-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

GENERAL INFORMATION

-Module Number- **2270304** **-Session- 1994-95**

-Superclass- **VF**

-Title- **DRAUGHTING: PIPEWORK**

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Developing and enhancing draughting skills required in the preparation of pipeline layouts.

OUTCOMES

1. specify the design principles for pipework and for pipeline layout;
2. construct simple pipeline layouts;
3. select pipe components and fittings;
4. produce detail drawings and material lists.

CREDIT VALUE: 1 NC Credit

ACCESS STATEMENT: Access is at the discretion of the centre. However it would be beneficial if the candidate had experience of drawing practice and some aspect of pipework fabrication; this may be evidenced by possession of appropriate units, ie 74801 Engineering Drawing Office Practices and/or 94806 Graphical Engineering Communication and one of the following:

2270214 Pipework Preparation, Forming, Assembly and Installation: Plain Carbon Steel
2270224 Pipework Preparation, Forming, Assembly and Installation: Copper
2270234 Pipework Preparation, Forming, Assembly and Installation: Stainless Steel
2270244 Pipework Preparation, Forming, Assembly and Installation: Non-metallic

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For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

Additional copies of this unit may be purchased from SQA (Sales and Despatch section). At the time of publication, the cost is £1.50 (minimum order £5).

NATIONAL CERTIFICATE UNIT: UNIT SPECIFICATION

STATEMENT OF STANDARDS

UNIT NUMBER: 2270304

UNIT TITLE: DRAUGHTING: PIPEWORK

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

OUTCOME

1. SPECIFY THE DESIGN PRINCIPLES FOR PIPEWORK AND FOR PIPELINE LAYOUT

PERFORMANCE CRITERIA

(a) Identification of the different elements of design is correct.
(b) Specification of the various forms of given material supply is correct.
(c) Specification of the order of assembly is correct.

RANGE STATEMENT

Design elements: contents; pressure; flow; temperature; volume; weight; cost; environmental considerations.

Materials supply: metallic and non-metallic; pipes and fittings; insulation; gaskets; capillary and compression fittings; jointing components.

EVIDENCE REQUIREMENTS

Written and/or pictorial evidence that the candidate has an introductory knowledge of the elements of design, the form and range of materials in use and an appreciation of the methods of assembly in a pipeline system.

OUTCOME

2. CONSTRUCT SIMPLE PIPELINE LAYOUTS

PERFORMANCE CRITERIA

(a) Description of the relationship between a full range of given drawings is correct.
(b) Description of methods used in a drawing office to update drawings is correct.
(c) Application of relevant British Standards pipeline symbols is correct.
(d) Production of a restricted range of engineering drawings is clear and precise.

RANGE STATEMENT

Full range of engineering drawings: General Assembly (G.A.) site drawing; orthographic engineering drawing; isometric pipe drawing; engineering diagram.

Restricted range of engineering drawings: orthographic engineering drawing; isometric pipe drawing; engineering diagram.

EVIDENCE REQUIREMENTS

Written and/or pictorial evidence that the candidate clearly understands the relationship between the different types of drawings and methods of revision.

Written and/or pictorial evidence that the candidate can apply the appropriate British Standards pipeline symbols.

Graphical and written evidence of the candidate's ability to produce simple pipeline layouts.

Supplementary oral evidence to ensure that the candidate covers all of the critical classes in the range.

OUTCOME

3. SELECT PIPE COMPONENTS AND FITTINGS

PERFORMANCE CRITERIA

(a) Selection of pipe material for given service conditions is correct.
(b) Selection of pipe fittings for given service conditions is correct.
(c) Selection of valves for given service conditions is correct.
(d) Selection of pipe hangers and supports for given service conditions is correct.

RANGE STATEMENT

Pipe fittings: elbows; tees; couplings; reducers; plugs; caps; return bends; flange type socket weld fittings; weldolets.

Valves: gate type; plug valves (or cocks); diaphragm; ball; globe; needle; butterfly; check; pressure relief; steam traps.

Pipe materials: non-metallic; metallic ferrous; metallic non-ferrous.

Hangers and supports: plain; spring.

EVIDENCE REQUIREMENTS

Written and oral evidence of the candidate's ability to select pipe components and fittings.

OUTCOME

4. PRODUCE DETAIL DRAWINGS AND MATERIAL LISTS

PERFORMANCE CRITERIA

(a) Preparation of a set of detail drawings which contain the essential information for manufacture and assembly are drawn to acceptable standards of draughtsmanship as illustrated in B.S.308.
(b) Preparation of a full material list for the pipework layout drawing is correct.

RANGE STATEMENT

Material list: pipes; fittings: valves; hangers; supports; joining material.

EVIDENCE REQUIREMENTS

Written and graphical evidence of the candidate's ability to produce detail drawings and materials lists. Supplementary oral evidence to ensure full coverage of the performance criteria.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

In certain cases, modified outcomes and range statements can be proposed for certification. See references at end of support notes.

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

SUPPORT NOTES

UNIT NUMBER: 2270304

UNIT TITLE: DRAUGHTING: PIPEWORK

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

PURPOSE SQA publishes summaries of units for easy reference, publicity purposes, centre handbooks, etc. The summary statement for this unit is as follows:

On completion of this unit, you may be able to become a junior member of a team working in a drawing office undertaking detailing of pipework drawings. You will be aware of basic design principles, the forms of material supply and be able to select the correct fittings, valves, hangers and supports when detail draughting. Additionally you will be competent to draw up material lists using the correct terminology and, if required for quality control purposes, be able to quote the relevant standard(s) while doing so.

CONTENT/CONTEXT The candidate should achieve the level of competence required from a junior draughtsperson in a drawing office doing piping and pipeline draughting. An adequate supply of the relevant standards and other relevant publications, eg: manufacturers' catalogues, or photocopies of, should be available.

Corresponding to Outcomes 1-4:

1. Could be carried out initially by visual aids, eg: O/H projector, showing the design cycle and the effects that the various constraints have on design.

   Support sheets summarising forms of material supply and methods of joining, assembling and supporting to accommodate movement are essential, backed up if possible, by 'hands-on' examination of materials. Videos/films of joining and assembly should be shown if possible.

2. Could be carried out initially by visual aids, eg: O/H projector showing components in isometric, orthographic, and diagrammatic views. Similarly with symbols the use of an O/H projector before the introduction of worksheets may be advantageous. 'Hands-on', if necessary using isometric paper and completed drawings which have to be revised and up-dated, should follow since this is essentially a drawing outcome.

   In this context an engineering diagram is in single plane form, showing the inter-relationships of components and how the system operates, linear dimensions rarely being used; whereas an orthographic engineering drawing is in multi-plane form and the physical relationships of components is important, therefore precise dimensions and locations must be fully given - B.S. Definition.

3. Again an introduction, using visual aids, eg. an O/H projector, may help in the selection of component parts. The selection of materials may be assisted by visual examination of any pipe systems in the centre. A selection of fittings, valves (sectioned or whole) and pipe hangers for the candidates to examine would be beneficial. Worksheets based on (or photocopies of) B.S. 1387 Steel Pipes: screwed and socket welded; B.S. 4825 Stainless Steel Tubes and Fittings; B.S. 2871 Copper Tubes; B.S. 1306 Copper Pressure Pipe; B.S. 6464 Reinforced Plastics for Process Plants; B.S. 7291 Thermo Plastic Pipes and Fittings; B.S. 1740 Welded and Seamless Fittings for Pipe to 1387; B.S.1640 Carbon Steel and Chrome Nickel Fittings; B.S. 1560 Steel and Copper Alloy Flanges; B.S. 7076 Gaskets for Flanges to 1560; B.S.864 Capillary and Compression Fittings; for copper tubes; BS 5480 G.R.P. pipes, joints and fittings; B.S. 4346 P.V.C. Joints and Fittings and B.S. 3974 Pipe Hangers and Supports should be readily available. Worksheet covering a selection of valves, suitable for the piping background of the candidates, should be available from (or based on); B.S. 759, 1010, 1123, 1212, 1414, 1552, 1655, 1868, 1873, 2580, 5041, 5150, 5152, 5153, 5154, 5155, 5156, 5158, 5159, 5160, 5163, 5351, 5352, 5433, 5793, 6282, 6283, 6364, 6759, and B.S. E.N.19.

4. This is the 'core' of the unit, it is entirely 'hands-on' and should produce drawings to an acceptable standard of draughtspersonship. Candidates could work as a team using the same G.A. drawing (if all the candidates have the same background) with each candidate detailing a separate part. Pipeline backgrounds are: chemical plant; refinery; water supply including cooling towers; power plant-boilers; sludge and slurries systems - clay mining; plumbing systems; refrigeration systems; nuclear; hydraulic power transmission; gas transmission; fire protection - separate from other water piping; cryogenic; aircraft; and steam heating.

   Dependent upon the area(s) chosen, assistance may be gained from British Standards, ie. B.S. 6700 Design and Installation of Domestic Services.

APPROACHES TO GENERATING EVIDENCE The delivery of the unit could be organised in such a way that the basic principles of design and material supply and fittings is dealt with prior to any drawing. The relationship between the different types of drawings and diagrams can then follow, finishing finally with the production of detail drawings. At all times, during the drawing sessions, the tutor/trainer should be present to correct errors and offer advice. 'Hands-on' candidate activities and support material can, and should, be used throughout all outcomes. It should be the tutor/trainer's aim to constantly apply the outcomes to practical situations to accustom candidates to constantly apply underpinning knowledge themselves when working in industry. Any cognitive assessments required in the unit would be best managed by including restricted response questions within the context of worksheets and/or support sheets.

ASSESSMENT PROCEDURES Centres may use the Instruments of Assessment which are considered by tutors/trainers to be the most appropriate. The assessment of this unit could also be approached in an integrated way with worksheets covering Outcomes 1-4 developed as a complete project, rather than as four separate outcomes. Examples of Instruments of Assessment which could be used are as follows:

Outcome 1 Restricted response and/or pictorial questions. A minimum number of questions would be eight for Performance Criterion (a), ten for Performance Criterion (b) and five for Performance Criterion (c).

Outcome 2 Restricted response and/or pictorial questions for Performance Criterion (a) with a minimum number of questions of six. Performance Criterion (b) requires a minimum of five questions. Performance Criterion (c) requires a minimum of three symbols to be named and three named fittings to have the symbol sketched. Pictorial evidence in the form of three drawings namely orthographic to pipe isometric; pipe isometric to 1st angle orthographic and pipe isometric to 3rd angle orthographic is required for Performance Criterion (d).

Outcome 3 Observation checklists are required for all criteria in this outcome. It is essential that the criteria used by the candidates are correct to reduce or eliminate any tendency to guess. Since the range of materials is very broad and many different areas of pipe engineering could be covered it should be relatively simple to have a variety of 'set-piece' situations for the candidate to work from.

Outcome 4 The number of, and complexity of, the drawings produced should be commensurate with the time available. One drawing having a number of auxiliary, or isometric, views on it may suffice, or alternatively, two or three smaller detail drawings may be offered as evidence. It may be possible for candidates to work from the same G.A. drawing, eg: from a refinery, with each candidate detailing a different part. In all cases, a neat material list, as expected in a D.O., based on the detail drawings(s) must be presented.

Satisfactory achievement of the unit is based on all the performance criteria in all the outcomes being met.

RECOGNITION Many SQA units are recognised for entry/recruitment purposes. For up-to-date information see the SQA guide 'Recognised and Recommended Groupings'.

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Procedures for special needs statements are set out in SQA's guide 'Students with Special Needs'.
4. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
5. For details of other SQA publications, please consult SQA's publications list.