

## Overview

This standard identifies the competences you need to bend and form ferrous, non-ferrous and/or non-metallic pipe, using hand methods, in accordance with approved procedures. In producing pipe bends and forms, you will be expected to select and use a range of hand tools, forming equipment and techniques, which are appropriate to the type of material and operations being performed.

Activities will include cutting the pipes to the required lengths using hand sawing, band sawing or pipe/cutting machines, bending pipes using hand bending machines, springs, fillers or heating techniques, and the use of templates or set wires to check bend profiles. The pipework produced will have the features that include angular bends, offsets, bridge sets and expansion loops.

Your responsibilities will require you to comply with organisational policy and procedures for the pipe bending and forming activities undertaken, and to report any problems with the equipment, materials or pipe bending activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying pipe bending and forming procedures. You will understand the pipe bending and forming activities, and their application, and will know about the pipe bending and forming equipment and techniques, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is completed to the required specification.

You will understand the safety precautions required when carrying out the pipe bending activities and using the associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

## Performance criteria

*You must be able to:*

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the correct component drawing and any other related specifications for the component to be produced
3. determine what has to be done and how this will be achieved
4. use the appropriate tools and equipment for the bending and forming operations and check that they are in a safe and usable condition
5. shape the materials to the required specification using appropriate methods and techniques
6. check that all the required operations have been completed to the required standard
7. deal promptly and effectively with problems within your control and report those that cannot be solved

## Knowledge and understanding

### *You need to know and understand:*

1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. the specific personal protective equipment (PPE) to be worn when carrying out the pipe bending activities
3. the hazards associated with carrying out the pipe bending activities and how to minimise them and reduce any risks
4. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate standards) in relation to work undertaken
5. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
6. principles and methods of marking out pipework, and the type of equipment used
7. how to prepare the pipes in readiness for the marking-out activities
8. methods of holding and supporting pipework during the marking out activities, and the equipment that can be used
9. allowances to be made in the marking out, for bending or the assembly of the various fittings that will be used
10. the characteristics of the various materials that are to be used with regard to the bending operations, and why some materials may require the addition of heat/hot air to aid the bending process
11. the methods used to hand bend and form the pipe
12. how to produce the various bends required
13. the reasons for incorporating expansion loops in a system, and where they should be positioned
14. the tools and equipment used in the cutting, bending and forming process
15. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

### Scope/range related to performance criteria

1. Carry out all of the following during the pipe hand forming and bending activities:
  - 1.1 obtain and use the appropriate documentation
  - 1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
  - 1.3 check that bending and forming equipment is in a safe and usable condition
  - 1.4 follow safe practice/approved pipe bending techniques and procedures at all times
  - 1.5 return all tools and equipment to the correct location on completion of the pipe bending activities
  - 1.6 leave the work area in a safe and appropriate condition on completion of the activities
2. Mark out pipework using two of the following methods:
  - 2.1 direct marking using tapes and markers
  - 2.2 producing set wires
  - 2.3 set-outs of pipework using templates
  - 2.4 set-outs of pipework onto floor
  - 2.5 copy shape from original
3. Bend and form two of the following types of pipe:
  - 3.1 carbon steel
  - 3.2 brass
  - 3.3 stainless steel
  - 3.4 aluminium
  - 3.5 copper
  - 3.6 plastic
4. Cut and prepare pipework using three of the following:
  - 4.1 hack saws
  - 4.2 de-burring reamers
  - 4.3 power saw
  - 4.4 abrasive discs
  - 4.5 pipe/tube cutter
5. Bend and form pipe using four of the following methods:
  - 5.1 bending springs
  - 5.2 pipe expander
  - 5.3 swaging kit
  - 5.4 pipe bender
  - 5.5 heating methods
  - 5.6 fillers
  - 5.7 other specific method
6. Produce pipework forms that include three of the following:
  - 6.1 angular bends

Pipe bending and forming by hand methods

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- 6.2 radii
- 6.3 offsets
- 6.4 external swaged ends
- 6.5 bridge sets
- 6.6 internal swaged ends
- 6.7 expansion loops

7. Produce pipe bends and forms which comply with one of the following quality and accuracy standards:

- 7.1 BS, ISO or BSEN standards
- 7.2 customer standards and requirements
- 7.3 company standards and procedures
- 7.4 specific system requirements

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Pipe bending and forming by hand methods

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