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## **REQUIREMENTS FOR THE QUALIFICATION OF NDT PERSONNEL FOR ULTRASONIC TESTING OF SHELL BOILER 'T' BUTT (END ATTACHMENT) WELDS AND SHELL LONGITUDINAL SEAM WELDS**

### **INTRODUCTION**

This document is published by the British Institute of Non-Destructive Testing (BINDT). It has been agreed, in principle, that members of the Safety Assessment Federation (SAFed) will recognize the qualification described within.

The qualification process described in this document is a part of a wider process for the qualification of non-destructive testing drawn up by an Independent Qualification Body (IQB) using CEN/TC 138 WG9 N37 (Report on methodology for qualification of non-destructive tests) as guidance.

Further information on this qualification scheme, which is supported by SAFed, may be obtained from BINDT at the above address, or from SAFed at Nutmeg House, 60 Gainsford Street, Butlers Wharf, London SE1 2NY.



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The British Institute of Non-Destructive Testing is an accredited certification body offering personnel and quality management systems assessment and certification against criteria set out in international and European standards through the PCN Certification Scheme.

## 1. GENERAL

The normal process of ensuring the adequacy of NDT is to use procedures developed from codes and standards by personnel with a certificated ability to write such documents. The procedures are then applied by personnel with a known ability to carry out such non-destructive tests. This process has been used over many years and has proved to be perfectly adequate in most applications.

However, there are a number of circumstances where it might be judged appropriate to augment the conventional approach. These arise first whenever the safety or economic consequences of failure are particularly severe. This process of providing additional confirmation of the effectiveness of NDT is known as NDT qualification.

This document outlines the requirements for qualification of personnel to ultrasonically test welds in shell boilers, and to detect and accurately characterize and report any discontinuities present.

Qualification of non-destructive testing involves a systematic assessment by all those methods that are needed to provide reliable confirmation of an NDT system to ensure it is capable of achieving the required performance on site. This sometimes includes the use of blind trials, in which those applying the NDT method to test pieces have no specific knowledge of the defects in those test pieces. The practical examination described herein consists of a blind trial.

## 2. ELIGIBILITY, APPLICATION AND FEES

### 2.1 Eligibility for examination

2.1.1 Candidates must demonstrate eligibility for the qualification examination by submission of a verifiable portfolio of evidence demonstrating a background of training and experience in testing butt welds in plate and/or pipe, as well as variable geometry welds such as 'T' butt welds or nozzle welds. Examples of qualifications and experience which are acceptable to the Independent Qualifying Body (IQB) in terms of eligibility for examination are:

- a) Have held, for at least two years, an EN473 compliant level 2 certificate, e.g., PCN, for ultrasonic testing of ferritic steel variable geometry welds, and have undertaken relevant on-the-job training in ultrasonic testing of shell boilers, with evidence of continuity in the application through the submission of a verifiable portfolio of evidence endorsed by an independent referee;
- b) Have been trained and currently approved at level 2 within an employer's written practice (the IQB may require to review the written practice and records of qualification) to ultrasonically test shell boiler welds, and submit evidence of satisfactory performance of at least two continuous years in such testing.

2.1.2 The quality of the candidate's experience may be a factor taken into account when considering the candidate's application. The IQB reserves the right to refuse an application or to require further evidence of qualifications and experience.

2.1.3 Applications for examination are made using the form at Annex 2 and submitted with two passport size photographs and the current fee (see Annex 2) to ISIQ Administration. Examination availability may be restricted by the need for specific numbers of candidates to be registered. Provisional examination appointments may be made by telephone to: 01925 253786. The date of the examination will be confirmed to applicants as soon as the examination application and fee is received.

2.1.4 Examination fees must be paid in advance, and are non-refundable in the event of failure to attend or of cancellation by the candidate within 14 days of the examination date. The ISIQ Administration reserve the right to cancel examinations if necessary. In this event a full refund of the examination fees shall be made.

## **2.2 Eligibility for Qualification**

2.2.1 Verifiable experience of ultrasonic testing of shell boiler 'T' butt (end attachment) welds and shell longitudinal seam welds is essential for qualification to be awarded. However, if such experience was not gained prior to examination, it can be gained following examination and.

2.2.2 Whenever shell boiler testing experience is submitted, the candidate will provide verifiable evidence of having satisfactorily tested, under supervision, at least three relevant shell boilers. Evidence may take the form of a completed and signed form at Annex 3, or submission of at least 3 boiler inspection reports resulting from tests conducted by the applicant.

## **3. EXAMINATION**

### **3.1 Equipment**

The candidate will provide all necessary testing equipment. It is the candidate's responsibility to ensure that such equipment is suitable and is calibrated and maintained in accordance with the requirements of the qualified test procedure.

Candidates are required to advise the examiner or examination centre administration on the NDT equipment that will be used by them in the practical examination.

### **3.2 Examination Content**

#### **3.2.1 Written examination**

The open book written examination comprising 3 narrative answer questions which will test the candidate's ability to correctly extract, from a qualified test procedure, the required information concerning test preparation, carrying out the ultrasonic test, detection, characterisation of indications, reporting indications and sentencing the test piece against predetermined criteria. The written examination pass mark will be 70% and the time allowed is 1 hour.

The closed book examination comprising 20 multiple choice answer questions which will test the candidate's knowledge of typical shell boiler construction/configuration, and of the type and location of defects associated with in service degradation, including environmentally assisted cracking in welds. The examination pass mark will be 70% and the time allowed will be 1 hour.

#### **3.2.2 Practical Examination**

The practical examination will involve the testing of two samples. One practical sample will be representative of typical boiler shell/furnace-to-endplate attachment weld and a second sample will be representative of a longitudinal seam weld. The candidate is required to detect, characterize and report, within given tolerances (including position within a weld rather than through wall extent), all mandatory reportable defects in the specimens tested.

Because of constraints on specimen storage, the size of specimens and therefore the length of defects may not be fully representative of those found in service. Specimens may contain both fabrication flaws and defects representative of environmentally assisted cracking.

A maximum time of 5 hours is allowed for completion of the practical tests, which will include an oral examination on the approach to testing an actual shell boiler, including knowledge and understanding of boiler construction, safety during inspection, and SAFed specifications for inspection, including surface preparation, test equipment, test objectives and reporting of results.

### **3.3 Results**

An overall result, pass or fail, with grades and a brief statement concerning any particular deficiency will be issued within 5 working days of the examination. No candidate will be issued with a qualification unless all reportable defects are detected, correctly characterized and reported, and the grade attained in each of the two written examinations is at least 70%.

### **3.4 Retests**

One retest of failed written examination parts is allowed.

Retest of individual failed specimens is not allowed and, to gain the qualification sought, the candidate will be required to attempt the full practical test again.

Candidates must wait 30 days before re-applying.

Candidates who fail the examination at a second attempt will not be permitted to re-attempt the examination without providing evidence of completing appropriate further training, and gaining at least three months further experience under qualified supervision.

### **4. QUALIFICATION AVAILABLE**

On completion of the examination, and receipt by BINDT of a successful examination result, the candidate will be issued with a certificate of qualification for in-service ultrasonic testing of shell boilers.

### **5. VALIDITY**

The qualification is valid for five years from the date of successful completion of the examination only if the holder maintains continuity of testing within the scope of the qualification. Records of continuity shall be maintained and presented to BINDT upon demand.

Failure to carry out at least one ultrasonic test relevant to the scope of the qualification in any 12 month period will invalidate the qualification. A form is provided for recording, in a verifiable manner, evidence of continuity in the conduct of boiler inspections.

### **6. RENEWAL**

The certificate of qualification expires five years from the date of success in the examination, and may be renewed upon submission of evidence of continuity and satisfactory performance in the testing of shell boiler welds for a further five year period. Applications are made using PCN form PSL/57Q, which is available at [www.bindt.org](http://www.bindt.org). In the event that the criteria for renewal are not met to the satisfaction of the Independent Qualification Body, the applicant will be referred for re-qualification. Re-qualification is required after 10 years.

### **7. RE-QUALIFICATION**

Re-qualification is conditional upon further success in the written and practical examinations described at 3.2 above.

### **8. CODE OF ETHICS**

It is a condition of qualification that holders of a certificate of qualification shall undertake to comply with a code of ethics, which is published as PCN document reference CP27.

### **9. COMPLAINTS AND CANCELLATION OF QUALIFICATION**

An aggrieved party in a dispute, which considers itself to have reasonable grounds for questioning the competency or ethical behaviour of a qualified individual, may petition the IQB for cancellation of qualification. Such a petition must be made in writing and accompanied by all relevant facts.

If it is the view of the IQB that an adequate case has been presented, the qualification will be suspended pending the results of a full investigation of the circumstances under dispute.

If the petition is upheld, the qualification will be cancelled; if not, it will be restored.

### **10. APPEALS**

Appeals against cancellation, failure to qualify, renew or re-qualify may be made by the candidate, holder or the employer upon application in writing to the Secretary to the IQB.

The IQB Governing Board may delegate the process of dealing with complaints and appeals to a properly constituted sub-committee.

## 11. REFERENCES

PCN/GEN Appendix C: Specific Requirements for the Certification of Personnel in Ultrasonic Testing of Welds.

PCN CP27: Code of ethics for PCN certificate holders

IQB/QP2: Qualified NDT Procedure (for use in the qualification examinations described herein)

PSL-57Q: NDT Qualification Renewal Application.doc

SAFed document SBG1: Guidelines for the Examination of Boiler Shell-to-Endplate and Furnace to Endplate Welded Joints, including the further guidance published in SAFed documents NDTC03, PEC01, PEC03 and PEC05.

SAFed document SBG2: sections 6, 7 and 8.

SAFed documents can be obtained from the Safety Assessment Federation at: [Unit 4, First Floor, 70 South Lambeth Road, Vauxhall, London SW8 1RL](#) Telephone: +44 (0) 20 7582 3208  
Email: [peter.wilson@safed.co.uk](mailto:peter.wilson@safed.co.uk).

## **ANNEX 1: FURTHER INFORMATION TO CANDIDATES CONCERNING THE EXAMINATION**

### **1. EQUIPMENT**

The candidate will provide a calibrated portable ultrasonic flaw detector and suitable probes (as detailed in BINDT document IQB/QP2).

Reference and calibration blocks, and ultrasonic couplant are provided by the examination centre.

**WARNING:** In the event that digital test equipment is used by the candidate, the examination centre will ensure that examination specimen data is not stored in the memory of digital ultrasonic equipment. Candidates should be aware that this may involve deletion of all data stored in the machine's memory.

**NOTE:** Personal Protective Equipment in the form of overalls and safety boots/shoes is required in the practical examination area.

### **2. EQUIPMENT CHECKS PRIOR TO THE START OF INSPECTION**

Flaw detector calibration certificates must be submitted to the examiner prior to the commencement of the test.

Probes shall meet appropriate standards. The test sensitivities for each ultrasonic probe shall be determined and recorded on an equipment check sheet prior to attending the examination centre. This must be available for inspection by the examiner.

### **3. CONDUCT OF TESTS**

#### **Written**

The written examination consists of narrative and multi-choice answer papers (see clause 3.2.1). Clear instructions on the conduct and completion of the examinations is given on the frontispiece to the paper.

#### **Practical**

The candidate will conduct the test using a pre-qualified procedure (BINDT document IQB/QP2 which is obtainable from BINDT or can be supplied by the examination centre). The competence of the applicant will be evaluated through oral and practical assessments. In the practical assessment, the candidate's performance in the detection and characterization of indications will be evaluated against the following criteria, each of which will include tolerances on reporting:

- i. Detection: all mandatory reportable defects must be reported. If a candidate reports a non-existent defect which, if it did exist, would be unacceptable as defined in SBG1, this will constitute a fail.
- ii. Length of defect: + 25mm; – 10mm.
- iii. Longitudinal position (location) of defect centre: + or – 25mm with respect to identified datum.
- iv. Through-wall extent: should be reported, but is not included in pass/fail criteria.
- v. Cross-sectional location: + or – 5mm in any direction

#### **Oral**

The oral examination, which will establish the candidate's underpinning knowledge, consists of ten questions presented by the examiner during the practical examination section. To be successful, the candidate shall be fully conversant with:

The construction of shell boilers, the safety requirements when inspecting shell boilers, the SAFed documents SBG1 and SBG2, typical 'in-service flaws', the surface preparation of shell boilers prior to NDT, different types and designs of shell boilers, the NDT equipment used in the inspection of shell boilers, and defect reporting and recording.

### **4. NDT REPORTS**

The candidate will report the results of the test as specified in the pre-qualified procedure on pro-forma report sheets provided.

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 E-mail: [pcn@bindt.org](mailto:pcn@bindt.org)



**ANNEX 2 - APPLICATION FOR QUALIFICATION EXAMINATION FOR ULTRASONIC TESTING OF SHELL BOILER 'T' BUTT (END ATTACHMENT) WELDS AND SHELL LONGITUDINAL SEAM WELDS**

**PART 1. CANDIDATE'S PERSONAL DETAILS**

Family name:		Given names	
Address (including post code)			
Telephone number		PCN number (where relevant)	
E-mail address (optional)			
Examination applied for (initial, practical retest or written retest)			
Ultrasonic test instrument (manufacturer and model) that will be used by the candidate in the examination			
Please note that ultrasonic probe performance data sheets should be completed by the candidate prior to attending the examination centre. Data sheets for this purpose can be found in BINDT document IQB/QP2 (Procedure) obtainable from BINDT or from the examination centre.			

**PART 2. CURRENT EMPLOYMENT AND NDT CERTIFICATION DETAILS**

Employer's name and address (including post code)			
Fax or e-mail		Work phone	
By ticking the box (right), I confirm that I have attached a verifiable portfolio of evidence demonstrating a background of training and experience in support of this application (see eligibility criteria at paragraph 2).			<input type="checkbox"/>

**Candidate's statement: I confirm the accuracy of information provide in support of my application, and undertake to comply with the code of ethics in PCN document CP27.**

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**PART 3. PAYMENT** (complete applicable sections only)

Name and address for invoice (if different from applicant's):			
Post code:	Telephone	E-mail:	
Company order number:			
Name and signature of senior responsible official of the organisation paying examination fees (not the candidate - unless self employed):			
Method of payment. Bank draft <input type="checkbox"/> , BACS <input type="checkbox"/> , credit card <input type="checkbox"/> , debit card <input type="checkbox"/> , or cheque <input type="checkbox"/> payable to Serco Assurance.			If cheque enclosed, please check this box <input type="checkbox"/>
For payment by credit/debit card: Visa <input type="checkbox"/> , MasterCard <input type="checkbox"/> , Amex <input type="checkbox"/> or Switch <input type="checkbox"/> (tick relevant box):			
Card number:			
Card valid from (if a Switch card, issue date):		Card expires end:	
Name on card:			
Signature of above named individual:			
Address of credit card holder (if different from that in Part 1 of this form):			
Please debit the above credit/debit card for the application/examination fee (enter amount in box - right)		£	: (inc. 17.5%VAT)

**PART 4. FEES** (effective 1<sup>st</sup> January 2012)

**Initial & re-qualification examinations:** £568.00 plus VAT (£681.60)

**Retest (practical):** £568.00 plus VAT (£681.60)

**Retest (written):** £279.00 plus VAT (£334.80)

**Renewal (using form PSL/57Q):** £185.00 plus VAT (£222.00)

The examination application form, when completed, should be sent to ISIQ Administration, c/o IVC, Serco Assurance, Walton House, 404 Faraday Street, Birchwood Park, Risley, Warrington, WA3 6GA, Tel: 01925 253786. Fax: 01925 252617, with the current examination fee (which is non-refundable in the event of failure to attend or of cancellation by the candidate within 14 days of the examination date) and two passport size photographs of the applicant.

**PART 5. FOR INTERNAL USE ONLY**

<b>Examination date:</b>		<b>Candidate file raised:</b>	
<b>Examination type (initial, practical or written retest)</b>		<b>Correct examination fees and 2 passport photos received:</b>	
<b>Examination area reserved:</b>		<b>Written papers available:</b>	
<b>Examiner/invigilator booked (as required):</b>		<b>Candidate provided with necessary information:</b>	
<b>Examination result:</b>		<b>File closed and forwarded to BINDT:</b>	

### ANNEX 3 - RECORD OF PRE-QUALIFICATION BOILER INSPECTION EXPERIENCE

Candidate's name: \_\_\_\_\_ PCN number (if known): \_\_\_\_\_

Home address: \_\_\_\_\_ Post code: \_\_\_\_\_

Telephone number: \_\_\_\_\_ Fax or e-mail: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Date of Boiler Inspection	Class and serial number of Boiler	Location of Boiler	Details of procedure, code or standard applied	Name, signature and contact information of supervisor or referee