

supplementary criteria for accreditation

Welder Qualification
Testing to NZS 4711

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Welder Qualification Testing to NZS 4711

AS LAB C4.2

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1 Introduction

1.1 International Accreditation New Zealand's (IANZ) Supplementary Criteria provide supplementary information to the General Criteria for Accreditation for specific types or groups of tests or calibrations. They provide detail or add extra information to the generally stated requirements of IANZ General Criteria for Accreditation and IANZ Specific Criteria for the particular field.

1.2 This supplementary criteria details the specific requirements covering the accreditation of laboratories undertaking the assessment of mechanical tests and the interpretation of radiographs in accordance with NZS 4711.

1.3 These requirements were previously described in Telarc Technical Note 5. It is a supplementary document to IANZ Specific Criteria 4 (AS LAB C4), which includes requirements for mechanical testing laboratories generally. This document must be read in conjunction with the current issues of IANZ publications:

- (a) NZS ISO/IEC 17025 *General Requirements for the Competence of Testing and Calibration Laboratories*
- (b) *Specific Criteria for Accreditation: Mechanical Testing AS LAB C4*
- (c) *Procedures and Conditions of Accreditation AS 1.*

1.4 IANZ subdivides different types of testing into a structure referred to as classes of test. For mechanical testing laboratories, the class of test structure is defined in Specific Criteria 4 and the following class has been assigned to Welder Qualification Testing:

4.55 Welder Qualification Tests.

Approved Signatories meeting section 5 below will be awarded this class of test. A laboratory meeting all the requirements for accreditation appropriate to Welder Qualification Testing will have this class of test added to their Scope of Accreditation.

1.5 The addition of this class of test to the Scope of Accreditation may be granted only when the laboratory has:

- (a) Implemented a documented quality management system in accordance with NZS ISO/IEC 17025 (appropriate to Welder Qualification Testing).
- (b) Demonstrated to an assessment team that the laboratory has at least one staff member with the appropriate skills and qualifications to meet the requirements listed under Qualifications of Staff below. Staff members assessed as meeting these requirements will be awarded Approved Signatory status
- (c) Demonstrated to an assessment team that it has the necessary accommodation and equipment.

2 Requirements of NZS 4711

Note: NZS 4711 refers to Telarc Registration. The accreditation arm of the Testing Laboratory Registration Council (previously referred to as Telarc) formally changed its name in 1997 to International Accreditation New Zealand (IANZ). At that time, the term "registration" was replaced with the term "accreditation". When relevant, this criteria document will use the current terminology followed by the terminology used by NZS 4711 in brackets.

For the purposes of clarification, the following definitions should be taken in place of those quoted in NZS 4711:

Mechanical Test Assessor means the approved signatory of a laboratory accredited by IANZ for the assessment of mechanical tests required by this standard and appointed by a test authority to assess the mechanical tests.

Radiographic Interpreter means the approved signatory of a laboratory accredited by IANZ for the interpretation of the radiographs required by this standard and appointed by a test authority to assess a radiograph.

Telarc Registered Laboratory means an organisation accredited by International Accreditation New Zealand to issue IANZ endorsed test reports relating to the assessment of mechanical tests and/or the interpretation of radiographs.

NZS 4711 outlines the procedures to be followed in conducting the qualification testing of welders to establish their competency in manual, semi-automatic or automatic metal-arc welding of weldable steels. Tests are specified for welder qualification on:

- (a) Plate
- (b) Tube (welded from one side without backing).

The standard includes a separate qualification for single position (flat, horizontal-vertical, vertical or overhead) or multi position welds. Each test sets a time limit for the test weld to be completed, which is determined by the position, process, and experience of the welder. The period of validity of a welder qualification certificate is based on the weld position and previous qualification held.

NZS 4711 requires that the mechanical tests and the interpretation of the radiographs of welder test plates, as detailed in Appendix A, must be carried out by an organisation accredited (registered) by IANZ (Telarc) for such tests.

Note: For subsequent IANZ endorsement of the interpretation of radiographs, it is a requirement of accreditation that such radiographs are taken and processed by a laboratory accredited by IANZ for radiography on butt welds in steel.

Section 102 and Clause 502.1 of NZS 4711 define this latter requirement, and specify that the individuals responsible for the assessment of mechanical tests and the interpretation of radiographs must hold IANZ (Telarc) signatory approval for such tests.

3 Accommodation and Equipment

3.1 An organisation seeking accreditation (registration) for interpretation of radiographs in accordance with NZS 4711, must demonstrate that it has access to radiographic viewing facilities that comply with the requirements of Clause 2.10 AS 2177:2006.

3.2 The light output of radiograph viewers shall be adequate and checked for sufficient light output. Formal calibration is not required but operators shall have a positive means for ensuring suitability. The formal measurement of light output using an appropriate light measuring procedure may be one means for ensuring suitability. Records of such checks must be maintained for review during IANZ assessments.

3.3 Equipment such as a densitometer or a density strip must be held for the assessment of the density of radiographs. The radiograph viewing room must be equipped with charts or graphs enabling radiographic sensitivity to be calculated when wire type image quality indicators are used.

Note: The use of film density strips is not recommended unless operators are experienced and competent in their use. Working film density strips used for this purpose shall be maintained in good condition and be in service in accordance with dates shown on the manufacturer's certificate.

3.4 The organisation must have access to a press and formers complying with the requirements of clause A2.5 of NZS 4711 for the purpose of conducting bend tests and nick-break tests. The formers must be subjected to dimensional checks at least annually and records of such checks must be maintained. Where formers are not under the direct control of the laboratory (e.g. not owned by them), a record is to be generated at the time of use to show that the former was fit for purpose.

3.5 Copies of the following documents must be available to the staff conducting tests in accordance with NZS 4711:

- (a) NZS 4711:1984 *Qualification Tests for Metal-Arc Welders*
- (b) AS2177:2006 *Non-destructive testing – Radiography of welded butt joints in metal*
- (c) AS 2314 *Radiography of metals – Image quality indicators (IQI) and recommendations for their use.*

3.6 Copies of the following documents must be available in the accredited laboratory and approved signatories need to be familiar with them:

- (a) IANZ *Procedures and Conditions of Accreditation AS1*
- (b) NZS ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories*
- (c) IANZ *Specific Criteria for Accreditation – Mechanical Testing AS LAB C4.*

4 Test Records

4.1 Test records relating to welder qualification tests must include:

- (a) A clear, unique identification of the particular test plate under examination. This identification must also appear on the radiographs produced for interpretation. In general, use of the welder's initials alone is **not** sufficient identification
- (b) The name of the person undertaking the assessment of the mechanical tests and/or the interpretation of the radiograph
- (c) The date on which the tests were undertaken
- (d) The mechanical test assessor's assessment of the test pieces following the nick-break and bend tests
- (e) The density of the radiograph film in the weld area
- (f) The radiographic sensitivity achieved
- (g) The radiographic interpreter's interpretation of the weld discontinuities revealed by the radiograph
Note: All discontinuities must be recorded
- (h) The results of the welder qualification tests must be reported on the appropriate welder test sheet shown in the Standard.

5 Qualifications of Staff

5.1 Staff undertaking tests in accordance with NZS 4711 would normally be expected to have a background in engineering, welding, metallurgy or non-destructive testing. They must also have had extensive experience in the assessment of nick-break tests and bend tests and the interpretation of radiographs of fusion welded butt joints in steel. No prerequisite formal personal qualifications are required. However, personal qualification, such as a CBIP Certified Welding Inspector and/or holder of CBIP Radcert, will assist staff to understand the background technical aspects involved.

5.2 Staff undertaking the interpretation of radiographs must be familiar with:

- (a) The general requirements of clauses A4.2 and 304.2.4 of NZS 4711
- (b) The definition of radiographic sensitivity and methods of determining sensitivity
- (c) The definition of radiographic film density and methods of determining film density
- (d) The general requirements of AS 2177:2006 with regard to:
 - (i) Surface condition of the weld to be radiographed AS 2177:2006 Clause 3.2
 - (ii) Weld image location AS 2177:2006 Clause 3.10
 - (iii) Density of radiographs AS 2177:2006 Clause 3.5
 - (iv) Use of image quality indicators AS 2177:2006 Clause 2.7 and Clause 3.3
 - (v) Radiograph viewing AS 2177:2006 Clause 3.13.

5.3 Staff undertaking the assessment of mechanical tests must be familiar with clauses 304.1, 304.2.1, 304.2.2, 304.2.3, 404.2, 404.3 and 404.4 of NZS 4711. They must also be fully conversant with Appendices A1, A2 and A3.

5.4 Staff carrying out the assessment of mechanical tests or interpreting radiographs need to possess good eyesight. An adequate level of visual acuity is defined in clause 1.7 of AS 2177:2006. All approved signatories will be screened for adequate eyesight during IANZ assessments. Any staff member not meeting the required standard will be asked to provide a certificate from an appropriately qualified and recognised practitioner.

It is considered good practice for the accredited laboratory to have in place a system for detecting deterioration in visual acuity, and an adequate annual eyesight check is considered appropriate for this.

5.5 Staff seeking signatory approval status must meet the requirements set out in Appendix 2 of IANZ *Specific Criteria for Accreditation Mechanical Testing AS LAB C4*.

5.6 Staff carrying out mechanical assessments and interpretation of radiographs in accordance with NZS 4711 must be IANZ Approved Signatories and must have personally carried out the work for which they are signing (taking responsibility).

Appendix 1

Radiographic Density

In the image of the length of weld under examination, the film density corresponding to the sound weld metal shall be not less than 2.0 and not greater than 3.0, unless special arrangements are made for the adequate viewing of higher density film. These values are inclusive of the fog density of not greater than 0.3 max. Optical Density is defined as

$$D = \log_{10} \frac{I^o}{I_T}$$

Where I^o is the intensity of the incident light and I_T is the intensity of the transmitted light.

With films of density 2.0 and 3.0, the transmitted light has an intensity of 1/100 or 1/1000 respectively of its original value. Densitometers are available commercially for density measurement; alternatively, a visual comparison can be made using a calibrated density step-wedge.