SQA Advanced Unit Specification

General information for centres

Unit title: Pipework 2: Pipe Bending and Pipe System Design

Unit code: HV3X 47

Unit purpose: This Unit is designed to enable candidates to develop knowledge and understanding of piping systems, safety procedures and mechanical changes in metals when they have been cold formed within the construction, power generation, offshore and petro-chemical industries.

On completion of the Unit the candidate should be able to:

1 Demonstrate an understanding of the changes in mechanical properties when pipe bending has taken place.
2 Demonstrate an understanding of the main features of pipe system design.
3 Outline the safety procedures on pipe and vessel repair and inspection.
4 Demonstrate an understanding of pipe system inspection.

Credit points and level: 1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: It would be advantageous but not essential for the candidate to have completed the Unit *Pipework 1: Construction and Site Installation* (HV3W 47).

Core skills: There may be opportunities to gather evidence towards the Core Skills of Communication, Numeracy and Problem Solving in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: The assessment of this Unit should take the form of one assessment paper in which all outcomes are combined and should last no longer than two hours. The assessment paper could be composed of a case study or structured questions. The assessment should be conducted under controlled, supervised conditions.

SQA Advanced Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Demonstrate an understanding of the changes in mechanical properties when pipe bending has taken place

Knowledge and/or skills

- ovality
- wrinkling
- wall flattening
- wall thickening
- wall thinning
- ductility
- hardness
- tensile strength
- grain structure

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need to demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of this Outcome at least 60% of the knowledge and/or skills items should be sampled.

A different sample question should be asked each time the Outcome is assessed. Candidates must provide a satisfactory response to assessed questions.

Outcome 2

Demonstrate an understanding of the main features of pipe system design

Knowledge and/or skills

- product
- pipe materials
- corrosion allowance
- bursting discs
- valves
- insulation
- pressure safety valves
- pipe supports

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need to demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of this Outcome at least 60% of the knowledge and/or skills items should be sampled.

A different sample question should be asked each time the Outcome is assessed. Candidates must provide a satisfactory response to assessed questions.

Outcome 3

Outline the safety procedures on pipe and vessel repair and inspection.

Knowledge and/or skills

- permit to work system
- vessel entry certificates
- electrical and mechanical isolations
- safe working practices
- pressure testing
- nitrogen pipe freezing

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need to demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of this Outcome at least 60% of the knowledge and/or skills items should be sampled.

A different sample question should be asked each time the Outcome is assessed. Candidates must provide a satisfactory response to assessed questions

Outcome 4

Demonstrate an understanding of pipe system inspection

Knowledge and/or skills

- drawings
- specification
- materials
- standards
- quarantine

- sub standard work
- components
- pre test inspection

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need to demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of this Outcome at least 60% of the knowledge and/or skills items should be sampled.

A different sample question should be asked each time the Outcome is assessed. Candidates must provide a satisfactory response to assessed questions.

Administrative Information

Unit code: HV3X 47

Unit title: Pipework 2: Pipe Bending and Pipe System Design

Superclass category: XH

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

SQA Advanced Unit specification: support notes

Unit title: Pipework 2: Pipe Bending and Pipe System Design

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

In delivering this Unit centres should be aware of developments in the pipework industry and would be expected to review teaching and learning materials from time to time.

Outcome 1

This Outcome would be ideal for a case study as the candidate could carry out practical tasks in a supervised environment. This could involve removing a section from the bend and preparing to check mechanical changes. It will also allow the candidate to learn and understand wrinkling, thinning, ovality and wall flattening.

Outcome 2

With pipe system design the candidate should be aware of the factors relating to the product (ie pressure, temperature, corrosiveness, toxicity and flammability). This will then assist the candidate in the selection of the correct materials. It would be beneficial for the centre/college to provide pressure safety valves and bursting discs if available to underpin learning. Heat conservation by the use of insulation material available to the industry should be included, together with the various types of pipe supports.

Outcome 3

Within this Outcome the dangers of the industry should be discussed at length, as it will involve vessel entry, removal of in-service pipe sections, nitrogen freezing, pressure testing and electrical and mechanical isolations. These dangers can be controlled with the understanding and use of the permit to work system and vessel entry procedures. The relevant HASWA regulations could be included.

Outcome 4

As pipe system inspection is an important part of this industry the reasons and procedures of inspection should be taught. It is important that the following topics should be included: specifications, materials, standards, quarantine and the effects of sub standard work.

Guidance on the delivery and assessment of this Unit

It would be of advantage to the candidate to receive regular feedback on progress through this Unit by formative tutorials.

Final assessment for this unit will be an end test as detailed in the section on assessment.

Opportunities for developing Core Skills

There may be opportunities to gather evidence towards the Core Skills of Communication, Numeracy and Problem Solving in this Unit.

Open learning

This Unit is essentially a technology based Unit. Opportunities could be made available for open/flexible learning and the opportunity should be available for assessment on demand.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

General information for candidates

Unit title: Pipework 2: Pipe Bending and Pipe System Design

This Unit has been designed to provide you with the knowledge and skills that will enable you to understand the various factors involved in Pipe Bending and Pipe System Design.

You will be required to learn the changes to mechanical properties after pipe bending has taken place and you will possibly participate in lab testing.

You will understand all aspects of the factors involved in pipe system design: pressure, temperature, viscosity, corrosiveness, toxicity and flammability.

You will become conversant with the hazards and dangers involved and develop an understanding of safety requirements when repairing pressure vessels and pipe systems.

You will participate in pipe system inspection and become conversant with pressure test and reinstatement procedures.

You will undertake formative assessment tutorials that will not affect the results of final assessments.

Assessment of this Unit will be in the form of a closed-book end test lasting no longer than two hours. The test will be in the form of structured questions related to a case study where a pass mark is set at 50% of the available marks.