

# EPA Specification Utilities Engineering Technician



## EPA Specification Section 4 – Utilities Engineering Technician Standard with Amplification and Guidance

### Contacts

This specification has been designed to provide all the advice and guidance you need to prepare yourself and your apprentices for end-point assessment. However, if you have any further questions please contact the EUIAS Help Desk using one of the following:

Help Desk email: [enquiries@euias.co.uk](mailto:enquiries@euias.co.uk)

Help Desk telephone: 0121 713 8310

## The Utilities Engineering Technician standard in detail

The Utilities Engineering Technician consists of:

- Core knowledge (5 elements)
- Core skills (14 elements)
- Behaviours (12 elements)
- Specific skills (10 elements for Electrical, 10 for Mechanical and 13 for Instrumentation Control and Automation)

The following pages list each of the elements of the standard and additional amplification and guidance from EUIAS on the range and depth expected.

Core Knowledge	
Assessed in Multiple Choice Test	
<b>Knowledge</b>	<p>K1 Relevant industry health and safety standards and regulations, and environmental and regulatory requirements</p> <p>K3 Relevant level of theory and principles that underpin the design and function of electro-mechanical and instrumentation systems and equipment</p>
<b>Skills</b>	<p>S9i. Read, understand and interpret computer data and displays</p>

## Core Knowledge: Amplification and Guidance

Assessed in Multiple Choice Test

### **K1 Relevant industry health and safety standards and regulations, and environmental and regulatory requirements**

To include

- Health and Safety: The Health and Safety at Work Act; The Management of Health and Safety at Work Regulations; Provision and Use of Work Equipment Regulations; The Electricity at Work Regulations; Workplace (Health and Safety and Welfare) Regulations; COMAH; Control of Substances Hazardous to Health (COSHH); RIDDOR
- Environment: Environmental Protection Act; Control of Asbestos at Work Regulations; The Hazardous Waste Regulations; Pollution Prevention and Control Act; Control of Pollution Act; The Control of Noise at Work Regulations; The Waste Electrical and Electronic Equipment Regulations
- Personal Protective Equipment (PPE)
- Manual Handling
- Working at Height
- Awareness of Confined Space
- Awareness of Permit to Work
- Warning signs for the main groups of hazardous substances: COSHH, CLP, ISO
- Roles and responsibilities of employers and employees with regard to current relevant protection of health, safety and the environment in the workplace
- The meaning of the term 'risk' and how to rate the level of risk in the workplace

## Core Knowledge: Amplification and Guidance

Assessed in Multiple Choice Test

- The meaning of the term 'hazard' and how to identify specific hazards associated with maintenance and operations
- Company practices and procedures for addressing hazards, accidents and emergencies; appropriate responsible persons; RIDDOR; first aid; handling, maintenance and storage of tools, equipment and materials; safe working practices; isolation and locking-off procedures

### **K3 Relevant level of theory and principles that underpin the design and function of electro-mechanical and instrumentation systems and equipment**

- For **all** pathways to include
- Engineering mathematics:
  - appropriate degree of accuracy
  - use formulae and algebraic expressions to solve problems
  - use Sine, Cosine and Tangent to solve typical engineering problems
  - apply Pythagoras' Theorem
- Engineering theories & principals:
  - energy: electrical; kinetic (rotational and linear movement); potential; heat; chemical
  - primary units of the SI system: length, mass, time, temperature
  - derived units of the SI system: force, stress, density, conductivity, power, capacity
- Common engineering materials:
  - characteristics of metallic and non-metallic materials used in engineering

## Core Knowledge: Amplification and Guidance

### Assessed in Multiple Choice Test

- causes of corrosion in materials
- defects that can occur in materials/products
- select materials to meet specification requirements in a typical engineering environment
- Quality control:
  - understand quality control in function and maintenance of equipment
  - making recommendations whether to re-work, adjust or scrap items/components that do not meet required standards
  - basic principles of document control
  - the importance of quality records and the type of inspection records needed
- Engineering information:
  - extract information from drawings
  - abbreviations and notation used on various standard engineering drawings
  - interpret the information that can be extracted from reference charts, tables, graphs and BS EN standards
  - interpret drawings and labelling
  - use charts, tables, graphs and BS EN standards

#### To include for individual pathways

- Electrical
  - Equipment: switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms
  - Engineering mathematics: calculations involving power, electromotive force and resistance
  - Engineering theories & principals: basic electrical principles

## Core Knowledge: Amplification and Guidance

Assessed in Multiple Choice Test

- ICA
  - Equipment: SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner
  - Engineering mathematics: calculations involving power, voltage, current
  - Engineering theories & principals: theory of analogue and digital systems, basic principles of digital monitoring, basic principles of instrumentation for process monitoring and control
- Mechanical
  - Equipment: bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening
  - Engineering mathematics: calculations involving forces, friction, work done and power
  - Engineering theories & principals: work and power transmission; laws of friction; the relationship between temperature changes and changes in length; define moments of a force

### **S9i Read, understand and interpret computer data and displays.**

- Data from systems including
  - flow statistics
  - pH

## Core Knowledge: Amplification and Guidance

### Assessed in Multiple Choice Test

- dissolved oxygen (DO) measurements
- air flows
- turbidity
- chemical concentrations
- Interpretation to include
  - process performance – within acceptable parameters or not
  - identification of faults and problems
  - compliance with relevant standards

## Core Skills

Assessed in Practical Observation with Questions

### Knowledge

- K2. Maintenance practices, processes and procedures covering a range of waste and water systems, plant and equipment
- K5. Planned, reactive, and predictive maintenance processes, practices and procedures

### Skills

- S2. Follow and comply with industry health and safety and environmental working practices and regulations
- S4. Carry out maintenance activities on a range of waste and water systems, plant and equipment
- S6. Carry out and follow planned, reactive and predictive plant and equipment maintenance procedures
- S7i. Communicate with and provide information and guidance to colleagues in line with personal role and responsibilities
- S8. Handover and confirm completion of engineering activities
- S9ii. Work to technical specifications and supporting documentation
- S10. Adhere to safe working practices and procedures and carry out risk assessments
- S11. Carry out safe isolation of equipment, using permit and lock-off systems as required
- S13i. Maintain equipment and components as required

### Behaviours

- B1. Display a self-disciplined, self-motivated approach whilst recognising personal limitations and seeking advice from fact holders and specialists when required
- B2. Accept responsibility for work of self or others
- B4i. Work effectively and safely when undertaking tasks to approved standards and safe working practices when working alone
- B5. Undertake and complete work in a way that contributes to sustainable development
- B6. Be risk aware and minimise risks to life, property and the environment when undertaking work activities
- B7i. Be quality focused
- B8. Identify, organise and use resources effectively to complete



## Specific Skills

Assessed in Practical Observation with Questions

### Electrical

E4. Use electrical theories and principles to use test equipment for voltage, current and earth resistance testing to maintain the integrity of the electrical system.

E9. Carry out electrical procedures on industrial low voltage systems (up to 1000V AC) operating switchgear, fuses, motor control centres, transformers, manual & automatically controlled drives and motors.

### Mechanical

M2i. Inspect and monitor mechanical systems and maintain mechanical equipment and components.

M8i. Test and service mechanical equipment as part of planned preventative maintenance and/or reactive maintenance programmes.

### Instrumentation Control and Automation

I2i. Maintain instrumentation and control equipment and circuits.

I4i. Use Instrumentation and Control Systems knowledge and skills to maintain instruments, controllers, probes, attachments, cabling, meters and display units.

I7. Test, calibrate and validate fixed and portable analogue and digital instrumentation using approved procedures and standards.

I8i. Maintain and calibrate field instrumentation, communication devices and associated equipment used in system and process control, such as Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems.

I11. Carry out isolation procedures to ensure process or system stability and personnel safety when carrying out operations.

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

K2. **Maintenance practices, processes and procedures** covering a range of waste and water systems, plant and equipment

K5. Planned, reactive, and predictive **maintenance processes, practices and procedures**

S4. Carry out **maintenance activities** on a **range of waste and water systems, plant and equipment**

S6. Carry out and follow planned, reactive and predictive plant and equipment **maintenance procedures**

**Maintenance practices, processes and procedures**, depending on pathway, to include

- Water treatment processes (water dosing, filtration, disinfection)
- Maintenance of plant and equipment within the utilities sector
- RAMS (Risk Assessment and Method Statements)
- Operate control and maintain process control equipment and instrumentation

**Range of waste and water systems, plant and equipment** such as, but not limited to

- Electrical equipment: switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms
- ICA equipment: SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner
- Mechanical equipment: Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

components, chemical dosing equipment

S2. Follow and comply with industry health and safety and environmental **working practices and regulations**

S10. Adhere to safe **working practices and procedures** and carry out risk assessments

**Working practices and regulations / working practices and procedures** such as but not limited to

- Health and Safety: The Health and Safety at Work Act; The Management of Health and Safety at Work Regulations; Provision and Use of Work Equipment Regulations; The Electricity at Work Regulations; Workplace (Health and Safety and Welfare) Regulations; COMAH; Control of Substances Hazardous to Health (COSHH); RIDDOR
- Environment: Environmental Protection Act; Control of Asbestos at Work Regulations; The Hazardous Waste Regulations; Pollution Prevention and Control Act; Control of Pollution Act; The Control of Noise at Work Regulations; The Waste Electrical and Electronic Equipment Regulations
- Personal Protective Equipment (PPE)
- Awareness of Confined Space
- Warning signs for the main groups of hazardous substances
- Roles and responsibilities of employers and employees with regard to current relevant protection of health, safety and the environment in the workplace
- The meaning of the term 'risk' and how to rate the level of risk in the workplace
- The meaning of the term 'hazard' and how to identify specific hazards associated with maintenance and operations

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

- Company practices and procedures for addressing hazards, accidents and emergencies; appropriate responsible persons; RIDDOR; first aid; handling, maintenance and storage of tools, equipment and materials

**Safe working practices**, such as, but not limited to

- isolation and locking-off procedures
- RAMS – as above
- Permits to work
- Hot works permit

S7i. **Communicate with and provide information and guidance** to colleagues in line with personal role and responsibilities

**Communicate with and provide information and guidance**

- Provision of accurate verbal and written reports in line with company policy and procedures
- A polite and courteous service to relevant people

S8. **Handover** and confirm completion of **engineering activities**

**Handover** to include

- chain of command

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

- Verbal handovers
- Written handovers
- Handover documentation
- Correct sign-off procedure

### Engineering activities

- Maintenance procedures
- Operation and control of process equipment
- Inspection and testing of equipment (electrical, mechanical and instrumentation)

S9ii. Work to **technical specifications** and **supporting documentation**

### Technical specifications

- RAMS (Risk Assessment Method Statements)
- Operational manuals
- Manufacturers data sheet
- Commissioning reports

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

### Supporting documentation

- Company recording and reporting documents

S11. Carry out **safe isolation** of equipment, using **permit** and **lock-off systems** as required

- Safely isolate equipment from all sources of energy

S13i. Maintain **equipment** and **components** as required

### Range of equipment and components such as but not limited to

- Electrical equipment: switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms, LV (low voltage) ELV (extra low voltage) circuits
- ICA equipment: SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner
- Mechanical equipment: Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening

## Core Skills: Amplification and Guidance

Assessed in Practical Observation with questions: All pathways

components, chemical dosing equipment

### Behaviours

- B1. Display a self-disciplined, self-motivated approach whilst recognising personal limitations and seeking advice from fact holders and specialists when required
- B2. Accept responsibility for work of self or others
- B4i. Work effectively and safely when undertaking tasks to approved standards and safe working practices when working alone
- B5. Undertake and complete work in a way that contributes to sustainable development
- B6. Be risk aware and minimise risks to life, property and the environment when undertaking work activities
- B7i. Be quality focused
- B8. Identify, organise and use resources effectively to complete

## Specific Skills: Amplification and Guidance

Assessed in Practical Observation with Questions: Electrical

E4. Use **electrical theories and principles** to use test equipment for voltage, current and earth resistance testing to maintain the integrity of the electrical system

**Electrical theories and principles** such as, but not limited to

- Ohms Law
- Watt's Law
- Fleming / left hand right hand rule
- Single phase power
- Three phase power
- Frequency

E9. Carry out **electrical procedures** on industrial low voltage systems (up to 1000V AC) operating switchgear, fuses, motor control centres, transformers, manual & automatically controlled drives and motors

**Electrical procedures**

- Start up and shutdown
- Safe isolations
- Handover
- Fault finding



- Planned and reactive maintenance
- Inspection and testing
- Visual inspections
- Sensory perception: smell touch sight sound

## Specific Skills: Amplification and Guidance

Assessed in Practical Observation with Questions: Mechanical

M2i. Inspect and monitor **mechanical systems** and maintain **mechanical equipment and components**

M8i. Test and service **mechanical equipment** as part of planned preventative maintenance and/or reactive maintenance programmes

**Mechanical systems / mechanical equipment and components** such as, but not limited to

- Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches
- Pumping systems
- Aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters
- Actuators, blowers, compressors, air absorption vessels, air receivers
- Inlet and screening components
- Chemical dosing equipment

## Specific Skills: Amplification and Guidance

Assessed in Practical Observation with Questions: **Instrumentation Control and Automation**

I2i. Maintain **instrumentation and control equipment** and circuits

I4i. Use Instrumentation and Control Systems knowledge and skills to maintain **instruments**, controllers, probes, attachments, cabling, meters and display units

**Instrumentation and control equipment / instruments**, such as but not limited

- SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner

I7. Test, calibrate and validate fixed and portable **analogue and digital instrumentation** using approved procedures and standards

I8i. Maintain and calibrate field instrumentation, communication devices and associated equipment used in system and process control, such as Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems

**Analogue and digital instrumentation**

- Level measurement devices such as transmitters, switches, displacement, RF Probe, ultrasonic
- Flow measurement devices such as transmitters, switches, turbine, magmeter, ultrasonic, rotameters and differential pressure devices eg Venturi, Dall tube, Orifice plate, pitot tube
- Analytical instruments such as gas detection, turbidity, dissolved oxygen
- Digital sensors including proximity, electro-magnetic, infra-red
- Pressure measurement devices such as transmitters, switches, gauges
- Temperature measurement devices such as transmitters, switches, RTD's, thermocouples, thermometers, temperature gauges

## Specific Skills: Amplification and Guidance

Assessed in Practical Observation with Questions: **Instrumentation Control and Automation**

I11. Carry out **isolation procedures** to ensure process or system stability and personnel safety when carrying out operations

### **Isolation procedures**

- Safely isolate equipment from all sources of energy

## Core Skills

### Assessed in Interview

#### Knowledge

K4. Principles and processes that underpin the location, diagnosis and rectification of faults.

#### Skills

S1. Apply technical knowledge to carry out inspections, condition monitoring and reporting.

S3. Locate, diagnose and rectify faults on plant and equipment.

S5. Use workshop machinery and equipment to create, repair and modify component and apparatus.

S7ii. Communicate with and provide information and guidance to contractors, suppliers in line with personal role and responsibilities.

S12. Drive vehicles equipped with tools and materials to job sites.

S13ii. Install, replace and commission equipment and components as required.

S14. As required, undertake standby duties to provide 24-hour cover to remedy fault situations requiring diagnostic testing procedures.

#### Behaviours

B3. Deliver a polite, courteous professional service to customers and members of the public.

B4ii. Work effectively and safely when undertaking tasks to approved standards and safe working practices as part of a team or with appropriate supervision.

B7ii. Be professional in work and in personal standards.

B9. Accept, allocate and supervise technical and other tasks.

B10. Be aware of the needs and concerns of others, especially where related to diversity and equality.

B11. Carry out and record CPD necessary to maintain and enhance competence.

B12. Exercise responsibilities in an ethical manner.

## Specific Skills

### Assessed in Interview

#### Electrical

- E1. Inspect and monitor electrical systems, and inspect, monitor, maintain and repair electrical equipment.
- E2. Test electrical equipment and systems and assist in installing electrical systems and equipment.
- E3. Access a range of sites to install, maintain, test, repair and dismantle electrical equipment.
- E5. Consult design specifications to analyse and calculate electrical system parameters and rectification procedures.
- E6. Interpret electrical drawings to install, position or re-locate electrical equipment and cabling.
- E7. Test, service and repair electrical equipment as part of planned preventative maintenance and/or reactive maintenance programmes.
- E8. Install and connect electrical cables, switchgear, circuit breakers, motors, transformers and other associated equipment.
- E10. Carry out basic fault diagnostics on Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems.

#### Mechanical

- M1. Apply mechanical theories and principles in order to carry out diagnostic fault finding procedures.
- M2ii. Inspect and monitor mechanical systems, and inspect, monitor, dismantle and repair mechanical equipment and components.
- M3. Test mechanical equipment and systems and assist in installing mechanical systems and equipment.
- M4. Basic Fabrication and welding of structures and components.
- M5. Use mechanical knowledge and skills to install, maintain and dismantle a wide range of complex plant, machinery and components.
- M6. Consult design specifications to analyse and calculate mechanical system parameters and rectification procedures.
- M7. Interpret plans and drawings to install, position or re-locate mechanical equipment and components.
- M8ii. Repair mechanical equipment as part of planned preventative maintenance and/or reactive maintenance programmes.
- M9. Install and maintain mechanical components including motors, pumps and gearboxes, maintaining and replacing lubricants.
- M10. Inspect and maintain condition monitoring equipment.

## Specific Skills

### Assessed in Interview

#### **Instrumentation Control and Automation**

- I1. Apply theories and principles of electronics to use equipment to carry out diagnostic fault finding procedures.
- I2ii. Repair and overhaul instrumentation and control equipment.
- I3. Test and Calibrate Instrumentation and control equipment and circuits and assist in installing instrumentation and control equipment.
- I4ii. Use instrumentation and Control Systems knowledge and skills to install, and dismantle instruments, controllers, probes, attachments, cabling, meters and display units.
- I5. Carry out telemetry outstation and internal system configuration.
- I6. Identify and resolve data quality and calibration issues.
- I8ii. Repair and configure field instrumentation, communication devices and associated equipment used in system and process control, such as Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems.
- I9. Use standards and specifications to improve the information gathered by telemetry data.
- I10. Inspect and maintain security equipment, telecommunication devices and alarm systems.
- I12. Provide support to day-to-day users of instrumentation and control systems.
- I13. Complete data cleansing to ensure consistent and valid data is available for business and regulation purposes.

## Core Skills: Amplification and Guidance

Assessed in Interview: All pathways

K4. **Principles and processes** that underpin the location, diagnosis and rectification of faults  
S3. Locate, diagnose and rectify faults on plant and equipment

**Principles and processes** such as, but not limited to

- Sensory perception: visual, smell, touch, sound
- Six point technique
- Half split method
- Input to output technique
- Functional testing
- Unit substitution
- Injection and sampling techniques
- Equipment self-diagnostics

S1. Apply **technical knowledge** to carry out inspections, condition monitoring and reporting (see E1, E3, M2, M10, I2)

**Technical knowledge**

- Maintenance and repairing of equipment
- Defects and their causes

## Core Skills: Amplification and Guidance

Assessed in Interview: All pathways

- Calibration of equipment
- Company recording and reporting procedures

S5. Use **workshop machinery and equipment** to create, repair and modify **component and apparatus**

**Workshop machinery and equipment** including, but not limited to

- Drills, grinders, bearing heaters and/or pullers, test bench
- Safe operating of equipment

**Component and apparatus** including but not limited to

- Electrical equipment: switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms, LV (low voltage) ELV (extra low voltage) circuits
- ICA equipment: SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner
- Mechanical equipment: Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening components, chemical dosing equipment



## Core Skills: Amplification and Guidance

Assessed in Interview: All pathways

S7ii. **Communicate with and provide information and guidance** to contractors, suppliers in line with personal role and responsibilities

### **Communicate with and provide information and guidance**

- Provision of accurate verbal and written reports in line with company policy and procedures
- A polite and courteous service to relevant people

S12. **Drive vehicles** equipped with tools and materials to job sites

### **Drive vehicles**, if required

- Full driving licence or demonstrate progress to working towards achieving a full driving licence
- Complying with company driving procedures
- Carry out vehicle checks
- Safely load vehicles

S13ii. Install, replace and commission **equipment and components** as required

## Core Skills: Amplification and Guidance

Assessed in Interview: All pathways

### Equipment and components including

- Electrical equipment: switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms, LV and ELV circuits
- ICA equipment: SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner
- Mechanical equipment: Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening components, chemical dosing equipment

S14. As required, undertake **standby duties** to provide 24-hour cover to remedy fault situations requiring diagnostic testing procedures

### Standby duties if required

- A willingness to undertake priority out of hours work activities
- Provide an explanation of the hazards of working alone out of hours in line with the company procedures

### Behaviours

B3. Deliver a polite, courteous professional service to customers and members of the public

B4ii. Work effectively and safely when undertaking tasks to approved standards and safe working practices as part of a team or with appropriate supervision

## Core Skills: Amplification and Guidance

Assessed in Interview: All pathways

- B7ii. Be professional in work and in personal standards
- B9. Accept, allocate and supervise technical and other tasks
- B10. Be aware of the needs and concerns of others, especially where related to diversity and equality
- B11. Carry out and record CPD necessary to maintain and enhance competence
- B12. Exercise responsibilities in an ethical manner

## Specific Skills: Amplification and Guidance

### Assessed in Interview: Electrical

- E1. Inspect and monitor **electrical systems**, and inspect, monitor, maintain and repair **electrical equipment**  
 E3. Access a range of sites to install, maintain, test, repair and dismantle **electrical equipment**  
 E2. Test **electrical equipment and systems** and assist in installing **electrical systems and equipment**  
 E7. Test, service and repair **electrical equipment** as part of planned preventative maintenance and/or reactive maintenance programmes  
 E5. Consult design specifications to analyse and calculate **electrical system** parameters and rectification procedures

#### **Electrical systems and equipment** include

- LV (low voltage) ELV (extra low voltage) systems
- AC and DC power systems
- Motors and starters
- Switchgear and distribution panels
- Control systems and components
- Lighting systems
- Switchgear, circuit breakers, motors, transformers, motor control centres, drive mechanisms

- E6. Interpret electrical drawings to install, position or re-locate electrical equipment and cabling  
 E8. Install and connect electrical cables, switchgear, circuit breakers, motors, transformers and other associated equipment

#### **Electrical drawings**

- Refer to technical drawings to confirm specification

## Specific Skills: Amplification and Guidance

Assessed in Interview: Electrical

E10. Carry out **basic fault diagnostics** on Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems

### Basic fault diagnostics

- Using diagnostic equipment such as multimeter, multi-functional tester, network analysers, insulation resistance testers to identify faults such as
  - Input/output
  - Bad limit switch, bad motor
  - Power supply
  - Broken / damaged equipment
  - Equipment not earthed
  - Faulty sensors
  - Closed/open circuit devices

## Specific Skills: Amplification and Guidance

Assessed in Interview: Mechanical

M1. Apply mechanical theories and principles in order to carry out diagnostic fault finding procedures

### **Mechanical theories and principles**

- Forces, motion, space, time, mass, work, energy
- Newton's Laws
- Torque

### **Fault finding procedures**

- Sensory perception: visual, smell, touch, sound
- Six point technique
- Half split method
- Input to output technique
- Functional testing
- Unit substitution
- Injection and sampling techniques
- Equipment self-diagnostics

## Specific Skills: Amplification and Guidance

Assessed in Interview: Mechanical

M2ii. Inspect and monitor **mechanical systems**, and inspect, monitor, dismantle and repair **mechanical equipment and components**

M10. Inspect and maintain **condition monitoring equipment**

M3. Test **mechanical equipment and systems** and assist in installing mechanical systems and equipment

M7. Interpret plans and drawings to install, position or re-locate **mechanical equipment and components**

M8ii. Repair **mechanical equipment** as part of planned preventative maintenance and/or reactive maintenance programmes

M9. Install and maintain **mechanical components** including motors, pumps and gearboxes, maintaining and replacing lubricants

### **Mechanical systems / mechanical equipment and components**

- Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening components, chemical dosing equipment

### **Condition monitoring equipment** such as, but not limited to

- Vibration analysis, thermal imaging, ultrasonics, motor testing, laser alignment

M4. Basic **fabrication** and **welding** of structures and components

### **Fabrication including**

- Sheet metal, plate

## Specific Skills: Amplification and Guidance

Assessed in Interview: Mechanical

**Welding techniques and positions** such as, but not limited to

- Lap, fillet, tee, butt, horizontal-vertical, vertical up, overhead, vertical down

M5. Use mechanical knowledge and skills to install, maintain and dismantle a wide range of complex **plant, machinery and components**

**Plant, machinery and components**

- Bearing types, couplings type, belt/chains driven devices, gaskets, gearboxes, gland packing, impellers, mechanical seals, valves and penstocks, process equipment, position sensors, heat exchangers, proximity devices including sensors, solenoids, limit switches, pumping systems, aerators, filters and filter systems, scrapers and scraper systems, rotating biological contactors, digesters, actuators, blowers, compressors, air absorption vessels, air receivers, inlet and screening components, chemical dosing equipment

M6. Consult design specifications to analyse and calculate **mechanical system parameters** and rectification procedures

**Mechanical system parameters** including

- Vibration
- Pressure
- Contamination
- Purity



## Specific Skills: Amplification and Guidance

Assessed in Interview: Mechanical

- Level
- Flow
- Trend analysis

## Specific Skills: Amplification and Guidance

Assessed in Interview: Instrumentation Control and Automation

11. Apply **theories and principles** of electronics to use equipment to carry out diagnostic fault finding procedures

### Theories and principles

- Voltage, current, power, sine waves
- Single phase circuits, series and parallel circuits
- Electronic amplifier circuits, AC and DC circuits
- Design and test of digital electronic circuits used in electro-mechanical systems
- Bernoullis Principle (circuit theory?)
- Norton's Theorem

### Fault finding procedures

- Sensory perception: visual, smell, touch, sound
- Six point technique
- Half split method
- Input to output technique
- Functional testing
- Unit substitution
- Injection and sampling techniques

## Specific Skills: Amplification and Guidance

Assessed in Interview: Instrumentation Control and Automation

- Equipment self-diagnostics
- Trend analysis

I2ii. Repair and overhaul **instrumentation and control equipment**

I3. Test and calibrate **instrumentation and control equipment** and **circuits**, and assist in installing **instrumentation and control equipment**

### **Instrumentation and control equipment**

- SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner

### **Circuits**

- Single phase circuits, series and parallel circuits
- Electronic amplifier circuits, AC and DC circuits
- Test of digital electronic circuits used in electro-mechanical systems

I5. Carry out **telemetry** outstation and internal system configuration

I6. Identify and resolve data quality and calibration issues

I9. Use standards and specifications to improve the information gathered by **telemetry** data

### **Telemetry**

- Sensors

## Specific Skills: Amplification and Guidance

Assessed in Interview: Instrumentation Control and Automation

- Transmitters
- Communications technologies
- Software

### Calibration issues

- Hysteresis
- Repeatability
- Linearity
- Temperature
- Gravity

I4ii. Use Instrumentation and Control Systems knowledge and skills to install, and dismantle **instruments**, controllers, probes, attachments, cabling, meters and display units

I8ii. Repair and configure field instrumentation, communication devices and associated equipment used in system and process control, such as Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems

I10. Inspect and maintain security equipment, telecommunication devices and alarm systems

### Instruments

- SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner

I12. Provide support to day-to-day users of **instrumentation and control systems**

## Specific Skills: Amplification and Guidance

Assessed in Interview: Instrumentation Control and Automation

### Instrumentation and control systems

- SCADA units, sensors, analysers, pressure transmitter, level transmitter, flow transmitter, temperature transmitter, valve positioner

I13. Complete data cleansing to ensure consistent and valid data is available for business and regulation purposes

- Ensuring data is captured and presented in the relevant format
- Ensuring data is relevant and of the quality required