Level 3 Diploma in Electronic Security and Emergency Systems (1853-03)

Qualification handbook for centres

500/9798/2

www.cityandguilds.com
October 2017
Version 2.4

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Contents

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1 Introduction to the qualification

This document contains the information that centres need to offer the following qualification:

Qualification title and level	**Level 3 Diploma in Electronic, Security and Emergency Systems**
City & Guilds qualification number	1853-03
Qualification accreditation number	500/9798/2
Last registration date	31/12/16
Last certification date	31/12/17

This qualification is intended to provide the underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the following occupational areas of the electronic security and emergency systems industry

Intruder Alarms Systems,
Access Control Systems,
Fire Detection and Alarm Systems,
Integrated Electronic Security Systems – Personnel Alarm Systems,
Electronic Article Surveillance Systems
Closed Circuit Television Systems (CCTV)

Version and date	**Change detail**	**Section**
2.0 Oct 2011	UANs updated – No changes to unit content	**Qualification structure** **Unit details**
2.1 Oct 2013	Minor amends to typographical errors & document footer	**Test specifications** **Units**
2.2 April 2016	Amendments to last registration and certification dates	**Introduction to the qualification**
2.3 May 2016	Amendments to last registration and certification dates	**Introduction to the qualification**
2.4 October 2017	Added GLH and TQT details Removed QCF	**Introduction to the qualification** **Appendix 1 and Unit 016**

1.1 Qualification structure

To achieve the Level 3 Diploma in Electronic, Security and Emergency Systems, candidates must achieve a minimum of 38 credits to achieve this qualification.

Candidates must achieve 18 credits from the following mandatory units

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
J/601/8397	009	Electrical and electronic principles of electro-technology	13
Y/503/5811	010	Working effectively and safety in electro-technical environments	5

And a minimum of 20 credits from one of the following optional units

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
D/503/5812	011	Intruder alarm systems	24
H/503/5813	012	Access control systems	21
F/503/5852	013	Fire detection and alarm systems	22
J/601/8514	014	Integrated electronic security systems – Stand alone personnel systems	20
R/503/5855	015	Electronic article surveillance systems	20
H/503/5858	016	Closed circuit television (CCTV) systems	22

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 3 Diploma in Electronic, Security and Emergency Systems	261	380

1.2 Opportunities for progression

There are a wide variety of qualifications available to candidates who have successfully completed this qualification. For more information please visit the City and Guilds website at **www.cityandguilds.com**

1.3 Qualification support materials

Description	How to access
fast track approval form	available on the City and Guilds website at **www.cityandguilds.com**
Online GOLA multiple choice examinations	Available for registration from 1 April 2011 on City and Guilds Walled Garden
Written examinations	Available for June 2011 series on City and Guilds Walled Garden

2 Centre requirements

This section outlines the approval processes for Centres to offer this qualification and any resources that Centres will need in place to offer the qualifications including qualification-specific requirements for Centre staff.

Centres already offering City & Guilds qualifications in this subject area

Centres approved to offer the qualification Level 3 Certificate in Knowledge of Security and Emergency Alarm Systems (1852) may apply for approval for the new Level 3 Diploma in Knowledge of Electronic Security and Emergency Systems (1853) using the **fast track approval form**, available from the City & Guilds website.

Centres may apply to offer the new qualification using the fast track form

- providing there have been no changes to the way the qualifications are delivered, and
- if they meet all of the approval criteria specified in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After this time, the qualification is subject to the **standard** Qualification Approval Process. It is the centre's responsibility to check that fast track approval is still current at the time of application.

2.1 Resource requirements

Human resources

Staff delivering this qualification must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be technically competent and knowledgeable in the area for which they are tutoring, assessing or delivering training
- have recent relevant occupational experience in the specific area they will be tutoring, assessing or delivering training
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and quality assurance co-ordinator, but must never internally verify their own assessments.

Continuing professional development (CPD)

Centres are expected to support their staff in ensuring that their knowledge remains current of the occupational area and of best practice in delivery, mentoring, training, assessment and verification, and that it takes account of any national or legislative developments.

2.2 Candidate entry requirements

Candidates should not be entered for a qualification of the same type, content and level as that of a qualification they already hold.

There are no formal entry requirements for candidates undertaking this qualification. However, centres must ensure that candidates have the aptitude and opportunity to successfully gain the qualification.

Age restrictions

This qualification is not approved for use by candidates under the age of 16, and City & Guilds cannot accept any registrations for candidates in this age group.

3 Course design and delivery

3.1 Initial assessment and induction

Centres will need to make an initial assessment of each candidate prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification.

The initial assessment should identify:

- any specific training needs the candidate has, and the support and guidance they may require when working towards their qualification. This is sometimes referred to as diagnostic testing.
- any units the candidate has already completed, or credit they have accumulated which is relevant to the qualification they are about to begin.

City & Guilds recommends that centres provide an induction programme to ensure the candidate fully understands the requirements of the qualification they will work towards, their responsibilities as a candidate, and the responsibilities of the centre. It may be helpful to record the information on a learning contract.

3.2 Recommended delivery strategies

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their candidates
- satisfies the requirements of the qualification.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualification. This might include the following:

- literacy, language and/or numeracy
- personal learning and thinking
- personal and social development
- employability

Where applicable, this could involve enabling the candidate to access relevant qualifications covering these skills.

4 Assessment

4.1 Summary of assessment methods

For this qualification, candidates will be required to complete the following assessments:

City & Guilds unit number	Unit title	Type of Assessment	Where to obtain assessment materials
009	Electrical and electronic principles of electro-technology	GOLA on-line multiple choice examination	Book GOLA on-line examination on City and Guilds Walled Garden from 1 April 2011
010	Working effectively and safety in electro-technical environments	GOLA on-line multiple choice examination	Book GOLA on-line examination on City and Guilds Walled Garden from 1 April 2011

City & Guilds unit number	Unit title	Type of assessment	Where to obtain assessment materials
011	Intruder alarm systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series
012	Access control systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series
013	Fire detection and alarm systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series
014	Integrated electronic security systems – Stand alone personnel systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series
015	Electronic article surveillance systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series
016	Closed circuit television (CCTV) systems	Dated written examination paper	Order examination papers on City and Guilds Walled Garden for June 2011 series

4.2 Test specifications

The test specifications for the units within this qualification are below:

Unit 009 Electrical and electronic principles of electro-technology

Unit	Outcome	Underpinning knowledge	No of items	Total	%
009	1. Understand 'charge' and 'current' in electrical circuits and their applications in the electronic security and emergency systems industry	1.1 Demonstrate an understanding of (a) electrons and ions as vehicles of charge (b) electric current as a flow of charge	1	12	17%
		1.2 Use Ohms Law and the laws of series and parallel resistors and cells to explain each of the following in a DC circuit. (a) The relationship between Potential Difference (Voltage) and Current. (b) Energy and Power. (c) Problems associated with voltage drop in a circuit and how it occurs. (d) How to check for a voltage drop at a device and ways to alleviate it.	4		
		1.3 Use the appropriate formulae to explain (a) Resistance and Resistivity (b) Conductance and Conductivity. 1.4 Explain how variable resistors are used as (a) Rheostats to limit current (b) Potentiometers to control voltage..	1		
		1.5 Use circuit diagrams to explain how ammeters, voltmeters and multi-meters are used to measure circuit voltage, current and resistance.	1		
		1.6 Use a diagram to explain (a) the basic construction of a capacitor (b) the effect of the dielectric to enable the storage of Charge. 1.7 Use a voltage-time graph and practical examples to demonstrate how (a) a capacitor charges and discharges (b) the time constant (Tao) is determined from the exponential curve.	2		

Unit	Outcome	Underpinning knowledge	No of items	Total	%
		1.8 Explain how a capacitor is used for (a) smoothing fluctuating voltage (b) frequency tuning (c) allowing high frequency signals to 'bypass' parts of a circuit (d) timing. (e)	1		
		1.9 Use diagrams and calculations to show the effects of capacitors connected in series and parallel.	1		
		1.10 Use examples from working practice to explain how capacitors and resistors are used together in a circuit.	1		
	2. Understand Electromagnetism and Electromagnetic Induction and their applications in the security and emergency systems industry	2.1 Use diagrams and examples from working practice to explain permanent magnetic fields.	1	11	16%
		2.2 Use diagrams of a current carrying conductor to explain how a magnetic field forms around an electric current.	1		
		2.3 Use diagrams and working examples to explain (a) the forces between two current carrying conductors and the segregation of cables at different voltages. (b) how a solenoid uses electro magnetism combined with an iron core.	1		
		2.4 Explain the terms 'permeability' and 'reluctance'	1		
		2.5 Use a diagram of force on a current carrying conductor in a magnetic field to explain (a) the motor effect (b) the generator effect. 2.6 Explain how the generating effect of	1		

Unit	Outcome	Underpinning knowledge	No of items	Total	%
		electro magnetic induction(EMI) produces an alternating current (AC).			
		2.7 Explain the difference between AC and DC. 2.8 Explain inductance by using a simple circuit with a coil and permanent magnet. 2.9 Explain how the 'Inductive effect' of a coil in a circuit can be used to slow current. 2.10 Explain the operation of an inductance loop.	3		
		2.11 With the help of a diagram explain the operation of a Transformer.	1		
		2.12 Use a diagram to explain how a tuned circuit uses a combination of inductance and capacitance.	1		
		2.13 Explain how electrical and radio interference is induced into a system and how it can be overcome. 2.14 Explain how electro-magnetic induction (EMI) interference can effect electronic security and emergency systems and how it can be overcome.	1		
	3. Understand Alternating Currents and Electrical Power in the security and emergency systems industry	3.1 Use diagrams to show AC as a sine waveform. 3.2 Use an oscilloscope to show an AC sine waveform. 3.3 Explain how frequency is associated with AC circuits. 3.4 Explain RMS and working voltages.	2	6	9%
		3.5 Use a diagram to explain why electrical energy is transmitted from power stations (National Grid) to end users using AC in preference to DC. 3.6 State what voltages are transmitted at each stage of the generation process from the National Grid to the end user.	1		
		3.7 Use diagrams showing a combination of resistors, capacitors and inductors to explain reactance and iimpedance.	1		

Unit	Outcome	Underpinning knowledge	No of items	Total	%
		3.8 Explain why a stabilised DC power supply is critical to the reliability of a system . 3.9 Explain why the magnitude of a volt drop at a device is critical.	1		
		3.10 Explain why standby batteries should be checked and tested regularly. 3.11 Explain why a system requires adequate power and standby capacity, as defined in relevant standards.	1		
	4. Understand Electronic Components, Circuits and their application to systems in the security and emergency systems industry	4.1 Use examples from electronic security and emergency systems to show the three stages of input, processing and output., 4.2 Explain the use and operation of a Transducer. 4.3 Explain the difference between analogue and digital Systems.	2	10	14%
		4.4 Explain, with the aid of a diagram, the construction and operation of a junction diode. 4.5 Explain how a diode can be used to rectify AC to DC. 4.6 Use a diagram to explain diode bridge rectification and its purpose 4.7 Explain the operation of a a) Zener diode b) Schotty diode. 4.8 Explain the construction and operation of a Light Emitting Diode (LED).	4		
		4.9 Explain how a transistor can function as an (a) electronic switch for digital circuits (e.g. Logic gates) (b) amplifier in analogue circuits (e.g. Operational Amplifiers)	1		
		4.10 Explain what an integrated circuit (IC) is.			

Unit	Outcome	Underpinning knowledge	No of items	Total	%
		4.11 Explain how ICs are used to simplify the construction of circuits.	1		
		4.12 Explain how an end of line resistor gives tamper protection and detector loop monitoring.	1		
		4.13 Explain the operation of a data bus loop and addressable interface units.	1		
	5. Understand Internet Protocol (IP) and its application to the security and emergency systems industry	5.1 Explain the term 'network' in the context of computing. 5.2 Explain each of the following and describe how they work. (a) Local Area Network (LAN). (b) Wide Area Network (WAN).	1	8	11%
		5.3 Use schematic diagrams to explain each of the following processes. (a) Electronic Mail (E mail). (b) Simple Mail Transfer Protocol (SMTP). (c) Transmission Control Protocol (TCP). (d) User Data Protocol (UDP).	2		
		5.4 Explain how the Open Systems Interconnection model created by ISO defines Internet Protocol.	1		
		5.5 Explain the purpose and importance of a) IP Addresses. b) Internet Service Providers (ISPs) c) domain names.	1		
		5.6 Explain how a client server network operates.	1		
		5.7 Explain the difference between Internet & Intranet	1		
		5.8 Explain how an electronic security and / or an emergency system can utilise a customer's existing IT network 5.9 Explain how a customer's electronic security system can be accessed, interrogated and programmed from a remote location.	1		
	6. Understand Communication	6.1 Explain the difference between Analogue and Digital signal transmission.	1		

Unit	Outcome	Underpinning knowledge	No of items	Total	%
	methods and Signal Transmission systems in the security and emergency systems industry			11	16%
		6.2 Explain diagrammatically how 'Pulse Code Modulation' (PCM) and Pulse Amplitude Modulation (PAM) make analogue to digital conversions and vice versa.	1		
		6.3 Explain how signals travel in (a) wire cables (b) co axial cables (c) optical fibres (d) free space.	2		
		6.4 Explain the purpose of 'multiplexing' in signal transmission technology. 6.5 Use diagrams to explain the difference between 'frequency division multiplexing' and 'time based multiplexing'	1		
		6.6 Explain how the Public Switched Telephone Network (PSTN) and broadband services can be utilised to communicate from a system to a remote Alarm Receiving Centre' (ARC). 6.7 Describe the principles of operation of a modem. 6.8 Explain the operation of a digital communicator. 6.9 Explain the difference between a digital communicator and a direct line connection. 6.10 Explain how commercial 'over telephone line connections' operate.	4		
		6.11 Compare the benefits and disadvantages of each of the following types of transmission. a) Wi Fi b) hard wired. 612 Explain what is meant by dual path signalling.	1		
		6.13 Explain the difference between anlogue and addressable systems.	1		

Unit	Outcome	Underpinning knowledge	No of items	Total	%
	7. Understand Electro/Electronic Measurement and Test procedures used in the security and emergency systems industry	7.1 Explain the difference between Analogue and Digital measuring equipment. 7.2 Explain the operation of a multimeter used to measure Voltage, current and resistance. 7.3 Demonstrate the use of a multi-meter to take multiple readings for a) AC and DC voltage b) resistance c) current .	2	5	7%
		7.4 Explain why all test equipment must be calibrated at pre-determined periods. 7.5 Explain the process of calibration.	1		
		7.6 Explain the basic operating principles and demonstrate the use of each of the following. (a) Db meter. (b) Clamp meter. (c) Insulation tester. (d) Earth Loop Impedance Tester. 7.7 Demonstrate and explain the use of an oscilloscope.	2		
	8. Understand how standards and regulations influence and control electro/electronic applications in the security and emergency systems industry	8.1 Explain the scope and application of the IEE 17th edition regulations.. 8.2 Explain the IEE regulations relating to connecting a mains supply to fixed equipment in each of the following systems. (a) Electronic security. (b) Emergency FD&A. 8.3 Explain the IEE regulations relating to running mains, DC power and signalling cables in the same trunking	2		
		8.4 Explain the impact of each of the following on the design and operation of electronic security and emergency systems a) Disability discrimination Act			

Unit	Outcome	Underpinning knowledge	No of items	Total	%
		b) Data protection Act c) ISO 9000 Quality Systems d) Noise pollutions e) Consumer Protection f) Trading Standards g)Health & Safety at Work h) Construction Design Management	2	7	10%
		8.5 Explain the cost and design implications of complying with British Standards, Regulations and Codes of Practice.	1		
		8.6 Explain the role of a) BSIA b) BSI c) ECA d) Inspectorate bodies..	1		
		8.7 Explain the relevance of the EMI Directive.	1		

Unit 010 Working effectively and safety in electro-technical environments

Unit	Outcome	Underpinning knowledge	No of items	Total	%
	1. Understand the background to health & safety legislation and the principles thereof.	1.1 Explain the circumstances which led to the creation of the Health & Safety at Work (1974) Act (HASAW).	1	14	40
		1.2 Explain the role of the Health and Safety Executive (HSE). 1.3 Explain the role of the Health & Safety Inspectorate (HSI) and its importance.	1		
		1.4 Explain the difference between primary and secondary legislation in relation to HASAW.	1		
		1.5 Explain the importance of European Directives, regulations and codes of practice within the context of Health & Safety Legislation.	1		
		1.6 List the regulations contained within the '6 pack' and their implications for good health & safety practice.	1		
		1.7 Explain the importance of Clauses 1 and 2 of HASAW.	1		

		1.8 Explain the Construction (Design & Management) CDM regulations and their impact upon security and emergency system engineers working on construction sites. 1.9 Explain the responsibility of a Senior Engineer for other workers on a site.	2		
		1.10 Explain the importance of the Control of Substances Hazardous to Health (COSHH) regulations and their relevance to the security industry.	1		
		1.11 Explain the importance of RIDDOR (Reporting of Injuries, Deseases, Dangerous Occurances Regulations) and Incident Contact Centres (ICC).	1		
		1.12 Explain why Personal Protective Clothing (PPE) is important to installation engineers. 1.13 List the items of PPE you would expect an installation engineers to use.	2		
		1.14 Explain the procedure to be followed when an accident has occurred on a a) customer's site b) construction site.	1		
		1.15 Explain why health & safety induction training is important for new employees. 1.16 List what should be included in a health & safety induction programme.	1		
	2. Understand the requirements for health and safety in work areas premises	2.1 Describe a fire evacuation procedure for an office. 2.2 Explain the responsibility of all individuals during a fire alarm activation. 2.3 Explain the duties of a fire warden.	2	9	26
		2.4 Explain the responsibility on an employee with a supervisory responsibility for others.	1		
		2.5 Explain the purpose and importance of Portable Appliance Testing (PAT) and its application.	1		

		2.6 Explain the purpose of an office risk assessment. 2.7 Explain the purpose of a fire risk assessment.	1		
		2.8 Identify types of fire extinguisher and explain their uses.	1		
		2.9 Explain how manual handling regulations apply in an office environment.	1		
		2.10 Explain the statutory provision required by HSE for First Aid in an office and work area environment.	1		
		2.11 Explain why it is important to know their H&S and fire safety rules on a customer's site.	1		
		2.12 Explain the required safe working practices when attending in a customer's premises.	1		
	3. Understand the requirements for health and safety in a company vehicle.	3.1 Explain the HSE requirements for company vehicles and their drivers. 3.2 Conduct a risk assessment of a vehicle. 3.3 Describe the training a company car user should undergo	1	1	3
	4. Understand the requirements for health & safety on site.	4.1 State the statutory requirements for safe working with (a) ladders (b) scaffolding (fixed and mobile) (c) mobile hydraulic lift platforms (d) CCTV and other towers.	2	7	20
		4.2 Explain the circumstances where a harness should be used.	1		
		4.3 Describe the situations where a110V supply must be used. 4.4 Explain why 110V is the requirement for the safe use of power supplies.	1		
		4.5 List the inspections and tests that should be carried out regularly on power tools.	1		
		4.6 List the HSE requirements for manual handling on a site.			

		4.7 List the electrical statutory regulations that apply to contractors working on a site.	1		
		4.8 Describe the Construction Skills Certification Scheme (CSCS) and explain its purpose.	1		
		4.9 Explain the purpose of a method statement. 4.10 Produce a method statement for a supermarket construction build.			
		4.11 List the personal protective equipment a person should use on a construction site.			
	5. Understand the requirements for effective working practices within the security and emergency systems industry	5.1 Explain how each of the following support effective working practices in the security and emergency systems industry. (a) Employments Rights Act. (b) Data Protection Act. (c) Human Rights Act. (d) Race Relations Act. (e) Disability Discrimination Act. (f) Sex Discrimination Act.	2	4	11
		5.2 Describe how each of the following standards contribute to improving working practices. (a) ISO 9000. (b) Investors in People.	1		
		5.3 Identify how each of the following can help to ways to improve working practices in the security and emergency systems industry. a) Education and training b) Career pathways c) Transferable skills.	1		

011 Intruder alarm systems

Outcome	No of questions	No of marks	%
1. Understand the requirements and implementation of risk assessment, surveying, design and system design proposal of intrude and hold up alarm systems	2	10	10
2. Understand the principles of intruder alarm detection devices, system components, alarm transmission equipment and control indicating equipment	3	12	12
3. Understand the function and operation of control and indicating equipment used in intruder alarm systems	2	10	10
4. Understand cabling and cable/equipment installation for intruder and hold up alarm systems	1	5	5
5. Understand power supplies employed in intruder and hold up alarm systems	2	10	10
6.Understand configuration and administration methods for intruder and hold up alarm systems	3	15	15
7. Understand planning and project management of system installation	2	8	8
8. Understand how to commission and hand over intruder and hold up alarm systems	2	10	10
9. Understand the requirements for preventative and corrective maintenance of intruder and hold up alarm systems	2	10	10
10. Understand the requirements for auditing intruder and hold up alarm systems	2	10	10
Total	**21**	**100**	**100**

012 Access control systems

Outcome	No of questions	No of marks	%
1. Understand the requirements and implementation of surveying, design, and specification of access control systems	2	10	10
2. Understand the principles of access control devices, and control equipment	2	10	10
3. Understand the function and operation of common circuits used in access control systems	2	10	10
4. Understand the principles of			

Ethernet communications, applicable to access control systems	2	10	10
5. Understand cabling and cable/equipment installation for access control systems	2	10	10
6. Understand the principles of typical power supplies employed in access control systems	2	10	10
7. Understand typical system configurations, and administration methods for access control	2	10	10
8. Understand planning and project management of access control system installation	2	10	10
9. Understand the requirements and implementation of commissioning and handover of access control systems	2	10	10
10. Understand the requirements and implementation of maintenance and servicing of access control systems	2	10	10
Total	**20**	**100**	**100**

013 Fire detection and alarm systems

Outcome	**No of questions**	**No of marks**	**%**
1. Understand the relationship of FD&A to the fire safety industry	2	10	8
2. Understand the principles and features of Detection and alarm system components	4	20	16
3. Understand how FD&A systems communicate internally and externally	2	10	8
4. Understand the principles of typical primary and secondary power supplies employed in FD&A systems	2	10	8
5. Know the methods of surveying new & existing FD&A systems	3	15	12
6.Understand project management	3	15	12
7. Know how to design a fire detection and alarm system	3	15	12
8. Understand how to maintain a FD&A system after handover	3	15	12
9. Understand commissioning and handover	3	15	12
Total	**25**	**125**	**100**

014 Integrated electronic security systems – Stand alone personnel systems

Outcome	No of questions	No of marks	%
1. Understand the role of stand-alone personnel alarm systems and integration techniques	2	10	10
2. Understand the procedures required for a site survey for stand-alone personnel alarm systems and integration methods	2	10	10
3. Understand the operational features, network links and system components for stand-alone personnel alarms and integrated systems	4	20	20
4. Understand the requirements of system design for stand-alone personnel alarm systems and integration	2	10	10
5. Understand the installation techniques for stand-alone personnel alarm systems and their integration.	2	10	10
6. Understand the development and management of stand-alone personnel alarm systems and integrated networks	2	10	10
7. Understand the principles of testing, commissioning and handover of stand-alone personnel alarm systems and integrated systems	2	10	10
8. Understand the principles of maintaining the performance of stand-alone personnel alarm systems and integrated systems	2	10	10
9. Understand the principles of a technical audit for stand-alone personnel alarms systems and integrated systems	2	10	10
Total	**20**	**100**	**100**

015 Electronic article surveillance systems

Outcome	No of questions	No of marks	%
1. Understand the purpose of the electronic security systems industry, its regulatory and inspectorate bodies and the role of electronic article surveillance within it	2	10	10
2. Understand the system components of an EAS system	3	15	15

3. Know the operating principles and features of Electronic Article Surveillance systems	2	10	10
4. Demonstrate how to survey, design, and specify an EAS system	2	10	10
5. Explain the knowledge and skills required to install and supervise the installation of an EAS system	3	15	15
6. Demonstrate how to commission and handover an EAS system	2	8	8
7. Be able to maintain the performance of an EAS system	2	10	10
8. Explain the process of carrying out technical audits of EAS systems	2	10	10
9. Demonstrate how to prepare a quotation for the provision of a electronic article surveillance system employing sales and marketing skills allied to technical knowledge of EAS systems	2	9	9
Total	**20**	**100**	**100**

016 Closed Circuit Television (CCTV) systems

Outcome	**No of questions**	**No of marks**	**%**
1. Understand the requirements and process of surveying and auditing for CCTV systems	2	8	8
2. Understand the requirements and process of CCTV system design, specification and quotation	2	8	8
3. Understand the principles of CCTV cameras and Lenses	3	15	15
4. Understand the principles of CCTV cameras and Lenses	3	15	15
5. Understand the principles of CCTV image display, recording, and control equipment	3	14	14
6. Understand the principles of planning and managing CCTV projects	2	8	8
7. Understand the principles of installing CCTV systems	2	8	8
8. Understand the principles of testing , commissioning and handover of CCTV systems	3	15	15
9. Understand the principles of maintaining CCTV systems	2	9	9
Total	**22**	**100**	**100**

4.3 Recording forms

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems. Further details are available at: **www.cityandguilds.com/eportfolios**.

Although it is expected that new centres will use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre.

Amendable (MS Word) versions of the forms are available on the City & Guilds website.

5 Units

Availability of units

The units for this qualification follow.

The learning outcomes and assessment criteria are also viewable on the National Database of Accredited Qualifications (NDAQ) **www.accreditedqualifications.org.uk**

Structure of units

The units in this qualification are written in a standard format and comprise the following:

- City & Guilds reference number
- unit accreditation number
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria

Unit 009 Electrical and electronic principles of electro-technology

Level: 3
Credit value: 13
NDAQ number: J/601/8397

Unit aim
This unit provides underpinning generic technical knowledge for persons preparing for any one of the electronic security systems specialist area qualifications, or simply to support their employment in any area of this industry.

Learning outcomes
There are **eight** learning outcomes to this unit. The learner will be able to:
1. Understand 'charge' and 'current' in electrical circuits and their applications in the electronic security and emergency systems industry
2. Understand Electromagnetism and Electromagnetic Induction and their applications in the security and emergency systems industry
3. Understand Alternating Currents and Electrical Power in the security and emergency systems industry
4. Understand Electronic Components, Circuits and their application to systems in the security and emergency systems industry
5. Understand Internet Protocol (IP) and its application to the security and emergency systems industry
6. Understand Communication methods and Signal Transmission systems in the security and emergency systems industry
7. Understand Electro/Electronic Measurement and Test procedures used in the security and emergency systems industry
8. Understand how standards and regulations influence and control electro/electronic applications in the security and emergency systems industry

Guided learning hours
It is recommended that **82** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)

This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)
This unit is endorsed Skills for Security.

Assessment
This unit will be assessed by:
- GOLA Multiple choice examination.

Unit 009 Electrical and electronic principles of electro-technology

Outcome 1 Understand 'charge' and 'current' in electrical circuits and their applications in the electronic security and emergency systems industry

Assessment Criteria

The learner can:

1.1 Demonstrate an understanding of
- a. electrons and ions as vehicles of charge
- b. electric current as a flow of charge

1.2 Use Ohms Law and the laws of series and parallel resistors and cells to explain each of the following in a DC circuit
- a. The relationship between Potential Difference (Voltage) and Current
- b. Energy and Power
- c. Internal Resistance and EMF of Primary and Secondary cells
- d. Problems associated with voltage drop in a circuit and how it occurs
- e. How to check for a voltage drop at a device and ways to alleviate it

1.3 Use the appropriate formulae to explain
- a. Resistance and Resistivity
- b. Conductance and Conductivity

1.4 Explain how variable resistors are used as
- a. Rheostats to limit current
- b. Potentiometers to control voltage

1.5 Use circuit diagrams to explain how ammeters, voltmeters and multi-meters are used to measure circuit voltage, current and resistance

1.6 Use a diagram to explain
- a. the basic construction of a capacitor
- b. the effect of the dielectric to enable the storage of Charge

1.7 Use a voltage-time graph and practical examples to demonstrate how
- a. a capacitor charges and discharges
- b. the time constant (Tao) is determined from the exponential curve

1.8 Explain how a capacitor is used for
- a. smoothing fluctuating voltage
- b. frequency tuning
- c. allowing high frequency signals to 'bypass' parts of a circuit
- d. timing

1.9 Use diagrams and calculations to show the effects of capacitors connected in series and parallel

1.10 Use examples from working practice to explain how capacitors and resistors are used together in a circuit

Unit 009 Electrical and electronic principles of electro-technology

Outcome 2 Understand Electromagnetism and Electromagnetic Induction and their applications in the security and emergency systems industry

Assessment Criteria

The learner can:

2.1 Use diagrams and examples from working practice to explain permanent magnetic fields

2.2 Use diagrams of a current carrying conductor to explain how a magnetic field forms around an electric current

2.3 Use diagrams and working examples to explain
a. the forces between two current carrying conductors and the segregation of cables at different voltages
b. how a solenoid uses electro magnetism combined with an iron core.

2.4 Explain the terms 'permeability' and 'reluctance'

2.5 Use a diagram of force on a current carrying conductor in a magnetic field to explain
a. the motor effect
b. the generator effect

2.6 Explain how the generating effect of electro magnetic induction (EMI) produces an alternating current (AC)

2.7 Explain the difference between AC and DC

2.8 Explain inductance by using a simple circuit with a coil and permanent magnet

2.9 Explain how the 'Inductive effect' of a coil in a circuit can be used to slow current

2.10 Explain the operation of an inductance loop

2.11 With the help of a diagram explain the operation of a Transformer

2.12 Use a diagram to explain how a tuned circuit uses a combination of inductance and capacitance

2.13 Explain how electrical and radio interference is induced into a system and how it can be overcome

2.14 Explain how electro-magnetic induction (EMI) interference can effect electronic security and emergency systems and how it can be overcome

Unit 009 Electrical and electronic principles of electro-technology

Outcome 3 Understand Alternating Currents and Electrical Power in the security and emergency systems industry

Assessment Criteria

The learner can:

3.1 Use diagrams to show AC as a sine waveform

3.2 Use an oscilloscope to show an AC sine waveform

3.3 Explain how frequency is associated with AC circuits

3.4 Explain RMS and working voltages

3.5 Use a diagram to explain why electrical energy is transmitted from power stations (National Grid) to end users using AC in preference to DC

3.6 State what voltages are transmitted at each stage of the generation process from the National Grid to the end user

3.7 Use diagrams showing a combination of resistors, capacitors and inductors to explain reactance and impedance

3.8 Explain why a stabilised DC power supply is critical to the reliability of a system

3.9 Explain why the magnitude of a volt drop at a device is critical

3.10 Explain why standby batteries should be checked and tested regularly

3.11 Explain why a system requires adequate power and standby capacity, as defined in relevant standards

Unit 009 Electrical and electronic principles of electro-technology

Outcome 4 Understand Electronic Components, Circuits and their application to systems in the security and emergency systems industry

Assessment Criteria

The learner can:

4.1 Use examples from electronic security and emergency systems to show the three stages of input, processing and output

4.2 Explain the use and operation of a Transducer

4.3 Explain the difference between analogue and digital Systems

4.4 Explain, with the aid of a diagram, the construction and operation of a junction diode

4.5 Explain how a diode can be used to rectify AC to DC

4.6 Use a diagram to explain diode bridge rectification and its purpose

4.7 Explain the operation of a
a. Zener diode
b. Schotty diode

4.8 Explain the construction and operation of a Light Emitting Diode (LED)

4.9 Explain how a transistor can function as an
a. electronic switch for digital circuits (e.g. Logic gates)
b. amplifier in analogue circuits (e.g. Operational Amplifiers)

4.10 Explain what an integrated circuit (IC) is

4.11 Explain how ICs are used to simplify the construction of circuits

4.12 Explain how an end of line resistor gives tamper protection and detector loop monitoring

4.13 Explain the operation of a data bus loop and addressable interface units

Unit 009 Electrical and electronic principles of electro-technology

Outcome 5 Understand Internet Protocol (IP) and its application to the security and emergency systems industry

Assessment Criteria

The learner can:

5.1 Explain the term 'network' in the context of computing

5.2 Explain each of the following and describe how they work
a. Local Area Network (LAN)
b. Wide Area Network (WAN)

5.3 Use schematic diagrams to explain each of the following processes
a. Electronic Mail (E mail)
b. Simple Mail Transfer Protocol (SMTP)
c. Transmission Control Protocol (TCP)
d. User Data Protocol (UDP)

5.4 Explain how the Open Systems Interconnection model created by ISO defines Internet Protocol

5.5 Explain the purpose and importance of
a. IP Addresses
b. Internet Service Providers (ISPs)
c. domain names

5.6 Explain how a client server network operates

5.7 Explain the difference between Internet & Intranet

5.8 Explain how an electronic security and / or an emergency system can utilise a customer's existing IT network

5.9 Explain how a customer's electronic security system can be accessed, interrogated and programmed from a remote location

Unit 009 Electrical and electronic principles of electro-technology

Outcome 6 Understand Communication methods and Signal Transmission systems in the security and emergency systems industry

Assessment Criteria

The learner can:

6.1 Explain the difference between Analogue and Digital signal transmission

6.2 Explain diagrammatically how 'Pulse Code Modulation' (PCM) and Pulse Amplitude Modulation (PAM) make analogue to digital conversions and vice versa

6.3 Explain how signals travel in
a. wire cables
b. co axial cables
c. optical fibres
d. free space

6.4 Explain the purpose of 'multiplexing' in signal transmission technology

6.5 Use diagrams to explain the difference between 'frequency division multiplexing' and 'time based multiplexing'

6.6 Explain how the Public Switched Telephone Network (PSTN) and broadband services can be utilised to communicate from a system to a remote Alarm Receiving Centre' (ARC)

6.7 Describe the principles of operation of a modem

6.8 Explain the operation of a digital communicator

6.9 Explain the difference between a digital communicator and a direct line connection

6.10 Explain how commercial 'over telephone line connections' operate

6.11 Compare the benefits and disadvantages of each of the following types of transmission.
a. Wi-Fi
b. hard wired

6.12 Explain what is meant by dual path signalling

6.13 Explain the difference between analogue and addressable systems

Unit 009 Electrical and electronic principles of electro-technology

Outcome 7 Understand Electro/Electronic Measurement and Test procedures used in the security and emergency systems industry

Assessment Criteria

The learner can:

7.1 Explain the difference between Analogue and Digital measuring equipment

7.2 Explain the operation of a multi-meter used to measure Voltage, current and resistance

7.3 Demonstrate the use of a multi-meter to take multiple readings for
a. AC and DC voltage
b. resistance
c. current

7.4 Explain why all test equipment must be calibrated at pre-determined periods

7.5 Explain the process of calibration

7.6 Explain the basic operating principles and demonstrate the use of each of the following
a. Db meter
b. Clamp meter
c. Insulation tester
d. Earth Loop Impedance Tester

7.7 Demonstrate and explain the use of an oscilloscope

Unit 009 Electrical and electronic principles of electro-technology

Outcome 8 Understand how standards and regulations influence and control electro/electronic applications in the security and emergency systems industry

Assessment Criteria

The learner can:

8.1 Explain the scope and application of the IEE 17th edition regulations

8.2 Explain the IEE regulations relating to connecting a mains supply to fixed equipment in each of the following systems
a. Electronic security
b. Emergency FD&A

8.3 Explain the IEE regulations relating to running mains, DC power and signalling cables in the same trunking

8.4 Explain the impact of each of the following on the design and operation of electronic security and emergency systems
a. Disability discrimination Act
b. Data protection Act
c. ISO 9000 Quality Systems
d. Noise pollutions
e. Consumer Protection
f. Trading Standards
g. Health & Safety at Work
h. Construction Design Management

8.5 Explain the cost and design implications of complying with British Standards, Regulations and Codes of Practice

8.6 Explain the role of
a. BSIA
b. BSI
c. ECA
d. Inspectorate bodies

8.7 Explain the relevance of the EMI Directive

Unit 010 Working effectively and safely in electro-technical environments

Level: 3
Credit value: 5
NDAQ number: Y/503/5811

Unit aim

This unit provides the necessary underpinning health and safety at work knowledge and advised effective working practices for persons preparing for any one of the electronic security systems specialist area qualifications, or simply to support their employment in any area of this industry.

Learning outcomes

There are **five** learning outcomes to this unit. The learner will be able to:

1. Understand the background to health & safety legislation and the principles thereof
2. Understand the requirements for health & safety in offices and work areas within premises
3. Understand the requirements for health & safety in a company vehicle
4. Understand the requirements for health & safety on site
5. Understand the requirements for effective working practices within the security and emergency systems industry

Guided learning hours

It is recommended that **30** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)

This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)

This unit is endorsed by Skills for Security.

Assessment

This unit will be assessed by:

- GOLA Multiple Choice Exam.

Unit 010 Working effectively and safely in electro-technical environments

Outcome 1 Understand the background to health & safety legislation and the principles thereof

Assessment Criteria

The learner can:

1.1 Explain the circumstances which led to the creation of the Health & Safety at Work (1974) Act (HASAW)

1.2 Explain the role of the Health and Safety Executive (HSE)

1.3 Explain the role of the Health & Safety Inspectorate (HSI) and its importance

1.4 Explain the difference between primary and secondary legislation in relation to HASAW

1.5 Explain the importance of European Directives, regulations and codes of practice within the context of Health & Safety Legislation

1.6 List the regulations contained within the '6 pack' and their implications for good health & safety practice

1.7 Explain the importance of Clauses 1 and 2 of HASAW

1.8 Explain the Construction (Design & Management) CDM regulations and their impact upon security and emergency system engineers working on construction sites

1.9 Explain the responsibility of a Senior Engineer for other workers on a site

1.10 Explain the importance of the Control of Substances Hazardous to Health (COSHH) regulations and their relevance to the security industry

1.11 Explain the importance of RIDDOR (Reporting of Injuries, Diseases, Dangerous Occurrences Regulations) and Incident Contact Centres (ICC)

1.12 Explain why Personal Protective Clothing (PPE) is important to installation engineers

1.13 List the items of PPE you would expect an installation engineers to use

1.14 Explain the procedure to be followed when an accident has occurred on a
a. customer's site
b. construction site

1.15 Explain why health & safety induction training is important for new employees

1.16 List what should be included in a health & safety induction programme

Unit 010 Working effectively and safely in electro-technical environments

Outcome 2 Understand the requirements for health & safety in offices and work areas within premises

Assessment Criteria

The learner can:

2.1 Describe a fire evacuation procedure for an office

2.2 Explain the responsibility of all individuals during a fire alarm activation

2.3 Explain the duties of a fire warden

2.4 Explain the responsibility on an employee with a supervisory responsibility for others

2.5 Explain the purpose and importance of Portable Appliance Testing (PAT) and its application.

2.6 Explain the purpose of an office risk assessment

2.7 Explain the purpose of a fire risk assessment

2.8 Identify types of fire extinguisher and explain their uses

2.9 Explain how manual handling regulations apply in an office environment

2.10 Explain the statutory provision required by HSE for First Aid in an office and work area environment

2.11 Explain why it is important to know their H&S and fire safety rules on a customer's site

2.12 Explain the required safe working practices when attending in a customer's premises

Unit 010 Working effectively and safely in electro-technical environments

Outcome 3 Understand the requirements for health & safety in a company vehicle

Assessment Criteria

The learner can:

3.1 Explain the HSE requirements for company vehicles and their drivers

3.2 Conduct a risk assessment of a vehicle

3.3 Describe the training a company car user should undergo

Unit 010 Working effectively and safely in electro-technical environments

Outcome 4 Understand the requirements for health & safety on site

Assessment Criteria

The learner can:

4.1 State the statutory requirements for safe working with
a. ladders
b. scaffolding (fixed and mobile)
c. mobile hydraulic lift platforms
d. CCTV and other towers

4.2 Explain the circumstances where a harness should be used

4.3 Describe the situations where a 110V supply must be used.

4.4 Explain why 110V is the requirement for the safe use of power supplies

4.5 List the inspections and tests that should be carried out regularly on power tools

4.6 List the HSE requirements for manual handling on a site

4.7 List the electrical statutory regulations that apply to contractors working on a site

4.8 Describe the Construction Skills Certification Scheme (CSCS) and explain its purpose

4.9 Explain the purpose of a method statement

4.10 Produce a method statement for a supermarket construction build

4.11 List the personal protective equipment a person should use on a construction site

Unit 010 Working effectively and safely in electro-technical environments

Outcome 5 Understand the requirements for effective working practices within the security and emergency systems industry

Assessment Criteria

The learner can:

5.1 Explain how each of the following support effective working practices in the security and emergency systems industry
- a. Employments Rights Act
- b. Data Protection Act
- c. Human Rights Act
- d. Race Relations Act
- e. Disability Discrimination Act
- f. Sex Discrimination Act.

5.2 Describe how each of the following standards contribute to improving working practices
- a. ISO 9000
- b. Investors in People

5.3 Identify how each of the following can help to ways to improve working practices in the security and emergency systems industry
- a. Education and training
- b. Career pathways
- c. Transferable skills

Unit 011 Intruder alarm systems

Level: **3**
Credit value: **24**
NDAQ number: **D/503/5812**

Unit aim

This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Intruder Alarm Systems area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will be able to:

1. Understand the requirements and implementation of Risk assessment, surveying, design, and system design proposal of Intruder and Hold up Alarm systems
2. Understand the principles of intruder alarm detection devices, system components, alarm transmission equipment and control indicating equipment
3. Understand the function and operation of Control and Indicating Equipment used in intruder alarm systems
4. Understand cabling and cable/equipment installation for intruder and hold up alarm systems
5. Understand power supplies employed in Intruder and Hold up Alarm systems
6. Understand configuration and administration methods for intruder and hold up alarm systems
7. Understand planning and project management of system installation
8. Understand how to commission and hand over intruder and hold up alarm systems
9. Understand the requirements for preventative and corrective maintenance of intruder and hold up alarm systems
10. Understand the requirements for auditing intruder and hold up alarm systems

Guided learning hours

It is recommended that **188** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)

This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)

This unit is endorsed by Skills for Security.

Assessment

This unit will be assessed by:

- Short answer written paper.

Unit 011 Intruder alarm systems

Outcome 1 Understand the requirements and implementation of Risk assessment, surveying, design, and system design proposal of Intruder and Hold up Alarm systems

Assessment Criteria

The learner can:

1.1 List the documentation required for a site survey and describe how these documents would be used

1.2 List the information that must be obtained during a site survey in relation to
a. customer's system operational requirements
b. working on site (i.e., risk assessment, site access, equipment / tool storage, etc.)
c. identification of key personnel
d. availability of site details (i.e., site plans, building plans, details of existing equipment, etc.)
e. existing IT provision / capabilities
f. specific equipment requirements (i.e., access equipment, power tools, etc)
g. timescales
h. methodology statement

1.3 Relate relevant Codes of Practice and Standards to a particular intruder and hold up alarm system during
a. site survey Risk Assessment
b. system design Grading of system
c. equipment specification Classification of components

1.4 Explain how TS 50131-7 influences intruder system components

1.5 Produce system designs, and equipment / hardware specification lists, for a given site survey and operational requirements

1.6 Produce costings / quotations for system installation

Unit 011 Intruder alarm systems

Outcome 2 Understand the principles of intruder alarm detection devices, system components, alarm transmission equipment and control indicating equipment

Assessment Criteria

The learner can:

2.1 Explain the operating principles of each of the following detection technologies
- a. Fixed
- b. Moveable
- c. Passive movement
- d. Active movement
- e. Dual technology movement
- f. Acoustic vibration
- g. Structural vibration
- h. Beam interruption
- i. Doppler Effect

2.2 Explain the operation of detection circuits specified in TS 50131-7 for the following interconnections
- a. Specific
- b. Non-specific (integrated)
- c. Wire free

2.3 Describe typical applications for each of the detection devices listed in 2.1

2.4 With reference to the current standards, identify the factors that influence the choice of detection for each of the detection types listed in 2.1

2.5 With reference to BS EN 50136, explain the function of each of the following
- a. ATE General requirement
- b. Dedicated path transmission
- c. Digital communicator
- d. Voice communicator

2.6 Describe the following transmission methods with respect to intruder and hold-up alarm systems
- a. TCP/IP
- b. PSTN
- c. ISDN
- d. GSM
- e. GPRS

2.7 Explain how the following Standards and Codes of Practice are relevant to Intruder and Hold-up Alarm devices and equipment
- BS EN 50131-1
- BS EN 50131-7
- BS 7671
- PD 6662
- DD243

- BS EN 50136
- NSI CoP
- SSAIB CoP
- ACPO policy
- BS 5979
- ABI
- BSIA

Unit 011 Intruder alarm systems

Outcome 3 Understand the function and operation of Control and Indicating Equipment used in intruder alarm systems

Assessment Criteria

The learner can:

3.1 Explain, with the aid of schematic diagrams, the relationship and operation of each of the following
a. Control and Indicating Equipment.
b. Ancillary Control Equipment
i) Setting devices DD243
ii) Unsetting devices DD243
iii) Remote Keypads
iv) Remote audio/visual devices
v) Remote input/output devices
vi) Access levels 1 – 4
vii) confirmation time DD 243

3.2 Describe typical connection and configuration methods for each of the following communications systems when used in intruder and hold up alarm systems
a. Serial port (RS 232)
b. USB
c. RS 485
d. RS 422

3.3 Describe, with the aid of schematic diagrams, common methods for connecting the following intruder and hold up alarm system components.
a. Detection devices
b. Control and indicating equipment
c. Ancillary control equipment
d. Notification equipment
e. Warning devices

Unit 011 Intruder alarm systems

Outcome 4 Understand cabling and cable/equipment installation for intruder and hold up alarm systems

Assessment Criteria

The learner can:

4.1 Describe the effect that different building materials have on installation practices.

4.2 Describe typical applications for each of the following cable types in intruder and hold up alarm systems
a. 230V ac mains supply (1.5mm2 and 2.5mm2)
b. Flexible and solid core
c. Composite
d. Shielded

4.3 Describe typical applications for each of the following cable containments in intruder and hold up alarm systems
a. Conduit (Metal, PVC)
b. Trunking (Metal, PVC)

4.4 Relate current regulations and codes of practice to the installation, termination and labelling of intruder and hold up alarm cables and equipment

Unit 011 Intruder alarm systems

Outcome 5 Understand power supplies employed in Intruder and Hold up Alarm systems

Assessment Criteria

The learner can:

5.1 Demonstrate methods for performing each of the following PSU tests
- a. Mains input voltage
- b. Mains isolation
- c. PSU output voltage
- d. PSU load current
- e. Fuse serviceability

5.2 Calculate power supply and stand-by battery requirements for intruder and hold up alarm systems as specified in PD6662

5.3 Describe typical earthing arrangements for intruder and hold up alarm equipment and containments in terms of
- a. BS 7671
- b. Building Regulation Part P-Electrical Safety
- c. Electricity at Work Regulations

5.4 Explain the designation of Type A, B and C power supplies defined in BS EN 50131-1 System Requirements

Unit 011 Intruder alarm systems

Outcome 6 Understand configuration and administration methods for intruder and hold up alarm systems

Assessment Criteria

The learner can:

6.1 Describe hardware requirements and configurations for each of the following intruder and hold up alarm functions
- a. DD243 setting and unsetting methods
- b. Use of transistor controlled interfaces for outputs
- c. Remote outputs controlling warning devices and notification equipment
- d. Use of remote outputs, interfaces and electric locks to inhibit entry during the set periods
- e. Use of remote outputs to switch mains powered lighting
- f. Use of remote outputs to provide video confirmation of alarm activation
- g. Use of remote outputs to provide audio confirmation of alarm activation
- h. Use of auxiliary alarm inputs and remote outputs to monitor customer facilities.
- i. Sequential confirmation

6.2 Describe methods for local and remote programming

6.3 Describe methods for remote maintenance of intruder and hold up alarm systems defined in PD6662

Unit 011 Intruder alarm systems

Outcome 7 Understand planning and project management of system installation

Assessment Criteria

The learner can:

7.1 Describe best practice for agreeing arrangements for working on site with a customer

7.2 Identify the documentation required for the installation of intruder and hold up alarm systems

7.3 Explain the need to maintain confidentiality whilst working with third parties when installing intruder and hold-up alarm systems

7.4 Understand the implication of relative timescales between the different trades which may be present during the installation of an intruder and hold up alarm system

7.5 Describe methods for dealing with problems that can occur during system installation

7.6 Describe procedures for agreeing and recording variations to the system design proposal

7.7 Explain how the following are relevant to the installation of intruder and hold up alarm systems
a. BS EN 50131-1
b. BS EN 50131-7
c. BS 7671
d. HASAWA
e. Working at Heights Regulations 2005
f. COSHH
g. RIDDOR

Unit 011 Intruder alarm systems

Outcome 8 Understand how to commission and hand over intruder and hold up alarm systems

Assessment Criteria

The learner can:

8.1 Describe how to verify calibration and correct functionality of test equipment, and procedures for dealing with defective equipment used in intruder and hold-up alarm systems

8.2 Describe methods for recording intruder and hold-up alarm systems test results

8.3 Interpret intruder and hold-up alarm system test results and draw accurate conclusions from the interpretation

8.4 List the documentation that would be required for intruder and hold-up alarm system handover

8.5 Describe procedures for processing documentation following intruder and hold-up alarm system handover

8.6 Describe methods for arranging handover and co-ordinating interested parties for intruder and hold-up alarm systems

8.7 Describe methods of ensuring that users understand handover instructions

Unit 011 Intruder alarm systems

Outcome 9 Understand the requirements for preventative and corrective maintenance of intruder and hold up alarm systems

Assessment Criteria

The learner can:

9.1 Explain why it is important to make appropriate arrangements for preventative and corrective maintenance visits.

9.2 Produce costings for maintenance of intruder and hold-up alarm systems.

9.3 List the documentation required for preventative and corrective maintenance visits.

9.4 Explain what should be recorded on preventative and corrective maintenance visit documentation.

9.5 Describe the tests that would be carried out during a preventative maintenance visit of an intruder and hold-up alarm system.

9.6 Describe the tests that would be carried out during a corrective maintenance visit of an intruder and hold-up alarm system.

9.7 Describe how to use hard copy and PC-based administration records for fault diagnosis of intruder and hold up alarm system, including use of
a. event logs
b. system logs
c. remote keypad messages, warnings, indicators, etc.
d. service record cards
e. service call forms
f . centralised historical records.

9.8 Describe procedures that should be followed subsequent to
a. replacing defective components / items in an intruder and hold up alarm system
b. re-instating system operation following replacement of defective components / items.

Unit 011 Intruder alarm systems

Outcome 10 Understand the requirements for auditing intruder and hold up alarm systems

Assessment Criteria

The learner can:

10.1 Explain why it is important to make appropriate arrangements for technical audit visits

10.2 List the documentation required for a technical audit

10.3 Describe how to carry out a technical audit

10.4 Explain the requirements of TS 50131-7 when carrying out a technical audit on intruder and hold up alarm system

Unit 012 Access control systems

Level: 3
Credit value: 21
NDAQ number: H/503/5813

Unit aim
This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Access Control Systems area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes
There are **eleven** learning outcomes to this unit. The learner will be able to:

1. Understand the requirements and implementation of surveying, design, and specification of access control systems
2. Understand the principles of access control devices, and control equipment
3. Understand the function and operation of common circuits used in access control systems
4. Understand the principles of Ethernet communications, applicable to access control systems
5. Understand cabling and cable/equipment installation for access control systems
6. Understand the principles of typical power supplies employed in access control systems
7. Understand typical system configurations, and administration methods for access control
8. Understand planning and project management of access control system installation
9. Understand the requirements and implementation of commissioning and handover of access control systems
10. Understand the requirements and implementation of maintenance and servicing of access control systems
11. Understand the requirements and implementation of auditing of access control systems

Guided learning hours
It is recommended that **161** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)
This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)
This unit is endorsed by Add the Body Name Here.

Assessment
This unit will be assessed by:

- Short answer written paper.

Unit 012 Access control systems

Outcome 1 Understand the requirements and implementation of surveying, design, and specification of access control systems

Assessment Criteria

The learner can:

1.1 Explain how the documentation required for a site survey is used

1.2 State the information that must be obtained during a site survey for an access control system in relation to
a. customer's system operational requirements
b. working on site (i.e., risk assessment, site access, equipment / tool storage, etc.)
c. identification of key personnel
d. availability of site details (i.e., site plans, building plans, details of existing equipment, etc.)
e. existing IT provision / capabilities
f. specific equipment requirements (i.e., access equipment, power tools, etc)
g. timescales

1.3 State the relevance of Codes of Practice and Standards access control systems during
a. site survey
b. system design
c. equipment specification

1.4 Identify factors that affect installation or operation of a particular system

1.5 Explain how to produce system designs, and equipment / hardware specification lists, for an access control system site survey and operational requirement using
a. drawings
b. written specifications
c. reference to manufacturer's technical information

1.6 Explain the following costings / quotations for system installation:
a. access control system equipment costs
b. installation costs
c. additional hire (i.e., subcontracted labour, special equipment, etc.)
d. other contracted work (i.e., electrical, groundworks, IT, etc.)
e. profit margin

Unit 012 Access control systems

Outcome 2 Understand the principles of access control devices, and control equipment

Assessment Criteria

The learner can:

2.1 Explain the operating principles of each of the following reader technologies
- a. Proximity (RFID)
- b. Smart (Mifare)
- c. Pin
- d. Dual technology
- e. Magnetic stripe
- f. Bar code
- g. Biometric types, including fingerprint, palm, signature, iris, voice and retina

2.2 Describe the principle of, and typical applications for, each of the following reader protocols
- a. Wiegand
- b. Mifare

2.3 Describe typical applications for each of the following in access control systems
- a. Master door controller
- b. Slave door controller
- c. Serial to Ethernet converter
- d. Standalone power supplies
- e. Reader protocol converter
- f. Input / Output module

2.4 Identify the factors that affect the choice of lock for each of the following lock types
- a. Maglock
- b. Shear mag
- c. Electric strike
- d. Shoot bolt
- e. Rim latch
- f. Solenoid handle lock
- g. Motorised lock

2.5 Identify the factors that affect the choice of the following access control points
- a. Gates
- b. Paddle
- c. Turnstile
- d. Rising kerb
- e. Rising bollard

2.6 Explain the features of each of the following access control system database types
- a. SQL (Scripted Query Language)
- b. Microsoft™ SQL Express
- c. Microsoft™ Access
- d. DRAM
- e. SRAM

2.7 Describe methods for backing up and restoring access control system databases

2.8 State how the following Standards and Codes of Practice relate to access control devices and equipment

- BS EN 50133
- BS EN 50136
- BS 7671
- TS 50398
- BSIA
- NSI Code of Practice
- SSAIB Codes of Practice

Unit 012 Access control systems

Outcome 3 Understand the function and operation of common circuits used in access control systems

Assessment Criteria

The learner can:

3.1 Explain, with the aid of schematic diagrams, the operation of each of the following door controller circuits
- a. Reader
- b. Exit button
- c. Door contact
- d. LED indicator
- e. Auxiliary input / output
- f. Lock (Fail unlocked / Fail locked)

3.2 Describe typical connection and configuration methods for each of the following communications systems when used in access control
- a. Serial port (RS 232)
- b. USB
- c. RS 485
- d. RS 422
- e. Ethernet network
- f. GPRS modem
- g. PSTN modem
- h. GSM modem

3.3 Describe, with the aid of schematic diagrams, common methods for connecting the following access control system components
- a. Door controllers
- b. Administration PCs
- c. Administration reader

3.4 Explain how to calculate the volt drop for given circuits

Unit 012 Access control systems

Outcome 4 Understand the principles of Ethernet communications, applicable to access control systems

Assessment Criteria

The learner can:

4.1 Explain the difference between TCP and UDP transmission methods

4.2 Explain the function of each of the following
a. IP address
b. Subnet mask
c. Default gateway
d. Port
e. MAC (Hardware) address
f. Network server
g. Network switch
h. Network router
i. DHCP (Dynamic Host Configuration Protocol) server

4.3 Explain the importance of applying static IP addresses to network connected access control equipment.

4.4 Describe the following methods for configuring IP access control equipment:
a. Manufacturer's bespoke software applications
b. Command line (i.e. ARP, Telnet)

4.5 Explain the function of, and applications for, each of the following network test commands
a. ping
b. ipconfig
c. tracert

4.6 Describe the configuration and connection issues relating to network connected access control equipment that can occur when each of the following are present on a network
a. Routers
b. Firewall

4.7 Describe typical methods of overcoming the issues related to network connected access control equipment

Unit 012 Access control systems

Outcome 5 Understand cabling and cable/equipment installation for access control systems

Assessment Criteria

The learner can:

5.1 Describe the effects that different building materials have on
a. working practice
b. system installation
c. fixing of cables and equipment

5.2 Describe typical applications for each of the following cable types in access control systems
a. 230V ac mains supply cable (1.5 mm^2 and 2.5 mm^2)
b. 1mm2 solid core cable
c. 0.22 mm^2 intruder alarm cable
d. unshielded twisted pair (UTP)
e. shielded twisted pair (STP)
f. shielded cable
g. CAT 5e cable
h. CAT6e cable

5.3 Describe methods for measuring, cutting, terminating and labelling cable types

5.4 Describe typical applications for each of the following cable containments in access control systems
a. conduit; Metal, PVC
b. trunking; Metal, PVC
c. tray / basket
d. duct

5.5 Describe methods for measuring, cutting, drilling and assembling cable containment types

5.6 Explain the requirements for segregation of power and access control cables

5.7 Describe methods for segregating power and access control cables

5.8 Describe the effects on system performance when data cables are installed in close proximity to electromagnetic sources

5.9 Describe connection arrangements for cable shields, and the effects on system performance for incorrect connection

5.10 Describe methods for testing cable types in relation to
a. cable integrity
b. integrity of joints and terminations

5.11 Describe post installation procedures for
a. closing cable containment openings
b. restoring building surfaces
c. clearing of waste (in line with relevant regulations and codes of practice)

5.12 State how current regulations and codes of practice to the installation, termination and labelling of access control cables and equipment

5.13 State how current regulations and codes of practice to the handling and disposal of waste materials

Unit 012 Access control systems

Outcome 6 Understand the principles of typical power supplies employed in access control systems

Assessment Criteria

The learner can:

6.1 Describe the function of switched mode power supplies in terms of
- a. efficiency
- b. regulation
- c. mains isolation
- d. overload protection

6.2 Describe methods for performing each of the following PSU tests
- a. mains input voltage
- b. mains isolation
- c. PSU output voltage
- d. PSU load current
- e. fuse serviceability

6.3 Describe how to calculate power supply requirements for access control systems in terms of
- a. load currents
- b. output voltages
- c. individual PSU wattage
- d. physical location

6.4 Describe earthing arrangements for access control equipment and containments in terms of
- a. BS7671
- b. BS EN60950-1

Unit 012 Access control systems

Outcome 7 Understand typical system configurations, and administration methods for access control

Assessment Criteria

The learner can:

7.1 Describe typical hardware requirements and configurations for each of the following access control functions
- a. Anti-passback (local, area controlled, timed)
- b. Anti-tailgate
- c. Door alarms
- d. Duress alarm
- e. Manual lock/unlock
- f. Timed lock/unlock
- g. Fire alarm door over ride
- h. Airlock
- i. Lift control
- j. Evacuation and muster
- k. Access restriction when IHAS is set
- l. Database backup
- m. Event archive

7.2 Describe typical setup methods for standalone and PC administered access control systems using
- a. Flow charts
- b. Administration software screen shots

Unit 012 Access control systems

Outcome 8 Understand planning and project management of access control system installation

Assessment Criteria

The learner can:

8.1 Describe the factors to be considered when discussing the following with customers
a. arrangements for working on site
b. site access
c. equipment / tool storage

8.2 Identify and describe the documentation required during installation of access control systems

8.3 Describe methods for checking that the following are on site at the start of system installation
a. system equipment
b. ancillary hardware (i.e., cables, containments, fixings, etc.)
c. access equipment
d. specialised tools

8.4 Describe methods for monitoring and recording progress of contract against
a. agreed programmes
b. estimated / agreed costings

8.5 Describe methods for ensuring that work is carried out in accordance with current legal and statutory requirements

8.6 Explain the relationship between the different trades which may be present during the installation of an access control system

8.7 Explain the timescales between the different trades which may be present during the installation of an access control system

8.8 Identify problems that can occur during system installation

8.9 Describe methods for dealing with problems that can occur during system installation, including
a. lack of, or incorrect, equipment / ancillary hardware
b. lack of, or incorrect, access equipment
c. installation not to current Standards and / or system specifications

8.10 Describe procedures for agreeing and recording amendments to system specifications

8.11 State how the following Standards and Codes of Practice to the installation of access control systems
- BS EN 50133
- BS EN 50136
- NSI Code of Practice
- SSAIB Codes of Practice
- BS 7671
- HASAWA

- Working at Heights Regulations 2005
- COSHH
- RIDDOR

Unit 012 Access control systems

Outcome 9 Understand the requirements and implementation of commissioning and handover of access control systems

Assessment Criteria

The learner can:

9.1 Describe methods for verifying calibration and correct functionality of test equipment, and procedures for dealing with defective equipment

9.2 Describe typical test procedures for each of the following items of test equipment, and expected test results
a. Multimeter (volts, amps, ohms, continuity, and diode test ranges)
b. Battery tester
c. Insulation resistance tester
d. Mains supply tester
e. Ethernet network tester

9.3 Describe methods for recording test results

9.4 Explain how to interpret test results and draw accurate conclusions from the interpretation

9.5 List the documentation that would be required for system handover

9.6 Describe procedures for processing documentation following system handover

9.7 Describe methods for arranging handover and co-ordinating interested parties

9.8 Describe methods of minimising disruption to others during commissioning and handover

9.9 Describe methods of ensuring that users are understanding instructions during handover, and assessing understanding following handover

Unit 012 Access control systems

Outcome 10 Understand the requirements and implementation of maintenance and servicing of access control systems

Assessment Criteria

The learner can:

10.1 Describe methods for scheduling and arranging preventative maintenance visits

10.2 Explain the following costings for system maintenance:
a. labour
b. component replacement

10.3 List the documentation required, and describe how these documents would be used, during
a. preventative maintenance visits
b. service visits

10.4 Describe methods for verifying calibration and correct functionality of test equipment, and procedures for dealing with defective equipment

10.5 Describe tests that would be carried out during a preventative maintenance visit

10.6 Describe procedures for using each of the following items of test equipment for the purposes of fault location
a. Multimeter (volts, amps, ohms, continuity, and diode test ranges)
b. Battery tester
c. Insulation resistance tester
d. Mains supply tester
e. Ethernet network tester

10.7 Describe methods of fault diagnosis using PC-based access control administration software, including use of
a. event logs
b. system logs
c. on-screen messages, warnings, indicators, etc

10.8 Describe methods for testing on IP-based systems, including the use of
a. ping, and ping-t
b. tracert (trace route)
c. ipconfig, and ipconfig/all
d. ipconfig/release, and ipconfig/renew
e. ipconfig/flushdns
f. arp -s
g. telnet

10.9 Describe methods for testing functionality and connectivity of
a. PSTN modems
b. GSM modems
c. GPRS modems

10.10 Describe procedures for
a. replacing defective components/items in an access control system

b. re-instating system operation following replacement of defective components / items

Unit 012 Access control systems

Outcome 11 Understand the requirements and implementation of auditing of access control systems

Assessment Criteria

The learner can:

11.1 Describe methods for scheduling and arranging technical audit visits

11.2 List the documentation required, and describe how these documents would be used, during a technical audit

11.3 State how relevant Codes of Practice and Standards to a particular access control system during a technical audit

11.4 Identify areas of common non-compliance

11.5 State corrective action(s) necessary to deal with non-compliance

Unit 013 Fire detection and alarm systems

Level: **3**
Credit value: **22**
NDAQ number: **F/503/5852**

Unit aim
This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Fire Detection and Alarm Systems (FD&A) area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes
There are **nine** learning outcomes to this unit. The learner will be able to:
1. Understand the relationship of FD&A to the fire safety industry
2. Understand the principles and features of detection and alarm system components
3. Understand how FD&A systems communicate internally and externally
4. Understand the principles of typical primary and secondary power supplies employed in FD&A systems
5. Know the methods of surveying new and existing FD&A Systems
6. Understand project management
7. Know how to design a fire detection and alarm system
8. Understand how to maintain a FD&A system after handover
9. Understand commissioning and handover

Guided learning hours
It is recommended that **179** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)
This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)
This unit is endorsed by Skills for Security.

Assessment
This unit will be assessed by:
- Short answer written paper.

Unit 013 Fire detection and alarm systems

Outcome 1 Understand the relationship of FD&A to the fire safety industry

Assessment Criteria

The learner can:

1.1 List the key pieces of legislation and guidance governing fire safety

1.2 Indicate the roles and responsibilities of those who enforce the legislation

1.3 State the key elements of the following standards

- BS5839-1
- BS5839-6
- BS5839-8
- BS5839-9
- BS7671

1.4 Explain how the following organisations influence the FD&A Industry

- Trade Bodies
- Professional Bodies
- Third Party Certification Bodies
- Standard Setting Bodies
- Third Party Certification schemes

Unit 013 Fire detection and alarm systems

Outcome 2 Understand the principles and features of detection and alarm system components

Assessment Criteria

The learner can:

2.1 Describe the principal operations and characteristics of common types of detector

2.2 Select and appropriately position common types of detector

2.3 Describe the key features, operating principles and applications of common types of audible and visual alarm devices

2.4 Describe the key features, operating principles and applications of common devices found on Addressable circuits

2.5 Describe how and why other building services and equipment may be interfaced with FD&A systems

2.6 Describe the purpose, key features and locations of Control and indicating equipment and zone plans

2.7 Describe the purpose, function and size limitations of detection zones and alarm zones

Unit 013 Fire detection and alarm systems

Outcome 3 Understand how FD&A systems communicate internally and externally

Assessment Criteria

The learner can:

3.1 Describe the inter connection of cable and equipment used in common wiring and wire-free systems

3.2 Describe how FD&A equipment communicates (addressable, none addressable and wireless)

3.3 Describe how FD&A systems communicate to remote locations

Unit 013 Fire detection and alarm systems

Outcome 4 Understand the principles of typical primary and secondary power supplies employed in FD&A systems

Assessment Criteria

The learner can:

4.1 Describe in detail the requirements for the primary electrical supply to FD&A equipment

4.2 Determine the size of valve regulated lead acid batteries for the secondary supply for a BS5839-1 2002 AMD2 system based on predicted standby and alarm currents and measured standby and alarm currents, using manufacturer data and/or Annexe D

4.3 Explain how to calculate standby capacity for batteries for a given system using Annexe D

Unit 013 Fire detection and alarm systems

Outcome 5 Know the methods of surveying new and existing FD&A Systems

Assessment Criteria

The learner can:

5.1 Propose a suitable category of system based on the recommendations of Annex A BS 5839-1

5.2 Suggest the appropriate type, quantity and location of detection, alarm, control and indicating equipment required for an FD&A system

5.3 Describe information required in a specification to enable a preliminary design and quotation for a FD&A system complying with BS5839-1.

5.4 List potential non-compliance issues with the installation of BS5839-1 system

5.5 List the methods of overcoming non-compliance issues, including false alarm prevention

Unit 013 Fire detection and alarm systems

Outcome 6 Understand project management

Assessment Criteria

The learner can:

6.1 Identify the roles and responsibilities of individuals and organisations involved

6.2 State how to plan and programme a system installation

6.3 Explain the key processes of a project

6.4 Explain third party certification schemes LPS1014 and SP203, indicating their purpose

Unit 013 Fire detection and alarm systems

Outcome 7 Know how to design a fire detection and alarm system

Assessment Criteria

The learner can:

7.1 Explain how to design a non-addressable, addressable and networked fire detection and alarm system complying with the recommendations of BS5839-1

7.2 Select appropriate system components for a given system design

7.3 Explain how to produce a Specification which includes Cause and Effects

7.4 State how to select appropriate types/grade of cable for the critical signal path and mains supply

Unit 013 Fire detection and alarm systems

Outcome 8 Understand how to maintain a FD&A system after handover

Assessment Criteria

The learner can:

8.1 State the requirements of BS5839-1 for attention by the user

8.2 State the requirements of BS5839-1 for attention by a competent person

8.3 State the information to be passed to a client where extensions and modifications are required for each of the following
a. starting work
b. extent of testing
c. documentation and certification.

8.4 Explain the purpose of the system log book

8.5 Identify solutions for the following conditions changes to building, fault indications, false alarms, ageing and damage

Unit 013 Fire detection and alarm systems

Outcome 9 Understand commissioning and handover

Assessment Criteria

The learner can:

9.1 Explain the purpose and importance of commissioning

9.2 Describe how to test common types of detectors

9.3 Describe how to test fault monitoring on detection and alarm circuits

9.4 List the measuring instruments that may be used to test a system during installation and commissioning and describe the purpose of these measurements

9.5 Explain how to recognise non-compliant results specifying and recording the remedial action necessary

9.6 Explain how to produce a programme of work and a checklist to ensure the system is fully tested and the results recorded

9.7 Describe the handover / acceptance process

Unit 014 Integrated electronic security systems - Personnel alarm systems

Level: **3**
Credit value: **20**
NDAQ number: **J/601/8514**

Unit aim
This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Integrated Electronic Security Systems - Personnel Alarm Systems area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes
There are **nine** learning outcomes to this unit. The learner will be able to:
1. Understand the role of stand-alone personnel alarm systems and integration techniques
2. Understand the procedures required for a site survey for stand-alone personnel alarm systems and integration methods
3. Understand the operational features, network links and system components for stand-alone personnel alarms and integrated systems
4. Understand the requirements of system design for stand-alone personnel alarm systems and integration
5. Understand the installation techniques for stand-alone personnel alarm systems and their integration
6. Understand the development and management of stand-alone personnel alarm systems and integrated networks
7. Understand the principles of testing, commissioning and handover of stand-alone personnel alarm systems and integrated systems
8. Understand the principles of maintaining the performance of stand-alone personnel alarm systems and integrated systems
9. Understand the principles of a technical audit for stand-alone personnel alarms systems and integrated systems

Guided learning hours
It is recommended that **157** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)
This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)
This unit is endorsed Skills for Security.

Assessment

This unit will be assessed by:

- Short answer written paper.

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 1 Understand the role of stand-alone personnel alarm systems and integration techniques

Assessment Criteria

The learner can:

1.1 Develop an effective plan to illustrate how overall security can be established for a given scenario taking into account
- a. risk assessment
- b. security issues to be resolved
- c. local and remote site areas
- d. an effective solution using stand-alone or integration techniques

1.2 Apply standards, specifications, codes of practice and guidelines to satisfy the requirements of
- a. Inspectorates
- b. ACPO
- c. Trade Associations
- d. Association of British Insurers
- e. Local Authorities
- f. legislation relevant to data protection, human rights and freedom of information

1.3 Apply principles that employ installation and management data which is used in the industry by the various electronic security systems technologies

1.4 Explain the different methods of how a stand-alone personnel alarm system can be designed to become a part of an integrated electronic security system solution

1.5 Produce statements of how stand-alone personnel alarm systems can be used within management networks to enhance functions in relation to
- a. local and remote protecting
- b. audio and video confirmation
- c. automatic monitoring
- d. control of secure physical locking devices
- e. time and attendance.

1.6 Describe the most effective means of determining how both stand-alone personnel alarm systems and integrated solutions can be related to different sites by considering
- a. customer requirements
- b. key personnel
- c. a range of user levels
- d. electricity supplies and IT networks
- e. site and building details

1.7 Show an understanding of how the current editions of the following impact upon any integrated electronic security system installations and how they inform of appropriate working practices

- a. BS 4737
- b. BS 5979
- c. BS EN50131
- d. BS EN 50136

e. BS 50398
f. PD6662
g. DD 243
h. Health & safety at Work Act
i. BS 7671 IEE Wiring Regulations
j. BSIA Guidance sheets
k. Codes of practice including those of employers and customers
l. Disability Discrimination Act
m. Relevant parts of the Building Regulations

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 2 Understand the procedures required for a site survey for stand-alone personnel alarm systems and integration methods

Assessment Criteria

The learner can:

2.1 List the information required prior to the survey visit

2.2 Explain how to obtain accurate and up to date details when carrying out a site survey for the following
a. commercial
b. industrial
c. residential
d. government
e. public

2.3 Explain the importance of obtaining accurate and current information for system design to include
a. use
b. occupancy
c. access
d. anticipated alterations to the site
e. users

2.4 Explain when it is important to liaise with internal departments, architects, suppliers, main contractors and third parties to review drawings

2.5 Explain how the requirements listed in 1.7 should be met during the survey stages

2.6 Demonstrate how to interpret architectural and similar drawings

2.7 Explain how to recognise factors that could affect system installation or operation and how to record the details

2.8 Identify the unique security requirements of customers as defined by the risk assessment

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 3 Understand the operational features, network links and system components for stand-alone personnel alarms and integrated systems

Assessment Criteria

The learner can:

3.1 Describe the operation and characteristics of stand-alone personnel alarm systems

3.2 List the electronic/electrical techniques by which stand-alone systems are linked to provide an integrated systems solution. Consider the use of
a. electronic switching
b. electromechanical switching
c. bespoke IT software
d. hybrid control equipment
e. inputs and outputs
f. interface methods

3.3 Describe the additional functions available with bespoke IT software for building management to include
a. lighting and environmental control
b. heating and ventilation
c. security and emergency systems

3.4 List the interconnections used by system components for
a. hard wired systems
b. free space transmission
c. hybrid links

3.5 Explain the factors to be considered in the selection of cabling and associated components and equipment in terms of
a. types available
b. attenuation
c. electrical interference
d. cost

3.6 Explain the factors to be considered in the selection of data cabling and associated components and equipment in terms of
a. types available
b. attenuation
c. electrical interference
d. cost
e. networking

3.7 Explain the factors to be considered in the selection of fibre optic cabling and associated components and equipment in terms of
a. types available
b. connections
c. terminations
d. cost

3.8 Explain the characteristics of IP systems in terms of
a. IP address
b. protocol
c. configuration
d. software
e. networking and integration

3.9 Explain the characteristics of free space transmission to include
a. infra-red
b. microwave
c. radio
d. GPS
e. transmission and receiving equipment
f. signal strength
g. licences
h. interference

3.10 Explain the differences between one way and two way communication systems and their application

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 4 Understand the requirements of system design for stand-alone personnel alarm systems and integration

Assessment Criteria

The learner can:

4.1 Produce a system design proposal using manufacturers equipment and component lists with reference to
- a. drawings and schematics
- b. block diagrams
- c. technical data
- d. schedules and check lists

4.2 Compile a specific list of system components that interprets data for
- a. transmission
- b. signalling
- c. monitoring
- d. operational and management features

4.3 Provide a costing and quotation for a system design

4.4 Produce a schematic diagram to show the interconnections between the systems to be integrated

4.5 Summarise how the different requirements listed in 1.7 are applied to the overall system

4.6 Illustrate how each of the following auxiliary devices and facilities can be employed in a design
- a. Visual indicators – LED and neon
- b. Warning devices – audio and visual
- c. Photocells
- d. Timers
- e. Manual overrides
- f. Zone isolation

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 5 Understand the installation techniques for stand-alone personnel alarm systems and their integration

Assessment Criteria

The learner can:

5.1 Select the appropriate requirement from 1.7 for a specified installation

5.2 Explain how to relate the physical locations for system cabling arrangements to
a. technical documents
b. installation specifications
c. cable and wiring diagrams
d. architectural and configuration charts

5.3 Describe how the type of building materials, site layouts and building status can have an effect on
a. cable runs and containments
b. equipment positioning
c. working practices
d. fixing methods
e. installation costs

5.4 Describe typical applications for
a. solid core cable
b. stranded core cable
c. data cable (including UTP/STP/CAT5e/CAT6e)
d. co-axial cable (including RG59/RG11/URM70)
e. fibre optic links
f. armoured cable
g. single and multi phase supplies.

5.5 Explain the process of the technical survey to confirm suitability of the system design proposal for integrated systems

5.6 Describe the installation and setting up of free space transmission systems as listed in 3.9

5.7 Explain the importance of maintaining confidentiality of documentation during an integrated systems installation

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 6 Understand the development and management of stand-alone personnel alarm systems and integrated networks

Assessment Criteria

The learner can:

6.1 Explain how to record information taken from the site survey, including the integration of remote sites

6.2 Explain the reasons for recording current details of existing and proposed systems, including customer requirements

6.3 Explain the procedures for corresponding with other relevant parties on how the network will be managed

6.4 Explain the procedures to be put in place for future site changes and system expansions

6.5 Describe the factors to be considered for integration with other management systems

6.6 Explain how to ensure that compatibility with components from a variety of manufacturers and suppliers is managed

6.7 Describe how provision would be made to account for faults occurring in the individual parts of the integrated system and how these separate systems could be isolated

6.8 List the order of activities required to finalise the system development and management for operation by the different user groups

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 7 Understand the principles of testing, commissioning and handover of stand-alone personnel alarm systems and integrated systems

Assessment Criteria

The learner can:

7.1 Describe the purpose of commissioning and handover of stand-alone personnel alarms systems and integrated systems

7.2 Explain how the requirements of the Inspectorates impact upon individual systems within an integrated system

7.3 Explain how current standards and codes of practice impact upon integrated systems

7.4 Describe the performance testing of system components for an integrated system

7.5 Describe the information needed to complete
a. test schedules
b. handover forms
c. customer acceptance forms
d. on site record cards
e. office record forms
f. as fitted documents

7.6 Describe the procedures required to bring integrated systems into operation

7.7 Explain the procedure for handing over stand-alone personnel alarm systems and integrated systems to the customer

7.8 Explain the customer's responsibilities as specified in TS50131-7

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 8 Understand the principles of maintaining the performance of stand-alone personnel alarm systems and integrated systems

Assessment Criteria

The learner can:

8.1 Explain the preventative maintenance procedures for stand-alone personnel alarms systems and integrated systems

8.2 Explain why the following readings need to be checked and recorded on all preventative and corrective maintenance visits
a. Resistance
b. Voltage
c. Current

8.3 Explain the procedure to be followed in the event of a third party fault, including customer IT interfaces.

8.4 Describe the adjustments and replacements a maintenance engineer is authorised to make on an integrated system

8.5 Explain how system performance can be affected by operational changes, deterioration or the links between third party systems

8.6 Explain the customer's responsibilities for ensuring that the maintenance should be carried out to a designated and agreed schedule

Unit 014 Integrated electronic security systems - Personnel alarm systems

Outcome 9 Understand the principles of a technical audit for stand-alone personnel alarms systems and integrated systems

Assessment Criteria

The learner can:

9.1 Explain the purpose of ISO 9000 and all relevant standards in relation to integrated systems

9.2 Explain the use of system documentation, when conducting a technical audit

9.3 Explain the purpose of a technical audit

9.4 Explain how documents should be used to record audit activities in relation to stand-alone personnel alarms systems and integrated systems

Unit 015 Electronic article surveillance systems

Level: 3
Credit value: 20
NDAQ number: R/503/5855

Unit aim

This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Electronic Article Surveillance Systems area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will be able to:

1. Understand the purpose of the electronic security systems industry, & the role of EAS
2. Understand the system components of an EAS system
3. Know the operating principles and features of Electronic Article Surveillance systems
4. Understand how to survey, design, and specify an EAS system
5. Understand how to install and supervise the installation of an EAS system
6. Understand how to commission and handover an EAS system
7. Know how to maintain the performance of an EAS system
8. Know how to carry out technical audits of EAS systems
9. Understand how to prepare a quotation for provision of an EAS system

Guided learning hours

It is recommended that **149** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)

This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)

This unit is endorsed by Skills for Security.

Assessment

This unit will be assessed by:

- Short answer written paper.

Unit 015 Electronic article surveillance systems

Outcome 1 Understand the purpose of the electronic security systems industry, & the role of EAS

Assessment Criteria

The learner can:

1.1 Describe three electronic security systems which protect life, property and premises

1.2 Explain the role of the following and how they operate in the market:

- NSI (national Inspection Board)
- SSAIB
- SIA (Security Industry Association)
- Home office and ACPO
- Retail Industry Consortium

1.3 Explain how EAS systems are used as anti-theft alarms, especially within a retail environment to reduce shrinkage

1.4 Explain how an EAS system can be integrated with other security and building management systems

1.5 Describe how EAS systems can be used in a variety of applications.

1.6 Apply standards, specifications and codes of practice to a typical EAS retail system and show how it meets the requirements of
a. Inspectorates
b. ACPO
c. Trade Associations
d. Association of British Insurers
e. Local Authorities
f. Legal Acts relevant to data protection, human rights and freedom of information

Unit 015 Electronic article surveillance systems

Outcome 2 Understand the system components of an EAS system

Assessment Criteria

The learner can:

2.1 Identify the following system components for an EAS system
- a. electronic Tags
- b. antenna
- c. power supply
- d. detach devices
- e. scan - out reader

2.2 Explain the operating principle of soft and hard Tags

2.3 Explain the purpose of an antenna and its location

2.4 Explain why it is important to use shielded cables from control equipment to antenna.

2.5 Describe typical applications for each of the following
- a. solid core cable
- b. stranded core cable
- c. data cable (including UTP/STP/CAT5e/CAT6e)
- d. co-axial cable (including RG59/RG11/URM70)
- e. fibre optic links
- f. armoured cable
- g. single and multi phase supplies

2.6 Explain how a BNC connector is connected to a length of co-axial cable.

2.7 Describe the range of indication devices available to notify alarm activation

2.8 Explain how different tags are used for a range of applications

2.9 Explain how physical/electronic de-activators work

Unit 015 Electronic article surveillance systems

Outcome 3 Know the operating principles and features of Electronic Article Surveillance systems

Assessment Criteria

The learner can:

3.1 Describe how a Radio Frequency EAS system works

3.2 Describe how an Electromagnetic EAS system works

3.3 Explain the difference between a “hard tag” and a “soft tag“

3.4 Explain why the customer may specify soft or hard tags

3.5 State the operating frequency of RF and E/M tags

3.6 State the limitations of a tag system through shielding

3.7 Describe how radio signals can interfere with an EAS system and how this can be rectified

3.8 Explain the operational principles of different tag removers

Unit 015 Electronic article surveillance systems

Outcome 4 Understand how to survey, design, and specify an EAS system

Assessment Criteria

The learner can:

4.1 Explain when to obtain accurate and up to date details needed to produce system designs and specifications

4.2 Explain when they might need to liaise with third parties

4.3 Explain how to read and interpret architectural and similar drawings

4.4 Explain factors that could affect system installation or operation, and how to record the details fully and accurately

4.5 Produce a list of the activities required on a site visit to produce a specification for the system

Unit 015 Electronic article surveillance systems

Outcome 5 Understand how to install and supervise the installation of an EAS system

Assessment Criteria

The learner can:

5.1 Describe how to apply standards, specifications, codes of practice and guidelines

5.2 Explain why they need to plan how they are going to install cabling support and containment systems, or instruct others particularly anticipating potential problems

5.3 Explain the limits of their authority and responsibility, and how to get help when they need it and where from

5.4 Explain why it is important to check the safe and correct operation of tools, power tools and equipment and how to deal with any that do not comply

5.5 Describe the capabilities and limitation of the tools, power tools, and equipment that they use, and why it important to use the correct tools and equipment

5.6 Explain the purpose of drawings, specifications, manufacturer's booklets, method statements, risk assessments, they need to install systems

5.7 Demonstrate on drawings given how to relate physical locations for equipment, and cable containment arrangements to technical documents PD 6662, BS EN 50131, BS 7671 IEE wiring regulations 17th edition, Current regulations and codes of practice relevant to installing cable containments

5.8 Show how to measure typical cable containments routes, allowing for bends and jointing, and minimising waste

5.9 Identify the different types of cable containment & fixing devices, how to select and use them

5.10 Describe the properties of typical building materials and how to fix containments to them safely and securely

5.11 Explain how to safely handle, cut, drill, join, assemble, de-burr and fix containments

5.12 Explain the capabilities and limitation of the tools and equipment that they use, and why it is important to use the correct tools and equipment

5.13 Show from the drawings & plans supplied how to relate physical locations for cables, wiring and termination points to technical documents (installation specifications, cable and wiring diagrams, architectural and similar drawings, configuration charts)

5.14 Explain the current regulations and codes of practice relevant to installing, terminating and labelling cables and wires

5.15 Explain why it is important to comply with segregation requirements (for power and signalling)

5.16 Explain how to measure cable and wires, allowing for bends and terminating, and minimising waste

5.17 Describe the properties, handling requirements, and methods of securing the different types of cables and wires used in systems

5.18 Explain how to test cables and wires against their required operating performance and what to do when these requirements are not met

5.19 Explain why it is important to close all cable containment openings, and how to do this

5.20 Explain why they must remove all unwanted items from sites after installation of cabling is complete

5.21 Describe the house-keeping requirements at the sites where they install cabling

5.22 Describe the current regulations and codes of practice relevant to handling waste or debris material

5.23 Explain why it is important to dispose of waste, debris and surplus material safely and in line with the relevant regulations and codes of practice

Unit 015 Electronic article surveillance systems

Outcome 6 Understand how to commission and handover an EAS system

Assessment Criteria

The learner can:

6.1 Explain how to commission systems

6.2 Describe the processes needed to bring systems into operation

6.3 List actions to minimise disruption to customers and third parties during commissioning

6.4 Describe the action to be taken to deal with problems arising during commissioning

6.5 Describe the operation and features of the system

6.6 Describe how to demonstrate the operation of the system to users and complete the handover in a way that inspires their confidence

6.7 Explain how the customer and the appropriate personnel including security should react to system activation

Unit 015 Electronic article surveillance systems

Outcome 7 Know how to maintain the performance of an EAS system

Assessment Criteria

The learner can:

7.1 Explain tests and maintenance procedures relevant to systems and equipment

7.2 Explain why it is important to record accurate details of test results and maintenance visits

7.3 Explain the importance of discussing and agreeing work activities with the customer

Unit 015 Electronic article surveillance systems

Outcome 8 Know how to carry out technical audits of EAS systems

Assessment Criteria

The learner can:

8.1 Explain the information needed to conduct a technical audit

8.2 Explain the purpose of a technical audit

8.3 Explain where they would find the criteria to judge whether a system complies

8.4 Explain the procedure if a systems fails an audit

8.5 Explain how to relate technical audits to systems' specifications and their operational requirements

Unit 015 Electronic article surveillance systems

Outcome 9 Understand how to prepare a quotation for provision of an EAS system

Assessment Criteria

The learner can:

9.1 Describe the roles of the persons involved in producing and preparing a quotation for an EAS system

9.2 Explain how the following items that make up a quotation are selected and costed in terms of materials and labour

- Control Equipment
- System components
- De-activation devices
- Electronic tags
- Power supplies
- Cabling
- Transmission medium

Unit 016 Closed circuit television systems (CCTV)

Level: 3
Credit value: 22
NDAQ number: H/503/5858

Unit aim
This unit provides underpinning specialist technical knowledge for Surveyors and Designers, Installation, Commissioning, Maintenance and Auditing Technicians employed in the Closed Circuit Television (CCTV) area of the electronic security and emergency systems industry. The unit also provides for personnel (i) with responsibility for others, (ii) in other appropriate areas eg Sales and Marketing.

Learning outcomes
There are **nine** learning outcomes to this unit. The learner will be able to:
1. Understand the requirements and process of surveying and auditing CCTV systems
2. Understand the requirements and process of CCTV system design, specification and quotation
3. Understand the principles of CCTV cameras and lenses
4. Understand the principles of CCTV transmission systems and equipment
5. Understand the principles of CCTV image display, recording and control equipment
6. Understand the principles of planning and managing CCTV projects
7. Understand the principles of installing CCTV systems
8. Understand the principles of testing, commissioning and handover of CCTV systems
9. Understand the principles of maintaining CCTV systems

Guided learning hours
It is recommended that **167** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards (if appropriate)
This unit is mapped to the Electronic Security Systems NOS by Skills for Security

Support of the unit by a sector or other appropriate body (if required)
This unit is endorsed by Skills for Security.

Assessment
This unit will be assessed by:
- Short answer written paper.

Unit 016 Closed circuit television systems (CCTV)

Outcome 1 Understand the requirements and process of surveying and auditing CCTV systems

Assessment Criteria

The learner can:

1.1 Explain how a survey is used to establish the overall security of a CCTV system in terms of:
- a. site plan showing areas of security concern
- b. the security issues to be resolved
- c. the stakeholders
- d. a risk assessment for areas of security concern
- e. success criteria for areas of security concern
- f. the most effective security systems solution

1.2 Explain how codes of practice and standards are applied to survey in terms of:
- a. problem definition, location, activity, purpose of observation, target speed
- b. operational issues for live viewing, who monitors, when monitored, where monitored, response
- c. system requirements, alert function, displays, recording, export/archive
- d. management issues, constraints, legal issues, maintenance resources

1.3 Explain how documentation is used during a CCTV installation in relation to:
- a. customer requirements, key personnel
- b. working on site, access, risk assessments
- c. secure storage for materials and equipment
- d. site and building details
- e. electricity supplies
- f. IT provision
- g. access equipment
- h. working times
- i. project timescales

1.4 State how relevant Codes of Practice and Standards relate to the site and security survey stages of a CCTV installation

1.5 Describe methods for arranging a technical audit visit for a CCTV system

1.6 Explain how the documentation is used during a technical audit

1.7 Explain how Codes of Practice and Standards relate to a particular CCTV system in terms of
- a. areas of non compliance
- b. corrective action

Unit 016 Closed circuit television systems (CCTV)

Outcome 2 Understand the requirements and process of CCTV system design, specification and quotation

Assessment Criteria

The learner can:

2.1 Explain how the following are used during a CCTV system design:
- a. drawings, schematics, block diagrams
- b. manufacturers technical information
- c. check lists
- d. schedules

2.2 Describe the impact of the following on CCTV system design:
- a. Lighting, existing and required
- b. Cameras, housings, supports
- c. control equipment
- d. transmission systems
- e. Display
- f. recording and archive
- g. interface with other systems

2.3 Explain how the following are taken into account during costings/quotations for a CCTV system
- a. typical customer information
- b. equipment
- c. installation
- d. equipment and tool hire
- e. subcontract work
- f. long term maintenance

2.4 Explain how relevant Codes of Practice and Standards relate to a given CCTV system during
- a. system design
- b. equipment specification
- c. system operation

Unit 016 Closed circuit television systems (CCTV)

Outcome 3 Understand the principles of CCTV cameras and lenses

Assessment Criteria

The learner can:

3.1 Explain the characteristics of types of camera used internally in buildings

3.2 Explain the characteristics of types of camera used externally

3.3 Explain the characteristics of cameras used for specialist applications

3.4 Explain the following features and characteristics of cameras
- a. C/CS mount
- b. CCD imaging device
- c. Single chip, 3 chip
- d. Infra-red cut filters
- e. Resolution
- f. analogue signal processing
- g. digital signal processing (DSP)
- h. Signal output; Composite, S-Video, IP
- i. sensitivity
- j. spectral sensitivity
- k. Iris control output format
- l. menu programming
- m. digital zoom
- n. backlight compensation
- o. white balance; Auto, Indoor/Outdoor presets
- p. day/night camera
- q. power supply; 230 Vac, 24 Vdc, 12 Vdc, PoE
- r. remote adjustment
- s. signal to noise ratio
- t. audio
- u. back focus adjustment

3.5 Describe camera specifications for selected applications

3.6 Explain the need for protection of cameras against damage and premature failure due to their immediate environment

3.7 Explain standards for the Index of Protection (IP) of housings for camera equipment

3.8 Describe types of external housing in terms of
- a. ease of access during assembly, installation, service
- b. IP rating, condensation elimination
- c. mounting security/rigidity, position adjustments
- d. cable connections, management/protection

3.9 Compare lens specifications for selected applications

3.10 Explain features and characteristics of lenses including
- a. format
- b. focal length, fixed, variable, zoom

c. angle of view
d. C/CS mount, board mount
e. manual Iris, auto iris, direct drive, video drive
f. aperture, 'F' number
g. transmittance
h. I R corrected, day/night, chromatic aberration
i. distortion, barrel, pin cushion
j. aspherical
k. fish eye
l. depth of field
m. Neutral density spot filter
n. filters, polarising, neutral density

3.11 Describe the use of lens selection aids to select lens focal lengths

3.12 State how to calculate lens focal lengths/scene dimensions using formula

3.13 Relate required image sizes/distances to situations in 11 and 12

3.14 Explain the process of adjusting and checking the tracking for camera/zoom lens combinations

3.15 Explain the use of filters to enhance images and aid setting/testing of lens/camera combinations

Unit 016 Closed circuit television systems (CCTV)

Outcome 4 Understand the principles of CCTV transmission systems and equipment

Assessment Criteria

The learner can:

4.1 Explain the characteristics of hard wired cabling and the associated equipment for unbalanced CCTV signal transmission in terms of
- a. types available
- b. screening
- c. impedance
- d. signal loss dB
- e. connections
- f. equipment to counteract signal loss
- g. data interference
- h. ground loop transformer
- i. cost

4.2 Explain the characteristics of hard wired cabling and the associated equipment for balanced CCTV signal transmission in terms of
- a. types available
- b. interference rejection
- c. signal loss dB
- d. connections
- e. connecting equipment
- f. cost

4.3 Explain the characteristics of fibre optic cabling and the associated equipment for CCTV signal transmission in terms of
- a. types available
- b. interference rejection
- c. signal loss dB
- d. connections
- e. connecting equipment
- f. cost
- g. information security

4.4 Explain the characteristics of structured cabling and the associated equipment for CCTV signal transmission in terms of
- a. network Types; LAN, WAN, internet
- b. data transmission; UDP, TCP
- c. cable types; CAT 5e, CAT 6e
- d. connections
- e. connecting equipment; Switches, Routers, analogue to IP converters

4.5 Explain the requirements of IP systems for CCTV signal transmission in terms of
- a. Wired/wireless
- b. bandwidth
- c. Network addressing; Hardware (MAC address), IP address, subnet mask
- d. configuration; Addressing, Routing, Port forwarding, VPN (Virtual Private Network)

4.6 Explain the characteristics of free space CCTV signal transmission in terms of
- a. types, Infra Red, microwave, radio

b. transmitting and receiving equipment
c. sighting and fixing of equipment
d. signal loss
e. licences
f. interference

4.7 State how current Standards and Codes of Practice relate to transmission systems

Unit 016 Closed circuit television systems (CCTV)

Outcome 5 Understand the principles of CCTV image display, recording and control equipment

Assessment Criteria

The learner can:

5.1 Describe the different types of monitor available for CCTV in terms of
- a. technology; LCD, Plasma, Projection, CRT
- b. resolution
- c. format
- d. screen size
- e. inputs
- f. loop through
- g. adjustments
- h. cost

5.2 Explain the following features of digital video recorders (DVR) and network video recorders (NVR)
- a. resolution
- b. compression
- c. inputs; analogue, IP
- d. outputs; analogue, IP, Scart, phono, SVHS, HDMI, VGA
- e. recording rates, storage capacity, resolution
- f. live viewing, recording, archive, remote access
- g. archive security, watermarking, tamper protection
- h. playback, post occurrence search
- i. management software
- j. PTZ , camera control, protocols; Pelco D, ONVIF
- k. video image processing/analysing
- l. privacy masking
- m. alarm functions
- n. event logs
- o. power failure recovery

5.3 Explain how the quality of recorded images is affected by
- a. lens distortion
- b. resolution of camera
- c. resolution of recording
- d. observed image size
- e. colour, lighting of scene, reflectivity of scene
- f. compression algorithm
- g. frame rate
- h. Image movement

5.4 Explain the effects of the following on video recording storage capacity for a digital CCTV recorder
- a. image size
- b. frames per second, continuous/triggered
- c. number of input channels
- d. operational hours
- e. retention period

5.5 Explain methods of producing evidential video copies from digital CCTV systems

5.6 Explain the setting up and use of a typical DVR linked to cameras and display monitors, using proprietary software

5.7 Explain the features and use of the following types of control equipment
a. quad
b. switcher
c. fully functional camera controller/keyboard/joystick/touch screen

5.8 State how current Standards and Codes of Practice relate to display, recording and control equipment

Unit 016 Closed circuit television systems (CCTV)

Outcome 6 Understand the principles of planning and managing CCTV projects

Assessment Criteria

The learner can:

6.1 Explain the importance of documentary records of meetings

6.2 Describe the structure of formal meetings in terms of
a. arrangements, venue, facilities, attendees, time, date
b. agenda, distribution, organisation
c. action minutes

6.3 List the meetings that are likely to occur during the course of a project from inception to continued operation

6.4 Describe the planning requirements for the consultation with
a. local authorities
b. police
c. building owner consents
d. affected parties
e. civil works
f. power supplies
g. contractors/trades

6.5 Describe the use of planning techniques (manual/software) to aid the project in terms of
a. surveying
b. budgeting
c. ordering
d. resource management
e. timings
f. monitoring progress
g. documentation

6.6 Explain the necessity for co-ordination of different trades during a project

6.7 Describe methods for ensuring that work is carried out in accordance with current legal and statutory standards

6.8 Explain how the following can affect a CCTV project and how they may be dealt with
a. personnel
b. equipment
c. access
d. specification changes
e. standards compliance
f. health and safety

6.9 State how the following Standards and Codes of Practice relate to the planning and management of CCTV systems
- BS EN 50132
- BS EN 50136
- BS 7671
- BS 8495

- HASAWA
- COSHH
- RIDDOR
- DD 243
- BS 5979
- BS 8418
- BS 5958
- TS 50398
- NSI CoP
- SSAIB CoP
- Insurers (ABI)
- HOSDB

Unit 016 Closed circuit television systems (CCTV)

Outcome 7 Understand the principles of installing CCTV systems

Assessment Criteria

The learner can:

7.1 Describe how different building materials, construction, site layouts and listed status can influence
- a. cable runs
- b. equipment placement
- c. equipment types
- d. working practices
- e. fixing methods
- f. civil works

7.2 Describe typical applications for each of the following cable types in CCTV systems
- a. twin and earth 230 Vac
- b. unshielded twisted pair (UTP)
- c. shielded twisted pair (STP)
- d. coaxial, RG 59, RG 11, URM 70
- e. CAT 5e, CAT 6e
- f. RG59/DC
- g. fibre optic
- h. 0.22mm2 alarm cable

7.3 Describe methods of measuring, cutting, trimming, joining, terminating and labelling cable types

7.4 Describe typical applications for each of the following cable containment systems
- a. conduit, metal, PVC
- b. trunking, metal, PVC
- c. tray
- d. duct
- e. catenary

7.5 Describe methods of measuring, cutting, trimming, fixing and labelling cable support and protection systems

7.6 Explain the reasons for the segregation of power and signal cables

7.7 Describe methods of segregating power and signal cables

7.8 Explain the arrangements for connecting cable shields and the problems that may be caused by incorrect arrangements

7.9 Describe methods of verifying the integrity of installed cabling

7.10 Describe the installation and setting up of free space CCTV transmission systems

7.11 Describe the requirements and methods for restoring building fire compartments and decorated surfaces

7.12 Explain the requirement for signs to inform public of CCTV zones

7.13 State how the current Regulations and Codes of Practice relate to installation practices and the handling and disposal of waste material

Unit 016 Closed circuit television systems (CCTV)

Outcome 8 Understand the principles of testing, commissioning and handover of CCTV systems

Assessment Criteria

The learner can:

8.1 Describe methods for verifying the calibration and correct functionality of test equipment, and procedures for dealing with defective equipment

8.2 Describe test instruments, procedures and typical results relating to CCTV systems that include
a. power supplies (volts, amps, ohms, insulation, continuity, diode)
b. networks
c. video transmission lines, balanced, unbalanced

8.3 Describe the testing of PC based systems involving the operation of the system and the use of on screen messages, event and system logs

8.4 Describe the performance testing of CCTV system displays in terms of
a. quality
b. fields of view
c. multiple, sequenced display
d. test records
e. use of Operational Requirement information
f. control

8.5 Describe the performance testing of cameras and associated equipment in terms of
a. lens settings, function, focus, aperture
b. zoom lens operation, tracking, zoom ratio, view
c. lighting of scene, required image detail
d. environmental effects, rain, sun, fog, wind
e. telemetry action
f. test records

8.6 Describe the performance testing of recording equipment in terms of
a. image quality
b. frame rates
c. image search/export/archive
d. test records
e. use of Operational Requirement information

8.7 Describe the performance testing of control equipment in terms of
a. control and adjustment of system equipment
b. control of displays
c. control of recording
d. video motion/analytics/alarms action
e. camera presets/tour/view restrictions
f. use of Operational Requirement information
g. system security
h. labelling, date and time setting
i. power supply interruption recovery
j. test records

8.8 Explain the purpose of commissioning a CCTV system

8.9 Describe the process of commissioning a CCTV system in terms of
a. checking the operational function in all aspects of the system, based on the original design
b. final adjustments and system validation in line with the Operational Requirement
c. record every operational aspect using checklists, logs

8.10 Explain the purpose of handover of a CCTV system

8.11 Describe the process of handover of a CCTV system in terms of
a. coordination, organisation
b. demonstration and training of users, verification of competence
c. specification and Operational Requirement review
d. agreement of function in line with 11 b
e. records of system settings/corrections/adjustments
f. documentation
g. signing over of system
h. user maintenance
i. security

8.12 State how the current Regulations and Codes of Practice relate to testing, commissioning and handover of CCTV systems

Unit 016 Closed circuit television systems (CCTV)

Outcome 9 Understand the principles of maintaining CCTV systems

Assessment Criteria

The learner can:

9.1 Explain methods of scheduling and arranging preventative and corrective maintenance

9.2 Explain how to produce preventative maintenance check lists for system elements

9.3 Describe how CCTV system information and documentation is used as a basis for maintenance checks and procedures

9.4 Explain how to produce cost estimates for system maintenance of specific systems for the following
a. labour
b. access equipment
c. component replacement
d. testing

9.5 Explain the importance of maintenance records, logs

9.6 Explain the use of instruments and tests for verifying the function and performance of CCTV system elements for locating faults that result in
a. display image deterioration, loss
b. incorrect view
c. poor/ lost recordings

9.7 Describe how the following are used using PC based CCTV system administration software
a. event logs
b. system logs
c. on-screen messages, warnings, flags

9.8 Describe methods of testing IP based systems including the use of
a. ping
b. tracert
c. ipconfig

9.9 Describe procedures for the replacement of defective items and system re-instatement

Unit 016 Closed circuit television systems (CCTV)

Outcome 10 Understand the requirements and implementation of maintenance and servicing of access control systems

Assessment Criteria

The learner can:

10.1 This is a common unit to all electronic security systems. Appropriate units/learning outcomes are SYS 14 and SYS 15 for sales negotiation and presentation

Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Providing City & Guilds qualifications – a guide to centre and qualification approval contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Ensuring quality contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:

- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- ***Walled Garden***
  Find out how to register and certificate candidates on line
- ***Events***
  Contains dates and information on the latest Centre events
- ***Online assessment***
  Contains information on how to register for GOLA assessments.

City & Guilds

Skills for a brighter future

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Useful contacts

UK learners **General qualification information**	**T: +44 (0)844 543 0033** **E: learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres Exam entries, Registrations/enrolment, Certificates, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **centresupport@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: **singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, GOLA, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business_unit@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that City & Guilds provides, email: feedbackandcomplaints@cityandguilds.com

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