Institute for Apprenticeships & Technical Education

# BUILDING SERVICES ENGINEER

## Key information

- ☑ Proposal approved
- ☑ Occupational standard approved
- ☑ End-point assessment plan approved

**Reference:** ST0372
**Level:** 6
**Degree:** integrated degree

**Typical duration to gateway:** 60 months
**Typical EPA period:** 8 months
**Route:** Construction and the built environment
**Date updated:** 11/12/2023
**Lars code:** 198
**EQA provider:** Ofqual

## Details of the occupational standard

### Occupation summary

This  occupation is found in the construction, built environment and engineering sectors, with building services engineers employed in a variety of organisation types and sizes.

The broad purpose of the occupation is to bring the built environment to life by connecting up the buildings we live and work in, ensuring they meet the needs of the people, plant, and services they need to accommodate, whilst providing comfort, building safety, security and efficiency through ever increasing environmental safeguarding.

Building services engineers use and apply advanced theoretical and technical knowledge and know how to solve broadly defined  engineering problems to design, deliver and manage building services engineering solutions and systems within a building. The main types of building services systems are:

- Mechanical: heating, ventilation, and cooling;
- Electrical: power, lighting, fire detection, communications; and
- Public health: water and waste services, and drainage.

In these areas, building services engineers may consider:

- Comfort and control, including heating and ventilation, air conditioning and refrigeration, and lighting (artificial and natural) and acoustics.
- Efficiency and sustainability, including the capture, supply and use of energy (electrical, mechanical, and other power systems, renewable energy systems (such as solar, wind or heat pump sources), water supply and management (including plumbing and drainage), communication networks to aid integrated systems and intelligent buildings, and façade engineering.

- Safety and security, including emergency lighting, security and alarm systems, fire detection and prevention, emergency back-up systems, inclusive access, and flow through buildings for both people and equipment, including escalators and lifts.

Building services engineers use and apply advanced engineering knowledge, underpinned by advanced scientific and mathematical principles and theories, whilst using a range of methods, techniques, and procedures to deliver building services engineering solutions. They do so by sourcing, reviewing, interpreting, critically analysing and evaluating a range of data and information, specifying materials or processes, and propose and deliver solutions for building services engineering problems, evaluating performance and support continuous improvement.

With the need to mitigate the detrimental effects on the environment and an increased drive for carbon emission reduction, improvements in building performance and sustainability, building services engineers will consider the whole life cycle of a building services asset, ensuring building service engineering systems and projects align with United Nations Sustainable Development Goals (UNSDG), respond to carbon net-zero emissions targets, and are compliant with environmental and sustainability policies and legislation, including the climate change act.

Building services engineers will prepare, produce and present building services engineering information, designs and documentation, with regard for the practical need to install, maintain, manage and improve building services equipment and systems, and to relevant codes of practice and industry standards, to statutory and regulatory requirements (such as the Building Safety Act 2022, BSI Flex 8670, Construction (Design and Management) (CDM)), and complying with health, safety and wellbeing requirements.

They use appropriate analytical and computational software, including engineering analysis software (such as CAD, Revit or building energy management system (BEMS) software), to prepare, produce, and communicate building services engineering solutions, recognising the limitations of the techniques and outputs produced. Many building services engineers now use digital data modelling processes and systems, such as Building Information Management (BIM), using ISO 19650 standards, to manage information over the whole life cycle of a building services engineering asset (such as the information required for the ‘golden thread’).

Building services engineers will be responsible for initiating, planning, and managing tasks, projects or processes, the team members, or specialist technical input, and wider resources needed, whilst applying appropriate project, financial, legal and commercial management knowledge and techniques, using quality management systems and risk assessment procedures to mitigate risks, and to improve safe systems and security.

They will also commission, carry out, or review site inspections or surveys, report progress against performance criteria, and check specified technical aspects of design, site or manufacturing activities.

In their daily work, employees interact with their line manager, often a senior engineer or project manager, and their team members, to determine, manage, and review tasks, projects and programmes of work, agreeing individual and team responsibilities; they do so to design, produce and evaluate building services engineering solutions, ensuring they are fit for purpose, safe, secure, environmentally sustainable, and meet customer and industry specifications.

Building Services Engineers will regularly work with other building services engineers and technicians, and specialist contactors for which they may be responsible for.  They will also

collaborate with others working in a range of disciplines, and from various employer types (e.g. clients, consultancies, contractors); these might include civil engineers, surveyors, architects, project managers, planners, environmental practitioners, legal or finance teams, where they will need to communicate effectively in relation to technical and project matters.

Depending on their employer, building services engineers will also communicate and collaborate with those outside their own organisation, including clients or customers, consultants or contractors, suppliers, manufacturers, and with stakeholders or with representatives from appropriate regulatory bodies.

Building services engineers, depending on their employer, will spend their time in an office environment, working on site, working remotely or a combination of these.

Employees are responsible for designing, delivering and managing building services engineering technical solutions to specification, ensuring accuracy and quality, within financial, time, resource, commercial and legal limits, and compliant with health and safety regulations, to industry, regulatory and legislative standards, including the Building Safety Act 2022. They must also comply with health and safety regulations, including the Health and Safety at Work Act 1974, Construction (Design and Management) regulation, and environmental and sustainability policies.

They are able to make decisions, exercising sound independent engineering judgement, whilst knowing their own limits of authority when undertaking the occupational duties in a range of contexts and environments, adapting to issues that arise, informing the actions to be taken and reviewing the effectiveness of these actions. They are also responsible for their own, and promoting the benefits of, equality, diversity and inclusion and continuing professional development, and recognising their own obligations to society.

## Typical job titles include:

**Acoustics engineer** **Building services design engineer**
**Building services engineer** **Building services installation manager**
**Building services site engineer** **Electrical engineer**
**Electrical systems engineer** **Engineering project manager**
**Heating & cooling systems engineer** **Lighting systems engineer**
**Mechanical engineer** **Project engineer** **Project management engineer**
**Public health engineer**

## Entry requirements

Whilst individual employers will set the selection criteria for their Apprenticeships, employers will work with their chosen training provider to agree specific entry requirements. However, candidates will typically have completed a relevant level 3 or 4 apprenticeship in the field, or have relevant qualifications, such as a BTEC Diploma, T-Level, A levels, or Higher National Certificate

(HNC) or Diploma (HND) in building services engineering, construction, or physical and mathematical sciences.

## Occupation duties

| DUTY | KSBS |
| --- | --- |
| **Duty 1** Deliver solutions to broadly defined building services engineering problems, by preparing, producing and presenting engineering diagrams and documents, to engineering specifications, industry codes of practice, regulations, standards, and procedures. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 2** Deliver appropriate and effective technical building services engineering solutions, through the identification, selection, review and evaluation of data and technical information, and the use of a range of appropriate engineering analytical methods, techniques, processes, and technologies. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 3** Manage building services engineering tasks or projects, and the input of others, by applying project, team and quality management principles and techniques to effectively identify, organise and manage resources, budgets or costs. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 4** Contribute to the design and development of building services engineering systems, checking the systems meet the requirements of the end user or business need, and that relevant industry standards and procedures are adhered to. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 5** Use a range of practical and workshop skills, selecting and applying appropriate materials, equipment, technologies and processes, to plan, undertake, analyse and evaluate building services engineering activities. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21 |

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| | B1 B2 B3 B4 B5 B6 |
| **Duty 6** Use analytical and engineering analysis software (such as Computer Aided Design (CAD and Revit), digital data modelling systems (such as Building Information Management (BIM), Building Energy Management Systems (BEMS), and other techniques), recognising the limitations of the techniques used, to inform, develop or manage building services engineering solutions. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 7** Ensure compliance with health, safety & welfare requirements, apply safe systems of work (including for example the Health and Safety at Work Act 1974, the Construction (Design and Management) regulations), understanding the safety implications of their works, ensuring they apply and improve safe systems of work. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 8** Identify, evaluate and mitigate risks associated with their work, and in the tasks and activities they are responsible for. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 9** Comply with relevant policies, standards, regulations, legislation, strategies, technical guidance, and codes of practice, for example Building Safety Act 2022 or BSI Flex 8670, ensuring they are interpreted, implemented and communicated correctly and appropriately. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 10** Comply with environmental policies and legislation, practice sustainable principles, evaluating how these impact on the building services engineering projects, and how these assist in the achievement of United Nations Sustainable Development Goals (UNSDG) and reducing carbon emissions. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21 |

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| | B1 B2 B3 B4 B5 B6 |
| **Duty 11** Use data, information and quality management, and assurance systems and processes, for example ISO 19650, recognising the need for these in managing building services engineering information (for example, information relating to the golden thread) and their application in continuous improvement. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 12** Communicate and liaise effectively with others internal and external to their organisation, such as customers or specialist contractors, respecting the need for the confidentiality and security of data and information. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 13** Work reliably and effectively with others, taking responsibility for their own work and the input of others, and where appropriate, managing others. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 14** Ensure compliance with equality, diversity & inclusion (EDI) and ethical standards, recognising the importance of these in the workplace. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21<br><br>B1 B2 B3 B4 B5 B6 |
| **Duty 15** Plan and maintain their own learning and skills development by carrying out continuing professional development in line with professional codes of conduct and/or industry specifications and obligations, and promoting the benefits of this to others. | K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K22<br><br>S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21 |

B1 B2 B3 B4 B5 B6

# KSBs

## Knowledge

**K1**: Engineering principles, underpinned by theoretical and technical scientific, mathematical and statistical knowledge.

**K2**: Engineering techniques, procedures and methods used to measure, test and analyse the performance of building services engineering components and systems.

**K3**: Analytical tools and techniques to support integrated or systems-based approaches to problem solving.

**K4**: Properties of, identification and selection criteria for materials, components or parts, and processes used in building services engineering.

**K5**: Techniques and methods used to research and collect data and technical information.

**K6**: Building services engineering design principles and control processes, including the factors that affect design, and the compliance with building safety and health and safety legislation, codes of practice and industry standards.

**K7**: Technical drawings, designs, and analytical and computer-based techniques.

**K8**: The use and limitations of computational and digital models, including Building Information Modelling (BIM).

**K9**: Industry policies, standards, regulations and legislation, and codes of practice, including Building Safety Act 2022 or BSI Flex 8670.

**K10**: Statutory health, safety and welfare legislation and regulations including Health and Safety at Work Act 1974 and Construction (Design and Management) (CDM) and policies and procedures to enable safe systems of work.

**K11**: Hazard and risk assessment, evaluation, and mitigation processes, in the building services engineering environment.

**K12**: Principles of sustainable development and their impact on the lifecycle of building services engineering solutions, including United Nations Sustainable Development Goals (UNSDG) and net-zero carbon emissions, environmental policies and legislations, the environmental protection and the climate change acts.

**K13**: Project management techniques, including quality and information management and assurance systems and the need and use of continuous improvement processes.

**K14**: Methods for planning, managing and resourcing building services engineering projects, and the impact on cost, quality, safety, security, environment, commercial and legal matters.

**K15**: Methods of communication and when to use them, using appropriate engineering terminology and conventions.

**K16**: Roles and responsibilities within their organisation and the wider building services engineering sector.

**K17**: Principles of teamwork and collaboration.

**K18**: Relationships between organisations, customers, partners and suppliers in the building services engineering sector, including how these are affected by relevant commercial and legal matters.

**K19**: Equality, diversity and inclusion, including the Equality Act, their responsibilities, its benefits and importance.

**K20**: Awareness of issues and common symptoms and warning signs of stress, anxiety and depression, plus where to go for help and the resources available.

**K21**: Ethical principles and practices, including the implications to legal, civil, reputational and professional risk.

**K22**: Methods to maintain and enhance professional competence and technical knowledge (CPD).

## Skills

**S1**: Apply engineering principles to solve broadly defined engineering problems and contribute to continuous improvement: scientific, theoretical, and technical principles.

**S2**: Apply building services engineering techniques, procedures and methods, review and evaluate the results, including when measuring and testing, designing, installing, commissioning, maintaining or operating building services engineering systems or improving the performance of building services engineering components and systems.

**S3**: Employ mathematical, statistical and data interpretation tools, using analytical and computational methods, and apply an integrated or systems-based approach.

**S4**: Identify, interpret, and compare information in relation to materials, components or parts used in building services engineering.

**S5**: Research, collect, select and evaluate technical literature and other sources of data and information to address, analyse and evaluate building services engineering problems.

**S6**: Produce building services engineering technical solutions in accordance with relevant industry standards, policies, codes of practice, regulations, and legislation.

**S7**: Select and apply computational and analytical techniques to model building services engineering problems, recognising the limitations of the techniques employed.

**S8**: Contribute to the design, development and implementation of building services engineering solutions, and evaluate their effectiveness in the context of the whole project life cycle.

**S9**: Manage and comply with statutory health, safety and welfare policies, procedures and regulation, and contribute to improvements in health, safety and welfare, within their own area of responsibility.

**S10**: Complete risk assessments to identify, evaluate, manage and mitigate risks.

**S11**: Apply principles of sustainable development and evaluate their effectiveness on the whole project lifecycle of building services engineering solutions.

**S12**: Manage engineering activities that contribute to sustainable development and the United Nations' Sustainable Development Goals (UNSDGs).

**S13**: Apply project management techniques, identifying, measuring, recording and reporting progress against building services engineering project performance criteria.

**S14**: Manage quality processes and contribute to quality improvements.

**S15**: Plans and manages resources, equipment and technology, to meet project requirements, specifications, costs and budgets and timescales, with an appreciation of statutory and commercial arrangements.

**S16**: Monitor and manage individual performance, and the input of others, recognising the need to adapt to, and communicate, changing demands.

**S17**: Comply with appropriate codes of practice and equality, diversity and inclusion (EDI) requirements.

**S18**: Communicate in verbal and written contexts using appropriate methods for the audience. Use appropriate engineering terminology and conventions.

**S19**: Apply teamwork and collaboration principles.

**S20**: Apply ethical principles, Identifying and analysing ethical concerns and making reasoned ethical choices.

**S21**: Plan, undertake and review their own professional competence, regularly updating, recording and reviewing their continuing professional development (CPD).

## Behaviours

**B1**: Works to health, safety and welfare requirements, safe systems of work, industry standards, statutory regulation and legislation, policies, and codes of practice, and ensuring others do likewise.

**B2**: Makes decisions, exercising sound independent engineering judgement, whilst knowing their own limits of authority and when to ask for help or to escalate.

**B3**: Works effectively, individually and as part of a team.

**B4**: Solves problems with attention to detail, accuracy, and diligence, and seeks to continually improve.

**B5**: Promotes equality, diversity and inclusivity in the workplace, maintains professional working relationships with internal, external, and connected stakeholders, and makes reasoned ethical choices.

**B6**: Takes responsibility for their own professional development, seeking opportunities to extend and enhance their knowledge, skills, and experience, and support others, in line with professional codes of conduct.

# Qualifications

## English and Maths

Apprentices without level 2 English and maths will need to achieve this level prior to taking the End-Point Assessment. For those with an education, health and care plan or a legacy statement, the apprenticeship's English and maths minimum requirement is Entry Level 3. A British Sign Language (BSL) qualification is an alternative to the English qualification for those whose primary language is BSL.

## Other mandatory qualifications

### Building services engineering degree accredited by the Engineering Council

Level: 6 (integrated degree)

# Professional recognition

This standard aligns with the following professional recognition:

- Engineering Council in partnership with The Chartered Institution of Building Services Engineers for Incorporated Engineer (IEng)

# Version log

| Version | Change detail | Earliest start date | Latest start date | Latest end date |
|---|---|---|---|---|
| Revised version awaiting implementation | In revision | 28/02/2025 | Not set | Not set |
| 1.0 | Approved for delivery | 04/10/2017 | 27/02/2025 | Not set |