IFE Level 5 Diploma in Fire Engineering Design

Qualification Specification and Handbook

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IFE Level 5 Diploma in Fire Engineering Design

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.

Members of the IFE share a commitment to envisioning, preparing, mentoring and building for the future, ensuring that the fire profession remains relevant and valued, protecting people, property and the environment from fire.

The IFE has six strategic priorities. The work of the IFE's awarding organisation and the provision of qualifications contributes to three of these 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.

Section 1: Qualification Information and Content

Introduction

The IFE Level 5 Diploma in Fire Engineering Design forms part of the Competency Framework for Fire Engineering which has been developed by the Chief Fire Officer Association (CFOA). The content of the qualification has been developed and approved by CFOA's Fire Engineering and Technical Standards working group.

This qualification supports the IFE's strategic priority to increase knowledge in the science, practice and professionalism of fire engineering

Aims of the Qualification

The aim of the qualification is to provide individuals with a practical and technical understanding of fundamental engineering principles, enabling them to identify proven techniques and procedures to solve practical fire engineering problems and, when appropriate, to hand over to a fire engineer.

Target Audience

The qualification has been designed to meet the needs of individuals who work, or intend to work, in a position where they are involved in auditing or risk assessing fire engineering premises and designing or assessing fire engineering design submissions.

It will be appropriate for building control officers, approved inspectors, fire engineers, fire safety auditors, inspectors, fire risk assessors, managers, surveyors, architects and fire safety professionals.

It is also appropriate for regulators i.e. those who have the responsibility for ensuring the requirements of fire safety and associated regulation are achieved through cooperation or enforcement.

Qualification Structure

To achieve this qualification, learners must successfully complete all 10 mandatory units.

Unit 1 - Principles of Fire Development and Spread
Unit 2 - Principles of Fire Engineering
Unit 3 - Review the Effectiveness of Automatic Fire Suppression Systems
Unit 4 - Fire Engineering Design and its Impact on Human Behaviour
Unit 5 - Fire Engineering Design and its Impact on the Fire Resistance of Materials and Structures
Unit 6 - Smoke Control and Heat Exhaust Ventilation Systems
Unit 7 - Pressure Differential Systems
Unit 8 - Fire Engineering Design and its Impact on the External Spread of Fire
Unit 9 - Fire Engineering Design and its Impact on Access and Facilities for Fire-Fighting
Unit 10 - Principles of Fire and Evacuation Modelling

Form of Assessment

Assessment for this qualification is by portfolio. Evidence generated by learners will be internally assessed and will be externally quality assured by the IFE. In order to achieve a pass, candidates must demonstrate that they have met all of the specified assessment criteria.

Centres and candidates are advised that assessment should be designed to enable candidates to demonstrate that they are performing at Level 5. Please see level descriptors provided below.

Candidates may demonstrate attainment by a variety of methods as long as these methods are appropriate to the assessment of the knowledge, understanding and skills set out in the specification. Examples of acceptable methods include:

- Direct observation
- Expert witness testimony
- Work products
- Records
- Reflective accounts
- Professional discussion
- Assignments
- Case studies assessing/comparing different contexts
- Reviews of systems

Qualification Level

This qualification has been designed to enable candidates to demonstrate that they have attained skills and knowledge at Level 5. Other types of qualifications that are set at Level 5 include diplomas of higher education (DipHE), foundation degrees and higher national diplomas (HND)

The qualifications regulator, Ofqual, has provided the following descriptors to illustrate the knowledge and skills expected from those who hold qualifications at Level 5.

Level 5 Knowledge descriptor

The candidate:

- has practical, theoretical or technological knowledge and understanding of a subject or field of work to find ways forward in broadly defined, complex contexts.
- can analyse, interpret and evaluate relevant information, concepts and ideas.
- is aware of the nature and scope of the area of study or work.
- understands different perspectives, approaches or schools of thought and the reasoning behind them.

Level 5 Skills descriptor

The candidate can:

- determine, adapt and use appropriate methods, cognitive and practical skills to address broadly defined, complex problems.
- use relevant research or development to inform actions.
- evaluate actions, methods and results.

Relevant Standards, Regulations and Approved Documents

In order to achieve this qualification and to work within the fire safety sector, individuals will need to be familiar with, and able to refer to and apply, a wide range of industry specific regulations, approved documents and standards. Information on relevant documents, together with additional recommended reading materials, is provided at the end of each unit.

Certification

Candidates who achieve all ten units will be awarded the IFE Level 5 Diploma in Fire Engineering Design. The qualification is not graded.

Candidates who achieve fewer than ten units will be able to achieve a Unit Certificate that identifies the unit(s) achieved.

To achieve the full qualification, candidates are required to achieve all ten units within two years.

Entry Requirements

There are no formal entry requirements although learners should be able to work at level 5 or above, be proficient in use of English Language, be proficient in mathematics with ability to carry out equations and use scientific calculators and have previous experience applying fire safety guidance such as Approved Document B (or equivalent) and BS 9999.

Progression

Candidates who achieve the IFE Level 5 Certificate in Fire Engineering Design will be able to build on their learning to progress to qualifications at higher levels such as degree qualifications.

Learning Time and Learning Methods

Total qualification time is 370 hours.

- 360 hours of self-study and/or course training
- 10 hours of assessment (directed time)

It is anticipate that most candidates will undertake at least 100 hours of directed learning ie where a member of training centre staff is present to provide formal teaching/training via support such as lectures, tutorials, supervised study and assignments.

Candidate should note that significant reading and self-study will also be required as attainment of this qualification requires candidates to develop awareness and understanding of an extensive range of industry-specific regulations and approved documents as well as developing underpinning understanding of relevant scientific and engineering principles.

All assessment will be carried out at IFE-approved assessment centres and candidates are therefore advised to register with an approved centre prior to commencing study.

Relationship to Level 4 Diploma in Fire Safety (Fire Inspector) and to the IFE Level 4 Certificate in Fire Science and Fire Safety

Those learners who have already achieved the Level 4 Diploma in Fire Safety (Fire Inspectors) (QCF) or equivalent will be able to build on the knowledge, understanding and skills developed in order to meet the following National Occupational Standards:

FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS6: Review fire safety matters relating to existing or proposed construction
FS7: Review fire protection systems in complex premises and environments

Candidates who have completed either the full IFE Level 4 Certificate in Fire Science and Fire Safety or only the units of the qualification focussed on Fire Engineering Science and/or Fire Safety will find that this also provides them with a firm basis on to which to commence their study for this qualification.

Progression

Candidates who achieve this qualification will have attained the technical knowledge and practical skills to be able them to progress to further specialist study such as degree programmes.

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 assessments without comprising the assessment process or the validity of the certificate.

Candidates undertaking this qualification who wish to access reasonable adjustments should liaise with their training/assessment centre in the first instance.

Unit 1: Principles of Fire Development and Spread

Introduction

This unit is about understanding how fires in compartments ignite, their stages of development and spread to adjacent compartments. It is also about understanding how a compartment's design, construction, fire load, ventilation and weather conditions impact on fire growth. It is relevant to all types of buildings ie: small, large, simple and complex.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand how fire develops and spreads in buildings

Learning Content

1. Understand how fire develops and spreads in buildings

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Explain the principles of fire development	Behaviour and growth of fires, fire growth rates, time-based growth calculations. Building characteristics: dimensions, nature and geometry of construction, flashover, backdraft, neutral plane. Enclosure: wall/ceiling linings, ventilation systems, unusual fire hazards, potential ignition sources. Fire load: type, location, arrangements and quantity of combustibles. Environmental influences (internal): temperature, air movement. Fuel controlled and ventilation controlled fires. Content, use and application of relevant national standards, guidance and regulations.
1.2 Explain how fires are initiated and develop within enclosure of origin	
1.3 Explain how smoke and toxic gases spread within and beyond enclosure of origin	

Assessment

Candidates must demonstrate that they have achieved each of the assessment criteria specified in the unit. Examples of appropriate evidence include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references to show use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 7974
- BS 9991
- BS 9999
- BS ISO/TR 13387-2 Part 2: Design fire scenarios and design fires

Recommended Learning Time: 20 hours

Links to National Occupational Standards

This unit builds on the knowledge, skills and understanding set out in National Occupational Standard FS2: Assess risks associated with fire in complex premises and environments.

Unit 2: Principles of Fire Engineering

Introduction

This unit is about development of a fire engineering framework for design of buildings based on scientific and engineering principles to protect people, property and the environment from fire. It applies to large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the principles of fire engineering design
- understand best practice for fire engineering consultations
- evaluate the effectiveness of fire engineering designs
- conduct an impact assessment of a fire engineering design

Learning Content

1. Understand the principles of fire engineering design

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Explain the principles of fire engineering design frameworks	General approach, advanced approach. Qualitative design review (QDR) Deterministic studies. Probabilistic risk assessment.
1.2 Evaluate design frameworks	Design approaches. Architectural design of building. Fire safety objectives, fire hazards and possible consequences. Trial fire safety designs. Acceptance criteria and methods of analysis. Analysis of fire scenarios.
1.3 Explain the principles of fire development, fire spread and the impact of fire on buildings	Fire development - pre-flashover, flashover, fully developed fire, decay. Smoke - spread of smoke and toxic gases, characteristics of smoke and toxic gases. Fire severity, temperature, heat flux. Ability of elements to withstand exposure to fire.
1.4 Analyse management levels for fire engineering designs	Use and content of relevant national standards, guidance and regulations.
1.5 Explain detection and activation systems	Detection of fire, activation of alarm. Fire protection systems - sprinklers, smoke venting, roller shutters, fire service notification.
1.6 Explain the requirements for fire service intervention	Time: call to arrival. Time: arrival to initial attack. Time: additional resources to arrive, extent of resources available and extinguishing capacity.

1.7 Evaluate evacuation strategies	Assess response of people to fire. Evacuation time of occupants from any space within building.
1.8 Explain the principles of a Qualitative Design Review (QDR)	Design and occupant characteristics, fire safety objectives, fire hazards and possible consequences, trial fire safety designs, acceptance criteria and methods of analysis, fire scenarios for analysis.
1.9 Understand and know how to apply relevant national standards, guidance and regulations	Content, use and application of relevant national standards, guidance and regulations.

2. Understand best practice for fire engineering consultations

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Explain best practice for fire engineering pre-consultations	Content, use and application of relevant national standards, guidance and regulations.
2.2 Explain best practice for fire engineering consultations	

3. Evaluate the effectiveness of fire engineering designs

Assessment Criteria	**Knowledge, Understanding and Skills**
3.1 Explain the principles of quantitative design analysis	Content, use and application of relevant national standards, guidance and regulations.
3.2 Evaluate the effectiveness of a quantitative analysis review guidance	

4. Conduct an impact assessment of a fire engineering design

Assessment Criteria	**Knowledge, Understanding and Skills**
4.1 Explain the principles of an impact assessment	Content, use and application of relevant national standards, guidance and regulations.
4.2 Conduct an impact assessment of fire engineering designs	

Assessment

Candidates must demonstrate that they have achieved each of the assessment criteria specified in the unit.

Assessment Criteria 3.2 and 4.2 are competence-based. Simulation in a learning and development environment is recommended but practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references showing use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- BS 5588
- BS 7974
- BS 9991
- BS 9999
- PD8
- Regulation 38 (Building Act) - (plus UK equivalents), ADB (plus UK equivalents)

Recommended Reading

- Qualitative design review (QDR)
- Fundamentals of fire phenomena. Quintiere
- The SFPE Handbook of Fire Protection Engineering. NFPA
- CIBSE Guide E
- Principles of fire behaviour. Quintiere (basic)
- Fire safety engineering, Chitty BRE (basic)
- An introduction to fire dynamics. Drysdale (basic)

Recommended Learning Time: 60 hours

Links to National Occupational Standards

This unit has links to National Occupational Standards:
FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS7: Review fire protection systems in complex premises and environments

Unit 3: Review the Effectiveness of Automatic Fire Suppression Systems

Introduction

This unit is about the range of automatic systems which suppress and control fire development. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the principles of automatic fire suppression systems
- assess the effectiveness of sprinkler systems
- assess the effectiveness of water mist systems
- understand the principles of oxygen reduction systems
- understand the principles of gaseous, foam systems and other fire suppression systems

Learning Content

1. Understand the principles of automatic fire suppression systems

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Describe automatic fire suppression systems	Advantages, vulnerabilities and suitability of system types. Vulnerable persons. Compensatory features. Special circumstances. Content, use and application of relevant national standards, guidance and regulations.
1.2 Confirm the suitability of automatic fire suppression systems for risk	
1.3 Compare the advantages and disadvantages of automatic fire suppression systems	

2. Assess the effectiveness of sprinkler systems

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Explain technical guidance relating to sprinkler systems	Pumps, pump sets, valve sets, pipework, valves, alarm arrangements. Towns mains, booster pumps, tanks and pumps, duration, effective/reduced capacity, reduced capacity, automatic pump sets, storage and pressure tanks, reservoirs, superior, duplicate and combined water supplies. Hazard classes: light, ordinary and high hazard, occupancy.
2.2 Evaluate the suitability of sprinkler system components	
2.3 Explain water supply arrangements for sprinkler systems	

2.4 Describe the design criteria of sprinkler systems	Design criteria, design density, design points, hydraulic calculations, pre-calculated, fully calculated, area of coverage, head spacing, locations, zoning, protection of property and protection of life systems. Commissioning, testing, maintenance, frequency, competency, documentation. Content, use and application of relevant national standards, guidance and regulations.
2.5 Evaluate the effectiveness of sprinkler system designs	
2.6 Determine the effectiveness of a maintenance programme for sprinkler systems	

3. Assess the effectiveness of water mist systems

Assessment Criteria	**Knowledge, Understanding and Skills**
3.1 Evaluate technical guidance relating to water mist systems in premises	Residential, domestic, commercial. Low, medium and high pressure systems Design criteria, design points, hydraulic calculations, pre-calculated, fully calculated, area of coverage, head coverage, locations. Content, use and application of relevant national standards, guidance and regulations.
3.2 Evaluate the effectiveness of water mist system designs	
3.3 Determine the effectiveness of a maintenance programme for water mist systems	

4. Understand the principles of oxygen reduction systems

Assessment Criteria	**Knowledge, Understanding and Skills**
4.1 Explain technical guidance relating to oxygen reduction systems	Oxygen reduction. Oxygen dilution (nitrogen). Content, use and application of relevant national standards, guidance and regulations.
4.2 Explain the principles of oxygen reduction systems	

5. Understand the principles of gaseous, foam systems and other fire suppression systems

Assessment Criteria	**Knowledge, Understanding and Skills**
5.1 Explain technical guidance relating to gaseous, foam systems and other fire suppression systems	Foam systems, CO2 systems, portable systems, specialised fire suppression systems, new developments. Content, use and application of relevant national standards, guidance and regulations.
5.2 Explain the principles of gaseous, foam systems and other fire suppression systems	
5.3 Recognise future developments in fire suppression systems	

Assessment

Candidates must demonstrate that they have achieved each of the assessment criteria specified in the unit.

Assessment Criteria 2.6 and 3.3 are competence-based. Simulation in a learning and development environment is recommended but practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references demonstrating use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 5306
- BS 8458
- BS 8489,
- BS 9251
- BS 9252
- BS 7974
- BS 9991
- BS 9999
- BB100 risk assessment tool
- NFPA 13
- NFPA 13D
- NFPA 13R
- NFPA 750
- RTi
- UL 1626
- BS EN 12094
- BS EN 12845
- BS EN 13565
- BS EN 16750
- PREN 14972

Recommended Reading

- An Environmental Impact and Cost Benefit Analysis for Fire Sprinklers in Warehouse Buildings (BRE)
- LPC Rules for Automatic Sprinkler Installations
- Sprinkler heads
- Red Book
- Third party schemes

Recommended learning time: 70 hours

Links to National Occupational Standards

This unit has links to National Occupational Standards:

FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS7: Review fire protection systems in complex premises and environments

Unit 4: Fire Engineering Design and its Impact on Human Behaviour

Introduction

This unit is about understanding how fire, heat and toxic gases impact on humans. It is also concerned with studies in human behaviour in fire and how fire engineering design is utilised to improve human survival. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the effect of fire on human bodies and behaviour
- understand how fire engineering design impacts on human behaviour
- review the impact of fire engineering design on human behaviour

Learning Content

1. Understand the effect of fire on human bodies and behaviour

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Explain the principles of tenability limits	Heat transfer and thermo-fluids, examples of heat transfer; convective portions and Archimedes principle. Radiated heat, fire separation: Boltzmann Law, configuration factor, tenable limits for escape and ignition. Simple criteria, zero exposure, willingness to enter, ability to move through smoke, effects of smoke on walking speed, human factors, occupant evacuation, behaviour and condition. Studies in human behaviour; historically, its place in evacuation analysis; introduction to evacuation models and interpretations. Movement in smoke, smoke densities, effects of heat and fire, lethal dose rates, breathability, vulnerable persons, disabilities, effects of alcohol, smoke obscuration/visibility, impacts on vision, breathing and burning, awake, asleep, familiar/unfamiliar, group dynamics, flight/fight, fractional lethal dose, fractional incapacitating dose. Content, use and application of relevant national standards, guidance and regulations.
1.2 Identify the tenability criteria for exposure to fire, heat and toxic gases	
1.3 Explain the impact of heat and smoke on the human body	
1.4 Explain the impact of heat and smoke on human behaviour	
1.5 Explain the effects of fire on group dynamics	

2. Understand how fire engineering design impacts on human behaviour

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Identify how fire engineering design impacts on human Behaviour	Exit routes, alarms, pre movement times, response time, movement/travel times, signage, emergency lighting, management. Effects fire effluent and heat, ASET, RSET, principles, concepts. Calculation of available safe egress time (ASET) for differing criteria. Content, use and application of relevant national standards, guidance and regulations.
2.2 Define the principles of ASET and RSET	
2.3 Review simple ASET/RSET calculations	

3. Review the impact of fire engineering design on human behaviour

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Assess the impact of fire engineering design on human behaviour	Design assessment, fire safety principles, management, principles of human behaviour, impact of design on human behaviour, alternative solutions. Content, use and application of relevant national standards, guidance and regulations.
3.2 Identify areas of non-compliance with best practice, design advantages/disadvantages of solutions standards and guidance	
3.3 Propose options to resolve areas of non-compliance in human behaviour	

Assessment

Candidates must demonstrate that they have achieved each of the assessment criteria specified in the unit.

Learning Outcome 3 is competence-based. Simulation in a learning and development environment is recommended but practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references demonstrating use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- BS 5839
- BS 7899-2
- PD 7974-6

Recommended Reading

Case studies: Summerland, Woolworth, Stardust, Bradford City, Darley and Latané study, Station Night Club

Recommended learning time: 30 hours

Links to National Occupational Standards

This unit has links to National Occupational Standards:
FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS7: Review fire protection systems in complex premises and environments

Unit 5: Fire Engineering Design and its Impact on the Fire Resistance of Materials and Structures

Introduction

This unit is about understanding how fire engineering is utilised to comply with the functional requirements for internal spread of fire. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the effects of fire on materials and structures
- understand how fire engineering design impacts on the fire resistance of materials
- and structures
- review the impact of a fire engineering design on the fire resistance of materials and structures

Learning Content

1. Understand the effects of fire on materials and structures

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Explain the impact of fire on materials	Testing Approval bodies Ventilation Content, use and application of relevant national standards, guidance and regulations.
1.2 Evaluate the suitability of materials used for building structures	
1.3 Explain the methods for testing the levels of fire resistance of materials	

2. Understand how fire engineering design impacts on the fire resistance of materials and structures

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Explain guidance relating to achieving suitable levels of fire resistance	Suppression, fire resting covering, intumescent coating, ventilation, separation Content, use and application of relevant national standards, guidance and regulations.
2.2 Evaluate methods of reducing impact of fire on materials	
2.3 Propose alternative methods for reducing levels of fire resistance	

3. Review the impact of a fire engineering design on the fire resistance of materials and structures

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Assess the impact of a fire engineering design on levels of fire resistance	Design assessment, fire resistance levels, suitability of materials, alternative solutions, advantages and suitability of solutions, ventilation Content, use and application of relevant national standards, guidance and regulations.
3.2 Assess levels of fire resistance on a fire engineering design	
3.3 Identify areas of non-compliance with best practice, design standards and guidance	
3.4 Propose options to resolve areas of non-compliance on the levels of fire resistance	

Assessment

Candidates must demonstrate that they have achieved each of the assessment criteria specified in the unit.

Learning Outcome 3 is competence-based. Simulation in a learning and development environment is recommended but practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references to us of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 476
- BS 7974
- BS 9991
- BS 9999
- BR368
- BS EN 1363
- BS EN 1364
- BS EN 1365,
- Eurocode 1: Part 2: Actions on structures exposed to fire

Recommended Reading

- Case studies: Monte Carlo fire (Las Vegas), The Windsor Tower fire (Madrid)

Recommended learning time: 25 hours

Links National Occupational Standards

This unit has links to National Occupational Standard FS6: Review fire safety matters relating to existing or proposed construction.

Unit 6: Smoke Control and Heat Exhaust Ventilation Systems

Introduction

This unit is about understanding how natural and mechanical ventilation systems are used to control and exhaust heat and smoke to allow occupants to escape from a building which is affected by fire. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the principles of smoke control and heat exhaust ventilation systems
- determine a suitable design fire
- determine the mass flow of smoke and temperature in smoke layers
- assess smoke control and heat exhaust ventilation system components
- evaluate the effectiveness of existing smoke control and heat exhaust ventilation systems
- design a simple natural and mechanical smoke control and heat exhaust ventilation systems
- evaluate the effectiveness of the maintenance and commissioning programme for smoke control and heat exhaust ventilation systems

Learning Content

1. Understand the principles of smoke control and heat exhaust ventilation systems

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Explain the principles of smoke control and heat exhaust ventilation systems	Natural ventilation systems, mechanical ventilation systems. Safe evacuation, Compensatory features, Design purpose. Functional requirements of Building Regulations. Content, use and application of relevant national standards, guidance and regulations.
1.2 Explain technical guidance relating to smoke control and heat exhaust ventilation systems	
1.3 Analyse the objectives of smoke control and heat exhaust ventilation systems	

2. Determine a suitable design fire

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Define the concept of a design fire	Radiated heat, fire separation, suppression, growth rates, radiation calculations. Heat release rate, mass production rate of smoke, mass production rate of fire effluents, flame size and temperature, temperature within enclosure, time to flashover, area of fire involvement, space separation, radiation calculations, smoke calculations. Content, use and application of relevant national standards, guidance and regulations. Content, use and application of relevant national standards, guidance and regulations.
2.2 Analyse design fire parameters	
2.3 Identify a suitable design fire	

3. Determine the mass flow of smoke and temperature in smoke layers

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Identify the mass flow of smoke within a smoke layer	Radiated heat, fire separation, suppression, growth rates, radiation calculations. Heat release rate, mass production rate of smoke, mass production rate of fire effluents, flame size and temperature, temperature within enclosure, time to flashover, area of fire involvement, space separation, radiation calculations, smoke calculations.
3.2 Identify the temperature within a smoke layer	
3.3 Check for the stratification of a smoke plume	

4. Assess smoke control and heat exhaust ventilation system components

Assessment Criteria	Knowledge, Understanding and Skills
4.1 Explain the requirements for components of smoke control and heat exhaust ventilation systems	Fans, pulse/jet fans, detection, vents. Components for smoke and heat control systems. Content, use and application of relevant national standards, guidance and regulations.
4.2 Evaluate the effectiveness of system components	

5. Evaluate the effectiveness of existing smoke control and heat exhaust ventilation systems

Assessment Criteria	Knowledge, Understanding and Skills
5.1 Explain the design principles of smoke control and heat exhaust ventilation systems	Calculation for natural ventilation systems, calculation for mechanical ventilation systems Number of extract points, areas of stagnation, plugholing, air inlet provision Pressurisation systems do not work and present a risk to life safety (Lay). Types of system, occupancies, car parks, underground areas, shopping malls, atria, flats, smoke shafts, corridors, staircases Content, use and application of relevant national standards, guidance and regulations.
5.2 Evaluate the effectiveness of existing smoke control and heat exhaust ventilation systems	

6. Design a simple natural and mechanical smoke control and heat exhaust ventilation systems

Assessment Criteria	Knowledge, Understanding and Skills
6.1 Identify design calculations for smoke control and heat exhaust ventilation systems	Calculation for natural ventilation systems, calculation for mechanical ventilation systems Number of extract points, areas of stagnation, plugholing, air inlet provision Pressurisation systems do not work and present a risk to life safety (Lay). Types of system, occupancies, car parks, underground areas, shopping malls, atria,flats, smoke shafts, corridors, staircases Content, use and application of relevant national standards, guidance and regulations.
6.2 Design natural and mechanical smoke control and heat exhaust ventilation systems	

7. Evaluate the effectiveness of the maintenance and commissioning programme for smoke control and heat exhaust ventilation systems

Assessment Criteria	Knowledge, Understanding and Skills
7.1 Identify the maintenance and commissioning requirements of a smoke control and heat exhaust ventilation system	Maintenance requirements and commissioning, weekly, monthly and yearly tests, test results, documentation. Content, use and application of relevant national standards, guidance and regulations.
7.2 Evaluate the effectiveness of a maintenance and commissioning programme for a smoke control and heat exhaust ventilation system	

Assessment

Simulation in a learning and development environment is recommended where candidates are providing evidence to demonstrate achievement of competence-based assessment criteria. However, practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references demonstrating use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 476
- BS 7346
- BS 7974
- BS 9991
- BS 9999
- BR 186
- BR368
- BR 375
- BR 79204
- BD 2410

Recommended Reading

- Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (SCA)

Recommended learning time: 60 hours

Links National Occupational Standards

This unit has links to National Occupational Standards:
FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS7: Review fire protection systems in complex premises and environments

Unit 7: Pressure Differential Systems

Introduction

This unit is about understanding how pressure differential systems are used to prevent spread of combustion products to escape routes. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand the principles of pressure differential systems
- evaluate existing pressure differential systems
- assess a simple pressure differential system design
- evaluate the effectiveness of the maintenance and commissioning programme for pressure differential systems

Learning Content

1. Understand the principles of pressure differential systems

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Identify codes of practice and technical guidance relating to pressure differential systems	Pressurisation systems, depressurisation systems, protected space, unprotected space, high pressure side, low pressure side, supply air, exhaust air, control of smoke by airflow, pressure differences, leakage paths, system classes. Airflow velocity (open door), pressure differential (closed door), large gaps, small gaps, cracks, supply air parameters, door velocity, design differential, series leakage paths, parallel leakage paths, volumetric flow rates, air supply requirements, air release and over pressure requirements. Content, use and application of relevant national standards, guidance and regulations.
1.2 Explain the principles of pressure differential systems	
1.3 Identify the objectives of pressure differential systems	
1.4 Explain how smoke moves in buildings	
1.5 Identify methods of controlling smoke	
1.6 Explain the requirements for components of pressure differential systems	

2. Evaluate existing pressure differential systems

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Analyse pressure differential system components	Design principles, concept and criteria, design calculations. Pressurisation systems do not work and present a risk to life safety (Lay).
2.2 Evaluate existing pressure differential systems	

	Content, use and application of relevant national standards, guidance and regulations.

3. Assess a simple pressure differential system design

Assessment Criteria	Knowledge, Understanding and Skills
3.1 Explain the design criteria for pressure differential systems	Design calculations. Pressurisation systems do not work and present a risk to life safety (Lay). Content, use and application of relevant national standards, guidance and regulations.
3.2 Identify design calculations for pressure differential systems	
3.3 Evaluate a simple pressure differential system design	

4. Evaluate the effectiveness of the maintenance and commissioning programme for pressure differential systems

Assessment Criteria	Knowledge, Understanding and Skills
4.1 Identify maintenance and commissioning requirements for pressure differential systems	Maintenance requirements: weekly, monthly and yearly tests, re-tests, test results, documentation. Content, use and application of relevant national standards, guidance and regulations.
4.2 Evaluate the effectiveness of the maintenance and commissioning programme	

Assessment

Simulation in a learning and development environment is recommended where candidates are providing evidence to demonstrate achievement of competence-based assessment criteria. However, practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references demonstrating use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- BS 12101-6

Recommended Reading

- Smoke control by pressurisation (Fläkt Woods)
- Pressurisation Systems (Colt)

Recommended learning time: 45 hours

Links National Occupational Standards

This unit has links to National Occupational Standards:
FS2: Assess risks associated with fire in complex premises and environments
FS3: Ensure measures are in place to protect people from fire in complex premises and environments
FS7: Review fire protection systems in complex premises and environments

Unit 8: Fire Engineering Design and its Impact on the External Spread of Fire

Introduction

This unit is about understanding how fire engineering is utilised to comply with the functional requirements for external spread of fire. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand how fire engineering design impacts on the external spread of fire
- apply fire engineering design to the external spread of fire requirements

Learning Content

1. Understand how fire engineering design impacts on the external spread of fire

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Explain the principles of space separation	Radiation calculations, cladding, shielding, occupancy, CFD. Functional requirements of Building Regulations. Content, use and application of relevant national standards, guidance and regulations.
1.2 Explain the effect of external spread of fire on materials	

2. Apply fire engineering design to the external spread of fire requirements

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Assess the external spread of fire for a fire engineering design	Functional requirements of Building Regulations. Fire from adjacent building overriding sprinkler system, when space separation has been reduced as a compensation for sprinklers. Content, use and application of relevant national standards, guidance and regulations.
2.2 Identify areas of non-compliance with best practice, design standards and guidance	
2.3 Propose options to resolve areas of non-compliance in the external spread of fire requirements	

Assessment

Simulation in a learning and development environment is recommended where candidates are providing evidence to demonstrate achievement of competence-based assessment criteria. However, practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references demonstrating use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 7974
- BS 9991
- BS 9999
- BR187
- BR187
- DIN
- NFPA

Recommended Reading

- Case studies: Bradford City, “Walkie Talkie” skyscraper (Fenchurch Street, London)

Recommended learning time: 20 hours

Links to National Occupational Standards

This unit has links to National Occupational Standard FS6: Review fire safety matters relating to existing or proposed construction.

Unit 9: Fire Engineering Design and its Impact on Access and Facilities for Firefighting

Introduction

This unit is about understanding how fire engineering is utilised to comply with the functional requirements for access and facilities for fire-fighting. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand how fire engineering design impacts on the access and facilities for firefighting
- apply fire engineering design to the access and facility requirements for firefighting

Learning Content

1. Understand how fire engineering design impacts on the access and facilities for firefighting

Assessment Criteria	**Knowledge, Understanding and Skills**
1.1 Explain access and facility requirements for firefighting	Suppression systems, compensatory features. Vehicle and fire-fighter access, fire-fighting shafts, stairs and lifts, water supplies, dry risers, wet risers, fire mains, communications, control centres, control systems. Content, use and application of relevant national standards, guidance and regulations.
1.2 Explain the impact of fire engineering design on access and facility requirements for firefighting	

2. Apply fire engineering design to the access and facility requirements for firefighting

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Evaluate the effectiveness of the access and facilities requirements for firefighting in a fire engineering design	Suppression systems, compensatory features. Vehicle and fire-fighter access, fire-fighting shafts, stairs and lifts, water supplies ,dry risers, wet risers, fire mains, communications, control centres, control systems. Content, use and application of relevant national standards, guidance and regulations.
2.2 Identify areas of non-compliance with best practice, design standards and guidance.	
2.3 Propose options to resolve areas of non-compliance in the access and facilities requirements for firefighting on fire engineering designs	

Assessment

Simulation in a learning and development environment is recommended where candidates are providing evidence to demonstrate achievement of competence-based assessment criteria. However, practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references to demonstrate use of appropriate Approved/BS Documents to support recommendations/conclusions

Relevant Standards, Regulations and Approved Documents

- Approved Document B (plus UK equivalents)
- BS 7974
- BS 9991
- BS 9999
- Physiological Assessment of Firefighting, Search and Rescue in the Built Environment BDAG07

Recommended learning time: 20 hours

Links to National Occupational Standards

This unit has links to National Occupational Standard FS6: Review fire safety matters relating to existing or proposed construction.

Unit 10: Principles of Fire and Evacuation Modelling

Introduction

This unit is about understanding how fire and evacuation modelling programmes and are used to support fire engineering solutions. It applies to small, large and complex premises.

Learning Outcomes

Candidates who achieve this unit should be able to:

- understand principles of fire and evacuation modelling
- identify suitable fire and evacuation models

Learning Content

1. Understand principles of fire and evacuation modelling

Assessment Criteria	Knowledge, Understanding and Skills
1.1 Explain the principles of fire and evacuation modelling	Principles and concepts of CFD, model types, zone and field models, suitability, limitations, justification, functional requirements of building regulations. Smart Fire, Exodus, NIST (CFAST, FDS, Smoke view), PyroSim. CFD files, inputs (text files), parameters, compensatory features. Content, use and application of relevant national standards, guidance and regulations.

2. Know how to identify suitable fire and evacuation models

Assessment Criteria	Knowledge, Understanding and Skills
2.1 Explain best practice relating to fire and evacuation modelling	Principles and concepts of CFD, model types, zone and field models, suitability, limitations, justification, functional requirements of building regulations. Smart Fire, Exodus, NIST (CFAST, FDS, Smoke view), PyroSim. CFD files, inputs (text files), parameters, compensatory features. Content, use and application of relevant national standards, guidance and regulations.
2.2 Evaluate the suitability of fire and evacuation models	

Assessment

Simulation in a learning and development environment is recommended where candidates are providing evidence to demonstrate achievement of competence-based assessment criteria. However, practical assessment in a workplace environment is also permitted.

Examples of appropriate evidence to support the knowledge and understanding requirements include:

- knowledge and understanding assessments (eg written assignment or presentation)
- reports showing application of relevant scientific/engineering principles and understanding when assessing a situation/making recommendations
- references to demonstrate use of appropriate Approved/BS Documents to support recommendations/conclusions

Recommended learning time: 20 hours

Links to National Occupational Standards

This unit has links to National Occupational Standard FS3: Ensure measures are in place to protect people from fire in complex premises and environments.

Section 2: Centre Approval

Introduction

In order to deliver this qualification and carry out assessment, potential assessment centres must first secure approval from the IFE to operate as an assessment centre.

The Process

The process involves the following steps:

- Applicants must complete the centre approval form provided by the IFE. This form is available on request from the IFE.
- A desk review of the information provided will be carried out and the IFE will ask for additional information if appropriate.
- A centre visit will be arranged. The IFE will be represented by an appropriately experienced and qualified expert who will take on the role of External Quality Assurer (EQA).
- If the feedback from the EQA includes a recommendation that the centre should be approved, the approval process will be progressed. If further information is required (eg copies of centre policies or information on local assessors), approval will be delayed until all relevant documents have been received and reviewed. When all required standards have been met, the IFE will confirm that approval has been granted.

Requirements for Centres

The centre approval process will require centres to demonstrate that they have:

- facilities for managing local assessment – including equipment for use during candidate assessments.
- facilities for managing and maintaining assessment materials including recordings and documentation.
- assessors who have both subject and assessment expertise. (The IFE will require assessors to demonstrate experience and/or qualifications in the area that they are assessing.)
- robust processes for managing internal standardisation and verification of assessments.

Fees

An initial approval fee will be charged. Please see current fee lists.

Once approved, a fee per candidate will be charged for each candidate undertaking assessment and seeking certification.

There may be additional charges for centres in respect of EQA visits where only a small number of candidates are undertaking assessment.

Ongoing Quality Assurance Arrangements

The IFE operates a quality assurance strategy that applies to all centres and the IFE reserves the right to carry out centre audits at any time.

The number of qualification-related visits to centres each year will depend upon the number of candidates undertaking assessment. Most centres will receive a minimum of two external quality assurance visits per year. The IFE reserves the right to increase the number of visits and/or to request submission of candidate portfolios for further checks.

Section 3: Assessment and Quality Assurance

Introduction

This qualification is locally assessed with assessments standardised locally and external quality assurance undertaken by an IFE-appointed External Quality Assessor (EQA).

Roles and Requirements

Assessors

Centres will be required to identify and allocate assessors to undertake the assessment process. They will be required to provide details of those who carry out assessment to the IFE.

The IFE has set minimum requirements for those who carry out assessment for this qualification and centres must ensure that assessors meet these requirements. Assessors must:

- be subject experts with current experience of working in the specialist area; ideally, assessors should be qualified to level 6 (degree level) or above and have at least two years of experience of working in the specialist area. (Where potential assessors have extensive experience, in excess of four years and are recognised as expert by their employers, the requirement to hold a qualification at level 6 may be relaxed.)
- have experience of carrying out assessments in the specific subject area and/or hold an appropriate qualification.
- demonstrate commitment to CPD.

In addition, centres must, under all circumstances, be mindful of the potential for conflicts of interest and should ensure that assessors do not have personal/commercial interests in the outcome of any assessments that they undertake.

Centres should ensure that records are maintained that show which assessor undertook which assessment.

Standardisation and Internal Quality Assurance

Centres are responsible for ensuring that a robust system of standardisation and quality assurance is in place in order to ensure that standards are applied consistently and equitably across candidates regardless of the assessor that undertook the initial assessment.

An Internal Quality Assurance Lead/Internal Verifier must be appointed. The IFE should be notified of the person who has been allocated to the role. The individual leading on internal QA must have sufficient authority and resources to enable them to carry out the role effectively. They must have occupational knowledge and should have experience of assessment, ideally holding subject and assessment qualifications.

Centres must establish an internal standardisation process whereby assessors meet and cross-moderate assessment decisions. A formal record of internal moderation should be kept. This

record should demonstrate that standardisation has taken place and should note any areas where decisions have been made that set precedents to be followed on future occasions.

Internal quality assurance arrangements must include regular monitoring of assessor decisions and sampling of assessment decisions. Records should be made of the monitoring and checks undertaken to enable audit trails to be followed.

Note: as well as providing confirmation of the way in which centres are applying the assessment criteria, the information from internal assessment will be used by the IFE to contribute to the ongoing enhancement of assessment guidance.

External Quality Assurance

The IFE will arrange external quality assurance visits.

The purpose of external quality assurance is to ensure that:

- the centre is operating robust assessment processes (including internal quality assurance arrangements) that lead to appropriate and consistent decisions.
- assessment is fit for purpose, at the right level and generating sufficient evidence of attainment.
- all required policies and procedures are in place and are being applied.

Most centres will receive at least two quality assurance visits per year. The IFE reserves the right to increase the number of visits where a high volume of candidates are involved or where areas of concern have been noted.

Where additional external quality assurance visits are required, the IFE may re-charge the cost of the visit(s) to the centre.

During an external quality assurance visit, the IFE external quality assurer, will:

- meet candidates, assessors and internal verifiers.
- view candidate assessment records and evidence.
- view a list of candidates registered for the qualification
- view centre records including minutes of meetings, procedures, details of any new assessors etc.
- review progress following on from any previous visit.

Retaining Candidate Assessments

Centres should retain candidate portfolios/assessment materials for a minimum of six months after assessment decisions have been issued. In cases of appeals by candidates, individual assessments will need to be kept until any disputes about outcomes or appeals have been resolved.

Assessment

Introduction

The aim of assessment is to ensure that candidates have met the published standard.

Assessors must therefore be satisfied that the candidate has fully met the published requirements and has provided enough evidence for the assessor to be satisfied that the candidate could apply the knowledge, understanding and skills competently in the workplace.

The Assessment Process

Only approved assessors may undertake assessment.

Assessors should review the assessment outcomes against the requirements of the published specification. Prior to confirming that a candidate has met the standard, assessors should be confident that:

- the candidate had independently produced sufficient evidence in terms of depth and breadth.
- all aspects of the criteria have been fully met.

After the assessor has examined the evidence, the assessor must record an assessment decision and the justification for the decision.

Assessors must use the recording documents provided by the IFE when confirming that published criteria have been met.

Recognition of prior attainment

In some instances it may be possible for candidates to present evidence that has been attained prior to commencing the qualification. In determining whether or not evidence of prior achievement is appropriate, assessors must consider the following criteria:

- Specific requirements of the unit/qualification specification: all evidence must be evaluated against the specific requirements set out in the unit/qualification that the candidate is seeking to attain. Assessors must be confident in determining that there is sufficient evidence available to confirm that the candidate has fully met the requirements.
- Currency: all evidence must have been generated within two years of the date of issue of the qualification certificate.
- Individual's own work: it must be clear that the evidence provided is the candidate's own work and was completed in the required assessment conditions.
- Reliability: having considered the evidence available, the assessor must be confident that he/she would have arrived at the same decision if the assessment were to be repeated. In some instances, this may require further professional discussion with the candidate to confirm attainment.

Centres should see the IFE's Recognition of Prior Achievement (RPA) Policy and Process guidance for further information.

Section 4: Summary Assessment Forms

Introduction

The summary assessment forms that follow have been designed to enable assessors to collate the relevant evidence and to summarise the reason for their judgements.

Assessors are requested to use these documents for all candidates. Centres may substitute their own evidence summary forms as long as these documents contain, as a minimum, the information required on the IFE forms.

Assessors should be aware that evidence may be generated across different assessment tasks.

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 1: Principles of Fire Development and Spread

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of fire development	
1.2 Explain how fires are initiated and develop within enclosure of origin	
1.3 Explain how smoke and toxic gases spread within and beyond enclosure of origin	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 2: Principles of Fire Engineering

1. Understand the principles of fire engineering design

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of fire engineering design frameworks	
1.2 Evaluate design frameworks	
1.3 Explain the principles of fire development, fire spread and the impact of fire on buildings	
1.4 Analyse management levels for fire engineering designs	
1.5 Explain detection and activation systems	
1.6 Explain the requirements for fire service intervention	
1.7 Evaluate evacuation strategies	
1.8 Explain the principles of a Qualitative Design Review (QDR)	
1.9 Understand and know how to apply relevant national standards, guidance and regulations	

2. Understand best practice for fire engineering consultations

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Explain best practice for fire engineering pre-consultations	
2.2 Explain best practice for fire engineering consultations	

3. Evaluate the effectiveness of fire engineering designs

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Explain the principles of quantitative design analysis	
3.2 Evaluate the effectiveness of a quantitative analysis review guidance	

4. Conduct an impact assessment of a fire engineering design

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
4.1 Explain the principles of an impact assessment	
4.2 Conduct an impact assessment of fire engineering designs	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 3: Review the Effectiveness of Automatic Fire Suppression Systems

1. Understand the principles of automatic fire suppression systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Describe automatic fire suppression systems	
1.2 Confirm the suitability of automatic fire suppression systems for risk	
1.3 Compare the advantages and disadvantages of automatic fire suppression systems	

2. Assess the effectiveness of sprinkler systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Explain technical guidance relating to sprinkler systems	
2.2 Evaluate the suitability of sprinkler system components	
2.3 Explain water supply arrangements for sprinkler systems	
2.4 Describe the design criteria of sprinkler systems	
2.5 Evaluate the effectiveness of sprinkler system designs	
2.6 Determine the effectiveness of a maintenance programme for sprinkler systems	

3. Assess the effectiveness of water mist systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Evaluate technical guidance relating to water mist systems in premises	
3.2 Evaluate the effectiveness of water mist system designs	
3.3 Determine the effectiveness of a maintenance programme for water mist systems	

4. Understand the principles of oxygen reduction systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
4.1 Explain technical guidance relating to oxygen reduction systems	
4.2 Explain the principles of oxygen reduction systems	

5. Understand the principles of gaseous, foam systems and other fire suppression systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
5.1 Explain technical guidance relating to gaseous, foam systems and other fire suppression systems	
5.2 Explain the principles of gaseous, foam systems and other fire suppression systems	
5.3 Recognise future developments in fire suppression systems	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 4: Fire Engineering Design and its Impact on Human Behaviour

1. Understand the effect of fire on human bodies and behaviour

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of tenability limits	
1.2 Identify the tenability criteria for exposure to fire, heat and toxic gases	
1.3 Explain the impact of heat and smoke on the human body	
1.4 Explain the impact of heat and smoke on human behaviour	
1.5 Explain the effects of fire on group dynamics	

2. Understand how fire engineering design impacts on human behaviour

3.

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Identify how fire engineering design impacts on human Behaviour	
2.2 Define the principles of ASET and RSET	
2.3 Review simple ASET/RSET calculations	

3. Review the impact of fire engineering design on human behaviour

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Assess the impact of fire engineering design on human behaviour	
3.2 Identify areas of non-compliance with best practice, design advantages/disadvantages of solutions standards and guidance	
3.3 Propose options to resolve areas of non-compliance in human behaviour	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 5: Fire Engineering Design and its Impact on the Fire Resistance of Materials and Structures

1. Understand the effects of fire on materials and structures

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the impact of fire on materials	
1.2 Evaluate the suitability of materials used for building structures	
1.3 Explain the methods for testing the levels of fire resistance of materials	

2. Understand how fire engineering design impacts on the fire resistance of materials and structures

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Explain guidance relating to achieving suitable levels of fire resistance	
2.2 Evaluate methods of reducing impact of fire on materials	
2.3 Propose alternative methods for reducing levels of fire resistance	

3. Review the impact of a fire engineering design on the fire resistance of materials and structures

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Assess the impact of a fire engineering design on levels of fire resistance	
3.2 Assess levels of fire resistance on a fire engineering design	
3.3 Identify areas of non-compliance with best practice, design standards and guidance	
3.4 Propose options to resolve areas of non-compliance on the levels of fire resistance	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 6: Smoke Control and Heat Exhaust Ventilation Systems

1. Understand the principles of smoke control and heat exhaust ventilation systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of smoke control and heat exhaust ventilation systems	
1.2 Explain technical guidance relating to smoke control and heat exhaust ventilation systems	
1.3 Analyse the objectives of smoke control and heat exhaust ventilation systems	

2. Determine a suitable design fire

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Define the concept of a design fire	
2.2 Analyse design fire parameters	
2.3 Identify a suitable design fire	

3. Determine the mass flow of smoke and temperature in smoke layers

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Identify the mass flow of smoke within a smoke layer	
3.2 Identify the temperature within a smoke layer	
3.3 Check for the stratification of a smoke plume	

4. Assess smoke control and heat exhaust ventilation system components

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
4.1 Explain the requirements for components of smoke control and heat exhaust ventilation systems	
4.2 Evaluate the effectiveness of system components	

5. Evaluate the effectiveness of existing smoke control and heat exhaust ventilation systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
5.1 Explain the design principles of smoke control and heat exhaust ventilation systems	
5.2 Evaluate the effectiveness of existing smoke control and heat exhaust ventilation systems	

6. Design a simple natural and mechanical smoke control and heat exhaust ventilation systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
6.1 Identify design calculations for smoke control and heat exhaust ventilation systems	
6.2 Design natural and mechanical smoke control and heat exhaust ventilation systems	

7. Evaluate the effectiveness of the maintenance and commissioning programme for smoke control and heat exhaust ventilation systems

Assessment Criteria	**Knowledge, Understanding and Skills**
7.1 Identify the maintenance and commissioning requirements of a smoke control and heat exhaust ventilation system	
7.2 Evaluate the effectiveness of a maintenance and commissioning programme for a smoke control and heat exhaust ventilation system	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 7: Pressure Differential Systems

1. Understand the principles of pressure differential systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Identify codes of practice and technical guidance relating to pressure differential systems	
1.2 Explain the principles of pressure differential systems	
1.3 Identify the objectives of pressure differential systems	
1.4 Explain how smoke moves in buildings	
1.5 Identify methods of controlling smoke	
1.6 Explain the requirements for components of pressure differential systems	

2. Evaluate existing pressure differential systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Analyse pressure differential system components	
2.2 Evaluate existing pressure differential systems	

4. Assess a simple pressure differential system design

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
3.1 Explain the design criteria for pressure differential systems	
3.2 Identify design calculations for pressure differential systems	
3.3 Evaluate a simple pressure differential system design	

4. Evaluate the effectiveness of the maintenance and commissioning programme for pressure differential systems

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
4.1 Identify maintenance and commissioning requirements for pressure differential systems	
4.2 Evaluate the effectiveness of the maintenance and commissioning programme	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 8: Fire Engineering Design and its Impact on the External Spread of Fire

1. Understand how fire engineering design impacts on the external spread of fire

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of space separation	
1.2 Explain the effect of external spread of fire on materials	

2. Apply fire engineering design to the external spread of fire requirements

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Assess the external spread of fire for a fire engineering design	
2.2 Identify areas of non-compliance with best practice, design standards and guidance	
2.3 Propose options to resolve areas of non-compliance in the external spread of fire requirements	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 9: Fire Engineering Design and its Impact on Access and Facilities for Firefighting

1. Understand how fire engineering design impacts on the access and facilities for firefighting

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain access and facility requirements for firefighting	
1.2 Explain the impact of fire engineering design on access and facility requirements for firefighting	

2. Apply fire engineering design to the access and facility requirements for firefighting

Assessment Criteria	**Knowledge, Understanding and Skills**
2.1 Evaluate the effectiveness of the access and facilities requirements for firefighting in a fire engineering design	
2.2 Identify areas of non-compliance with best practice, design standards and guidance.	
2.3 Propose options to resolve areas of non-compliance in the access and facilities requirements for firefighting on fire engineering designs	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**

IFE Level 5 Diploma in Fire Engineering Design

Evidence Summary Sheet

Candidate Name:	

Unit 10: Principles of Fire and Evacuation Modelling

1. Understand principles of fire and evacuation modelling

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
1.1 Explain the principles of fire and evacuation modelling	

2. Know how to identify suitable fire and evacuation models

Assessment Criteria	**Evidence Provided**
	Meets assessment criterion: Yes/No
	Briefly explain reason for decision and identify where and how the evidence provided demonstrates (or fails to demonstrate) achievement of each assessment criterion
2.1 Explain best practice relating to fire and evacuation modelling	
2.2 Evaluate the suitability of fire and evacuation models	

Assessor:	**Date of Internal QA:**
Assessor signature:	**Name of Internal Quality Assurer:**
Date:	**Decision:**