

SQA Advanced Unit Specification

General information for centres

Unit title: Inspection Systems

Unit code: HV2P 47

Unit purpose: This Unit is designed to enable candidates to develop knowledge and understanding of the basic inspection systems available in the fabrication industry for the detection of surface and sub-surface defects. The Unit also provides candidates with the opportunity to select the most appropriate method of inspection for a particular set of circumstances.

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

- 1 Specify the role of standards and the types of inspection in the fabrication industry.
- 2 Identify the components of dimensional inspection techniques.
- 3 Identify surface methods of Non-Destructive Testing and their safe use.
- 4 Identify sub-surface methods of Non-Destructive Testing and their safe use.

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 an advantage for candidates to have a basic/general knowledge and understanding of fabrication/welding techniques, processes and their associated defects. This may be evidenced by possession of an appropriate cluster of NC Units.

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.

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Assessment: Outcome 1 should be assessed by the candidate producing a report on the role of inspection. This should take approximately 30 minutes.

Outcomes 2 and 3 should be assessed by structured questions and should last no more than 30 minutes for each Outcome

The assessment for Outcome 4 should take the form of a case study to be completed in approximately 30 minutes.

The assessments should be conducted under controlled and supervised conditions.

An assessment exemplar will be available for this unit.

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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

Specify the role of standards and the types of inspection in the fabrication industry

Knowledge and/or skills

- ◆ role of various standards
- ◆ inspection systems
- ◆ certification of inspection personnel
- ◆ role of third party inspection
- ◆ duties of the welding inspector

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 for this Outcome should take the form of a report on the role of inspection within a quality system.

Outcome 2

Identify the components of dimensional inspection techniques

Knowledge and/or skills

- ◆ measurement
- ◆ levelling
- ◆ component geometry

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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 for this Outcome should take the form of structured questions covering all of the knowledge and /or skills requirements.

Outcome 3

Identify surface methods of Non-Destructive testing and their safe use

Knowledge and/or skills

- ◆ visual
- ◆ penetrant testing
- ◆ magnetic particle testing
- ◆ eddy current testing
- ◆ safe use

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 for this Outcome should take the form of structured questions covering all of the knowledge and/or skills requirements.

Outcome 4

Identify sub-surface methods of Non-Destructive testing and their safe use

Knowledge and/or skills

- ◆ X-ray and Gamma ray
- ◆ ultrasonic testing
- ◆ health and safety legislation relating to NDT processes and their safe use

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 for this Outcome should take the form of a case study where the candidate will be required to select a suitable method of non-destructive testing for a given application.

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Administrative Information

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| Unit code: | HV2P 47 |
| Unit title: | Inspection Systems |
| Superclass category: | WD |
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FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our [Centre Feedback Form](#).

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SQA Advanced Unit Specification: support notes

Unit title: Inspection Systems

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 and, where possible, have access to inspection equipment including solvent removable and post emulsified fluorescent and non fluorescent dyes. MPI prods, yokes, permanent magnets, coils threader bars and flexible cable techniques wet and dry/fluorescent and non fluorescent inks should be utilised where possible.

Guidance on the delivery and assessment of this Unit

Outcome 1

Specify the role of associated current standards and the types of inspection in the fabrication industry. Identify various inspection systems and their applications, such as Goods receiving, In-Process, Patrol and Final inspection and state their advantages and limitations. Recognise and understand the role of various Inspection certification bodies, such as CSWIP (Certification for Welding Inspection Personnel), AWS (American Welding Society), CEGB (Central Electricity Generating Board), PCN (Personnel Certification in Non-destructive Testing), TWI (The Welding Institute), The British Institute of NDT. Recognise and understand the role of third party inspectorates such as DNV (Det Norske Veritas), Lloyds Register of shipping, NEI (Northern Engineering Inspection).

Identify the components of visual inspection techniques, prior, during and after welding, such as: weld preparation bevel angle, root face and root gap as per weld procedure. Ensure pre-heat and maximum inter-pass temperatures are correct. Ensure weld documentation is correct as per EN 288 and EN 287 (or other comparable standard). Procedure sheets, welder certification and heat treatment procedures. Ensure pre-weld conditions, baking oven temperature, holding oven, portable ovens are correct. Ensure procedure conditions such as polarity, current settings, use of amperage meter, temple sticks, pyrometers and digital thermometers are correct. Identify typical weld defects.

Outcome 2

Measurement: use of standard instruments, vernier, micrometer, caliper and height gauge, slip gauges, sine bar etc. Surface plates and angular blocks. Laser.

Levelling: Laser, theodolite, dumpy, water tube etc.

Component geometry: squareness, angular.

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Outcome 3

Identify surface methods of Non-Destructive Testing, surface inspection using inspection resources such as Boreoscopes, intrascope and endoscopes. Remote inspection techniques. Equipment should also include photography, thermography and the use of video cameras.

Dye Penetrant types, water washable, solvent removable and post emulsifiable (fluorescent and non fluorescent). Select applications on various metals and non-metals.

Magnetic particle inspection, prods, yokes, permanent magnets, coils threader bar and flexible cable techniques fluorescent and non fluorescent particles/ fluorescent and non fluorescent inks. Application on a variety of ferrous metal shapes.

Eddy current testing application on ferrous and non-ferrous metals, principles of operations, probe types and shapes with advantages and limitations.

Outcome 4

Identify sub-surface methods of Non-Destructive Testing. Electro-magnetic radiations (Spectrum), x-ray, gamma-ray, associated advantages and limitations between them. X and Gamma equipment. Radiographic technique, films, film processing, units of radiation, safety. Select appropriate IQIs and film types for given materials. Ionising radiation, protection methods, radiation detection and ionising radiation regulations

Application of ultrasonic testing equipment using: compression wave probes for plate thickness and lamination testing; shear wave probe for weld defect detection.

Associated dangers: basic electrical safety with flaw detectors in ultrasonic inspection.

Safe working practices for all NDT processes and following the current Ionising Radiation Regulations for industrial radiography

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 could be delivered by distance learning, which may incorporate some degree of on line support. However, with regard to assessment planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangement would be required to be put in place to ensure that the assessment, which is required to be a single event, was 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.

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General information for candidates

Unit title: Inspection Systems

In this Unit you will gain an understanding of the role of standards and inspection systems adopted in the fabrication industry. This will include certification of personnel, the role of third party inspection and the duties of a welding inspector.

You will be given the opportunity to learn about dimensional inspection techniques for various component types.

You will be introduced to all aspects of surface and sub-surface methods of Non Destructive Testing (NDT).

You will be required to undertake the following assessments:

The assessment for Outcome 1 should be assessed by a report on the role of inspection to be completed in approximately 30 minutes.

Outcomes 2 and 3 should be assessed by structured questions and should last no more than 30 minutes for each Outcome

The assessment for Outcome 4 should take the form of a case study to be completed in approximately 30 minutes.