SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Inspection – Non-Destructive Testing Skills (Higher)

NUMBER D159 12

COURSE Fabrication and Welding Engineering (Higher)

SUMMARY

This unit focuses on applying the principles of non-destructive testing to a range of general applications.

OUTCOMES

1 Test components using non-destructive testing (NDT) methods.
2 Assess and record results from each NDT test.
3 Complete a proforma report with the results from each test.
4 Comply with regulations, procedures and safe working practices specified for the use of NDT methods in workshops and laboratories.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following:

- Intermediate 2 Structures together with Standard Grade Mathematics at grade 3
- a minimum of Standard Grade Mathematics at grade 4 and Craft and Design, Graphic Communication or Technological Studies at grade 3
- equivalent National units
- Intermediate 2 Scottish Group Award in a related area

Administrative Information

Superclass: WD

Publication date: December 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

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CREDIT VALUE

0.5 credit at Higher.

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	None	
Core skills components for the unit	Planning and Organising	Int 2
	Using Graphical Information	Int 2

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

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 the Scottish Qualifications Authority.

OUTCOME 1

Test components using non-destructive testing (NDT) methods.

Performance criteria

(a) Identification of appropriate test locations on components is correct.
(b) Interpretation of NDT instructions and technique sheets is correct.
(c) Application of the appropriate NDT method to the component and defects to be detected is correct.
(d) Post-test instructions are carried out correctly.

Note on range for the outcome

NDT methods: penetrant, magnetic particle, ultrasonic.
Technique factors: surface condition, consumables, equipment, calibration, test parameters, post-test requirements.
Components: carbon steel, wrought products, plate and T-joint.

Evidence requirements

Performance evidence of the candidate's ability to carry out NDT tests using each of the methods given in the range on selected components, for the detection of either surface breaking or sub-surface flaws, as appropriate.

Supplementary oral/written questioning to establish that the criteria in the test technique, and its application, for the methods given in the range statement, are correctly understood. Supplementary evidence may be in the form of completed checklists.

OUTCOME 2

Assess and record results from each NDT test.

Performance criteria

(a) Defects in components are recorded correctly on related drawings.
(b) The thickness of component is measured accurately using ultrasonic NDT.

Note on range for the outcome

Defects: surface breaking, internal.
NDT methods: penetrant, magnetic particle, ultrasonic.

Evidence requirements

Performance evidence which may be in the form of drawings showing thickness measurement where appropriate and accurate location of defect(s) detected, using each of the NDT methods identified in the range statement.

OUTCOME 3

Complete a proforma report with the results from each test.

Performance criteria

(a) Information contained in each test report complies with relevant current standards and NDT instruction sheet.
(b) The faults detected are correctly stated with respect to type, location and size.

Note on range for the outcome

Proforma report: surface condition, consumables, equipment, calibration, test parameters, inspection, acceptance criteria, test results, post-inspection, cleaning.
NDT methods: penetrant, magnetic particle, ultrasonic.

Evidence requirements

Oral and written evidence of the candidate's ability to complete test reports for the NDT methods listed in the range statement. Oral evidence may be in the form of completed staff checklists.

OUTCOME 4

Comply with regulations, procedures and safe working practices specified for the use of NDT methods in workshops and laboratories.

Performance criteria

(a) Applications of working practices are safe and in accordance with health and safety regulations for the given NDT methods.
(b) Applications of all necessary safety clothing and protective accessories are correct.

Note on range for the outcome

Working practices: visual, penetrant, magnetic particle, ultrasonic NDT.
Safety clothing: overalls, footwear, safety glasses.

Evidence requirements

Performance evidence that practical application of NDT methods (visual, magnetic particle, penetrant and ultrasonic) are carried out safely and in accordance with health and safety regulations.

Written and/or oral evidence that the candidate knows how to comply with the safety criteria that must be observed when using ionising radiations.

National Unit Specification: support notes

UNIT Inspection – Non-Destructive Testing Skills (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

It is recommended that you refer to the SQA Arrangements document for Higher Fabrication and Welding Engineering before delivering this unit.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 20 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

Awareness of the safety requirements applicable to the NDT methods. Awareness of safety aspects to be considered in the use of X-ray and gamma ray (X and γ) radiography. The factors that underpin the conduct of NDT operations according to written instructions and under close supervision at all times. Setting up of equipment, developing skills in carrying out the tests, recording and classifying the results in terms of given criteria and reporting accordingly for the NDT methods.

PCN is the national scheme for the certification of competence in NDT methods. The first level of competence is Level 1. This unit will not provide training or competence to Level 1 requirements.

All Outcomes should be taught in the context of the classroom/lecture room and the workshop. The workshop should be equipped for the NDT methods covered in the unit. Each NDT method should be related to the appropriate British Standard or EN Standard, from which guidance on technique factors and their relevance to the quality of the test will be obtained. Attention should be given to examples of relevant and non-relevant test indications.

For penetrant testing it is recommended that portable inspection kits are used with colour contrast and fluorescent penetrant types. Guidance should be taken from BS 6443: Penetrant Flaw Detection.

For magnetic particle testing the magnetising techniques should use both contact current flow and magnetic flow and take into account defect orientation and detecting media, both colour contrast and fluorescent with black light. Guidance should be taken from BS 6072: Method for Magnetic Particle Flaw Detection.

Ultrasonic testing should in the main be applied to calibration blocks, samples for thickness and lamination checking, samples with machine-made artificial defects to simulate components with easily detectable defects, and selected wrought products and weldments suitable for this initial development of NDT skills.

Guidance should be taken from BS 2704: Specification for Calibration Blocks for Use in Ultrasonic Flaw Detection, BS 4124: Methods for Ultrasonic Detection of Imperfections in Steel Forgings and BS 3923: Ultrasonic Examination of Welds. (It is anticipated that EN Standards will replace the above standards in due course.)

Eddy current testing may be included for comparison purposes. It is not included as a mandatory part of the unit.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Information on learning and teaching is available in the Subject Guide, produced by the Higher Still Development Unit (HSDU) in partnership with the Scottish Further Education Unit (SFEU) and the Scottish Consultative Council on the Curriculum (SCCC). The Subject Guide is intended to support the information contained in the SQA Arrangements document for the Higher Fabrication and Welding Engineering. The SQA Arrangements document contains the standards against which candidates are assessed.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Centres may use the instruments of assessment which are considered by teachers or lecturers to be the most appropriate. Examples of instruments of assessment which could be used are as follows.

Outcome 1

Observation checklists are required for the stated criteria and they should be related to each of the NDT methods used. The assessment and record of the results for each test undertaken should be made in the workshop/laboratory, with due account being taken of the guidance given in the references listed in the content/context section. Candidates should be provided with appropriate components for testing, accompanied by drawings where required to enable candidates to determine the test location(s).

Outcome 2

Each report presented by the candidate should be compared with the exemplar report held by the teacher/lecturer and due account taken of its compliance with British or related standards and the satisfactory detection of any defects. The preparation of each report with the results from the related test may be carried out either in the workshop/laboratory or in the lecture room. If in the latter environment, access to the item tested should be maintained until the report has been completed. For reporting, the guidance given in the references listed in the content/context section should be observed.

Outcome 3

Observation checklists are required for the stated criteria for Outcome 4. The checklists should be applied to the application of each NDT method used. Reference to Health and Safety Regulations and British Standards will be a core part of the practical work to support this outcome. The 'practical element' will be the core part of Outcomes 1, 2 and 3 and this gives an opportunity for the assessment process to be integrated.

Outcome 4

It is essential that candidates are made aware of safety considerations for X and γ radiography during the coverage of Outcome 4.

The delivery of this unit should be organised in such a way that the greater proportion of all activity is carried out in the workshop/laboratory. Equipment, safety and test method criteria should reflect the item to be tested and the defects to be detected.

National Unit Specification: support notes (cont)

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SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).