

Overview

This standard covers a range of basic pipe fitting competences that will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the pipe fitting activities, by obtaining all the necessary job instructions, materials, tools, equipment and any documentation that may be required.

In carrying out the pipe fitting activities, you will be expected to use a range of hand tools, pipe bending and forming equipment and pipe assembly techniques, appropriate to the type of pipe and operations being performed. Pipe fitting activities will include, cutting the pipes to the required lengths, bending and forming pipes and assembling them using a range of different pipe connectors.

During, and on completion of, the pipe fitting operations, you will be expected to check the quality of your work, to recognise pipe bending and fitting defects, to take appropriate action to put right any faults that occur, and to ensure that the finished workpiece is within the drawing/job requirements. On completion of the pipe fitting activities, you will be expected to return all tools and equipment to the correct location, and to leave the work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the pipe fitting activities undertaken. You will need to report any difficulties or problems that may arise with the pipe fitting activities, and to carry out any agreed actions. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate pipe fitting techniques safely. You will understand the pipe fitting equipment and techniques used, and their application, and will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the pipe fitting activities, and when using the associated tools and equipment. You will

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be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

At least one of the pipework assemblies produced must include a combination of pipe fitting features and techniques, for example: by cutting pipe to length using saws or tube cutters, bending the pipe to form an offset, joining the pipework using elbows and tee pieces.

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Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
 - P2 cut the pipes to the appropriate lengths, ensuring appropriate allowances for bending and attachment of fittings
 - P3 bend and form the pipes, using the appropriate tools and equipment for the type and size of pipes used
 - P4 assemble and secure the pipework, using the correct fittings and pipe joining techniques
 - P5 check the completed pipe assembly to ensure that all operations have been completed, and that the finished assembly meets the required specification
 - P6 report any difficulties or problems that may arise with the pipe fitting activities, and carry out any agreed actions
 - P7 leave the work area in a safe and tidy condition on completion of the assembly activities

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Knowledge and understanding

You need to know and understand:

- K1 the health and safety requirements, and safe working practices and procedures required for the pipe fitting activities undertaken
- K2 the importance of wearing appropriate protective clothing and equipment (PPE), and keeping the work area safe and tidy
- K3 the hazards associated with the pipe fitting activities (such as handling long pipe lengths, using damaged or badly maintained tools and equipment, using pipe bending equipment, using heating and soldering equipment, using adhesives), and how they can be minimised
- K4 the procedure for obtaining the required job instructions, drawings and other related specifications
- K5 how to use and extract information from engineering drawings and related specifications (to include BS or ISO standard symbols and abbreviations, imperial and metric systems of measurement, workpiece reference points and system of tolerancing)
- K6 how to determine the overall length of the pipework required, taking into account allowances for pipe fittings and, where appropriate, screwed connections
- K7 the tools and equipment used in the cutting and preparing the pipes (such as saws, pipe and tube cutters)
- K8 the methods used to hand bend and form the pipe (including the use of bending springs, hand bending machines, fillers, heating methods)
- K9 how to produce the various bends required (such as angled bends, dog-leg sets, bridge sets and expansion loops)
- K10 the preparation of pipework and fittings for the assembly operation (such as checking for damage, removing foreign objects, dirt and swarf from the bore of the pipe, removing burrs)
- K11 the range of pipe fittings that can be used (such as straight connectors, elbows, tee pieces, reduction pieces, flanged fittings, valves, blanking pieces/cap ends), and how to identify them
- K12 the different types of fitting available (such as screwed fittings, soldered fittings, compression fittings, push fit fittings and cemented fittings)
- K13 methods used to seal screwed joints (such as tapes and sealing compounds)
- K14 the methods used to prepare pipe ends and fittings for soldering or brazing, and why it is necessary to ensure that these preparations are carried out
- K15 the various types of soldered connector available (such as solder ring types and capillary fittings)
- K16 the methods used to solder the joints, and how to recognise when the fitting is correctly soldered on
- K17 the precautions to be taken when using gas torches to form the joint, and

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- the effect of overheating the joint
- K18 the methods used to prepare pipe ends and fittings when using adhesives, and why it is necessary to ensure that these preparations are carried out
- K19 the methods used to cement the joints, and how to recognise when the fitting is correctly secured
- K20 the precautions to be taken when using the adhesives and sealing compounds (such as adequate ventilation, fume extraction, away from naked flames, avoiding skin contact)
- K21 the use of compression fittings; how the pipes are sealed; and the effects of over tightening the fittings
- K22 the use of push-fit connectors, and their advantages and disadvantages
- K23 how to identify the correct orientation of fittings with regard to flow, and the consequences of incorrectly orientating the fitting
- K24 the supporting methods that are used when assembling pipework, and the type of fittings that are used
- K25 methods of testing pipework systems for leaks (using air, water or hydraulic testing methods)
- K26 when to act on your own initiative and when to seek help and advice from others
- K27 the importance of leaving the work area in a safe and clean condition on completion of the pipe fitting activities (such as returning hand tools and equipment to the designated location, cleaning the work area, and removing and disposing of waste)

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Additional Information

Scope/range related to performance criteria

You must be able to:

1. Carry out **all** of the following during the pipe fitting activities:
 - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
 - 1.2 follow job instructions, assembly drawings and procedures
 - 1.3 check that the bending and forming equipment is in a safe and usable condition
 - 1.4 apply safe and appropriate pipe fitting techniques and procedures at all times
 - 1.5 return all tools and equipment to the correct location on completion of the pipe fitting activities
 - 1.6 apply safe working practise at all times

2. Produce pipework assemblies using **one** of the following types of pipe:
 - 2.1 carbon steel
 - 2.2 copper
 - 2.3 aluminium
 - 2.4 stainless steel
 - 2.5 brass
 - 2.6 plastic

3. Cut and prepare the pipes for forming and assembly, to include carrying out **all** of the following:
 - 3.1 cutting pipes to the correct length, with appropriate allowance for fittings
 - 3.2 removing all external and internal burrs
 - 3.3 cleaning pipe ends for soldering or cementing (where appropriate)
 - 3.4 cutting threads on pipe ends, to the appropriate length (where appropriate)
 - 3.5 checking that prepared pipes are the correct length

4. Cut and prepare pipework, using **two** of the following:
 - 4.1 saws (hand or power)
 - 4.2 abrasive cloth
 - 4.3 wire pipe cleaners
 - 4.4 pipe/tube cutter
 - 4.5 de-burring reamers

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5. Bend and form pipe, using **one** of the following methods:
 - 5.1 bending springs
 - 5.2 pipe expander
 - 5.3 swaging kit
 - 5.4 hand operated pipe bender
 - 5.5 heating methods
 - 5.6 fillers
 - 5.7 hydraulic pipe bending equipment

6. Produce pipework bends/forms that include **two** of the following:
 - 6.1 angular bends
 - 6.2 expansion loops
 - 6.3 external swaged ends
 - 6.4 offsets
 - 6.5 radii
 - 6.6 internal swaged ends
 - 6.7 bridge sets

7. Assemble pipes, using **one** of the following methods:
 - 7.1 compression fittings
 - 7.2 soldered fittings
 - 7.3 cemented fittings
 - 7.4 snap-on/push fittings
 - 7.5 brazed fittings
 - 7.6 welded joints
 - 7.7 screwed connections

8. Assemble pipework using **four** of the following types of fitting:
 - 8.1 straight couplings
 - 8.2 elbows
 - 8.3 tee pieces
 - 8.4 flanges
 - 8.5 reduction pieces
 - 8.6 drain/bleeding devices
 - 8.7 unions
 - 8.8 valves
 - 8.9 blanking caps
 - 8.10 screwed fittings (such as tank, tap, pump, gauges)

9. Produce pipework assemblies which comply with **all** of the following quality and accuracy standards:
 - 9.1 pipes are bent to the appropriate shape/form and position
 - 9.2 all pipe bends are free from buckling or deformation
 - 9.3 appropriate fittings are used, and are secure and leak free
 - 9.4 soldered and cemented fittings are free from excessive residues

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(where appropriate)

- 9.5 pipe assemblies are of the correct dimensions
- 9.6 the completed assembly meets the specific system requirements

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