



THE INSTITUTION OF FIRE ENGINEERS

FOUNDED 1918 • INCORPORATED 1924

# **IFE Level 3 Certificate in Fire Investigation**

## **Qualification Specification**

**Qualification Number: 603/6611/4**

## 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.

## About 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 aims. 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.

## Contact Details

Email: [exams@ife.org.uk](mailto:exams@ife.org.uk)

IFE House, 64-66 Cygnet Court, Timothy's Bridge Road, Stratford-upon-Avon, CV37 9NW

Tel: +44 (0)1789 261463

# IFE Level 3 Certificate in Fire Investigation

## Introduction

The IFE Level 3 Certificate in Fire Investigation has been developed by the Institution of Fire Engineers (IFE), representatives of the UK Fire and Rescue services and Fire Investigators working in specialist organisations. The content and structure of the qualification reflects the roles and responsibilities of those working in fire investigator roles.

The assessment focuses on the knowledge and understanding required to carry out investigations in different fire contexts. Candidates will be required to demonstrate and apply detailed understanding of fire science in order to support their assessments and conclusions.

This qualification is derived from unit 7: Fire Investigation within the Level 3 Diploma in Fire Science and Fire Safety. It is directly equivalent to that unit in that the content and assessment remain exactly the same. Individuals who achieve this qualification may use it towards the achievement of the Level 3 Diploma in Fire Science and Fire Safety in the same way as unit 7 is used. For information, please see - <https://www.ife.org.uk/IFE-Qualifications-with-Syllabus-Links>

## Target Audience

This qualification focuses on the understanding and technical knowledge required by those who investigate the cause of fire. It is intended for Watch and Crew Managers in the Fire and Rescue Service in charge of operational fire appliances and for fire safety specialists.

The unit covers the scientific principles that underpin the dynamics of fire as well as the process of investigation for smaller fire scenes. It provides a basis for progression to Fire Investigation specialist roles.

## Learning Outcomes

Candidates who achieve this qualification should be able to:

- apply fire science principles in carrying out fire investigations at simple fire scenes and arrive at a conclusion
- explain the preparations and procedures to investigate an incident involving fire and/or explosion
- explain and apply the principles that underpin the collation and analysis of evidence
- analyse information to produce conclusions based on evidence and relevant fire science
- prepare a more complex scene for handover to a specialist investigator

## Qualification Content

The content of the qualification is set out in the section entitled “Content” below. This section provides information on the range of topics that must be studied including the way that candidates need to show their understanding (ie the assessment objectives) and the scope/range/contexts 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

Assessment takes the form of one three-hour examination. The examination is closed-book and provides a summative assessment of the full range of learning specified in the content below.

Candidates will be required to complete **six** questions from a choice of **eight** questions. There will be 20 marks available for each of the questions.

In order to achieve a pass, candidates will be required to attain at least 40% of the 120 marks available to them via the six questions (ie 48 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 48. Where candidates answer more than six questions, candidates will not benefit as only the six best responses will be included in the final total mark.

Past papers for the last three years are available on the IFE website - <https://www.ife.org.uk/Qualifications/Past-Papers-and-Exam-Reports> Please see the papers (and associated examiner reports) for March examinations for the L3D7 Fire Investigation unit (in the section for the Level 3 Diploma in Fire Science and Fire Safety).

Examinations are provided in English only.

## Grading and Certification

Results of examinations will be reported as follows:

Pass - this is awarded where candidates achieve a mark between the minimum pass mark of 48 marks (ie 40% of the marks available) and 71 marks (59%).

Distinction - this is awarded where candidates achieve a mark of 72 or above (ie 60% or more of the marks available).

Fail - candidates who achieve 47 marks or fewer will receive a result showing Fail. Where candidates receive 24 marks (ie 20% of the marks available) or fewer, the result will show Fail (X).

Candidates who are unsuccessful in the examination may re-sit the examination. There is no limit on the number of times that candidates may re-sit.

Note: The IFE reports results as described in the bands above. However, candidates who wish to know the specific mark awarded to them may email the IFE for this information.

## Entry Requirements

There are no formal entry requirements. However, this qualification covers a wide range of topics including topics that require understanding of fire science; candidates will benefit from previous studies that cover fire science and, in particular, combustion, fire behaviour and electricity.

As the paper is provided in English only, candidates will need to be able to read English fluently in order to access the examination questions and the relevant recommended reading material.

## 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 levels, Level 3 NVQs and Level 3 Diplomas such as the IFE Level 3 Diploma in Fire Science and Fire Safety.

The qualifications regulator for England, 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 candidate:

- 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 when preparing for assessment and when composing responses to examination questions.

## Qualification Learning Time

The length of time needed to prepare for this examination will vary depending upon the starting point for each individual.

Total qualification time for most candidates will be around 130 hours:

- 127 hours of learning/study. Study may be self-study (please see the section on recommended reading material below) and may include relevant fire and rescue service training programmes or other work-related training.
- 3 hours of assessment (directed time) ie one three-hour examination.

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 syllabus to ensure that all parts of the syllabus have been covered. Recommended reading materials are provided below.

## Progression

Candidates who are successful in achieving this qualification may consider progression to Level 4. Specialist qualifications in Fire Investigation at levels 4 and 5 are available from the IFE. In addition, candidates may wish to progress to specialist degree programmes such as a BSc in Fire Engineering Science.

Candidates who wish to broaden their knowledge and understanding at Level 3 could consider working towards other fire-specific qualifications such as the IFE Level 3 Certificate in Fire Safety or the IFE Level 3 Certificate in Fire Engineering Science.

## 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 adjustments 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.

## **Booking Examinations and Additional Information on Examination Arrangements**

This examination is available in March 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 through the IFE. Where appropriate, the IFE will direct individuals to 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 March 2021 examinations is available at: <https://www.ife.org.uk/March-2021-Examinations>

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>

## **Information for Examination Centres**

Organisations that would like to provide a venue for IFE examinations, should contact the IFE to discuss the requirements for centres – please email [exams@ife.org.uk](mailto:exams@ife.org.uk) in the first instance.

Centres will need to comply with the Terms and Conditions for centres. Information for centres, including the Centre Handbook which contains detailed guidance on running a centre, is available on the IFE website. Please see - <https://www.ife.org.uk/Information-for-Examination-Centres>. Centres are required to re-confirm their compliance with the Terms and Conditions prior to each examination session and to provide an Examination Centre Invigilation Report following the completion of examinations.

The IFE operates a centre inspection programme based on unannounced visits. All centres should anticipate visits from centre inspectors.

## Recommended Reading

This qualification covers an extensive range of contexts and candidates are advised to reflect this in their examination preparation.

Candidates are also advised to review past examination papers. Past papers, together with the associated examiner reports on the papers, can be downloaded, free of charge, from the IFE website - <https://www.ife.org.uk/Qualifications/Past-Papers-and-Exam-Reports>.

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 syllabus;
- the resource is recognised by industry professionals as providing valuable information.

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

- Kirks Fire Investigation, John D De Haan and David J Icové
- *A Guide to Fire Investigation (IFE 02)*, Patrick G Cox (Published by IFE as IFE02, and available via IFE online shop)\*
- Fire Investigator – Principles and Practice to NFPA921 and 1033, Published by Jones and Bartlett Learning in conjunction with IAFC, IAAI and NFPA
- Foundation for Hazardous Materials, NFCC, <https://www.ukfrs.com/foundation-knowledge/foundation-hazardous-materials?bundle=section&id=19546&parent=19547>

*Note: \*Can be ordered through the IFE's online shop*

## 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.

Candidates may also find the general guide for candidates which provides information on question times and levels helpful - [https://www.ife.org.uk/write/MediaUploads/Exams/Candidate\\_Guide.pdf](https://www.ife.org.uk/write/MediaUploads/Exams/Candidate_Guide.pdf)

Please address any queries to the IFE by emailing: [exams@ife.org.uk](mailto:exams@ife.org.uk)

# Content

## 1. Fire Science

Assessment Objective	Knowledge, Understanding and Skills
1.1 Understand the chemistry of combustion and its application in the context of fire investigation	<ul style="list-style-type: none"> <li>• Combustion processes</li> <li>• Fire chemistry</li> <li>• Fire tetrahedron</li> <li>• Combustion</li> <li>• Chain reactions</li> </ul>
1.2 Understand the properties and behaviour of accelerants, fuels and oxidisers and explain their signification in relation to fire investigation	<ul style="list-style-type: none"> <li>• Types and properties of accelerants</li> <li>• Flashpoints of liquids</li> <li>• Boiling points of liquids</li> <li>• Flammability (explosive limits)</li> <li>• Stoichiometric mixtures</li> <li>• Stoichiometry of vapours and gases</li> <li>• Fuels (metals)</li> <li>• Fuels (solid fuels)</li> <li>• Supporters of combustion</li> </ul>
1.3 Understand fire behaviour and apply this understanding to fire investigation	<ul style="list-style-type: none"> <li>• Fire development</li> <li>• Steady state fire</li> <li>• Compartment fire behaviour</li> <li>• Ventilation controlled fires</li> <li>• Fuel controlled fires</li> <li>• Estimating fire size</li> </ul>

## 2. Fire Scene Approach and Safety

Assessment Objective	Knowledge, Understanding and Skills
2.1 Explain the reasons for investigating fires	<ul style="list-style-type: none"> <li>• Determining cause of fire</li> <li>• Risk reduction</li> <li>• Preventing reoccurrence</li> <li>• Dealing with arson</li> <li>• Reporting to the Coroner</li> </ul>
2.2 Explain the scientific method/systematic approach	<ul style="list-style-type: none"> <li>• Understand scientific methodology/ systematic approach</li> <li>• Define and explain the key stages of an investigation</li> <li>• Devising and testing a hypothesis</li> <li>• Factors to take into account when drawing a conclusion</li> <li>• Providing a rationale for conclusions</li> </ul>
2.3 Assess hazards and risks and determine appropriate control	<ul style="list-style-type: none"> <li>• Scene safety</li> <li>• Utilities</li> </ul>

measures to maintain health and safety at fire scenes	<ul style="list-style-type: none"> <li>• Hazardous substances</li> <li>• Fire and explosion hazards</li> <li>• Electrical hazards</li> <li>• Personal equipment</li> <li>• Hygiene</li> <li>• Evaluating the risk</li> <li>• Recording a risk assessment</li> </ul>
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### 3. Scene Examination

Assessment Objective	Knowledge, Understanding and Skills
3.1 Describe the role of witnesses and understand the information that they can provide	<ul style="list-style-type: none"> <li>• Owners and occupiers</li> <li>• Fire service witnesses</li> <li>• Other members of the public</li> <li>• Interviewing witnesses</li> <li>• Specialists</li> <li>• Social media</li> </ul>
3.2 Understand fire patterns and explain their significance at the scene of a fire	<ul style="list-style-type: none"> <li>• Burn patterns</li> <li>• Charring of wood and calcination of plasterboard</li> <li>• Melting of plastic and metal</li> <li>• Tempering of metal</li> <li>• Identifying point of origin</li> <li>• The 'Radius of Error'</li> <li>• Spalling</li> <li>• Protection marks</li> <li>• Soot deposits</li> <li>• The influence of firefighting media</li> </ul>
3.3 Understand and explain the significance of glazing when assessing evidence at a fire	<ul style="list-style-type: none"> <li>• Types of glass</li> <li>• Effects of heating glass</li> <li>• Evidence of impact on glass</li> <li>• Fire temperatures</li> <li>• Speed of fire growth</li> <li>• Evidence of explosion</li> <li>• Evidence from items other than windows made from glass</li> </ul>
3.4 Understand and explain the temperature indicators at a fire scene	<ul style="list-style-type: none"> <li>• Discolouration of fabrics</li> <li>• Blistering of surface finishes</li> <li>• Discolouration of stone and concrete</li> <li>• Flame colours</li> </ul>
3.5 Understand excavation and examination techniques applied at fire scenes	<ul style="list-style-type: none"> <li>• Protecting the scene</li> <li>• Layering of evidence</li> <li>• Zones and the grid approach</li> <li>• Useful tools and equipment</li> <li>• Clean areas</li> <li>• Reconstruction</li> <li>• External evidence (outside a building, vehicle etc.)</li> </ul>

3.6 Understand the nature and properties of accelerants and how they apply to fire scenes	<ul style="list-style-type: none"> <li>• Detection methods</li> <li>• Pour patterns</li> <li>• Use of accelerant detection dogs and hand-held photo ionisation detectors (PID)</li> <li>• Identifying points for sampling</li> <li>• Sampling techniques</li> </ul>
3.7 Explain the processes used for recording the scene	<ul style="list-style-type: none"> <li>• Written notes</li> <li>• Photography and video</li> <li>• Diagrams, sketches and plans</li> <li>• Managing evidence and exhibits</li> <li>• Packaging and transportation of evidence</li> <li>• Need to seek assistance</li> </ul>
3.8 Describe methods used to minimise the contamination at fire scenes	<ul style="list-style-type: none"> <li>• Forensic awareness</li> <li>• Protective clothing</li> <li>• Protection of evidence</li> <li>• Decontamination and cleaning of equipment and clothing</li> </ul>

## 4. Special Scenes

Assessment Objective	Knowledge, Understanding and Skills
4.1 Understand electrical causes of fire and apply scientific understanding in examining scenes and carrying out calculations	<ul style="list-style-type: none"> <li>• Short circuit</li> <li>• Overload</li> <li>• Damage to cables and installations</li> <li>• Local resistance heating</li> <li>• Electrical arcing</li> <li>• Static electricity and lightning</li> <li>• Electrical appliances failures</li> <li>• Electrical intake (service head) fires</li> <li>• False indicators</li> <li>• Lost neutral</li> <li>• Photo-voltaic solar panels</li> <li>• Calculations using Ohm's Law and Power Laws</li> <li>• Circuit protection devices</li> <li>• Electrical cable types</li> <li>• Electrical test equipment</li> <li>• Electrical generation and supply</li> </ul>
4.2 Assess the causes of vehicle and transport fires	<ul style="list-style-type: none"> <li>• Vehicle arson</li> <li>• Significance of vehicle compartments</li> <li>• Vehicle security</li> <li>• Fires in moving vehicles</li> <li>• Vehicles fuels and other flammable liquids</li> </ul>
4.3 Explain the considerations to be applied and the approach to be followed at fatal fires	<ul style="list-style-type: none"> <li>• Multi-agency approach</li> <li>• Sensitivities of working at a fatal fire scene</li> <li>• Role of the Coroner</li> <li>• 'Reading' fire damage to a body</li> <li>• Identifying the deceased</li> <li>• Establishing cause of death</li> </ul>

	<ul style="list-style-type: none"> <li>• Reporting cause of fire and cause of death</li> </ul>
4.4 Explain the considerations to be applied and the approach to be followed at the scene of an explosion and understand the evidence that can be obtained	<ul style="list-style-type: none"> <li>• Types of explosion</li> <li>• Mechanical or pneumatic/hydraulic explosions</li> <li>• Cordons and cordon control</li> <li>• Properties of explosives</li> <li>• (UN) Classes of explosives</li> <li>• High (detonating) and low (deflagrating) explosions</li> <li>• Types and uses of explosives</li> </ul>
4.5 Understand and explain how to work with partners at crime scenes	<ul style="list-style-type: none"> <li>• Jurisdiction</li> <li>• Role of Police, Fire Service, Forensic Scientists and other investigators</li> <li>• Control of crime scenes</li> <li>• Agreeing responsibilities</li> </ul>

## 5. Evidence

Assessment Objective	Knowledge, Understanding and Skills
5.1 Identify, using scientific understanding and the application of appropriate methodology, when fires may be due to arson and preserve evidence	<ul style="list-style-type: none"> <li>• Explain the reasons for suspecting arson as a cause of fire from things observed and information provided</li> <li>• Understand appropriate steps to take to preserve a scene where arson is expected</li> <li>• Appreciate when to ask for help from a more senior or experienced investigator</li> </ul>
5.2 Explain the use of contemporaneous notes at fire scenes	<ul style="list-style-type: none"> <li>• Importance of contemporaneous notes</li> <li>• Content of contemporaneous notes</li> <li>• 'Rules' for writing contemporaneous notes</li> </ul>
5.3 Explain the use of imaging at fire scenes	<ul style="list-style-type: none"> <li>• Working with digital images</li> <li>• Still photographs</li> <li>• Video/CCTV</li> </ul>
5.4 Explain the need for, and purpose of, forensic awareness	<ul style="list-style-type: none"> <li>• Protecting the scene</li> <li>• The role of the laboratory</li> <li>• Reconstructive fire testing</li> <li>• Non-destructive testing and examination</li> </ul>
5.5 Explain the role of professional witnesses	<ul style="list-style-type: none"> <li>• The role of a professional witness</li> <li>• The status and role of a professional witnesses in court</li> </ul>
5.6 Explain the purpose and content of written reports	<ul style="list-style-type: none"> <li>• Content and structure of reports</li> <li>• Possible appendices to a report</li> <li>• Disclosure</li> </ul>