-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number- **2570327**

-Superclass- **XE**

-Title- **WELDING PRINCIPLES: OXY-FUEL GAS AND NON-FUSION JOINING**

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Developing a knowledge of the oxy-fuel gas processes, non-fusion and plastic joining processes, employed in the fabrication industry.

OUTCOMES

1. evaluate the oxy-fuel gas processes;

2. evaluate the applications of low temperature non-fusion joining processes;

3. outline the principles, equipment and applications used in plastic joining processes;

4. explain the principles of specialised oxy-fuel gas processes used in the fabrication industry.

CREDIT VALUE: 1 HN Credit

ACCESS STATEMENT: Access to this unit is at the discretion of the centre. However it would be beneficial if the candidate has prior knowledge of the welding processes. This may be evidenced by possession of HN Units:

2570127 Fabrication and Welding Applications: Basic
2570137 Fabrication and Welding Applications: Intermediate
2570147 Fabrication and Welding Applications: Advanced

or similar qualifications or experience.

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 £5.00).

HIGHER NATIONAL UNIT SPECIFICATION

STATEMENT OF STANDARDS

UNIT NUMBER: 2570327

UNIT TITLE: WELDING PRINCIPLES: OXY-FUEL GAS AND NON-FUSION JOINING

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. EVALUATE THE OXY-FUEL GAS PROCESSES

PERFORMANCE CRITERIA

(a) The process principles, techniques, equipment and applications of the oxy-fuel gas welding and joining processes are described correctly.
(b) Exothermic reactions; simple flame chemistry and temperature distribution of the oxyacetylene flame and on the weldment are correctly described.
(c) The manufacture of acetylene gas and the safe handling, storage and maximum withdrawal rates of dissolved acetylene gas are described correctly.

RANGE STATEMENT

Applications: fusion welding; flame brazing (of aluminium); bronze welding; hardfacing; flame cleaning; flame straightening; manual hard (brazing) and soft soldering; flame cutting.

Flame temperatures: propane; North sea gas.

Flame: oxidising; neutral; carburising.

EVIDENCE REQUIREMENTS

Written evidence that the candidate can evaluate the oxy-fuel gas processes, as specified in PCs (a) to (d).

OUTCOME

2. EVALUATE THE APPLICATIONS OF LOW TEMPERATURE NON-FUSION JOINING PROCESSES

PERFORMANCE CRITERIA

(a) The fundamental of low temperature joining processes are described clearly.
(b) The prerequisites required to produce a sound joint are correctly described.
(c) The advantages and limitations of low temperature processes are correctly described.

RANGE STATEMENT

Low temperature processes: soldering; brazing; braze welding.

Joint types: lap; butt; tee.

Fundamentals: necessity of fluxing; concept of capillary attraction; optimum gap; optimum lap.

Prequisites: filler metal selection; joint design; cleanliness; flux removal methods.

Processes: soft and hard soldering silver soldering, brazing and aluminium flame brazing); bronze welding.

EVIDENCE REQUIREMENTS

Written evidence is required to show that the candidate can evaluate the application of low temperature non-fusion joint processes, as specified in Pcs(a) to (c).

OUTCOME

3. OUTLINE THE PRINCIPLES, EQUIPMENT AND APPLICATIONS USED IN PLASTIC JOINING PROCESSES

PERFORMANCE CRITERIA

(a) The basic principles of manual hot gas and semi-automatic plastic joining processes are outlined correctly.
(b) The equipment used in manual hot gas and semi automatic plastic joining processes is correctly identified.
(c) The industrial applications of manual hot gas and semi-automatic plastic joining processes are correctly explained.

RANGE STATEMENT

Manual hot gas process: gases used; technique used; joint design and preparation; filler material; joint strength comparison with parent plastic; inspection criteria.

Semi-automatic processes: dielectric (high frequency); ultrasonic and vibration; extrusion; adhesives.

EVIDENCE REQUIREMENTS

Written evidence that the candidate can outline the principles, equipment and applications, as specified in performance criteria (a) to (c)

OUTCOME

4. EXPLAIN THE PRINCIPLES OF SPECIALISED OXY-FUEL GAS PROCESSES USED IN THE FABRICATION INDUSTRY

PERFORMANCE CRITERIA

(a) The principle of oxy-fuel gas flame cleaning process is explained correctly.
(b) The empirical techniques employed in the oxy-fuel gas flame straightening process is explained correctly.
(c) The use of oxygen lances in the fabrication industry is outlined correctly.
(d) The principles of the oxy-gas metal spraying process are explained correctly.

RANGE STATEMENT

The range for this outcome is fully expressed within the performance criteria.

EVIDENCE REQUIREMENTS

Written evidence that the candidate can explain the principles of specialised oxy fuel gas processes used in the fabrication industry as specified in performance criteria (c) to (d).

MERIT

To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. This may be demonstrated by:

(i) applying the principles of this unit to an industrial situation;
(ii) wide and deep understanding of the subject matter being set down with progressive, logical development and clarity.

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

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

HIGHER NATIONAL UNIT SPECIFICATION

SUPPORT NOTES

UNIT NUMBER: 2570327

UNIT TITLE: WELDING PRINCIPLES: OXY-FUEL GAS AND NON-FUSION JOINING

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 On completion of this unit the candidate will acquire a basic knowledge of a range of oxy-fuel gas processes and joining techniques employed in the fabrication industry. The candidate will also gain a basic knowledge of the effects of using oxy-fuel gas processes in the construction and repair of fabrications.

CONTENT/CONTEXT This unit has been written to cover sections 1.2, 1.3, 1.15, 1.17 and 1.18 of the European Welding Technologist document regarding the minimum requirements for the education, examination and qualification of European Welding Technologists.

The sections below show the topics to be covered from each of the relevant sections of the E.W.T. document.

Outcome 1

1.2 Oxy-fuel gas welding

Process principles, range of applications, types of flame, flame chemistry, temperature distribution effects, equipment, properties of acetylene gas in comparison to other gases, handling and storage of cylinders, manufacture of acetylene gas, joint design, welding techniques - leftward, rightward and all positional techniques, standards for filler materials, applications and typical problems.

Outcome 2

1.17 Brazing and soldering

Fundamentals (bonding mechanisms, surface tension, wetting, capillary), processes and equipment, consumables, brazable materials, brazing requisites, high vacuum brazing, brazing under controlled atmosphere, bronze welding, consumables and fluxes, soldering techniques (dip, wave, reflow, vapourphase soldering, applications and typical problems, advantages and limitations.

Outcome 3

1.18 Joining processes for plastics

Materials, hot plate welding, butt, hot gas welding, extrusion welding, induction heating, resistance heating, implant welding, high frequency, friction, electro fusion welding, ultrasonic welding, vibration, adhesive, applications (control of welding parameters, types of equipment, joint design).

Outcome 4

1.3 Special oxy-gas processes

Oxygen lances, flame-cleaning, flame-straightening, gas pressure welding, preheating and post heating. Flame spraying with wire; flame spraying with powder.

Health and safety relating to processes listed above to be taught as and when required.

APPROACHES TO GENERATING EVIDENCE The use of workshop demonstrations and/or the use of video presentations would greatly enhance the candidate's understanding of the topics covered in this unit. Tutors/trainers may wish to undertake industrial visits to local employers (where possible) allowing candidates to experience industrial applications of the processes discussed in the unit.

ASSESSMENT PROCEDURES Centres may use the Instruments of Assessment which are considered by tutors/trainers to be most appropriate.

Outcomes 1, 2, 3 and 4 could be assessed using 10-20 short answer or restricted response questions balanced appropriately across the performance criteria.

If demonstrations or industrial visits have taken place, candidates should be encouraged to produce written reports on their observations. Provided the report is of a suitable standard and covers the performance criteria, this may be accepted as appropriate evidence.

PROGRESSION

This unit does not progress onto any specific HN unit.

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.