Unit 51: Lighting Applications for Industrial and Commercial Buildings

Unit code: J/601/1384
QCF level: 4
Credit value: 15

Aim
This unit provides learners with the opportunity to develop an understanding of lighting applications for industrial and commercial buildings and the skills needed to produce design solutions for lighting systems.

Unit abstract
The purpose of this unit is to develop learner understanding of the principles that underpin the design, installation and operation of natural and artificial lighting systems. Learners will develop the skills needed to design lighting solutions for complex industrial and commercial applications. Learners will interpret the interior, exterior and emergency lighting requirements of buildings. Learners will also have the opportunity to explore the design of practical lighting schemes for a range of environments in industrial and commercial buildings, and evaluate the effectiveness of alternative schemes.

Learning outcomes
On successful completion of this unit a learner will:
1. Understand the lighting requirements of industrial and commercial buildings
2. Understand the characteristics of lighting equipment and the visual effects of lighting
3. Be able to design interior and exterior lighting schemes for industrial and commercial buildings
4. Be able to produce a design for an emergency lighting system.
1 **Understand the lighting requirements of industrial and commercial buildings**

*Lighting requirements*: operational requirements; design standards

*Operational requirements*: client and building operational requirements; balance between client, commercial, aesthetic and energy efficiency considerations; aesthetic and ergonomic requirements (specialised lighting situations)

*Design standards*: publications (industrial and commercial buildings); interrelationship between lighting and other mechanical and electrical building services

2 **Understand the characteristics of lighting equipment and the visual effects of lighting**

*Fundamental principles of lighting*: terminology; units; inverse square law; cosine law; colour temperature; light spectrum; natural daylight; luminous efficacy

*Characteristics of lighting equipment*: characteristics of light sources (light spectrum, natural daylight, luminous efficacy, colour temperature); characteristics of luminaires (standards, markings, lamp types and classifications, identification codes, lamp characteristics); luminaires for hostile and hazardous environments; polar curves and other photometric data; use of illuminance ratio charts; switching and dimming; lamp life; luminous flux; maintenance; lamp control gear

*Visual effects of lighting*: lighting levels; glare; illumination for task performance; appearance; colour rendering; revealing form; display lighting; light modulation

3 **Be able to design interior and exterior lighting schemes for industrial and commercial buildings**

*Design of interior and exterior lighting schemes*: design issues; general lighting schemes; specialised lighting schemes

*Design issues*: client and building requirements; commercial viability; performance; economics; appropriateness of proposed lighting schemes

*General lighting schemes*: multi-storey buildings; commercial buildings; wide variety of environments and requirements; layout; specification and control (interior and exterior lighting); car parks and walkway lighting; integration of lighting with other services installations; inverse square law; lumen method of design; glare

*Specialised lighting schemes*: general; localised and local lighting schemes; complex commercial situations in real buildings; wide variety of environments and lighting effects eg art galleries, museums, operating theatres, retail displays, theatres, concert halls, conference lighting; spot and flood lights; up-lighters; colour correction; enhancement lighting; integration of artificial lighting with natural daylight; permanent supplementary artificial lighting of interiors (PSALI); calculations of point-to-point illuminance levels; computer-aided design (CAD) software
4 Be able to produce a design for an emergency lighting system

*Design issues*: specification and design; maintenance and testing

*Specification and design*: current legislation and standards for emergency lighting; industrial and commercial building functions (escape lighting, standby lighting, external escape lighting); lighting levels; location of lighting; speed of operation

*Maintenance and testing*: requirements; documentation; responsibilities; coordination of emergency lighting schemes with other services and emergency systems
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<tr>
<th>Learning outcomes</th>
<th>Assessment criteria for pass</th>
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<td>On successful completion of this unit a learner will:</td>
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| LO1 Understand the lighting requirements of industrial and commercial buildings | 1.1 evaluate client and building operational requirements  
1.2 justify lighting design standards |
| LO2 Understand the characteristics of lighting equipment and the visual effects of lighting | 2.1 explain the fundamental principles of lighting design  
2.2 review the visual effects of lighting in relation to task performance and quality of appearance  
2.3 select appropriate luminaires for given purposes  
2.4 compare the characteristics of different light sources |
| LO3 Be able to design interior and exterior lighting schemes for industrial and commercial buildings | 3.1 follow guidelines to design a general lighting system  
3.2 produce designs and specifications for a specialised lighting system  
3.3 carry out an audit of the performance in use of lighting installations |
| LO4 Be able to produce a design for an emergency lighting system | 4.1 produce designs and specifications for an emergency lighting system for industrial or commercial buildings  
4.2 write a maintenance and testing schedule handbook for emergency lighting systems |
Guidance

Links

This unit links with other Edexcel BTEC HN Construction and the Built Environment units, for example:

- Unit 43: Electricity and Lighting for Building Services Engineering
- Unit 49: Electrical and Electronic Control Principles for Building Services Engineering
- Unit 52: Power Supplies for Building Services Engineering.

The content of this unit has been designed and mapped against the current CIC National Occupational Standards and the current NVQs at levels 4 and 5. Completion of the learning outcomes will contribute knowledge, understanding and skills towards the evidence requirements of the NVQs.

- See Annexe B for summary of mapping information to NVQs.

This unit has also been mapped to illustrate the links to the NQF units.

- See Annexe D for summary of mapping information to NQF units.

Essential requirements

Learners require access to a wide range of publications, reference data, manufacturers’ products/information and design and computer facilities. Learners will also need access to simulated installations and sample equipment to support their learning.

It is essential that a culture of health and safety is embedded in all the units to ensure that the learners understand the importance and relevance of health and safety issues. Therefore there should be clearly signposted aspects of current legislation and health, safety and welfare implications throughout the delivery and assessment of this unit.

Employer engagement and vocational contexts

Tutors should organise site visits as part of delivery for this unit. To ensure site visits are successful tutors should outline the aims and objectives of the visits and conduct preparatory briefings. Tutors should use real-life case studies, for example typical lighting applications in and around industrial and commercial buildings.