

Unit:

Unit: Level 3 Fire Detection and Alarm Advanced Designer
Development Group: FD&A Development Group

Date Completed: 31 Jan '17
Revised 20 Mar '19

Guided Learning Hours (GLH) 40 Directed Learning (DL) 8 Invigilated Assessment Hours (IA) 3 Total Qualification Time (TQT) 51

Assessment Method: Multi Choice and Short Answer

Learning Outcomes: This is the advanced unit specialising in the role of Systems Designer for the Fire Detection and Alarm Sector. Before completing this unit learners should already have successfully completed the Level 2 Foundation in Fire Detection and Alarm.

Learners who have successfully completed this unit along with;

- Level 2 Foundation in Fire Detection and Alarm
- Level 2 Environmental for Field Service Technicians
- Level 2 Health and Safety for Field Service Technicians

Will be awarded the FIA AO Level 3 in Fire Detection and Alarm Design, Theory and Regulatory Requirements.

Learners completing this unit will have gained advanced knowledge and understanding of the Legislative requirements, Codes of Practice and Guidance for systems design in the Fire Detection and Alarm (FD&A) sector of the Fire Industry. They will also have gained best practice methodology, numerous standards applicable to FD&A Systems and ancillary equipment, Customer specifications, systems technology, and maintenance methodology.

Subject	Knowledge Criteria	Performance Criteria
<p>A. Legislation</p>	<p>Learners will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Current legislation relevant to the areas in which they work (Including cross border legislation where appropriate) 2. Construction Design Management (CDM) Regulations 3. Building Regulations <ol style="list-style-type: none"> a. National requirements b. Local authority requirements 4. Equality and disability discrimination legislation 5. European Directives 6. Construction Products Regulations (CPR) 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Name, understand and provide an outline description of applicable legislation according to the UK nation in which the design is to be implemented 2. Regarding the principles and objectives of the CDM regulations <ol style="list-style-type: none"> a. Identify and apply design considerations according to the requirements of CDM b. Provide a summary explanation of the considerations to the system design 3. Name, understand and provide the scope and an outline description of Building Regulations as applicable to FD&A systems <ol style="list-style-type: none"> a. Identify and apply the relevant parts of the building regulations and the appropriate guidance documents b. Explain how local authority requirements can affect the application of Building Regulations 4. Identify and apply the requirements of equality and disability discrimination legislation applicable to the UK nation in which the design is to be 5. Identify applicable European Directives and their impact on system design

		<p>6. Identify and apply the requirements of the Construction Products Regulations (CPR) and the impact this may have on system design</p>
<p>Explanatory Notes</p> <p>Designers should have an understanding of legislation that has an impact on fire alarm systems to ensure that designs can be made to comply with, or at least take into account legislative requirements. Designers will need to be able to demonstrate their knowledge and understanding of legislation relevant to the UK Country in which the design is to be implemented</p> <p>In addition to knowledge and understanding of legislation and regulations applicable to their work, learners will also be required to demonstrate awareness of other related legislation and regulations and how to source further information where required.</p>		

<p>B. BS 5839/IS 3218</p>	<p>Knowledge Criteria</p> <p>Learners will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Applicable Codes of Practice to the FD&A sector and their application 2. System Categories 3. Zones 4. System integrity 5. Manual Call Points 6. Detection selection, siting and spacing <ol style="list-style-type: none"> a. Flat ceilings b. Pitched roofs c. Beams, obstructions and complex ceiling structures d. Ventilation e. Voids f. Vertical Intrusions (Lift shafts, Stairways Risers) g. Avoiding false alarms/unwanted fire signals h. Detector technology i. Mounting heights 7. Alarm Selection and siting <ol style="list-style-type: none"> a. Audible alarms b. Visual alarms c. Tactile alarms 8. Remote signalling 	<p>Performance Criteria</p> <p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify, understand and apply the relevant codes of practice 2. Understand and apply system categories <ol style="list-style-type: none"> a. Identify and apply the applicable protection of life category b. Identify and apply the applicable protection of property category 3. Identify and apply detection and/or alarm zones and how they can have an impact on the choice of system type and the effect they will have on system design 4. Provide an explanation of the term 'System Integrity' <ol style="list-style-type: none"> a. Types of fault b. Effects on the system c. Reporting 5. Identify and provide an explanation of requirements for the siting of manual call points 6. Identify, apply and describe the design requirements for: <ol style="list-style-type: none"> a. Flat ceilings b. Pitched roofs c. Beams, obstructions and complex ceiling structures d. Ventilation e. Voids f. Vertical Intrusions g. False Alarm and unwanted fire signal h. Detector technology
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	<p>9. Documentation</p>	<p>i. Mounting heights</p> <p>7. Identify, apply and describe the design requirements for:</p> <ol style="list-style-type: none"> a. Audible alarm b. Visual alarms c. Tactile alarm <p>8. Identify and apply recommendations for remote signalling</p> <ol style="list-style-type: none"> a. The need for automatic communications with the Fire and Rescue Services b. The features required of both the CIE and communication device <p>9. Identify and provide an explanation of the documentation produced by the designer</p>
<p>Explanatory Notes</p> <p>It is expected that the fire alarm designer would be familiar with the recommendations of the appropriate Codes of Practice, such that they should have a thorough working knowledge of the standard and of its application to system design. However, this is with recognition of the need to look up the standard in order to check and verify details. The designer should be aware of the limits to their own knowledge and how to source further information and advice when required.</p> <p>This unit recognises that many of the principles remain the same even if alternative standards are used and/or if the detail changes.</p>		

C. BS EN 54	Knowledge Criteria	Performance Criteria
	<p>Learners will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. EN54-1 <ol style="list-style-type: none"> a. Intent, scope and terminology b. Functional parts 2. EN54-13 <ol style="list-style-type: none"> a. Intent and scope b. Type 1 & type 2 components 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. With reference to EN 54-1 provide a brief overview of intent and scope of EN 54 <ol style="list-style-type: none"> a. Explain the importance of compliance with EN 54 with respect to European fire alarm systems b. Identify the appropriate part for FD&A system devices 2. Provide an explanation of EN54-13 and the benefits of this standard on a system design <ol style="list-style-type: none"> a. Identify type 1 components and provide an explanation of their application b. Identify type 2 components and provide an explanation of their application
	<p>Explanatory Notes</p> <p>EN 54 is the standard for fire alarm equipment in Europe. Compliance for much of it is mandatory, where parts have been harmonised under the Construction Products Regulations (CPR), in such cases, to use non-compliant products is illegal. It is essential that the designer has appropriate knowledge of this standard.</p> <p>The Designer should also understand what products are covered by this standard and ensure they know how to recognise those products that are compliant.</p>	

D. BS 7273	Knowledge Criteria	Performance Criteria
	<p>Learners will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. The parts of BS 7273 and their scope 2. Parts 1,3 & 5 <ol style="list-style-type: none"> a. Coincidence detection b. Type of detector c. Spacing and Siting d. CIE, controls and indications e. 1st and 2nd stage 3. Part 4 <ol style="list-style-type: none"> a. Categories of actuation b. Methods of actuation c. FD&A design considerations 4. Part 6 <ol style="list-style-type: none"> a. Ancillary Systems and Equipment (ASE) b. Methods of actuation c. Status monitoring 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify applicable parts of BS 7273 and provide an explanation of scope 2. Apply the requirements of Parts 1, 3 and/or 5 as applicable 3. Apply the requirements of part 4 to system design for: <ol style="list-style-type: none"> a. Categories of actuation b. Methods of actuation c. FD&A design considerations 4. Understand and apply the requirements of part 6 <ol style="list-style-type: none"> a. Recognise and identify Ancillary Systems and Equipment (ASE) b. Identify and apply methods of actuation as applicable to ASE c. Identify and apply status monitoring methods
	<p>Explanatory Notes</p> <p>BS 7273 covers the control of fire protection equipment and has an impact on the design and operation of the Control and Indicating Equipment and on the system design of the fire detection and alarm system.</p> <p>The designer must be aware of this impact and what appropriate steps can be taken to ensure that the resultant system is compliant.</p>	

E. BS 6266	Knowledge Criteria	Performance Criteria
	Learners will have knowledge and understanding of:	Learners will be able to:
	<ol style="list-style-type: none"> 1. Scope and design 2. Detection <ol style="list-style-type: none"> a. Selection b. Positioning/siting c. Sensitivity 3. Alarms and Indicators 4. Interaction with other systems 	<ol style="list-style-type: none"> 1. Provide an explanation of the scope of the standard <ol style="list-style-type: none"> a. Systems requiring design according to BS 6266 b. Understanding risk categories c. Fire strategies 2. Identify and apply recommendations for detection <ol style="list-style-type: none"> a. Selecting the appropriate detection b. Positioning and siting c. Setting sensitivity 3. Identify and apply recommendations for alarms and indicators <ol style="list-style-type: none"> a. Illuminated mimics b. Remote indicators c. Addressable systems d. Alarm locations e. Alarm stages f. Remote signalling 4. Identify and apply recommendations for interaction with other systems <ol style="list-style-type: none"> a. Connections to premises FD&A system b. Interface with other devices/equipment
Explanatory Notes		
Learners should have awareness and appropriate level of understanding of BS 6266 and its application to the design of FD&A systems in electronic equipment installations. In completing this unit learners will be able to recognise and apply recommendations from this standard to their system design and, where applicable, be able to refer back to the standard for further information and understanding.		

F. BS 7671	Knowledge Criteria	Performance Criteria
	Learners will have knowledge and understanding of: <ul style="list-style-type: none"> 1. Scope and intent of BS 7671 2. Relationship between Codes of Practice for FD&A Systems and the wiring regulations BS 7671 3. Safe electrical design 4. Cable containment 5. Separation and segregation 	Learners will be able to: <ul style="list-style-type: none"> 1. Provide a brief overview of the scope and intent of BS 7671 2. Provide an explanation of the relationship between the wiring regulations and the Codes of Practice for the fire alarm systems, including examples where applicable 3. Identify and apply basic principles of safe electrical design to FD&A system design <ul style="list-style-type: none"> a. Within the FD&A system b. Interfacing FD&A systems to ancillary equipment 4. Identify and apply appropriate cable containment systems/methods that would be used in FD&A systems 5. Apply appropriate principles for electrical separation and segregation to the FD&A system design
	Explanatory Notes All electrical installations will be required to comply with appropriate wiring regulations. In designing a Fire Detection and Alarm (FD&A) System learners will be required to recognise and apply the wiring regulations to their system design, and where appropriate apply the recommendations of other applicable standards.	

G. Emergency Lighting/Signage	Knowledge Criteria	Performance Criteria
	Learners will have knowledge and understanding of: <ul style="list-style-type: none"> 1. Emergency Lighting principles 2. Emergency Lighting and FD&A systems 3. Signage requirements 	Learners will be able to: <ul style="list-style-type: none"> 1. Provide a brief explanation of emergency lighting principles: <ul style="list-style-type: none"> a. Identify appropriate regulations, standards and guidance b. Types of lighting c. Areas of coverage d. Mode of operation 2. Explain how FD&A requirements could determine emergency lighting <ul style="list-style-type: none"> a. Requirements for emergency lighting levels b. Requirements for interlinking to dynamic signage 3. Explain how safety signs relate to FD&A Systems and escape routes
	<p>Explanatory Notes</p> <p>Fire alarm designers should have an understanding of emergency lighting, as FD&A systems and emergency lighting systems can both be required to comply with fire safety legislation.</p> <p>Learners will be able to demonstrate understanding of the requirements for emergency lighting and safety signage with reference to FD&A systems as applicable, and be able to refer back to appropriate standards and regulations for further information if required</p>	

H. BS 9999/BS 9991	<p>Knowledge Criteria</p> <p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Content and principles relating to FD&A 2. Fire safety principles 3. Escape routes 4. Compartmentation 	<p>Performance Criteria</p> <p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify and provide an explanation of the content and principles relating to FD&A systems and how they apply 2. Identify and provide an explanation of the principles of fire safety in buildings (e.g. Warning and escape, controlling spread of smoke and flame) 3. Identify and describe the the principles used to design escape routes, make recommendations for actions necessary to provide applicable levels of FD&A coverage (e.g. Size of escape route with respect to the occupancy of the building, the length of corridors between fire doors, refuges) 4. Describe what is meant by compartmentation and the implications compartmentation of a building will have on FD&A design
	<p>Explanatory Notes</p> <p>Buildings are designed to reduce the risk of rapid spread of fire. Fire detection and alarm systems are designed to give the earliest possible warning of fire so as to give the maximum time for building occupants to escape to a safer place. There is always a compromise with respect to the use of the building, the size of the escape routes, the compartmentation designed into the building and the time provided by the fire detection and alarm system. Therefore, a fire alarm designer should be aware of the other techniques that are used to reduce risk so that other effective and compliant solutions may be proposed.</p>	

I. BS EN 12845	Knowledge Criteria	Performance Criteria
	<p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Types of Automatic sprinkler systems 2. Interfacing with Fire Detection and Alarm Systems <ol style="list-style-type: none"> a. Types of interface b. Cause and Effect c. Monitoring and indication 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify and provide an explanation of types of automatic sprinkler systems 2. Identify and provide a description of interfaces including the requirements for interfacing between FD&A and Sprinkler systems <ol style="list-style-type: none"> a. Type of interface b. Describe and apply appropriate cause and effect c. Identify and provide an explanation of requirements for monitoring and indication
	<p>Explanatory Notes</p> <p>The standards describe separate systems for fire detection and alarm and sprinklers. It is therefore essential that the fire alarm designer understands sprinkler systems and their interface to FD&A systems.</p>	

J. BS 7974	Knowledge Criteria	Performance Criteria
	<p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. The aims and scope applicable to FD&A 2. Relationship with BS 5839 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Provide an overview of the framework as applicable to FD&A 2. Provide an explanation of the relationship between this and BS 5839
	<p>Explanatory Notes</p> <p>Prescriptive standards and fire safety engineering are two alternative approaches to fire safety that can be used either in isolation or together to reduce risk and provide a a cost-effective solution. Learners will require an awareness of alternative approaches so that they are appropriately prepared for such alternative approaches, and can recognise where further education/research is required.</p>	

K. Interpreting customer specifications	Knowledge Criteria	Performance Criteria
	<p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Scope of contract/specification <ol style="list-style-type: none"> a. Detection b. Alarm c. Extinguishing d. Passive protection e. Communication with Fire and Rescue Services (FRS) f. Drawings 2. Fire Strategy 3. Interpreting Fire Risk Assessment 4. Confirming system category 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Understand, extract and apply appropriate information from the scope of contract and/or system specification 2. Understand, extract and apply appropriate information from the fire strategy 3. Understand, extract and apply appropriate information from a Fire Risk Assessment 4. From the documents supplied identify and confirm system category according to: <ol style="list-style-type: none"> a. Protection of life and/or protection of property b. Appropriate level of coverage according to risk
	<p>Explanatory Notes</p> <p>The starting point of any fire detection and alarm system design is establishing the needs of the customer. The customer is often unaware of all of the issues, risks and solutions that can be used, so the designer may need to interpret the requirements from various sources to provide a proposal that shows how the system meets the objectives of the customer</p>	

L. Selecting System Type/System design	Knowledge Criteria	Performance Criteria
	<p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Wired, Radio or Hybrid systems 2. Non addressable or Addressable <ol style="list-style-type: none"> a. Analogue/Digital b. Conventional/Two wire c. Open/Closed protocol 3. Central or distributed CIE 4. Remote Services <ol style="list-style-type: none"> a. Fire and Rescue Service b. Other remote services 5. Multiple entrances 6. Cable <ol style="list-style-type: none"> a. Cable type b. Electrical Characteristics 7. Secondary power supply calculation 8. Environmental considerations <ol style="list-style-type: none"> a. Electro Magnetic Interference b. IP ratings c. Hazard mitigation d. Surge Protection Device (SPD) 9. System integrity 10. Speed of response (e.g. 3 seconds to a MCP) 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Recognise and apply solutions (with advantages and disadvantages) for wired, radio and/or Hybrid systems according to: <ol style="list-style-type: none"> a. Customer needs b. Building characteristics 2. Recognise and apply solutions (with advantages and disadvantages) for non-addressable or addressable systems according to: <ol style="list-style-type: none"> a. Customer needs b. System characteristics c. BS 5839 recommendations 3. Identify and apply solutions using central or distributed CIE 4. Identify and apply solutions for remote services according to: <ol style="list-style-type: none"> a. Communication requirements <ol style="list-style-type: none"> i. Fire and Rescue Service ii. Other remote services b. Equipment selection 5. Identify and apply solutions using Control and Indicating Equipment (CIE) when buildings have more than one entrance that could be used by the fire and rescue service 6. Identify and apply the appropriate cables for the fire alarm system <ol style="list-style-type: none"> a. select with the relative advantages and disadvantages cable type

	<ul style="list-style-type: none"> 11. Detection <ul style="list-style-type: none"> a. Technology b. Detection types (e.g. Point, beam, Aspirating detection) c. Avoiding unwanted alarms 12. Ancillary Equipment and Systems (AES) 13. Cause and Effect 14. Coincidence Detection 	<ul style="list-style-type: none"> <ul style="list-style-type: none"> i. Fire resistance ii. Mechanical protection iii. Application b. Calculate and assess the cable characteristics of an FD&A system to allow correct operation according to: <ul style="list-style-type: none"> i. Circuit type ii. Circuit loading iii. Volt drop iv. Manufacturer's specification <ul style="list-style-type: none"> 7. Identify and apply requirements for secondary power supplies <ul style="list-style-type: none"> a. Identify and apply appropriate standby periods b. Identify and apply appropriate alarm time period c. Demonstrate the use of the formula that should be used for calculating the power supply requirements for a fire alarm system and make recommendations for power supply 8. Identify environmental factors effecting system design and make recommendations to limit or mitigate their effects 9. Understand what is meant by system integrity, identify potential issues arising and apply measures that should be considered during the fire alarm design 10. Understand the speed of response from an activation to evacuation, where recommendations can be relaxed and apply appropriate measures to allow or mitigate factors effecting. 11. Identify and apply requirements for detection according to: <ul style="list-style-type: none"> a. Fire risk/objective
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		<ul style="list-style-type: none"> b. Physical space c. Environment d. Processes e. Maintenance f. Management <p>12. Identify ancillary equipment requiring interfacing to FD&A systems and apply appropriate methods for activation and feedback</p> <p>13. Identify requirements for Cause and Effect and apply recommendations to achieve:</p> <ul style="list-style-type: none"> a. Evacuation strategies b. Shut down of ancillary services c. Specifying/detailing d. g Cause and Effect <p>14. Identify the need for different types of coincidence detection and apply appropriate methods in system design</p>
<p>Explanatory Notes The fire alarm designer is the link between the requirements of the customer and the fire alarm system. Selection of equipment, interfacing, integration, reliability, maintenance and ease of use will all be affected by the system design, so it is essential that the designer has a broad and a detailed knowledge of the standards and the equipment that s specified.</p>		

M. Communication, Liaising with third parties and Documentation	Knowledge Criteria	Performance Criteria
	<p>Will have knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. Roles <ol style="list-style-type: none"> a. Customer b. Installer c. Specifier/Architect d. Fire Risk Assessor e. Supplier f. Insurer g. Fire and Rescue Service/Legislator h. Project Manager 2. Design Specification 3. Design Certificate 4. System calculations 5. Annex E 6. Variations 	<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Recognise and understand the roles of stakeholders that may influence or be affected by system design, applying appropriate methods of communication for each 2. Produce a design specification in accordance with details provided 3. Produce a design certificate in accordance with details and specification provided 4. Provide system calculations for power consumption, PSU ratings, cable type 5. Provide an appropriate detector selection document 6. Provide appropriate documentation for agreed variations
	<p>Explanatory Notes</p> <p>Effective communication is essential for the system designer if the provision of the fire alarm system is to proceed smoothly. The designer is responsible for documentation.</p>	

N. Advanced System Design Principles	Knowledge Criteria	Performance Criteria
	Will have knowledge and understanding of: <ul style="list-style-type: none"> 1. Complex applications <ul style="list-style-type: none"> a. Types of premises, e.g. shopping centres, transport hubs, hospitals b. Multi-building sites 2. Hazardous areas 	Learners will be able to: <ul style="list-style-type: none"> 1. Understand and apply any special considerations when designing fire alarm systems for complex applications 2. Identify and apply special considerations for hazardous areas
	Explanatory Notes Fire alarm system designers need to be aware of potential reliability and hazardous situations that could be experienced in the provision of a fire alarm system and how these risks can be reduced or avoided by specifying the appropriate equipment and system design	

O. Designing for inspection and test	Knowledge Criteria	Performance Criteria
	Will have knowledge and understanding of: <ul style="list-style-type: none"> 1. System Testing 2. Non routine attention 	Learners will be able to: <ul style="list-style-type: none"> 1. Recognise the inspections and tests required during the operational life of the system, produce a system design in order to facilitate those tests 2. Recognise the system design facilities to enable non-routine attention
	Explanatory Notes Choice and positioning of fire alarm equipment can have an impact on the inspection and test of the system; therefore, the fire alarm designer needs to be aware of the impact that the choices made will have on the system.	