SEMFWE3-44 - SQA Unit Code H1W1 04
Forming pipework by machine bending

Overview

This standard identifies the competencies you need to bend and form pipes using pipe-bending machines in accordance with approved procedures. You will be required to select the most appropriate type and size of machine and former, based on the pipe type, size and operations to be performed. In producing the components you will be required to operate the equipment safely and correctly, or direct operations for their effective use, to bend and form the pipe to the required profile without flats or deformations. The pipe bending and forming operations to be performed will include bending at right angles, bending to other angles, producing offsets, producing bridge sets, producing curved sections and producing expansion loops.

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

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to forming pipework using machine procedures. You will understand the equipment being used, the forming principles, and their application, and will know about the processes involved and their limitations in sufficient depth to provide a sound basis for carrying out the activities, correcting any faults and ensuring the work output is produced to the required specification. You will understand the safety precautions required when working with the forming machines and their 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.

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Performance criteria

You must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
- P2 confirm that the equipment is set up correctly and is ready for use
- P3 manipulate the machine controls safely and correctly in line with operational procedures
- P4 produce components to the required specification
- P5 carry out quality sampling checks at suitable intervals
- P6 deal promptly and effectively with problems within your control and report those that cannot be solved
- P7 shut down the equipment to a safe condition on conclusion of the machining activities

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Knowledge and understanding

You need to know and understand:

K1 the specific safety precautions to be taken when working with pipe bending equipment bending machines in a fabrication environment

K2 the general workshop and site safety requirements, statutory regulations; risk assessment procedures and COSHH regulations

K3 the safe working practices and procedures required for operating power operated bending and forming machines

K4 the specific personal protective equipment (PPE) that needs to be worn when carrying out the pipe bending activities (such as gloves, eye protection, safety helmets, ear protection)

K5 the handling precautions and correct methods of moving or lifting long lengths or heavy pipes

K6 the hazards associated with the pipe bending activities and how they can be minimised (handling long pipe lengths; using power operated bending equipment; using dangerous or badly maintained tools and equipment; using heating equipment)

K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)

K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing

K9 principles and methods of marking out pipework and the type of equipment used (direct marking; use of templates; use of set wires; marking out conventions applicable to the bending process (centre lines; bending lines))

K10 allowances that need to be made in the marking out for the bending and forming activities

K11 how to prepare the pipes in readiness for the bending and forming activities (visually checking for defects, cleaning the materials, removing burrs and sharp edges)

K12 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 to aid the bending process

K13 the various types of pipe bending machines used to bend and form the pipe (including the use of hand bending machines, hydraulic bending equipment, power operated equipment and heating methods)

K14 how to prepare and set up the machine for a range of different bends (angled bends, curved sections, twisted sections and straightening of sections)

K15 how to produce the various bends required (such as angled bends, dog-

leg sets, bridge sets and expansion loops)

K16 ways of limiting distortion, wrinkles, marking and creases in the finished workpiece

K17 the problems that can occur with the bending and forming activities, and how they can be avoided

K18 the organisational quality control procedures that are used, and how to recognise defects in the bends that you produce

K19 how to make dimensional and forming inspection checks and the tools and equipment that can be used

K20 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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Additional Information

Scope/range related to performance criteria

You must be able to:

1. confirm that the equipment is safe to use and fit for purpose by carrying out **all** of the following checks:
   - 1.1 the appropriate machine is selected for the operation being performed
   - 1.2 the machine guards and safety devices are in position and function correctly
   - 1.3 forming tools are appropriate and in a serviceable condition (secure, correct diameter, free of damage)
   - 1.4 machine settings are suitable for the pipe diameter, material thickness and operations to be performed
2. use **one** of the following types of pipe bending machines:
   - 2.1 hand operated manual bending machines (small diameter pipe)
   - 2.2 hydraulic operated bending machines
   - 2.3 powered pipe bending machines
   - 2.4 CNC bending machines
   - 2.5 power press with different former radii and sizes (pipe diameter)
3. bend and form **one** of the following types of pipework:
   - 3.1 small bore lubrication/fuel piping
   - 3.2 structural pipes
   - 3.3 cable ducting pipework
   - 3.4 high pressure pipes
   - 3.5 heavy duty pipes
4. produce pipework forms that includes **four** of the following:
   - 4.1 right angled bends
   - 4.2 bridge sets
   - 4.3 angular bends
   - 4.4 expansion loops
   - 4.5 offsets
   - 4.6 curved sections
5. bend and form pipes made from **one** of the following types of material:
   - 5.1 ferrous steel
   - 5.2 non-ferrous
   - 5.3 special metals
6. produce pipe bends and forms which comply with **all** of the following quality and accuracy standards as is applicable:
   - 6.1 meet drawing, specification, template or job requirements
   - 6.2 meet customer requirements
   - 6.3 have the required dimensional accuracy within specified

	tolerances
6.4	the form or sharpness of the bend conforms to best practice and or specification without deformation or cracking
6.5	the bend conforms to the required shape/geometry (to the template profile)

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