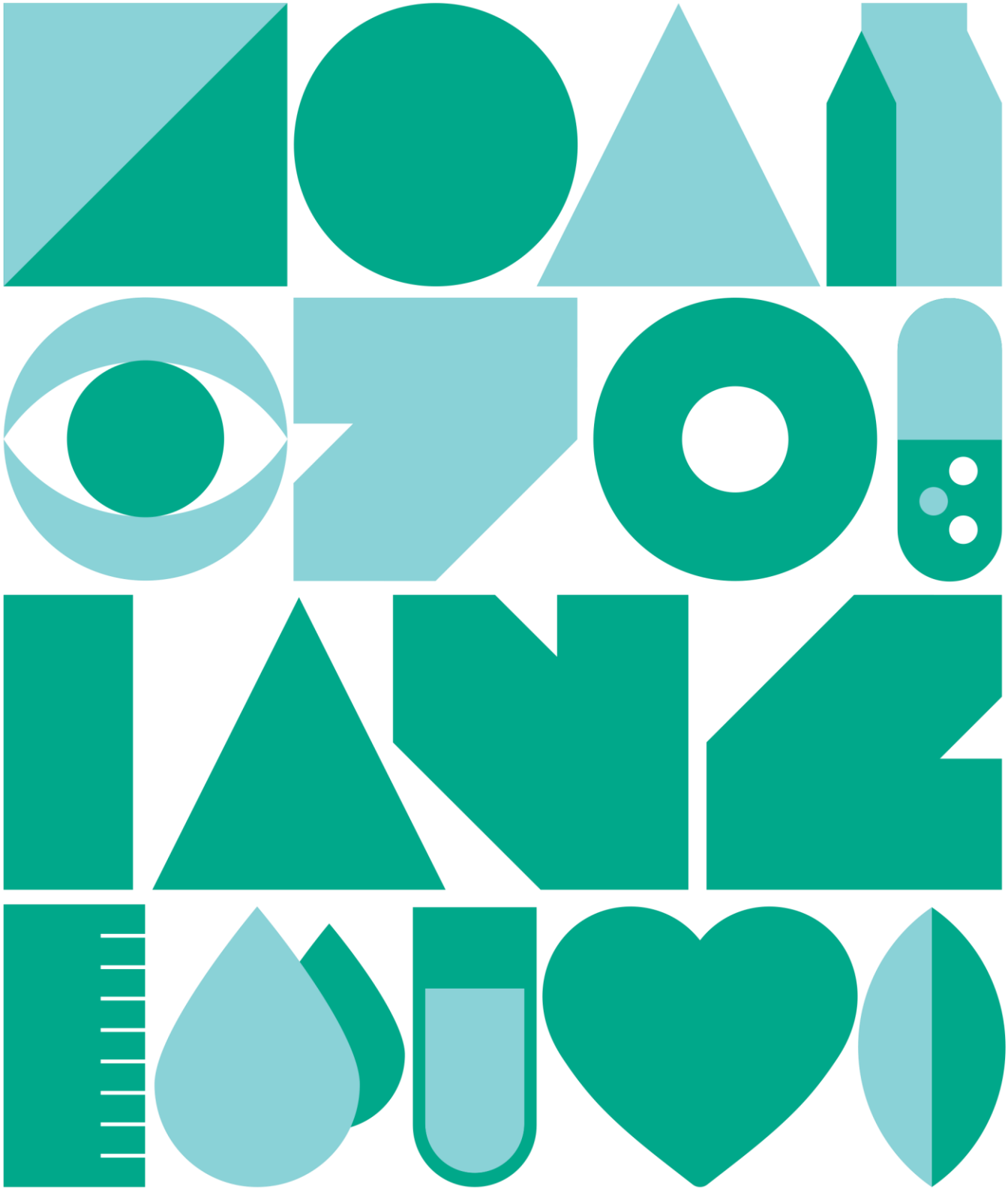

Supplementary Criteria for Accreditation
Welder Qualification Testing to AS/NZS 2980:2018 and ISO 9606-1:2012

Sixth Edition April 2021

The NZ mark of competence
Tohu Matatau Aotearoa

This page is intentionally blank

Supplementary Criteria for Accreditation

Inspection Body Accreditation Programme

Welder Qualification Testing to AS/NZS 2980: 2018 and ISO 9606-1:2012

AS IB C1.4

Sixth Edition April 2021

Published by:

International Accreditation New Zealand
626 Great South Road, Ellerslie, Auckland 1051
Private Bag 28908, Remuera, Auckland 1541, New Zealand
Telephone: +64 9 525 6655
Email: info@ianz.govt.nz
Internet: www.ianz.govt.nz

Edition Statement

Edition	Amendment	Date of Issue	ISBN No.
1	Updated from Telarc New Zealand issue	February 2002	0908611 48 X
2	Revised and reformatted	February 2008	978-0-908611-25-6
3	Revised to AS/NZS 2980:2018	May 2011	978-1-877531-01-9
4	Reference up-dates & stainless steel weld test requirements	August 2016	978-1-877531-31-6
5	Transferred from AS LAB C4.2; rebrand	July 2020	978-1-877531-96-5
6	Inclusion of ISO 9606-1 in scope & title; complete rewrite	April 2021	978-1-99-003619-4

Contents

1 Introduction

International Accreditation New Zealand (IANZ) Supplementary Criteria provide information supplementary to the General Criteria for Accreditation for specific types or groups of tests, inspections 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.

This supplementary criteria details the specific requirements covering the accreditation of inspection bodies undertaking the assessment of the welder qualification process in accordance with AS/NZS 2980:2018 and ISO 9606-1:2012.

This supplementary criteria document has been written in response to a significant level of industry dissatisfaction with incorrect and inconsistent interpretation of requirements for welder qualification certificates issued by Welder Qualification Examining Bodies (WQEB) in accordance with AS/NZS 2980:2018 and ISO 9606-1:2012. Dissatisfaction with issued certificates includes those issued by accredited and unaccredited organisations.

Accreditation of WQEBs is not a requirement of AS/NZS 2980:2018, ISO 9606-1:2012, other related standards or any New Zealand regulations. Organisations that elect to be accredited for this scope of work do so on a voluntary basis or when it is required by any other quality code or quality management system requested by client due to the technical scope of the work.

This document will have no effect on the processes or certificates of unaccredited organisations.

2 Definitions

2.1 welder qualification examining body

Organization appointed to verify compliance with the applicable standard

Note: This definition is identical to that of “examining body” in ISO 9606-1 (as referenced in AS/NZS 2980:2018)

The role of a Welder Qualification Examining Body (WQEB) is not to collect and rubber stamp records provided by other individuals or organisations and issue a certificate.

The role of an accredited (WQEB) is to gather information from appropriate sources, verify the competence of the organisations or individuals supplying the information, check the completeness, consistency and reliability of the information and make a conformity assessment decision based on the inspection of this information.

The conformity assessment decision, for which WQEB’s may be accredited, is whether or not the process has been followed correctly and whether or not there is sufficient, documented, reliable and retained evidence on which to base the issue of a welder qualification certificate.

Issuing welder qualification certificates itself is not part of the accredited process.

An organisation cannot be accredited as a personnel certification body under ISO/IEC 17020.

2.2 examiner

Person appointed to verify compliance with the applicable standard.

Definitions from ISO 9606-1 (as referenced in AS/NZS 2980:2018)

Note: AS 1796-2001 refers to ‘examiners’ of practical tests as ‘assessors’ and AS/NZS 1554.1 section 4.12.1 describes this role as a welding supervisor.

This definition does not require the person to be employed by a WQEB. The definition does require an examiner to be ‘appointed’ but does not specify which party shall appoint the examiner.

2.3 verification

Confirmation, through the provision of **objective evidence**, that specified requirements have been fulfilled.

2.4 welding test supervisor

A person, acceptable to the WQEB, that witnesses the practical activities involved in making the test welds, and provides all records required by the WQEB.

Note 1: Minimum qualification requirements for the role of welding test supervisor are defined in Annex 1

Note 2: In this document the term '**welding test supervisor**' is used in the sense that 'welding supervisor' is used in AS/NZS 1554.1 to differentiate the role of witnessing the practical welding activities from the verification role of the 'examiner'. A single, suitably qualified, person may perform the activities of both welding test supervisor and examiner. Minimum qualification requirements for each role are defined in Annex 1.

3 Scope

In many areas AS/NZS 2980:2018, ISO 9606-1:2012 and related standards do not provide comprehensive, clear and explicit criteria for the acceptance of evidence used to make decisions on the competence of welders.

The intent of this document is to use the existing requirements of ISO/IEC 17020 to specifically target known areas of inconsistency by highlighting where these requirements must be applied, by accredited inspection bodies, in this specific field.

This document is structured to follow the order of ISO 9606-1:2012 and to highlight the responsibilities of a WQEB, that is accredited to ISO/IEC 17020:2012, when verifying that the processes specified in the standard have been followed and appropriate records have been retained.

This document is limited to the inspection of the welder qualification process only.

4 General requirements for WQEB accreditation

WQEB process inspections may be added to the scope of Accreditation only when the organisation has:

(a) Implemented a documented quality management system in accordance with ISO/IEC 17020 (appropriate to a Welder Qualification Examining Body).

(b) Demonstrated to an assessment team that the organisation has available one or more personnel with appropriate competencies, including the qualifications listed in Annex 1, to meet the requirements for each activity involved in the welder qualification process.

5 Specific responsibilities of an accredited WQEB

A WQEB has a specific task, as defined and explained in Section 2 of this document. A WQEB may be a stand-alone body that performs this function and none of the contributory functions, or it may be part of a larger organisation that performs one or more of the functions that provide information used in the certification process.

5.1 Validation of information

However the work is organised, and however many parties are involved, the WQEB is responsible for the validity of the information contained in, and supporting, certificates issued. The accredited WQEB process must be robust enough and transparent enough to provide a high level of confidence in the reliability of welder qualification certificates generated by the process.

In all cases an accredited WQEB remains responsible for the verification of the information it uses and the conformity assessment decisions it makes (see ISO/IEC 17020:2012 clause 6.3.3).

(This requirement is mirrored in AS 1796:2001:1.6.1)

5.2 Welding procedure specifications (WPS)

Details of the designation of the qualification on a welder qualification certificate depends on the content of the welding procedure specification used for the test.

Standards do not specify who must provide the WPS for the test and therefore it could be a standard or generic procedure provided by the candidate or by the WQEB or it could be a project specific specification supplied by an employer, fabricator, engineer or other party. Whatever the source of the WPS, or its contents, a copy of the welding procedure qualification report (PQR/WPQR) and supporting destructive and non-destructive testing reports, must be retained as part of the test records. AS/NZS 1554.1 requires

welding procedures to be qualified before use, either specifically for a project, in accordance with clause 4.2 of AS/NZS 1554.1, or as pre-qualified procedures in accordance with clause 4.3.1 of AS/NZS 1554.1. Qualification of WPS is not an accredited activity.

For accreditation purposes a record of the person or organisation that qualified the WPS must be retained.

It is strongly recommended that some explanatory notes on the WPS, such as the range and limitations of the procedure and the qualification's applicability, are included, in plain English, in the certificate. This would assist welders and their employers who may not be fully conversant with the standard codes and abbreviations used to codify this information.

5.3 Validity of records from welding test supervisor

For accreditation purposes, as the welding test supervisor provides information critical to a conformity assessment decision and as the welding test supervisor's role is clearly 'part of the inspection', the WQEB must either perform the role themselves using their own employed or contracted personnel or they must treat an external welding test supervisor as a subcontractor. This requirement applies whether there is a formal contract between the WQEB and the welding test supervisor or not.

Whether the welding test supervisor is a member of the WQEB's personnel or a subcontractor, the WQEB remains responsible for establishing the welding test supervisor's competence, the reliability of their observations and records and the conclusions drawn from them. An accredited WQEB must be able to demonstrate the effectiveness of their documented verification processes; either through conformance with section 6.1 or 6.3 and 7.3 and 7.4 of ISO/IEC 17020.

An accredited WQEB shall not accept information from a welding test supervisor if it is not satisfied with the reliability and integrity of the information supplied or does not have retained evidence of the process and the competence of the welding test supervisor on which to base their confidence.

Note: Evidence based acceptance of a welding test supervisor is deemed to be equivalent to 'appointment' of a welding test supervisor by a WQEB.

The definition of a WQEB does not specify which party may appoint an examining body. In practice an examining body (WQEB) is considered to be 'appointed' by the party that contracts it to provide the service.

5.4 Verification of all supporting information

The definition of verification (2.3) makes clear that verification must be based on objective evidence, i.e. records, which could include photographs or other media as well as written descriptions and comments.

For accreditation purposes this means that the evidence on which decisions are based and the reasoning for decisions must be objective (recorded) and retained for a specified period (typically a minimum of 4 years or for the validity period of each certificate which will normally be more than 5 years). See clauses 6.3.3, 6.3.4, 7.3.1, 7.3.2, 8.4.1, 8.4.2 of ISO/IEC 17020:2012.

5.5 ISO 9606-1 standard reference numbers and abbreviations

Section 4 of ISO9606-1 requires standard abbreviations to be used when completing welder's qualification test certificates.

- Section 4.2 provides a list of 14 standard numbers for welding processes
- Sub section 4.3.1 provides a list of 14 standard abbreviations related to characteristics of test pieces
- Sub section 4.3.2 provides a list of 32 standard abbreviations for filler materials
- Sub section 4.3.3 provides a list of 11 standard abbreviations for other weld details
- Sub section 4.3.4 provides a list of 3 standard abbreviations for bend test parameters
- Sub section 4.3.5 provides a list of 3 standard abbreviations for types of arc welding

These abbreviations are provided in the standard to facilitate consistency and prevent confusion.

For accreditation purposes a WQEB must have a documented procedure for checking that appropriate abbreviations, from these lists, have been used in appropriate fields and that if any additional, non-standard, abbreviations are used that these are clearly defined in the records and on certificates that use them. See clause 7.1.3 of ISO/IEC 17020:2012.

As, in most cases, these abbreviations are initially recorded by welding test supervisors and are then transcribed onto certificates, an accredited WQEB must document and perform appropriate checks in accordance with ISO/IEC 17020:2012 clause 7.1.8. These checks must include identifying any use of incompatible combinations of codes as well as consistency with the designation given on the certificate.

A WQEB must be able to demonstrate the effectiveness of these checking processes.

5.6 Essential variables and range of qualification

ISO 9606-1 section 5.1 states that qualification of welders is based on essential variables and lists the 8 essential variables. A range of qualifications is defined for each essential variable.

There are a large number of permutations of these essential variables and other parameters that determine the qualifications that can be awarded. It is the WQEB's role to ensure that the qualification details on the certificate are consistent with the variables listed on the certificate and that every piece of information used to determine the qualification is reliable and retained for reference for a defined period.

For accreditation purposes a WQEB must document a procedure, in accordance with clause 7.1.3 of ISO/IEC 17020:2012, to ensure that the qualification details on the certificate are consistent with the variables listed on the certificate. An accredited WQEB must have a certificate template or procedure for creating certificates that ensures that all requirements of clause 7.4.2 of ISO/IEC 17020:2012 are included.

Note: To comply with ISO 9606-1 the list of essential contents of the report/certificate listed in clause 7.4.2 of ISO/IEC 17020:2012 must be augmented to include all the essential information required by ISO 9606-1.

To comply with clause 7.1.7 of ISO/IEC 17020:2012 an accredited WQEB must document a procedure to check that there is objective evidence to substantiate each and every essential variable listed in the certificate. This evidence shall be collected by the named welding test supervisor(s) and may take any objective form such as, documentation for parent material(s), consumables and shielding gas if applicable for the welding process used for the test a copy of the welding procedure used, photographs, written notes etc.

If the welding test supervisor is not working under the WQEB's quality management system then records must be maintained in accordance with clauses 6.3.1 and 6.3.4 of ISO/IEC 17020:2012 to justify the reliance on this inspection information from an external source.

5.7 Witnessing of the welding process

Section 6.1 of ISO 9606-1:2012 requires the welding of the test pieces to be witnessed by the examiner or examining body. AS/NZS 1554.1 section 4.12 describes this role as a welding supervisor. In this document the term 'welding test supervisor' is used to avoid ambiguity.

An accredited WQEB must define the competencies required of a welding test supervisor undertaking the witnessing of the welding process and retain records to demonstrate that the welding test supervisor met the competence requirements at the time of the witnessing.

Part of the definition of competence in accordance with ISO/IEC 17020:2012 clause 6.1.3, is the qualification of 'inspectors' (welding test supervisors). Minimum qualifications for this role are listed in Annex 1.

Note: In accordance with ISO/IEC 17020:2012 clause 6.1.1 and related guidance to 6.1.1 in the IANZ Specific Criteria for Accreditation: Application of ISO/IEC 17020:2012, definitions of competence cannot be limited to the achievement of qualifications. If the welding test supervisor is operating under the WQEB's quality management system, up to date evidence of competence should be included in the inspection body's personnel training, competence assessment, authorisation and monitoring records in compliance with clause 6.1.10 of ISO/IEC 17020:2012.

An accredited WQEB that uses external welding test supervisors, not operating under the WQEB's quality management system, must formally define and justify what information it requires about welding test supervisors who witness welding processes as part of its compliance with clause 6.3.1 of ISO/IEC 17020:2012. For accreditation purposes the WQEB must retain details such as the name, affiliation, qualifications and experience and any other evidence it considers relevant to justify the decision to rely on the records generated by each welding test supervisor.

Whether or not the welding test supervisor who witnesses the welding process is a member of the WQEB's personnel, evidence of competence must be gathered before the test welds are undertaken. To be valid information, including qualifications etc. must be current.

5.8 Verification of the testing of test pieces

Section 6.1 of ISO 9606-1 requires the testing of welded test pieces to be verified by the examiner or the examining body. ISO 9606-1 does not specify that tests must be performed by accredited organisations. However, historically, in New Zealand, it has been accepted practice that tests, both destructive and non-destructive have only been acceptable if performed by accredited laboratories and if the results are IANZ endorsed.

For accreditation purposes IANZ is formalising existing best practice by requiring test results to be in the form of IANZ endorsed reports, a copy of which must be retained as evidence to support the certification decision.

5.9 Marking of test pieces for traceability

Section 6.1 of ISO 9606-1 requires test pieces to be marked with the identification of the welding test supervisor and the welder. Additionally the test pieces must be marked with the welding position, and for fixed pipe welds the 12 o'clock welding position must be marked.

For accreditation purposes a WQEB must confirm that the test pieces are marked in accordance with section 6.1 of ISO 9606-1 and objective evidence must be retained to establish traceability of the welder, the weld procedure specification, the welding test supervisor, records of the conduct of the test welds, the test pieces and the results of tests on the test pieces. See clause 7.3.1 of ISO/IEC 17020:2012.

5.10 Verification of the dimensions of test pieces

Section 6.2 of ISO9606-1 specifies the dimensions of test pieces.

For accreditation purposes the WQEB must record the actual dimensions of test pieces, at the time of the test weld(s), and verify that they meet the requirements of the standard. These measurements must be part of the retained records of the test weld(s) verified by the welding test supervisor as required by clause 7.3.1 of ISO/IEC 17020:2012.

5.11 Verification of welding conditions

Section 6.3 of ISO 9606-1 specifies a number of welding conditions. These include requirements for the welding procedure (pWPS or WPS), the progress of the test weld(s) and marking of relevant positions on the test weld(s).

For accreditation purposes the examiner or the WQEB must confirm that the welding procedure is in conformance with ISO 15609-1 or ISO 15609-2. This requirement is explicit in ISO 9606-1 and is listed as a normative reference in AS/NZS 2980:2018. To facilitate this inspection the person making this assessment must have access to and be competent in the application of the two listed standards. This relates to clauses 7.1.1 and 7.1.2 of ISO/IEC 17020:2012. The examiner must have access to and be familiar with the welding procedure used for the test.

In addition, the throat thickness of the fillet weld test piece must be defined in the procedure and this must be recorded as evidence of compliance with clause 7.1.1 of ISO/IEC 17020:2012.

These requirements should be verified and recorded to comply with clause 7.1.1, preferably by the welding test supervisor, before the test weld(s) commence.

Compliance or noncompliance with the other conditions in 6.3 must be established and recorded in a timely manner to comply with clause 7.1.7 of ISO/IEC 17020:2012.

5.12 Appropriate tests for test pieces

Section 6.4 of ISO 9606-1 specifies the tests to be applied to the test pieces. Table 13 of ISO 9606-1 provides the options for testing according to the type of test pieces. In some cases there are options that may be chosen as a personal choice or according to the availability of test facilities etc.

Note: When welders are to be certified to AS/NZS 2980:2018 the tests shall be conducted in accordance with AS/NZS 2980:2018 Appendix B requirements where these differ from ISO 9606-1 Table 13.

Section 6.4 Table 13 footnote (e) include macroscopic examination option that sample shall be taken from start/stop area(s) which stated in clause 6.3 as the test piece shall have at least one stop and restart.

For accreditation purposes the name of the person who decided the tests to be done shall be recorded with reasons for the decisions when relevant.

Part of an accredited WQEB's role is to verify the appropriateness of the choice of tests and their compliance with ISO 9606-1 Table 13 (see note to 5.12 above) taking into account the recorded circumstances and variables. The verification decision and the name of the person who made the decision must be recorded to comply with clause 7.3.2 of ISO/IEC 17020:2012.

5.13 Verification of test piece parameters

Section 6.5 of ISO 9606-1 specifies parameters and limits for test pieces and test specimens.

As ISO 9606-1 does not include procedures an accredited WQEB must have documented procedures to meet the requirement of clause 7.1.3 of ISO/IEC 17020:2012.

For accreditation purposes an accredited WQEB is required to have a procedure for checking that the test pieces and test specimens comply with all requirements of the referenced standards and verifying that the test pieces are appropriate for the range of qualifications applied for. The WQEB must define how these checks are done, how they take into account all relevant variables and what form(s) of objective evidence must be retained.

Records must be retained to demonstrate the effective implementation of the procedure(s) to meet clauses 7.3.1 and 7.3.2 of ISO/IEC 17020:2012.

5.14 Records of welder qualification activities

Section 6.6 of ISO9606-1 refers to test reports

For accreditation purposes this refers to all the **records** made, collected, collated and retained to justify the issue of a welder qualification certificate. Contents of records must be in compliance with the specific standard(s) used. This implies that an accredited WQEB must have controlled copies of all the standards referenced in welder qualification certificates to comply with clause 7.1.4 of ISO/IEC 17020:2012.

If an accredited WQEB accepts records from external welding test supervisors it remains the responsibility of the WQEB to ensure, and be able to demonstrate, that the welding test supervisor has up to date reference materials, such as a current copy of the standard(s) or procedures incorporating the necessary parameters and conditions from relevant standards each time a welder is examined on behalf of the WQEB. This requirement should be part of the documented process for complying with clause 6.3.1 of ISO/IEC 17020:2012.

The records and records management systems of accredited WQEBs must also fully comply with clauses 7.3.1, 7.3.2, 8.4.1 and 8.4.2 of ISO/IEC 17020:2012.

5.15 Acceptance requirements for test pieces

Section 7 of ISO 9606-1 specifies the criteria against which test pieces must be assessed **before** testing. It also specifies the pass/fail criteria for test pieces following testing.

Compliance with the four criteria in section 7 shall be evaluated before test pieces are submitted for testing.

It is not clear in the standard who should do this. It could be the welding test supervisor, working on behalf of the WQEB, or it could be the laboratory as part of its acceptance criteria for test pieces.

For the purposes of accreditation these evaluations are the basis of the decision to test or not to test and therefore to pass or fail the test pieces. Evidence must be retained of the identity of the person who performed the evaluations, and the results of each evaluation.

Whoever performs these evaluations the WQEB remains responsible for the competence of the person(s) involved and for the records created and retained.

WQEB procedures shall define the competence criteria for persons performing these evaluations and the records to be made and retained. Minimum qualifications as part of the defined competencies are listed in Annex 1. The WQEB must be able to demonstrate effective implementation of these procedures.

5.16 Assessment of test results

Section 7 of ISO 9606-1 describes the pass/fail criteria for test pieces as the result of testing. In general the criteria to be used are defined as those specified in ISO 5817 and quality level B. However, there are exceptions to this explained in section 7.

For accreditation purposes the WQEB must have a controlled copy of ISO 5817 and a procedure that defines how the requirements of ISO 5817, as modified by ISO9606-1, are assessed, who makes the assessment, what competencies they must have and what records are to be made and retained to meet the requirements of clauses 7.1.1, 7.1.2, 7.1.3, 6.1.1, 6.1.2, 7.1.7, 7.3.1 and 7.3.2 of ISO/IEC 17020:2012.

5.17 Welder's qualification test certificate

Section 10 of ISO9606-1 defines the minimum content of Welder's qualification test certificates to comply with this standard.

For accreditation purposes a WQEB must have appropriate documented procedures to ensure that certificates issued following verification by the WQEB comply in **all** respects with the requirements of ISO9606-1 section 10, relevant requirements of other referenced standards AND **all** requirements of ISO/IEC 17020:2012 clause 7.4.2.

An accredited WQEB must be able to demonstrate that effective checks are in place in accordance with clause 7.1.8 of ISO/IEC 17020:2012 to ensure that all data has been accurately transcribed and is consistent.

5.18 Endorsement of Welder Qualifications Test Certificates

The accreditation of a WQEB to ISO/IEC 17020:2012 does **not** entitle the organisation to claim the status of a personnel certification body. That would require accreditation to ISO 17024.

Accreditation to ISO/IEC 17020:2012 covers the inspection of the **process** of gathering and validating all the information required to support the issue of a welder qualification test certificate. If certificates are IANZ endorsed they must include the following or equivalent text prominently near the IANZ endorsement to make clear the meaning and limitation of the IANZ endorsement.

> **"The process supporting this certificate has been verified by *"Name of accredited WQEB"* under its IANZ ISO/IEC 17020 accreditation."**

Accredited WQEBs must also add standard text to the relevant section of endorsed certificates indicating that the revalidation process for this welder qualification certificate is not covered by the IANZ accreditation.

5.19 Summary of WQEB responsibilities

An accredited WQEB is responsible for ensuring that all persons acting on its behalf, including full time employees, contracted persons and subcontractors have appropriate competencies including current qualifications as defined in Annex 1.

An accredited WQEB is responsible for ensuring that all relevant reference materials, (documents, standards, procedures etc.) are available to any persons performing any part of the inspection at the time of the inspection.

An accredited WQEB is responsible for controlling all reference material to ensure it is up to date at the time of each inspection.

An accredited WQEB is responsible for defining how each part of the inspection is to be performed by documenting detailed procedures.

An accredited WQEB is responsible for defining what records are to be kept and how the accuracy, consistency and completeness of all records are to be ensured.

An accredited WQEB is responsible for retaining records of all parts of inspections for reference for a defined period.

Annex 1 Minimum qualification requirements

Welding test supervisor

A person in the role of welding test supervisor, on behalf of an accredited WQEB, shall meet the following minimum requirements, based on AS/NZS 1554.1:2014 Clause 4.12.1

The welding test supervisor shall have a minimum of three years' experience in the welding techniques required by the WPS and shall comply with one or more of the following:

(a) Hold a Welding Supervisor's Certificate in accordance with AS 2214, or

(b) Hold a Welding Supervisor's Certificate in accordance with AS 1796 Certificate No. 10, or

(c) Hold a New Zealand Institute of Welding Supervisor's Certificate or

(d) Hold an International Institute of Welding qualification at the level of

- International Welding Specialist (IWS),
- International Welding Technologist (IWT) or
- International Welding Engineer (IWE) diploma

(e) Hold a New Zealand Institute of Welding Certificate in welding engineering

(f) Hold a postgraduate certificate, diploma or degree in welding engineering from a recognized university or an approved technical college

Examiner

Examiners in an accredited WQEB shall hold one or more of the following qualifications:

(a) International Institute of Welding diploma as an IIW Welding Inspector, at the appropriate level.

(b) A Welding Technology Institute of Australia Certificate as a Welding Inspector, at the appropriate level.

(c) A Certification Board of Inspection Personnel (CBIP) New Zealand Welding Inspector or

(d) another weld inspector certification from a recognised certification body, accredited to ISO/IEC 17024

(e) A certificate as a structural welding supervisor in accordance with AS 2214.

(f) A certificate as a welding supervisor in accordance with AS 1796.

(g) Hold a postgraduate certificate, diploma or degree in welding engineering from a recognized university or an approved technical college.