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GRADING PCN PRACTICAL EXAMINATIONS

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INTRODUCTION

This document provides instructions for examiners marking and grading PCN examinations in order to assure a consistent approach by all Authorised Qualification Bodies (AQB). Instances of failure to adopt or apply the instructions herein should be recorded and reported with justification to the Certification Services Division of the British Institute of NDT, which will take steps to resolve inconsistencies in approach through discussion at General Technical Committee and AQB Workshop levels.

This is a quality document subject to change control and it is the responsibility of the holder to ascertain the current issue status by reference to PCN document PSL/8A before use.

It is considered that no additional guidance further to that contained in the current editions of PCN Requirements for the qualification and certification of NDT personnel is required for grading level 3 examinations. This has therefore been omitted from this document in the interests of clarity.

Reference PCN GEN section 13 Grading of Examinations, certificate holders may only recertify to the same grade awarded at initial examination i.e. a certificate holder who was not awarded a distinction at initial examination may not be awarded a distinction at recertification.

Annex A to this document provides a range of example examination grading forms for use in practical examinations specific to each sector, method and level. Examiners may utilize these forms with or without modification, or devise forms to suit their own particular method of grading.

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Table 1a - distribution of marks for ET, PT, MT, UT and VT examinations.

Examination section	Maximum marks		
	Level 1	Level 2 with instruction	Level 2 without instruction
1. Knowledge of the NDT apparatus			
1.1 System control and functional checks	10	5	10
1.2 Verification of equipment settings	10	5	N/a
Total	**20**	**10**	**10**
2. Application of the NDT method			
2.1 Preparation of the test piece	5	2	2
2.2 Technique selection (level 2)	N/a	7	7
2.3 Setting up the NDT apparatus	15	5	5
2.4 Performance of test	10	5	5
2.5 Post test procedures	5	1	1
Total	**35**	**20**	**20**
3. Detection & reporting of discontinuities (see table 2 for RI)			
3.1 Detection of mandatory discontinuities (see penalty for reporting non-existent defects)	20	15	15
3.2 Characterisation	15	15	15
3.3 Level 2 evaluation of results (against reporting threshold or acceptance criteria)	N/a	15	15
3.4 Production of the test report	10	10	10
Total	**45**	**55**	**55**
4. NDT instruction (level 2 only)			
4.1 Foreword, status and authorisation		0.5	
4.2 Personnel		0.5	
4.3 Apparatus to be used		2.5	
4.4 Product/area to be tested		0.5	
4.5 Test conditions		2	
4.6 Detailed instructions for application of test		6	
4.7 Recording and classifying results		2.5	
4.8 Reporting the results		0.5	
Total	**N/a**	**15**	**N/a**
Total marks possible	**100**	**100**	**85**

Guidance on the application of table 1a headings

A selection of the following skills could be evaluated in the practical examination.

1.1 System control and functional checks

System control and functional checks will usually include predetermined checks, each being allocated a share of the maximum marks. Examples are:

ET: use of reference standards to provide confidence of detection of defects sought.

MT: measurement of magnetic ink solids content; use of CF and FF test pieces.

PT: use of test panels; colour, fluorescent intensity and comparator checks of penetrants; concentration checks on developers; efficiency of penetrant removers.

UT: calibration exercise to check flaw detector performance; time base linearity; sensitivity and signal to noise ratio; probe index, beam angle and width, squint, pulse duration.

VT: cleanliness and serviceability of optical and lighting equipment;

1.2 Verification of equipment settings

Verification of settings will involve the candidate carrying out predetermined checks to give demonstrate confidence in the ability of the technique to detect discontinuities in the range sought. Examples are:

ET: use of calibration blocks for setting sensitivity and reporting thresholds.

MT: use of portable flux indicators, field strength meter; viewing conditions - white light and UV(A) radiation assessment.

PT: compatibility of chemicals; pressure of water wash; viewing conditions - white light and UV(A) radiation assessment.

UT: sensitivity setting - DAC and/or DGS methods.

VT: calibration of measuring devices.

2.1 Preparation of the test piece

ET: surface conditions and preparation - ensuring coatings are uniform and that lift off is within tolerance; marking the area for inspection.

MT: surface preparation – pre-cleaning, contrast aid paint.

PT: surface preparation – pre-cleaning; temperature.

UT: Assessment of surface condition regularity, choice of couplant; datums and reference points.

VT: surface preparation – pre-cleaning.

2.2 Technique selection (level 2)

ET: equipment characteristics and selection; selection of probes and frequency to ensure complete coverage for the application, taking into account the limitations of the test equipment.

MT: selection of magnetisation techniques to provide complete coverage with respect to geometry of specimen; selection of current or flux values; UV or white light.

PT: selection of the penetrant and developer for optimum sensitivity with due regard to inspection criteria, surface condition and ambient light levels; UV or white light.

UT: choice of technique related to geometry, size, surface condition, parent metal composition, weld metal structure, taking into account the influence of attenuation in the test piece.

VT: selection of most appropriate optical viewing and measuring aids taking into account surface condition, roughness and reflectivity.

2.3 Setting up the NDT apparatus

ET: training/matching of probe to instrument; lift off compensation.

MT: preparation of portable and fixed units, prods, electromagnets, coils, contact heads; avoidance of fire hazards, correct ventilation, safe use of toxic materials and UV(A) radiation.

PT: avoidance of fire hazards, correct ventilation, safe use of toxic materials and UV(A) radiation.

UT: time base calibration for probe angle and test piece geometry; projected distance, shortened projected distance; attenuation correction.

VT: measurement of ambient light or of artificial light levels at inspection surface;

2.4 Performance of test

ET: correct use of instrument; probe handling (compensation for coating, edge, geometric and change of conductivity effects), investigation and interpretation of indications.

MT: correct application of field and detecting media with respect to the application of magnetisation; optimisation for detection of expected discontinuities.

PT: Correct application and removal of penetrant; correct use of liquid solvents, aqueous washes and post emulsifiers; correct contact times.

UT: correct use of equipment; appropriate scanning patterns; investigation and recording of indications.

VT: correct use of equipment; further investigation of indications.

2.5 Post test procedures

ET: recording and retrieval of information (on computer/digital instrument, and using written report sheets); marking up of indications; care of equipment.

MT: preservation and/or recording of indications; demagnetisation; cleaning.

PT: preservation and/or recording of indications - transparent tape transfer and other coating transfers, photographic (fluorescent and colour contrast); cleaning.

UT: equipment care; removal of couplant and restoration of test surface.

VT: preservation and/or recording of indications - photographic or direct marking.

3.1 Detection of mandatory reportable defects

See table 2 for radiographers and radiographic interpreters.

Detection of all reportable defects will attract maximum marks for detection. The candidate failing to report a discontinuity specified on the specimen master report as ‘mandatory for candidates to report’ when performing the test in the conditions specified in the master report shall be awarded zero marks for part 3 of the practical examination related to the specimen tested.

It should be noted that, although a candidate failing only one specimen may still achieve at least 70% for the practical part if sufficiently high marks are attained in all other specimens, he or she will not be awarded a pass since the applicable standards preclude this.

Examination centres will provide candidates with a code, specification or standard, or a locally devised instruction on defect reporting thresholds for each specimen.

3.2 Characterisation

See Table 2 for radiography and radiographic interpretation criteria.

Within the limitations of the NDT method, recording the nature of discontinuity detected (surface and sub-surface where applicable); its position and dimensions.

The candidate is expected to correctly state the nature of the reported indication. Candidate instructions will clarify what is expected in this respect, e.g., whether a simple description (volumetric or planar; crack-like indication) or a fuller description (fatigue crack; lack of sidewall fusion; cold shut; stress corrosion cracking) is required.

The candidate will be expected to accurately report the position of the reported indication with respect to a given datum by giving two dimensions longitudinal and transverse for surface methods and three dimensions length, through thickness and depth for volumetric methods.

Defect dimensions must be correctly reported within the tolerance defined in the master report. The tolerance allowed will depend upon the NDT method/technique and type/position of defect.

3.3 Level 2 evaluation against acceptance criteria

Acceptance criteria or reporting thresholds need not be provided but, in this case, all discontinuities recorded on the master report are considered mandatory to report unless the contrary is stated in writing.

See table 2 for radiographers and radiographic interpreters.

Off-line data analysis procedures for digital/computerised instruments.

Correct interpretation of procedure, code, standard or specification.

3.4 Production of the test report

All pertinent information is reported in writing or as computerised data..

See table 2 for radiographers and radiographic interpreters.

When performing the test in accordance with the conditions specified in the master report, the candidate failing to report a discontinuity recorded on the specimen master report will be awarded zero marks for section 3 of the practical examination related to the specimen tested unless that discontinuity is classified in writing on the report as "NOT mandatory for candidates to report", in which case the justification for the decision to classify as NOT mandatory for candidates to report must be documented.

Non-reportable discontinuity. The candidate will not be penalised for reporting a non-mandatory reportable discontinuity in the specimen. However, falsely reporting (classifying as a defect) an indication which does not actually exceed the reporting threshold will be penalized Examiners may use discretion in this but, where discretion is applied, the examination must be moderated.

Non-existent defects. The number of marks awarded for detection (table 1, examination section 3.1) will be zero where non-existent defects are reported as exceeding the reporting threshold, but marks may still be awarded for characterization and evaluation of the defects that were present and reported.

4.0 NDT instruction (level 2 only - excluding radiographic interpreter)

The level 2 candidate is required to produce an NDT instruction, suitable for level 1 personnel, for a specimen selected by the examiner. When the level 2 candidate is testing a specimen for which no NDT instruction is required, the grade for that specimen will be calculated as a percentage of the 85 remaining marks.

The marks are awarded against the criteria (4.1 to 4.8 inclusive) specified in Table 1. In order to achieve an examination pass, the candidate must achieve 70%, i.e., 10.5 marks, in section 4 (NDT instruction writing).

Table 1b - distribution of marks for RT examinations

Examination Section		Maximum Marks		
		Level 1	Level 2 with instruction	Level 2 without instruction
1,	**Knowledge of the NDT apparatus**			
1.1	Safety	8	8	8
1.2	System control and functional checks. Verification of equipment settings	2	2	2
	Total	**10**	**10**	**10**
2	**Application of the NDT Method**			
2.1	Preparation of the test piece	5	2	2
2.2	Technique selection (Level 2)	N/a	7	7
2.3	Setting up the NDT apparatus	15	5	5
2.4	Performance of test	10	5	5
2.5	Post test procedures	5	1	1
	Total	**35**	**20**	**20**
3	**Practical application**			
3.1	Technique	20	20	20
3.2	Sensitivity achieved	10	10	10
3.3	IQI/Position	5	5	5
3.4	Density achieved	10	10	10
3.5	Test report and identification of areas for further investigation	10	10	10
	Total	**55**	**55**	**55**
4	**NDT instruction (level 2 only)**			
4.1	Foreword, status and authorisation		0.5	
4.2	Personnel		0.5	
4.3	Apparatus to be used		2.5	
4.4	Product/area to be tested		0.5	
4.5	Test conditions		2	
4.6	Detailed instructions for application of test, including safety		6	
4.7	Recording and classifying results		2.5	
4.8	Reporting the results		0.5	
	Total	**N/a**	**15**	**N/a**
	Total marks attainable	**100**	**100**	**85**

Guidance on the application of table 1b headings

A selection of the following skills could be evaluated in the practical examination.

1.1 RT: Radiation safety - familiarisation with local regulations, wearing film badge or TLD; Safe storage of radiation sources; safety interlocks and alarms; isotope wind-out equipment serviceability; calibration and use of monitor.

1.2 RT: tube warm up; determination of focal spot size; use of characteristic curves, gradient density curves and exposure charts.

2.1 RT: correct use of collimators, masking and blocking media, selection of cassettes, screens and filters, identification of areas to be covered etc.

2.2 RT: Selection of an appropriate technique (DWDI, DWSI etc), Film, IQI's and radiation source, calculations in supporting of the technique (exposure details, offset, No of exposures)

2.3 RT: placement of film and radiation source for the selected technique, use of tube aiming devices; correct placement of IQI's; markers, identification of radiographs, positioning of IQI's.

2.4 RT: Film identification; coverage of the specified areas, position of IQI's, use of correct film size, correct use of equipment, safety.

2.5 RT: correct processing of radiographs for interpretation and archival; compliance of radiographs with relevant instructions, codes standards, specifications and technique. IQI sensitivity and density , reporting and identification of areas for further investigation.

Table 2 - Detection & reporting of discontinuities for radiographic interpretation

Candidates for radiography examinations are required to demonstrate competence in radiographic interpretation by achieving a grade of at least 70% in the interpretation part.

The following table shows a breakdown of the marks available for radiographic interpretation.

Criterion	Radiographic Interpretation	Marks available	See notes
3.1	Detection of mandatory reportable indications	15	4
3.2	Positioning of indications	5	-
3.2	Sizing of indications	5	-
3.2	Characterisation of indications	10	-
3.3	Comments on quality of radiographs	5	3
3.3	Film density	4	1
3.3	Sensitivity calculation	6	3
3.4	Reporting	5	3
3.0	**Total marks available**	**55**	2

Notes to Table 2

Note 1.The candidate for RI (welds) must state the densities in the weld and the parent plate to gain full marks in this section. For interpretation of other radiographs, the candidate must state that the range of densities on the radiograph is within that specified as acceptable in the relevant specification.

Note 2. A level 2 radiographer candidate who fails to attain the required pass mark for the practical radiography element of the examination may be awarded a radiographic interpreter certificate provided the grade attained for the general and specific written parts, and the interpretation section of the practical examination part is ≥70%.

Note 3. Candidates must produce a clear report (criterion 3.4) which includes the following: Detection (criterion 3.1) - reporting all mandatory reportable defects. Quality (criterion 3.3) - comment on the suitability of the radiographs for interpretation, including actual density, sensitivity and coverage of the area of interest.

Note 4. The candidate failing to report a discontinuity specified on the specimen master report as ‘mandatory for candidates to report’ when performing the test in the conditions specified in the master report shall be awarded zero marks for part 3 of the practical examination related to the specimen tested. For RT, this condition applies to radiographic interpretation i.e. failing one "mandatory to report" discontinuity on one radiograph leads to zero marks for the interpretation examination part.