees with regard to health and safety • Risk assessment and safety statement • Safe Person Concept • Health and safety issues



3. Leadership and Management

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Explain the contribution of leadership and management to organisation success	<ul style="list-style-type: none"> • Management skills • Leadership qualities and skills • Managing team and individual employee performance
3.2 Describe different leadership styles and assess the advantages and disadvantages of different styles in different situations	<ul style="list-style-type: none"> • Autocratic • Bureaucratic • Charismatic • Democratic • Laissez-faire • People-oriented and task-oriented styles • Transactional • Transformational • Situational
3.3 Describe and apply recognised management theories	<p>Management theories to include:</p> <ul style="list-style-type: none"> • Scientific Management • Hierarchy of Needs • Hawthorne Studies • Theory of Motivation • Theory X and Theory Y
3.4 Explain the importance of staff motivation in driving high performance and identify issues that influence motivation	<p>Issues affecting motivation and performance including:</p> <ul style="list-style-type: none"> • Organisational design • Objectives and targets • Delegation • Communication • Excessive conflict • Management • Training

4. Management Practice and Procedures

Assessment Criteria	Knowledge, Understanding and Skills
4.1 Explain the principles that underpin effective allocation of work and delegation	<ul style="list-style-type: none"> • Factors affecting decisions to delegate • Successful and unsuccessful delegation strategies
4.2 Explain the principles that underpin an effective approach to counselling	<ul style="list-style-type: none"> • Identification of when counselling may be appropriate • Features of a good counselling procedure
4.3 Explain the principles that	<ul style="list-style-type: none"> • Definition of “discipline”



underpin an effective approach to discipline	<ul style="list-style-type: none"> • Features of a good disciplinary procedure • Stages of a disciplinary procedure
4.4 Explain the importance of valuing equality and diversity for an organisation and the principles that underpin equality and diversity	<ul style="list-style-type: none"> • Definition of “equality” • Definition of “diversity” • Definition of “direct discrimination” • Definition of “indirect discrimination” • Equality and diversity policies

5. Organisation Systems and Administration

Assessment Criteria	Knowledge, Understanding and Skills
5.1 Explain the importance of good record keeping and identify methods of managing records	<ul style="list-style-type: none"> • The need for record keeping in an organisation • Advantages of good record keeping • Types of record keeping systems • Reviewing systems of record keeping • Types of records maintained
5.2 Explain the importance of budgets and budgetary control	<ul style="list-style-type: none"> • Definition of the term “budget” • Revenue costs and capital expenditure • Features of a good budget • Advantages of budgetary control • Problems associated with budgetary control
5.3 Explain the importance of meetings in contributing to the delivery of objectives	<ul style="list-style-type: none"> • Types of meetings: one-to-one, team, cross-team, external • Planning for meetings • Managing meetings • Recording meetings • Processing actions arising from meetings
5.4 Explain the implementation and importance of quality assurance systems	<ul style="list-style-type: none"> • Types of QA systems • Implementation of systems including procedures, review and training • Contribution to organisation performance • Audit and audit trails • Kite marking and external quality standards/marks • Value of QA and quality standards in dealing with external stakeholders/customers

6. Training and Development

Assessment Criteria	Knowledge, Understanding and Skills
6.1 Explain how managers can use learning and development opportunities to improve team	<ul style="list-style-type: none"> • The benefits of training, development and learning for individuals and organisations • Evaluating the benefits of training



performance and plan for the future	<ul style="list-style-type: none"> • The role of the manager in training and development • Training needs analysis
6.2 Describe different types of training and explain the benefits of each	<ul style="list-style-type: none"> • Types of training: <ul style="list-style-type: none"> ○ Induction ○ On-the-job ○ Continuing Professional Development
6.3 Assess the advantages and disadvantages of different methods of training	<ul style="list-style-type: none"> • Methods of training – on and off the job to include: <ul style="list-style-type: none"> ○ Training course ○ E-learning ○ Self-study ○ Discussion group ○ Case study ○ Secondment ○ On-the job
6.4 Identify the features of a good training programme	<ul style="list-style-type: none"> • Objectives • Plan/Schedule for training • Delivery options including on and off the job components • Training aids including IT resources • Assessment/Qualifications • Evaluation of learning
6.5 Explain the purpose and value of exercises	<ul style="list-style-type: none"> • Purpose of exercises • Types of exercise – discussion-based, table top, live and combinations of these • Developing exercise plans