National Unit Specification: general information

UNIT Pipework Systems (SCQF level 6)

CODE F5F9 12

SUMMARY

This Unit can be taken as part of a National Qualification Group Award in Engineering but can also be taken as a free-standing Unit by candidates who wish to enhance their skills in a fabrication, welding and pipework environment. It is also suitable for those who are studying the subject for the first time.

On completion of this Unit the candidate will have gained an understanding of the various pipe systems within an industrial setting and the various methods of joining pipe. It will also provide the candidate with an understanding of the materials and the components used on the various systems and relevant standards. The systems that will be considered in the delivery of this Unit are:

- Gas
- Fuel oil
- Steam and Condensate
- Water

OUTCOMES

1 Describe pipework supply systems.
2 Identify pipework system components.
3 Describe pipework system supports.
4 Identify pipework system insulation requirements.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have relevant industrial experience.

Administrative Information

Superclass: XH

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National Unit Specification: general information (cont)

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CREDIT VALUE 1 credit at Higher (6 SCQF credit points at SCQF level 6*).

**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 Access 1 to Doctorates.*

CORE SKILLS

There are opportunities to develop the Core Skills of *Problem Solving* and *Numeracy* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

National Unit Specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Describe pipework supply systems.

Performance Criteria

(a) Design of stated pipe system is correct.
(b) Explanation of the purpose of system components are correct.
(c) Selection of appropriate pipe supports are correct.
(d) Identification of a pipe system is correct in terms of current standards.

OUTCOME 2

Identify pipework system components.

(a) Pipework drawing interpretation is correct.
(b) Identification of pipework symbols is correct.
(c) Identification of pipe colour codes is correct

OUTCOME 3

Describe pipework system supports.

Performance Criteria

(a) Explanation for the need of pipework supports is correct.
(b) Selection of pipe support for given applications is correct.

OUTCOME 4

Identify pipework system insulation requirements.

Performance Criteria

(a) Reasons for pipework insulation are correct.
(b) Properties of pipework insulation materials are correct.
(c) Insulation for a stated pipework system is correct.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT.:

Evidence is required to demonstrate that the candidates have achieved all of the Outcomes and Performance Criteria.

Evidence for this Unit will be in the form of closed-book written and/or recorded oral evidence produced under controlled and supervised conditions lasting no more than two hours in total.

The evidence must be produced on one assessment occasion towards the conclusion of the Unit where the candidate will:

- select and describe **two** pipework supply systems
- identify the pipework system components for the selected supply systems
- describe the pipework system supports for the selected supply systems
- identify the pipework system insulation requirements for the selected supply systems

National Unit Specification: support notes

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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

The Unit is in the National Qualification Group Award (NQGA) in *Fabrication and Welding Engineering* but it may also be studied as a stand-alone Unit.

As this is a Unit to be taught in a classroom it would be important to be in possession of the British Standards, as this would allow the candidates to extract the information required. Installation drawings would also be of benefit if available.

Gas systems in a factory could have many different use; these could include: factory heating, cafeteria facilities, injection moulding and processes where heating is required. The installation of these systems to a maximum diameter of 50 mm would be threaded to BSP with an appropriate tape or sealing compound applied. It would be good practice to include pressure testing to max of 25 psi and methods of leak detection, it should also include reasons for electrical earthing and materials used. The inclusion of the relevant British Standards should be included.

Fuel oil supplies in a factory would mainly be used to fuel a boiler or boilers. The fabrication of this could be of welded construction, using butt weld fittings and flanges. The design of this system is important as sections of the system in the horizontal position require to have a fall or run approx 1mm in 250 mm; this should allow the oil to move within the system. If the oil is of low viscosity (thick) then it would be difficult for the oil to move. If this is the case then a form of heat tracing may have to be used, either steam tracing or electric tracing, both these systems are effective and a choice would have to be made. British Standards should be included.

Pipe supports come in many different types and selection would be dependant on the service of the pipe system ie liquid gas and high pressure steam are two systems that have high levels of expansion and contraction. It would be crucial when designing pipe systems to ensure this movement is controlled both in the horizontal and vertical planes, many systems with minimal movement would have basic standard pipe supports, systems with horizontal movement and sitting on steel would have a basic type of guide support.

The selection of insulation is important as the temperature of a process is critical; it is also cost effective and will also conserve energy. An exercise could be carried out using a thermometer, allowing the candidate to take the temperature of hot and cold water then select the type and form of insulation, ie preformed section, slabs and mats data sheets. When choosing insulation it is important to select the most suitable type for the selected pipe system as this will reduce operating costs.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Information and support sheets should be available to meet the requirements of this Unit. Pipelines carrying domestic/industrial gas should be installed with threaded fittings suitable for this purpose and in line with relevant Standards.

The candidate will be required to show an understanding of the various types of pipe systems.

Pipe lines carrying oil can be constructed using machine bends, threaded fittings or butt weld fittings, the final selection will depend on various factors ie pressure and flammability. If the system is under a pressure of approx 150 psi welded construction would be favoured, if the oil has a low flash point then the correct method of jointing should be selected, again welded joints would be preferable. If the oil is of low viscosity then the pipe system may have to be fitted with a method of external heating to raise the temp ie electric heat tracing or the more expensive steam tracing which would allow the oil to flow more easily. All fitting and colour codings should be to relevant Standards.

The candidate should be taught to identify the need for the required specific type of pipe supports. This could be in the form of a drawing, and the candidate could identify the need and the type of support required. For this the candidate should be provided with details of types of supports available and expected expansion or contraction.

Pipe insulation is important on pipe systems as it has several functions ie it will conserve heat, will act as a method of personal protection and is cost effective. Insulation comes in many types and forms and is dependant on working temperature; it will most likely be covered with a metal cladding to protect insulation.

This Unit should be delivered by a combination of teaching and learning approaches which could include:

- Lecturing
- Case studies
- Practical activities
- Group discussions
- Tutorials
- Directed study
- Investigation including the use of ICT
- Site visits
- Audio visual
- Guest speakers

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Exercises to support the development of relevant aspects of Core Skills will be an aspect of formative work across the award, with an emphasis on the application of skills in workplace situations. The ability to interpret, calculate and translate numerical and graphical data in a practical working context will be essential to conveying the requirements of pipe systems within an industrial setting.

Problem Solving skills such as critical thinking, planning, organising, and reviewing and evaluating, will be effectively developed and enhanced as candidates analyse materials, components and properties in the identification of system insulation requirements. Assessor feedback, including practical discussion of health and safety issues, could support on-going reflective evaluation of solutions proposed.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

A holistic approach should be adopted for assessing this Unit. The candidate would benefit from an end of Unit test that allows the demonstration of understanding of the subject using an industrial application requiring a meaningful solution.

The questions should be structured in a manner that guides the candidate through the assessment process.

There should an opportunity for assessment on demand where appropriate.

Recommended assessment procedures:

- assessment instruments should be short answer questions.
- short answer assessment paper of 12 questions with the candidate answering any 10

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.