SQA Advanced Unit Specification

General information for centres

Unit title: Containers: Design and Manufacture

Unit code: HV2M 47

Unit purpose: This Unit is designed to enable candidates to develop knowledge and understanding of designing, manufacturing and testing containers. It is intended to be undertaken by candidates who have theoretical knowledge of materials and practical and theoretical knowledge of fabrication and welding practice and procedures.

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

1 Design a closed container manufactured from a ferrous or non-ferrous metal to hold a non-corrosive material.
2 Formulate a strategy for the manufacture of a container from a ferrous or non-ferrous metal.
3 Carry out the manufacture of the container.
4 Carry out the testing of the container.
5 Evaluate the design and fitness for purpose of the completed container.

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: Candidates should possess a basic knowledge and understanding of fabrication and welding principles. This may be evidenced by proven experience within fabrication and welding.

Core skills: There may be opportunities to gather evidence towards the Core Skills of Communication, Numeracy, Problem Solving and Working With Others 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: In order to achieve this Unit, candidates must achieve all the minimum evidence requirements for each Outcome in the Unit. The assessment material for all five Outcomes in this Unit should be combined together and presented in the form of a written/graphical report.

Where a large number of candidates are attempting this Unit at a centre, the centre may allow two candidates to carry out the manufacture and testing of the container as a shared exercise. Where this option is chosen, alternate designs etc and a checklist should be made available for external verification showing the input from each candidate in the manufacture and testing process.

It is emphasised that this is only related to the practical work and individual candidates should generate their own written/graphical evidence.

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

Design a closed container manufactured from a ferrous or non-ferrous metal to hold a non-corrosive material

Knowledge and/or skills

- calculations relating to the manufacture of containers
- criteria for material selection
- methods of bracing, stiffening and reinforcing
- calculations on material costs

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided 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.

Assessment guidelines

The assessment should take the form of a short report, which should include all calculations to determine the container dimensions, shape and volume, along with the reasons for the choice of material, and the estimated costs.

Outcome 2

Formulate a strategy for the manufacture of a container from a ferrous or non-ferrous metal

Knowledge and/or skills

- comparison of manufacturing processes
- planning/operation sheets
- cutting lists
- weld preparations

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided 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.

Assessment guidelines

The assessment should take the form of a short report relating to the knowledge and skills.

Outcome 3

Carry out the manufacture of the container

Knowledge and/or skills

- manufacturing skills
- welding skills

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided 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.

Assessment guidelines

The manufacture of the container should follow the criteria listed in the assessment for Outcome 2.

Outcome 4

Carry out the testing of the container

Knowledge and/or skills

- testing methods
- safe working practices

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided 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.

Assessment guidelines

The assessment should take the form of a short report.

Outcome 5

Evaluate the design and fitness for purpose of the completed container

Knowledge and/or skills

- calculation of final costs
- fitness for purpose criteria

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided 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.

Assessment guidelines

The assessment should take the form of a short report.

Administrative Information

Unit code: HV2M 47

Unit title: Containers: Design and Manufacture

Superclass category: VF

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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: Containers: Design and Manufacture

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

Candidates should have access to current standards and specifications.

The container should be of a suitable size and design and consist of a number of manufacturing processes which relate to industrial practice.

Outcomes 1 and 2

Calculation of area, volume and weight; area of regular and irregular shapes using Simpson's and mid-ordinate rules; qualitative considerations of pressure and installation; stiffening, bracing and reinforcing; pressure heads and ends; manufacturing cost calculations.

Candidates should be introduced to methods of material selection and to aid justification, the comparison of process is a suggested method. The technical and economic factors governing selection should be introduced at this stage.

Containers could be closed tanks, vessels and drums.

Content material could include liquids, ash and dust.

Manufacturing processes are considered to be fundamental to the successful outcome of the unit and as such should be fully explained and demonstrated.

Calculations for volume etc must be demonstrated to ensure that the candidates can produce accurate results for their own use.

Outcomes 3 and 4

It is recommended that approximately 75% of the total time spent on this Unit is devoted to these two Outcomes.

Current standards and specifications should be used as support material with the role of safe practices of primary importance.

Accuracy of work should be emphasised at all stages of manufacture.

Pressure testing should be carried out only under the lecturer's supervision and candidates should satisfy themselves that the completed container is of a satisfactory construction to allow the test to be conducted safely.

Outcome 5

Accurate calculations of finished costs should be encouraged with explanations of the consequences if this is not carried out in terms of poor industrial practice.

Comparison of estimated to final costs should be used to reinforce the importance of accurate estimation.

It is envisaged that only simple quality reporting will be required in this Unit with the emphasis being placed on alternative methods of manufacture and/or construction.

Guidance on the delivery and assessment of this Unit

It should be noted that this Unit can be delivered on a free standing basis, but preferably towards the end of a programme, thus allowing the candidate to draw on the skills and knowledge gained from previous units

Outcome 1

- design to specification or given brief
- reasons for the selection of the material
- calculations for a given volume
- estimated costs in terms of time and material

Outcome 2

- sequence of operation sheet
- layout of the required plate
- suggested manufacturing methods
- weld procedure details

Outcome 3

- manufacturing methods: cutting; forming; joining; assembly
- safe working practices

Outcome 4

- preparation of the testing equipment and container
- dimensional checks
- identification of any defects arising from the pressure test (design or construction)
- analysis of any defects found with regard to proposed rectification

Outcome 5

- total cost calculations for completed container (material, labour, consumables, overheads)
- assessment of suitability of the container in terms of size, material, and construction

Opportunities for developing Core Skills

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

Open learning

Due to the practical nature of this Unit it does not lend itself well to distance learning.

However with regard to the assessment of Outcomes 3 and 4, planning would be required by the centre concerned to ensure the authenticity of the assessment. Arrangements would be required to be put in place to ensure that the practical assessments in Outcomes 3 and 4 were conducted under controlled, supervised conditions.

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: Containers: Design and Manufacture

This Unit has been designed to provide you with the basic knowledge and skills which, along with the knowledge gained from earlier units in the course, will enable you to understand the basic requirements for the design and manufacture of containers.

The early part of the Unit deals with the design and the strategy required to manufacture a container to a given specification or brief. It also covers the necessary calculations, and information on manufacturing methods and the associated paperwork required when planning the manufacture of a fabricated item.

You will be expected to manufacture and test a closed container to a given standard.

The final part of the Unit will entail a report on the evaluation of the container against a given specification or brief.

The assessment of the Unit will consist of a series of short written reports and a practical assignment, all of which will then be correlated into a final written/graphical report.

Your practical skills will be assessed by means of the practical assignment in which you will be required to satisfactorily manufacture and pressure test the container.