

Unit 74: Electrical Installation Design in Building Services Engineering

Unit code: F/600/0416

QCF Level: 3

Credit value: 10

Guided learning hours: 60

Unit aim

The aim of this unit is to give learners knowledge of the principles and processes, and skills, used in the design of electrical services for buildings. Learners will also develop knowledge and skills in data distribution, security and fire protection system requirements.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes	Assessment criteria
1 Know the regulations and legislation applicable to electrical installations	1.1 Describe the main regulations and legislation relating to electrical installations
2 Know the different wiring techniques used in electrical installations	2.1 Describe the operational features, characteristics and applications of cables and cords
	2.2 Describe the operational features, characteristics and applications of containment methods
	2.1 Describe the operational features, characteristics and applications of installation methods
3 Understand earthing and bonding principles	3.1 Explain the requirements, operational features, characteristics and applications of electrical earth and shock protection

4 Understand the need for final circuits and circuit protection	4.1 Explain the operational features, characteristics and applications of residual current devices
	4.2 Discuss the use of final circuits
	4.3 Apply the principles of diversity to final circuits
	4.4 Explain the principle and applications of overcurrent and short-circuit protection devices
5 Understand the requirements for special installations	5.1 Explain the application of regulations in locations containing baths, showers and electric floor heating systems

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Unit content

1 Know how to design electrical lighting and power requirements for buildings

Design: specification; information

Design specification: lighting and power; commercial installations; industrial installations; public sector installations; client requirements; user requirements; environmental considerations; locations with special requirements

Design information: standards; legislation

Lighting: principles; lamps and luminaires

Lighting principles: standard units; illumination levels; relationship to tasks; glare rating; inverse square law of illumination; cosine law of illumination; lumen calculation for number of luminaires for artificial light installations; spacing ratios; glare assessment and prevention

Lamps and luminaires: operational features and characteristics of lamps; efficacy, stroboscopic effect and re-strike time; operational features and characteristics of luminaires; classification; output ratios, ingress protection; photometric performance; applications; switching arrangements; zoning of lighting

Power requirements: installation, short circuit and overload protection; current carrying capacity

Power installation: identification of small and fixed power requirements; number and location of socket outlets and other power outlets; identification of electrical loads for mechanical plant; cable routing, distribution; location of distribution boards and equipment; load centres; load balancing; determining maximum demand; diversity

Short circuit and overload protection: prospective short-circuit current (PSC); operating time; backup protection; short circuit; overcurrent and combined protection, discrimination

Current carrying capacity: method of installation; operating temperatures; correction factors for ambient temperature, grouping; thermal insulation, semi-enclosed fusing; combination of grouping factors; cable sizing; cable rating and voltage drop for short circuit and overload protection

2 Be able to design electrical lighting and power installations for specific applications

Design: lighting (lamps and luminaires); power installations; drawings to support designs

Lamps and luminaires: lamps and luminaries for particular applications; cables and wiring systems; switching arrangements; lighting zones; cable routing

Power installation: suitable circuit arrangements; cables and wiring systems; number and location of socket outlets and other power loads; cable routing, distribution; location of distribution boards and equipment

Drawings: layout; schematic; detail; graphical symbols; distribution board/equipment schedules

3 Know how to establish the data distribution, security and fire protection system requirements

System requirements for: data distribution, security and fire alarm installations in commercial, industrial and public sector applications; client, user and environmental requirements and considerations; locations with special requirements; design information eg relevant standards, legislation and guides; risk assessments for security and fire protection systems for a building

Data distribution systems: data signals; serial and parallel data transmission; high-level data link control; LAN and WAN networks; network configurations eg bus, tree, ring, mesh and star; horizontal and vertical distribution; structured cables for communication; clean and dirty earths; earth loops; category 5 and 6 installations; cable types; links to other systems eg fire, security and BMS

Security systems: access control; types of detectors and their application; open and closed circuits

Fire protection systems: types of automatic detectors and their operation; choice of detectors; manual call points; suitability of cables; stand-alone smoke detectors; control and indicating equipment

4 Be able to design data distribution, security and fire protection installations for specific applications

Design for specific applications: data distribution; security; fire protection; drawings to support designs

Data distribution installations: network and network configurations; distribution and earthing systems; types of cables and wiring systems; cable routing

Security system installations: access control equipment; types of detectors; types of circuits; types of cables and wiring systems; cable routing; types of alarm/control panels

Fire protection system installation: detectors; manual call points; types of circuits; types of cables and wiring systems; cable routing; control and indicating equipment

Drawings: layout; schematic; detail; graphical symbols; distribution board/equipment schedules

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THIS IS AN ACCREDITED SPECIFICATION AND CAN BE USED FOR TEACHING AND ASSESSMENT