

Overview of the role

Producing engineering designs and drawings for components, structures and systems used in industrial and commercial construction.

Standard in development

L3: Engineering design technician

Title of occupation

Engineering design technician

UOS reference number

ST0164

Core and options

Yes

Option title/s

Electrical power design technician

Control and instrumentation design technician

Mechanical design technician

Piping design technician

Structural design technician

Level of occupation

Level 3

Route

Engineering and manufacturing

Typical duration of apprenticeship

42 months

Target date for approval

31/12/2023

Resubmission

No

Would your proposed apprenticeship standard replace an existing framework?

No

Does professional recognition exist for the occupation?

Yes

Occupation summary

This occupation is found in a wide range of industries of national importance including but not limited to power and water infrastructure, petrochemical, oil and gas, nuclear, renewables, food and drink processing, defence, chemicals and pharmaceuticals. This is a core and options apprenticeship standard. Apprentices will be trained and assessed against the core and one option. There are five options:

- Electrical power design technician
- Control and instrumentation design technician
- Mechanical design technician
- Piping design technician
- Structural design technician

The broad purpose of the occupation is to contribute to the preparation of design solutions and produce designs, drawings or models for structures, piping, electrical systems, control and instrumentation systems or mechanical components. They must understand technical models, drawings and specifications and be able to create their own. They will identify factors likely to affect design decisions, produce Computer Aided Design (CAD) models and engineering drawings and be able to communicate design information to internal and external parties.

In their daily work, an employee in this occupation interacts with a range of internal and external stakeholders. They are usually based at office locations within project design teams and occasionally work at on-site locations. They are required to understand on-site hazards and health, safety and environmental requirements.

An employee in this occupation will be responsible for contributing to the design of engineering components, structures and systems. They will typically report to an engineering design manager for supervision, greater levels of technical guidance and support, review approvals and sign-off.

Typical job titles

Architectural design technician Building information modelling (bim) technician and industrial design technician Cad technician Control and instrumentation design technician Design technician Draughtsperson Drawing technician Electrical design technician Engineering design technician Engineering designer Mechanical design technician Piping design technician Structural design technician Systems design technician

Are there any statutory/regulatory or other typical entry requirements?

No

Core occupation duties

DUTY	KSBS
Duty 1 Maintain working relationships, communicate and liaise effectively with own project team, customers, and internal and external stakeholders.	K1 K13 K14 K15 K16 S10 S18 B4 B5 B7
Duty 2 Work reliably, effectively, independently and as a member of a team, taking responsibility for their own work.	K1 S10 S12 B3 B4 B5 B6 B7
Duty 3 Meet requirements for health, safety, environmental, sustainability, and ethics in engineering design practice.	K1 K2 K8 K9 K17 S1 S2 S6 S7 S12 B1 B2
Duty 4 Comply with relevant legislation, regulations, company policies and procedures, strategies and technical guidance.	K1 K2 K9 K17 S1 S2 S6 S12
Duty 5 Interpret technical information to establish customer design requirements.	K2 K4 K5 S3 S16
Duty 6 Interpret, check and comment on design intent and make recommendations in line with industry standards where necessary.	K3 K4 K5 S3 S9 S13 S16
Duty 7 Support the identification, analysis and evaluation of factors affecting technical designs.	K4 K5 K7 K8 K9 K10 S4
Duty 8 Support the development of engineering concepts and design options to solve technical challenges.	K3 K5 S19
Duty 9 Contribute to the evaluation of design options to determine the most appropriate solution.	K3 K5 S14 S19
Duty 10 Contribute to the production, review and distribution of the final design package.	K3 K5 S8 S9

DUTY	KSBS
Duty 11 Update designs to incorporate any changes made as built.	K3 K5 S14
Duty 12 Update and maintain documentation and data according to the required change management process, including maintaining and issuing drawing registers.	K1 K2 K3 K14 S11
Duty 13 Assist in the selection of materials and components for their application in designs.	K11 S4 S5
Duty 14 Produce new, and update existing parts lists and bills of materials (BOMs) for associated designs.	K5 K7 K8 K9 K10
Duty 15 Create designs that are suitable, technically feasible and constructable.	K3 K4 K5 K6 K8 K9 K10 K12 K14 K18 S4 S7 S15 S17

Option duties

Electrical power design technician duties

DUTY	KSBS
Duty 16 Produce detailed electrical drawings or models to the specified design intent, according to company and industry codes of practice, regulations, standards and procedures.	K19 K20 K21 K22 K23 S20 S21 S22
Duty 17 Use digital technologies and techniques such as Computer Aided Design (CAD) and Building Information Modelling (BIM) to prepare, produce and present electrical designs in accordance with approved design procedures and systems.	K24 S23

Control and instrumentation design technician duties

DUTY	KSBS
Duty 18 Produce detailed instrumentation and control drawings or models (such as Loop Diagrams, Termination Diagrams, Hook Up Drawings, Schematic drawings, Instrument Datasheets and Schedules) to the specified design intent in accordance with company and industry codes of practice, regulations, standards and procedures.	K25 K26 K27 K28 K29 K30 K31 S24 S25 S26 S27
Duty 19 Use digital technologies and techniques such as Computer Aided Design (CAD) to prepare, produce and present control and instrumentation designs in accordance with approved design procedures and systems.	K32 S27

Mechanical design technician duties

DUTY	KSBS
Duty 20 Produce detailed mechanical drawings or models (part and assembly level) to appropriate company and industry codes of practice, regulations, standards and procedures.	K33 K34 K35 K36 K37 S28 S29 S30 S31 S32
Duty 21 Use digital technologies and techniques such as Computer Aided Design (CAD) to produce detailed 3D models in surfaces or solids of mechanical components at part and assembly levels.	K38 S33

Piping design technician duties

DUTY	KSBS
Duty 22 Produce detailed piping drawings or models including detailed design documentation and data; typically including 3D models, general arrangements (GAs), plant layouts, routing layouts, piping isometrics, fabrication drawings, skids, pipe supports, piping schedules, line lists, valve schedules, bills of materials (BOMs) and piping and instrumentation diagrams (P&IDs).	K39 K40 K41 K42 K43 K44 K45 S34 S35 S37
Duty 23 Use digital technologies and techniques such as Computer Aided Design (CAD), Plant Design Management Systems to prepare, produce and present piping designs in accordance with approved design procedures and systems.	K46 S36

Structural design technician duties

DUTY	KSBS
Duty 24 Produce detailed structural drawings or models to the specified design intent, company and industry codes of practice, regulations, standards and procedures.	K47 K48 K49 K50 K51 S38 S39 S41
Duty 25 Use digital technologies and techniques such as Computer Aided Design (CAD) or Building Information Modelling (BIM) to prepare, produce and present structural designs in accordance with approved design procedures and systems.	K52 S40

KSBS

Knowledge

K1: Requirements of company management systems, policies and procedures and codes of ethical working.

K2: Documentation: methods and requirements, data management and change control - electronic and paper.

K3: Awareness of engineering standards and regulations, relevance to the occupation and technician's responsibilities: International Organisation for Standardisation (ISO),

European Norm (EN) and British Standards (BS) for engineering representations, drawings and graphical information.

K4: Common engineering principles and the application of maths and science to engineering.

K5: Fundamentals of engineering drawing and design as defined by BS8888.

K6: Digital Literacy: Digital interfaces, email, Management Information Systems (MIS), spreadsheets, presentations, word processing, virtual communication, learning platforms, work collaboration platforms. General Data Protection Regulation (GDPR). Cyber security.

K7: Factors to consider in choice of materials and components: cost, quality, physical properties.

K8: Principles of sustainability and the circular economy. Energy efficiency and reuse of materials. Recycling procedures. Principles of control and management of emissions and waste. Efficient use of resources.

K9: Factors to consider in design safety and environmental impact: security, risk, whole life cycle impact, carbon emissions and end of use plans.

K10: Factors to consider in design end-user perspective and experience: ergonomics, aesthetics, the intended use and purpose of the design.

K11: Manufacturing and construction methods.

K12: Relevance and application of Building Information Modelling (BIM).

K13: Verbal communication techniques: Giving and receiving information. Matching style to audience. Barriers in communication and how to overcome them. Engineering terminology.

K14: Written communication techniques: Plain English principles. Report writing.

Engineering terminology

K15: Non-verbal communication techniques: Gestures, facial expressions, tone of voice, eye contact, body language.

K16: Equality Act - Equality, diversity, and inclusion in the workplace. Unconscious bias.

K17: Awareness of health and safety regulations, relevance to the occupation and the technician's responsibilities. Construction (Design and Management) Regulations (CDM), Control of Substances Hazardous to Health (COSHH), Display Screen Equipment, due diligence, electrical safety and compliance, emergency evacuation procedures, Health and Safety at Work etc. Act 1974 – responsibilities, isolation and emergency stop procedures, lone working, management systems of occupational health and safety ISO45001, manual handling, near-miss reporting, noise regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR). Risk assessments, safe systems of work, safety equipment: guards, signage, fire extinguishers, situational awareness, slips, trips and falls, types of hazards. Personal Protective Equipment (PPE), working at height, working in confined spaces.

K18: Constructability principles.

K19: Option 1. Basic electrical principles: Ohms Law, power, terminology, generating, transforming.

K20: Option 1. Principles of electrical regulations: Electricity at Work Regulations 1989, BS7671.

K21: Option 1. The drawing principles, electrical symbols, hatchings notifications and conventions required for producing standard designs.

K22: Option 1. Principles of producing general arrangements and detailed electrical power production drawings.

K23: Option 1. Cable types, specification and installation requirements.

K24: Option 1. Digital tools and techniques used in electrical power engineering design. CAD and BIM.

K25: Option 2. Combinational and sequential logic and control systems.

K26: Option 2. Instrumentation principles and application.

K27: Option 2. Digital and analogue devices and circuits and their application in measurement and control.

K28: Option 2. Principles of producing general arrangements and detailed control and instrumentation production drawings.

K29: Option 2. The drawing principles, electrical symbols, hatchings notations and conventions required for producing standard designs.

K30: Option 2. Cable types, specification and installation requirements.

K31: Option 2. Piping and Instrumentation Diagrams (P&ID).

K32: Option 2. Digital tools and techniques used in control and instrumentation engineering design. CAD.

K33: Option 3. Principles of manufacturing methods: Machining, fabrication and 3D printing.

K34: Option 3. Mechanical annotation: Geometric Dimensioning and Tolerancing (GD&T) symbols, limits and fits, surface finishes.

K35: Option 3. Welding, fixings, fasteners and fabrications, and how to select the appropriate part.

K36: Option 3. Mechanical principles: Motion and mechanics, storage and transfer of forces and energy in operation, motors and pumps.

K37: Option 3. Principles of producing general arrangements and detailed mechanical production drawings.

K38: Option 3. Digital tools and techniques used in mechanical engineering design. CAD.

K39: Option 4. Piping systems, layouts and flow control.

K40: Option 4. Isometrics: how to read and produce isometrics

K41: Option 4. Service conditions: Flow rates, material characteristics, temperature and working pressures.

K42: Option 4. Pipe supports, welding, fittings, valves and associated equipment.

K43: Option 4. Piping and Instrumentation Diagrams (P&ID).

K44: Option 4. Principles of piping general arrangements and design drawings: component identification, connection and instrumentation location.

K45: Option 4. Principles of manufacturing methods: Machining, fabrication and 3D printing.

K46: Option 4. Digital tools and techniques used in piping engineering design. CAD and plant design management systems.

K47: Option 5. Structural design principles.

K48: Option 5. General arrangements of structures showing multiple materials: Steel, concrete, masonry and timber.

K49: Option 5. Principles of producing general arrangements and detailed structural production drawings.

K50: Option 5. Construction design and build processes, methods and details.

K51: Option 5. Principles of structural design drawings: structural symbols, annotation, abbreviations, hatchings, and notations required for producing standard designs.

K52: Option 5. Digital tools and techniques used in structural engineering design. CAD and BIM

Skills

S1: Apply health and safety procedures and safe systems of work in compliance with regulations and standards.

S2: Work in accordance with the design process, company management systems, policies and procedures.

S3: Review and interpret technical information and requirements from different sources such as specifications, engineering drawings, concepts, stakeholders.

S4: Identify and assess factors that affect designs such as materials, application, location, risk and environment.

S5: Select appropriate materials and parts.

S6: Propose appropriate ideas for sustainable engineering concepts to solve engineering challenges.

S7: Develop solutions that can be manufactured or built, proven, operated and maintained during their operational life and decommissioned or recycled at the end of their operational life.

S8: Provide feedback on engineering designs as part of the process to determine the most effective solution.

S9: Apply quality assurance procedures to engineering drawings or models, including own designs and those of peers.

S10: Communicate with others verbally for example, colleagues and stakeholders.

S11: Produce written documents, schedules and reports.

S12: Identify, organise and use resources to complete tasks with consideration for cost, quality, safety, security and environmental impact.

S13: Identify inaccuracies or discrepancies in drawings and specifications and propose solutions.

S14: Incorporate changes to an existing design as a result of any modifications made during the as-built implementation of the design.

S15: Create concepts for system layouts and associated components.

S16: Read and interpret design intent.

S17: Determine the correct tolerances for components of the design.

S18: Follow equality, diversity and inclusion procedures.

S19: Perform simple calculations to use in design drawings.

S20: Option 1. Produce general arrangements of electrical power.

S21: Option 1. Produce detailed drawings of electrical power components such as wires connection, voltage, capacity, main switches.

S22: Option 1. Identify different cable types and appropriate application.

S23: Option 1. Use digital tools such as CAD and BIM to produce electrical power project deliverables such as output drawings and electrical designs.

S24: Option 2. Produce general arrangements of control and instrumentation designs.

S25: Option 2. Produce detailed drawings of control and instrumentation components such as cable numbers, wire colours, junction block numbers and panel identification.

S26: Option 2. Identify different cable types and appropriate application.

S27: Option 2. Use digital tools such as CAD to produce control and instrumentation project deliverables.

S28: Option 3. Produce general arrangements of mechanical designs.

S29: Option 3. Produce detailed drawings of mechanical components such as part dimensions, shape and manufacture.

S30: Option 3. Use measuring tools for reverse engineering.

S31: Option 3. Use analysis systems for motion analysis.

S32: Option 3. Use analysis systems for thermal analysis.

S33: Option 3. Use digital tools such as CAD to produce mechanical project deliverables.

S34: Option 4. Produce general arrangements of piping design.

S35: Option 4. Produce detailed drawings of piping components such as pipework, ducts and fittings and including supports and skids.

S36: Option 4. Use digital tools such as CAD or Plant Design Management Systems to produce piping design project deliverables.

S37: Option 4. Use analysis systems for thermal analysis.

S38: Option 5. Produce general arrangements of structures showing multiple materials such as steel, concrete, masonry, timber.

S39: Option 5. Produce detailed drawings for multiple materials such as steel, concrete, timber or masonry.

S40: Option 5. Use digital tools such as CAD and BIM to produce structural project deliverables.

S41: Option 5. Use analysis systems for thermal analysis.

Behaviours

B1: Take personal responsibility for and promote health and safety.

B2: Take personal responsibility for own sustainable working practices.

B3: Respond and adapt to work demands and situations.

B4: Act ethically.

B5: Act professionally.

B6: Be committed to continued professional development (CPD) to maintain and enhance competence in own area of practice.

B7: Supportive of the needs and concerns of others, for example relating to diversity and inclusion.

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.

Does the apprenticeship need to include any mandated qualifications in addition to the above-mentioned English and maths qualifications?

Yes

Other mandatory qualifications

BTEC Level 3 Diploma in advanced manufacturing engineering (development technical knowledge)

Level: 3

BTEC Level 3 National Diploma in Construction and the Built Environment

Level: 3

BTEC Level 3 National Diploma in Building Services Engineering

Level: 3

BTEC Level 3 National Diploma in Civil Engineering

Level: 3

BTEC Level 3 National Diploma in Electrical and Electronic Engineering

Level: 3

BTEC Level 3 National Diploma in Mechanical Engineering

Level: 3

Professional recognition

This standard aligns with the following professional recognition:

- Institution of Mechanical Engineers (IMechE) for Engineering Technician
- Institution of Structural Engineers (IStructE) for Engineering Technician
- Institution of Engineering and Technology (IET) for Engineering Technician
- Institution of Engineering Designers for Engineering Technician

Consultation

Consultation goes here.

Progression Routes

Supporting uploads

Mandatory qualification uploads

Mandated degree evidence uploads

Professional body confirmation uploads

Involved employers