Unit 54: Building Management Systems for Building Services Engineering

Unit code: M/601/1394
QCF level: 4
Credit value: 15

Aim

This unit enables learners to develop an understanding of building management systems (BMS) in relation to management and control requirements of buildings and develop skills to specify and install effective BMS.

Unit abstract

This unit allows learners to explore the characteristics of BMS installations and consider how these systems can be used to manage and control the mechanical and electrical services of buildings and promote internal environmental comfort and energy efficiency. Learners will investigate the use of BMS hardware to achieve the aims of BMS strategies and examine the associated installation and operational issues. Learners will also develop the skills needed to analyse and produce designs for BMS installations, and investigate the use of BMS reports and data to inform planned preventative maintenance (PPM) strategies and optimise the performance of BMS installations.

Learning outcomes

On successful completion of this unit a learner will:
1. Understand the management and control requirements of buildings
2. Understand the control functions of BMS hardware
3. Be able to design BMS installations
4. Be able to use BMS reports and data to optimise the performance of BMS installations.
Unit content

1. Understand the management and control requirements of buildings

Building requirements: management and control; power generation and load management; fire detection; maintenance; characteristics of BMS

Management and control: environmental control requirements of buildings (heating, natural ventilation, mechanical ventilation, air conditioning); lighting control requirements; lamps and luminaires; different strategies for different buildings

Power generation and load management: control of power generation; maximum demand; power factors; load management techniques (for modern industrial and commercial buildings)

Fire detection: access control and security systems; lift and escalator controls; integration of fire detection, building access and building security systems

Maintenance: requirements of plant and systems; maintenance (type and frequency); monitoring energy sources and energy consumption within buildings; realistic energy target criteria; financial implications of using BMS; benefits of BMS (compared to conventional control strategies)

Characteristics of BMS: terminology; functions performed; analogue and digital control; environmental monitoring; plant switching; data (monitoring, logging, reporting); types and configuration of BMS; role of BMS within intelligent buildings

2. Understand the control functions of BMS hardware

Control functions: identification of control requirements; configurations and techniques to achieve optimisation; compensation; sequencing; plant switching; cascade control; night time cooling

BMS fixed hardware: types eg analogue and digital condition sensors, actuators and metering devices, BMS control panel components; power supplies and conditions; operation characteristics and application (switching and protection equipment); wiring requirements; techniques and installation specification; earthing requirements; wiring configurations (LAN, WAN, networks, LON-Works, BACNET); system integration; intelligent processors

3. Be able to design BMS installations

BMS installations: design; software

Design: services installation proposals (application of control logic); planning control strategies; panel locations; production of controls installation, schematic drawings and logic drawings; control symbols and annotation of drawings; production of control points count schedules; specification of outstations and intelligent controllers (from manufacturers’ information); production of BMS equipment schedules and specifications

Software: logic drawings to identify node numbers and functions; programmes for hardware control strategies; commissioning requirements; procedures and documentation
4 Be able to use BMS reports and data to optimise the performance of BMS installations

BMS reports: installed equipment (system logic, settings, operating conditions); methods and techniques used to monitor and adjust BMS settings eg time schedules, set points, via both central and local BMS equipment; building and system performance reports (techniques for interrogating BMS installations)

BMS data: PPM programmes; extraction of plant running times; monitoring plant breakdown; alarm strategies; integration of BMS data into PPM regimes

BMS optimisation techniques: monitoring physical energy usage; exception reports, data analysis and alarm strategies; reduce energy resource demands (interpretation of BMS reports); BMS data (selection of energy tariffs, monitor plant efficiency performance and life expectancy, load shedding, plant switching strategies, optimisation of plant and building energy performance)
### Learning outcomes and assessment criteria

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<thead>
<tr>
<th>Learning outcomes</th>
<th>Assessment criteria for pass</th>
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<tr>
<td><strong>On successful completion of this unit a learner will:</strong></td>
<td><strong>The learner can:</strong></td>
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| **LO1** Understand the management and control requirements of buildings | 1.1 describe the functions of buildings that can be managed using BMS  
1.2 evaluate the functions performed by BMS installations and components  
1.3 justify the decision to use a BMS installation within a given building |
| **LO2** Understand the control functions of BMS hardware | 2.1 explain the control functions performed by BMS hardware  
2.2 evaluate the operation of fixed hardware components associated with BMS installations  
2.3 justify the techniques used to install BMS fixed hardware and wiring |
| **LO3** Be able to design BMS installations | 3.1 apply control logic to design BMS installations  
3.2 produce control points count schedules, controls installation, schematic drawings and logic drawings  
3.3 produce BMS component and equipment lists, schedules and specifications for given installations  
3.4 carry out BMS software procedures to achieve required control strategies  
3.5 produce commissioning schedules for BMS installations |
| **LO4** Be able to use BMS reports and data to optimise the performance of BMS installations | 4.1 analyse BMS installations to obtain performance reports  
4.2 analyse BMS settings to modify and adjust BMS installations  
4.3 produce planned preventative maintenance strategies using BMS reports and data  
4.4 produce energy management optimisation strategies using BMS reports and data |
Guidance

Links

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

- Unit 10: Building Services Design, Installation and Maintenance in Construction
- Unit 28: IT Applications for Construction
- Unit 35: The Use of Information and Communication Technology for Construction and the Built Environment
- Unit 47: Energy Utilisation and Efficiency 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

It is strongly recommended that learners have access to real or simulated BMS installations and software. Learners will require access to a wide range of publications, reference data, manufacturers’ products/information, and computer facilities and BMS software.

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, for example to complex buildings with BMS, manufacturers’ premises and/or software companies. To ensure site visits are successful tutors should outline the aims and objectives of the visits, conduct preparatory briefings and encourage learners to review the site visits once completed. Tutors should organise presentations by visiting speakers, for example building services engineers, building systems managers or facilities managers and/or qualified installation personnel. Tutors should use real-life case studies, based on site visits, for part of the assessment for this unit.