
L3 EPA Engineering Construction Pipefitter



EPA Specification Section 4 – The MOET 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 endpoint 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
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The Engineering Construction Pipefitter standard in detail

The Engineering Construction Pipefitter consists of:

- Knowledge (9 elements)
- Skills (11 elements)
- Behaviours (9 elements)

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

Knowledge

K1 Relevant health, safety and environmental legislation, regulations and company-specific requirements for safe working practices and procedures.

K2 Importance and benefits of recognised Industry safety passport schemes.

K3 How to work safely, personal site safety responsibilities and how to respond to and provide solutions to problems and emergencies.

K4 Engineering practices and principles including reading engineering drawings and marking out techniques.

K5 Mathematical techniques and formula related to the fabrication, development and installation of pipework systems.

K6 How to correctly select and safely use hand tools, mechanical tools and equipment in differing environments for the fabrication, repair, installation and decommissioning of pipework systems.

K7 Common and specialist pipe materials such as ferrous, non-ferrous and non-metallic including fittings associated with the pipework components and systems.

K8 Pipework preparation, fabrication, installation, maintenance, testing and decommissioning techniques commonly used throughout the Engineering Construction industry.

K9 Appropriate codes, practices and industry standards and their application to ensure quality requirements are met.

Knowledge: Amplification and Guidance

K1 Relevant health, safety and environmental legislation, regulations and company-specific requirements for safe working practices and procedures

- Health and Safety at Work Act (HASAWA). To include employer and employee duties, PPE.
- Noise at Work Regulations. To include employer and employee duties, PPE.
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR). Considerations such as knowing what to do when an accident occurs; ensuring reporting takes place.
- Control of Substances Hazardous to Health (COSHH). Considerations such as lubricating fluid for tools and equipment, coefficient lubricants for mechanical bolting e.g. Molykote and copperslip, cutting fluids, welding fume.
- Classification, Labelling and Packaging (CLP) regulation. Considerations such as identification of basic labelling symbols, associated hazard, advice.
- Provision and Use of Work Equipment Regulations (PUWER). Legislation regarding equipment such as grinders, hand tools, pipe benders, pressure testing equipment.
- Personal Protective Equipment at Work Regulations. Considerations such as PPE must be visually examined, must be worn, used in accordance with the instructions, take reasonable care of it, report loss or defect.
- Abrasive Wheels Regulations. Considerations such as HAVS, handheld grinders, hand/eye injuries, exposure limits (trigger times).
- Lifting Operations and Lifting Equipment Regulations (LOLER). Considerations such as the safe use of lifting equipment, lifting operations colour coding.
- Pressure testing procedures such as: HSE Guidelines (GS4 Safety in Pressure Testing), hydraulic and pneumatic tests, pumps, gauges, hoses, fittings, charts, pressure testing safety.
- Environmental considerations such as: waste disposal management, environmental conditions (e.g. untidy workplace or poor ventilation).

Knowledge: Amplification and Guidance

- Manual handling considerations such as: manual handling risks, musculoskeletal disorders, kinetic lifting techniques, team lifting.
- Method statements. Considerations such as: introduction and scope, key personnel, reference documents, any special requirements, detailed plan of execution, essential equipment, hazards, timing, emergency/environmental arrangements.
- Risk assessments. Considerations such as generic risk assessments, task/personal risk assessments (e.g. time out for safety, point of work risk assessments, etc), limiting the exposure to risks by identifying all potential hazards then implementing adequate control measures, working at height.
- Emergency procedures such as: raising the alarm, knowing your fire extinguishers, evacuation procedures, emergency actions, fire prevention, toxic alert systems, knowing where toxic refuges are.
- First aid procedures such as: knowing who the nominated first aiders are, location of first aid provisions.
- Pressure Systems Safety Regulations (PSSR) To include employer and employee duties.
- Pressure Equipment Directive (PED).
- Pressure Equipment Regulations (PER).

K2 Importance and benefits of recognised industry safety passport schemes

- Ability to work safely on different sites.
- Ensure competence of workers.
- Accessibility to sites.
- CCNSG (Client Contractor National Safety Group).
- CSCS (Construction Skills Certificate Scheme).
- ACE Card. (Assuring Competence in Engineering).
- EMSS Card (Essential Minimum Safety Standards).

Knowledge: Amplification and Guidance

K3 How to work safely, personal site safety responsibilities and how to respond to and provide solutions to problems and emergencies

- Health and Safety legislation such as: PUWER, HASAWA, LOLER, COSHH, RIDDOR. Consequences of not following legal Health and Safety responsibilities.
- Company or site inductions such as: policies & procedures (such as drug & alcohol, mobile phones, fire & emergency procedures, first aid & medical facilities, site security, traffic and pedestrian management, minimum PPE requirements, loose clothing)
- Risk assessments, permits, method statements.
- Specific site safety procedures such as: evacuation procedures, muster points, safe havens, emergency phone numbers, alarms.
- First Aid procedures such as first aid training, first aid, personnel.
- Waste disposal management such as: the disposal of different types of waste including toxic, plastics, wood, metals in conjunction with the sites waste disposal management policy.

K4 Engineering practices and principles including reading engineering drawings and marking out techniques

- Isometric Drawings, First and third angle projection drawings, 3D and CAD drawings. Information such as measurements, pipe size, fittings, outside diameters, tolerances, pipe falls, coordinates and elevations, hatch lines, penetrations, flows, BOM. (Bill of Materials), specifications, Non-Destructive Examination requirements (NDE), pressure testing requirements, Welding Procedure Specification (WPS), bolt hole orientation, in line item symbols, in line item orientation, pipe off sets and rolling offsets.
- Piping and Instrument Diagrams (P&ID) such as: symbols, instrumentation, process flows, isolations, branches, reducers.
- General Arrangements. (GA) such as: locations, overall compositions, structures.
- Branch Making such as: templates, formulae, equal and unequal, square and lateral, tools and equipment.
- Datum Lines such as: pipe centre lines, segmenting a pipe, tolerances, references, measurements, dimensions.

K5 Mathematical techniques and formula related to the fabrication, development and installation of pipework systems

Knowledge: Amplification and Guidance

- Surface areas, circumferences, section areas, pipe diameter, pipe weights, cut lengths of pipe, volume of a cylinder, trigonometry, triangle formulas.
- Branch pattern development such as: template drawings, development formulae, datum lines, mitres.
- Offsets, rolled offsets such as: run, travel, roll, angles, formulas.
- Torque values for controlled bolting such as: torque settings, bolts, gaskets, flanges, lubricants, co-efficient, k factor.
- Knowledge of calculations (but not the calculation) for safe distances in pressure testing, pressure, fittings.

K6 How to correctly select and safely use hand tools, mechanical tools and equipment in differing environments for the fabrication, repair, installation and decommissioning of pipework systems

- Marking out tools such as scribes, centre punches, Vernier callipers, line of chords, set/plate square, chalk line.
- Suitable surfaces such as: template paper, suitable clean benches and floors.
- Hand tools such as: files, saws, hammers, centre, levels, spanners, wraparounds, protractor, pipe stands, alignment tools, nut splitters, pipe wrenches.
- Mechanical tools and equipment such as: grinders, internal grinders, prepping machines, band saws, sanders, drills, hydraulic pipe bending machines, threading machines, impact wrenches, oxy fuel cutting equipment.
- Lifting equipment such as: slings, blocks, pull lifts, shackles.
- Mechanical joint integrity tools such as: torque wrenches, backing spanners, tensioning tools.
- Pressure testing equipment such as: test rig, gauges, pumps, hoses, valves, graphs, charts.

K7 Common and specialist pipe materials such as ferrous, non-ferrous and non-metallic including fittings associated with the pipework components and systems

To include the properties and heat effects on the materials listed below:

Knowledge: Amplification and Guidance

- Ferrous metals such as: carbon steel, cast iron, chrome Molybdenum, stainless steel, Duplex and super duplex, Cunifer
- Non-ferrous metals such as: copper, aluminium, brass, Monel, titanium, Inconel, Hastelloy
- Non-metallic materials such as:
 - Plastics e.g. ABS, HDPE, PE, PP, PVC, PVC-U.
 - Glass Reinforced Plastic (GRP)
 - Glass Reinforced Epoxy (GRE)
 - Glass
 - Cement
- Lined or Clad materials such as:
 - Cement lined
 - Glass lined
 - PTFE lined
 - Rubber lined
 - Fibreglass Reinforced Plastic (FRP) lined

Pipework fittings and components:

- 90/45-degree elbows (Short radius, long radius) such as: threaded, socket welded, butt welded, crimped, soldered, brazed, compression
- Tee Pieces such as: lateral and equal lateral, threaded, socket welded, butt welded, crimped, soldered, brazed, compression
- Integrally reinforced branch connections. Variants such as: equal branched, lateral branched, elbow branched; with connections of: butt welded, socket welded, threaded.
- Stub ends
- Caps, plugs

Knowledge: Amplification and Guidance

- Unions
- Cross
- Adapters
- Couplings
- Nipples
- Flanges, blind flanges, lap joint flanges. Including types of face such as full faced, raised faced, Ring Type Joint (RTJ); Including connection types such as: weld neck, slip on flanges, socket welded, screwed.
- Reducers such as: eccentric and concentric

K8 Pipework preparation, fabrication, installation, maintenance, testing and decommissioning techniques commonly used throughout the Engineering Construction industry

- Risks and hazards associated with pipe shaping, assembly and fabrication.
- Use of technical drawings such as: isometric drawings, P&ID, general arrangements, first and third angle projections, orthographic projections.
- Creating cutting lists such as: identification of fitting types, deduction of appropriate lengths and welds gaps.
- Working to tolerances.
- Correct installation of pipework systems such as: spring free installation
- Safe use of hand and power tools such as: files, spanners, hand saws, grinders, internal grinders, prep machine, pipe clamps, pipe supports, torque wrenches/backing spanners, nut splitters, reciprocating saws.
- Bolt tightening sequences.
- Gaskets. Including identification of, safe handling, checking for damage, correct installation.
- Removal of pipework systems such as: hazards associated with removal of pipework, estimating weights, identifying isolations, safe method

Knowledge: Amplification and Guidance

of breaking flanges.

- Pressure test procedures such as the differences between hydrostatic and pneumatic pressure testing.
- Pipe chamfer/root face and gaps.
- Pipe supports such as: hangers, shoes, U-bolts, spring pots, dynamic restraints, sliders, rollers, guides, anchors.
- Pipework expansion such as: bellows, expansion loops, flexible hoses, sliding joints.

K9 Appropriate codes, practices and industry standards and their application to ensure quality requirements are met

Have an awareness of company, manufacturer, national and international standards* such as

Piping design codes e.g.:

- ASME B31 - American Society of Mechanical Engineers (ASME) code for pressure piping
- ISO EN 13480 – European metallic industrial piping
- ASME Dimensional Standards

Flange joint integrity

The Manufactures Standardisation Society (MSS)

ASTM International – American Society for Testing and Materials

Company quality assurance and quality control procedures.

*A checklist of standards is provided in Section 7

Skills

- S1** Comply with appropriate health and safety, risk and quality requirements.
- S2** Correctly select and safely use tools and equipment for the fabrication, assembly, installation and decommissioning of pipework components and systems.
- S3** Plan, organise and undertake the fabrication, assembly, installation, maintenance and decommissioning of pipework components and systems.
- S4** Read, interpret and apply engineering drawing information.
- S5** Shape pipework components using hand and power tools to cut, drill, shape and finish components to the required tolerance, specification and standard.
- S6** Assemble and install pipework using the appropriate methods, techniques and equipment in accordance with the specification including welded, threaded, bolted and clamped jointing solutions.
- S7** Ensure the integrity of joints in accordance with specifications, in line with specified quality procedures and to precise tolerances.
- S8** Undertake the testing and inspection of the fabricated and/or installed pipework using the appropriate techniques.
- S9** Work with others and contribute to effective working relationships within an Engineering Construction environment.
- S10** Apply techniques for the temporary or permanent removal of an engineering construction piping related system or component.
- S11** Communicate by keeping others informed about work plans or activities which may affect them and seek assistance from others without causing undue disruption to normal work activities.

Skills: Amplification and Guidance

S1 Comply with appropriate health and safety, risk and quality requirements

Compliance with Health and Safety activities could include, taking part in or facilitating toolbox talks, filling in the appropriate safety paperwork, such as:

- The participation and following of the sites risk assessments and identification of potential hazards.
- Compliance with the different permit to work systems.
- Participation and following of method statement documents.
- The participation in the site/company inductions and toolbox talks.
- The understanding and compliance of technical drawings.
- Understanding of the relevant legislation associated with the pipefitting trade.
- Understanding site safety systems.
- Understanding and following the site/company quality procedures.

S2 Correctly select and safely use tools and equipment for the fabrication, assembly, installation and decommissioning of pipework components and systems

This includes:

- The safe withdrawal, from stores, of the relevant tools and equipment for the task.
- The reading of manuals and safety procedures appertaining to the task.
- The use of tools and equipment such as:
 - The safe and accurate use of bandsaw, threading machines, handheld threading equipment (banjos), hydraulic pipe bending machines, handheld grinder and internal grinder, reciprocating saws, prep machines, various drills such as pedestal drills, pistol drills, hammer drills, magnetic drills.
 - The safe and proper use hand tools such as hacksaws, various files such as the half round file and round file, hammers, combination

Skills: Amplification and Guidance

- spanners, pipe wrenches.
- A good understanding of torque wrenches, backing spanners, alignment tools and all other tools and equipment used in the controlled bolting process.
- The safe and accurate use of profile burners and other oxy-fuel cutting equipment.
- The safe use and a good understanding of basic lifting equipment such as strops, chains, blocks, pull lifts, shackles.

S3 Plan, organise and undertake the fabrication, assembly, installation, maintenance and decommissioning of pipework components and systems

- The planning and organising of the task. To include: understanding and complying with the RAMS or and permit to work, completing a personal risk assessment, identifying deficiencies or changes required to the RAMS or permit to work, obtaining of the correct drawings or procedures and of the correct tools and equipment for the task.
- The setting up of the work area. To include: a safe setting and environment for the task, making sure correct power supplies are connected.
- The material edge preparation. To include: the safe use of hand tools and power tools, the compliance with the drawings or specifications ensuring that tolerances are followed. The correct metal finishes should be obtained using the correct tools and measurements.
- Assembly such as: the fabrication of pipe spools from a drawing or specification using a variety of methods and fittings such as welded, threaded or the use of sockets. Bending could also be considered in this process.
- Installation. To include: the use of flanged pipework using the correct techniques, the safe use of the mechanical joint integrity procedures, the use of the welding process setting up field welds, installing screwed pipework.

Specific skills to look for could include:

- Reading and understanding technical drawings and isometrics.
- Accuracy of metal preparation.
- Use of spanners and torque wrenches.

Skills: Amplification and Guidance

- Tension settings.
- Correct gasket selection.
- Flange tightening sequences.
- Isolation procedures.
- Correct disassembling procedures.

S4 Read, interpret and apply engineering drawing information

- Isometric Drawings, first angle and third angle projection drawings, 3D and CAD drawings. To be able to demonstrate the following: to accurately measure; to fabricate items within tolerance; identify pipe sizes; identify and select fittings; to measure and identify outside diameters; identify and demonstrate pipe falls; follow coordinates and elevations; to match up hatch lines; identify penetrations; identify flows; understand and check BOM (Bill of Materials); understand the specifications; understand and identify what the Non Destructive Testing (NDE) requirements are; identify and undertake the required pressure testing; identify the Welding Procedure Specification (WPS); identify and ensure the correct bolt hole orientation; understand in line item symbols/in line item orientation; identify off sets and rolling offsets.
- Piping and Instrument Diagrams (P&ID). Such as: demonstrating and understanding of symbols, instrumentation, process flows, isolations, branches, reducers.
- General Arrangements. (GA). Such as: demonstrating and understanding locations, overall compositions, structures.
- Branch Making. Such as: demonstrating development of templates, formulae, equal and unequal branches, square and lateral, selecting the tools and equipment to be able to make branches.
- Datum Lines. Such as: demonstrating the ability to comply with tolerances, references, measurements, dimensions, mark out pipe centre lines and segmenting of a pipe.

S5 Shape pipework components using hand and power tools to cut, drill, shape and finish components to the required

Skills: Amplification and Guidance

tolerance, specification and standard

- Preparing pipework for welding following the technical instructions and specifications.
- Cut pipework using a handsaw, bandsaw and grinders to tolerance and specification.
- Preparing threaded pipework using hand-held and machine threading equipment.
- Drilling pipework by using different machines such as pistol drill, magnetic drill, pedestal drill to the required specification and tolerances.
- Hydraulic and manual bending of pipe and using the correct techniques and bending equipment to tolerance and specification.
- Manual bending of tubing using the correct techniques and bending equipment to tolerance and specification.
- The safe and accurate use of thermal cutting equipment such as hand-held oxy fuel, plasma cutting equipment and profile burners.
- Branch development preparation equal and lateral, drawing and cutting out branch templates, followed by transferring the branch template to pipe and developing the branch using hand tools to tolerance and specification.

S6 Assemble and install pipework using the appropriate methods, techniques and equipment in accordance with the specification

- The assembling methods and techniques used in the controlled bolting process such as correct bolting sequences and use of alignment equipment.
- The safe and accurate setting up of weld butts, following the specifications for the welder with correct chamfer angles, weld gaps and root faces.
- The correct use of 'bullet tacks' for thicker walled pipework.
- The assembling of threaded pipework using the correct fittings and joining compounds; ensuring that the pipework is correctly aligned and within the tolerances stated.
- The assembling of socket pipework, following the specifications/drawings and ensuring expansion gaps are used; ensuring that the pipework is correctly aligned and within the tolerances stated.

Skills: Amplification and Guidance

- When installing the pipework following the correct specifications and technical drawing information such as elevations, orientations and co-ordinations.
- Utilising basic lifting equipment to position and install the pipework to reduce the manual handling required.
- The installing of pipe supports such as shoes, U-bolts, spring pots, guides and anchors to the correct specification and technical drawing information.

S7 Ensure the integrity of joints in accordance with specifications, in line with specified quality and to precise tolerances

- Knowledge of the legislation associated with joint integrity.
- Compliance with the technical drawing (Isometric, P&ID).
- Hazards and risk assessments.
- Correct checking and cleaning of the jointing surface.
- Correct gasket, bolt, washer, bolt lubrication selection as required according to the drawings and specifications.
- Bolt lubrication and coefficient.
- Correct gasket insertion and placement.
- Flange alignment. To include different alignment methods and tools.
- Correct tensioning tool selection and pre-setting.
- Correct torque values, safe use of torque wrenches.
- Controlled bolting.
- Correct flange bolt sequencing.
- Using the correct backing spanners.
- Using the correct tensioning tools.

Skills: Amplification and Guidance

- Checking the completed joint for adherence to tolerances and specifications.
- Following the correct company, site, specification and legislative quality requirements.

S8 Undertake the testing and inspection of the fabricated and or installed pipework using the appropriate techniques

- Following legislative, company, site pressure test procedures and specifications.
- Different types of pressure testing such as strength/proof tests and leak tests.
- Awareness of the GS4 HSE pressure testing guidelines.
- The safe use of pressure test rigs ensuring they are rated appropriately in date and tagged correctly.
- The safe areas of work including designated testing areas, barriers and signs.
- Risks and hazards associated with pressure tests.
- The safe use of positive displacement pumps and mechanical pumps.
- The use of hoses ensuring they are rated appropriately in date and tagged correctly.
- The correct use of pressure recorders ensuring the calibration dates are correct and temperature and time are factored in and recorded.
- The different types of test medium such as hydrostatic, pneumatic and hydraulic tests.
- The use of analogue and digital gauges and their accuracy and eccentricities.
- The safe use of pressure relief valves.
- A good knowledge of PUWER and how it relates to testing.
- Inspection of fabricated and installed pipework by utilising measuring devices, levels, plate squares, theodolites to ensure they meet the required drawings and specifications.
- QA and QC company procedures such as fabrication control sheets, erection control sheets, pre-test check sheets, post-test checklist, punch lists and snagging.

Skills: Amplification and Guidance

S9 Work with others and contribute to effective working relationships within an Engineering Construction environment

- Good communication with work colleagues and clients.
- A good working knowledge of relevant Health and Safety legislation.
- Developing effective working relationships with colleagues, clients, management other people on site etc.
- Good communication of work plans, promoting positive conversations on how the task may effectively be completed.
- Good concise information given on handovers.

S10 Apply techniques for the temporary or permanent removal of an engineering construction piping related system or component

- Hazard and risk assessments.
- Legislation.
- Technical drawings (P&ID, Isometrics).
- Isolations.
- Safely break a flanged joint that has residual product in it.
- Installing slip plates, blind flanges, turning figure 8 spectacle blinds.
- Cold cutting of pipework such as handheld reciprocating saws, chain mounted reciprocating saws, clam shell/split frame cutters, manual wheeled/rotary pipe cutters.
- Controlled bolting.
- Hot bolting.

Skills: Amplification and Guidance

- Torque settings.
- Torque and tensioning tools.
- Waste disposal management.
- Removing spool pieces, individual valves or other in line equipment such as pumps, heat exchangers, filters etc.

S11 Communicate by keeping others informed about work plans or activities which may affect them and seek assistance from others without causing undue disruption to normal work activities

- HSE guidelines.
- Method statements.
- Permit to work.
- Signage.
- Roles and responsibilities.
- Handovers.
- Identifying that their work will influence others around them.
- Effectively and efficiently communicating with other personnel who may be above, below or adjacent to their work area to inform them of their work plans.
- Requesting assistance from colleagues and others without wasting their time.

Behaviours

- B1** Work with others to effectively and efficiently complete the allocated tasks.
- B2** Solve problems within their area of responsibility by applying technical skills and knowledge to define, identify, evaluate and select alternative solutions if required.
- B3** Take responsibility as an individual and team member for the quality of the work.
- B4** Support their own learning and development and that of others through activities such as mentoring and sharing of expertise and knowledge.
- B5** Act ethically, displaying maturity, honesty, integrity and responsibility.
- B6** Work safely in accordance with health, safety and environmental legislation, regulations and company-specific requirements.
- B7** Maintain a safe, clean and tidy work area.
- B8** Check for and identify potential hazards in the workplace and take collective responsibility to maintain a safe working environment.
- B9** Question unsafe behaviours and incorrect work practices and procedures.

Behaviours: Amplification and Guidance

B1 Work with others to effectively and efficiently complete the allocated tasks

- Sharing workload fairly between team members.

B2 Solve problems within their area of responsibility by applying technical skills and knowledge to define, identify, evaluate and select alternative solutions if required

This could include:

Behaviours: Amplification and Guidance
<ul style="list-style-type: none"> ● Potential clashes within the pipework systems ● Accessibility for equipment on site ● Calculations on site runs
B3 Take responsibility as an individual and team member for the quality of the work
<ul style="list-style-type: none"> ● Ensuring work completed meets the required specifications and tolerances.
B4 Support their own learning and development and that of others through activities such as mentoring and sharing of expertise and knowledge
B5 Act ethically, displaying maturity, honesty, integrity and responsibility
B6 Work safely in accordance with health, safety and environmental legislation, regulations and company-specific requirements
B7 Maintain a safe, clean and tidy work area
<ul style="list-style-type: none"> ● Work area preparation. To include: risk assessments, cable management, slip/trip hazards, removal of waste, clean environment, general safety, efficiency of operating standards, dusty/dirty floor workspaces, safe access and egress ● Work area re-instatement. To include: waste disposal policies, consumables, return of tools to stores, continuously ensuring high standards of housekeeping.
B8 Check for and identify potential hazards in the workplace and take collective responsibility to maintain a safe working environment
B9 Question unsafe behaviours and incorrect work practices and procedures