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HKIAS Supplementary Criteria No. 3

Construction Products Inspection - Welding Inspection

1 INTRODUCTION

- 1.1 The accreditation criteria for welding inspection include HKAS 002, HKIAS 003 (4th edition), the relevant HKAS Supplementary Criteria, and the current edition of this document which serves to clarify and supplement the accreditation requirements in the above standards.
- 1.2 The welding inspection includes, but not limited to, inspection of welding procedures, inspection of welders testing and inspection of welding processes.
- 1.3 Accreditation is granted for specific types of inspection (e.g. pre-welding activities, during and after welding processes, etc.) for specific types of welds and using specific inspection methods or standards. Inspection bodies may apply for accreditation for one or more inspection methods or standards and one or more welding types. Accreditation for generic inspection methods covering a broad range of different welds for the same types of welding inspection process may also be granted. The welding inspection activities covered by the generic inspection method or standard will be detailed in the scope of accreditation.
- 1.4 HKAS shall conduct reassessment and surveillance visit to an accredited inspection body. The reassessment and surveillance visit intervals stated in HKIAS SC-05 shall be followed. However, HKAS may vary the frequency of such visits to an individual accredited inspection body, where necessary. The reassessment intervals so determined will be stated in the notification letter.

2 TERMS AND DEFINITIONS

- 2.1 For the purposes of this document, the terms and definitions given in HKIAS 003 apply
- 2.2 The term “shall” is used throughout this document to indicate those provisions which are mandatory.

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3 PERSONNEL (HKIAS 003 Clause 6.1)

- 3.1 In addition to the requirements stated in HKIAS 003, the welding inspector shall hold a valid certificate or document certifying him/her as a Certified Welding Inspector of the American Welding Society (CWI of AWS), a Welding Inspector of the Certification Scheme for Welding and Inspection Personnel of The Welding Institute (WI of CSWIP of TWI), or equivalent. The welding inspector shall be able to communicate effectively with personnel at the inspection site.
- 3.2 HKIAS operates an approved welding inspector system for welding inspection. The minimum academic qualifications for nominees are the same as those stated in clause 3.1 above and they shall have a minimum of one year of relevant welding inspection experience.
- 3.3 Nominees for signatory approval for signing HKIAS endorsed welding inspection reports and certificates shall hold a valid certificate or document certifying him/her as a Senior CWI of AWS, a Senior WI of TWI's CSWIP, or equivalent. They shall have a minimum of two years relevant welding inspection experience. Alternatively, nominees holding a valid certificate or document certifying him/her as a CWI of AWS, a WI of TWI's CSWIP, or equivalent and having a minimum of five years relevant post-qualification experience may also be acceptable as signatories. Other requirements for approved signatories are detailed in HKIAS 003.
- 3.4 To safeguard against any impropriety of the welding inspectors and attempts to exert improper influence on them by their clients, the welding inspection body shall take appropriate actions. The system may include a combination of the following elements:
 - a. Providing proper relevant training to welding inspectors;
 - b. Issuing a code of ethics to welding inspectors;
 - c. Job rotation for welding inspectors;
 - d. Unannounced on-site visits by welding auditors or welding supervisors to check the welding inspection results;
 - e. Taking disciplinary actions and legal sanction against welding inspectors practicing impropriety;
 - f. Comparing the welding inspection against samples kept by the welding inspection body;
 - g. Comparing the average pass-fail rate of a welding inspector with other welding inspectors;
 - h. Asking welding inspectors to record their welding inspection actions in details;
 - i. Asking clients to sign to acknowledge the welding inspection body's

policy on not exerting improper influence before conducting the welding inspection;

- j. Providing immediate feedback channel for welding inspectors to report attempts of clients to exert improper influence; and
- k. Informing bodies or clients of parties attempting to exert improper influence.

3.5 When training welding inspectors, emphasis shall be given to:

- a. Requirements of the quality system;
- b. Expected standard of conduct and ethics;
- c. Rationale and practice of keeping information confidential;
- d. The quality assurance plan employed by the welding inspection body to assure the quality of results; and
- e. The importance of adhering to documented quality procedures.

3.6 For new or inexperienced inspectors, a structured training program covering the following aspects shall be conducted:

- a. Principle and practice of welding inspection;
- b. Interpreting drawings and other welding documents;
- c. Verifying that the base materials and consumables welding materials conform to the specification and those welding filler metals used are as specified for each base material;
- d. Verifying that the welding equipment to be used for the work is appropriate for use with the welding procedure and has the capability to meet the applicable requirements of the welding procedure;
- e. Inspection/approval of welding procedures - an established procedure is available, has been approved as required by the appropriate authority and is being employed in the welding process/production;
- f. Witnessing of welder and procedure approval tests - witnessing the preparation of test pieces and destructive tests, and verifying compliance with appropriate standards and specifications;
- g. Welder approval - verification that adequate and valid welder approvals are available, and that only approved welders as required are used in welding process/production;
- h. Post weld heat treatment - verification that post weld heat treatment has been conducted in accordance with specification requirements;
- i. Performing the required visual examinations;
- j. Verifying that the non-destructive examinations required are conducted in conformance to the specified requirements
- k. Non-destructive reports-the study and understanding of NDT results on any welding work for which the welding inspector is responsible;
- l. Preparation of welding inspector reports;

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- 3.7 After training, the competence of the trainee welding inspectors shall be assessed. Only welding inspectors appraised to be competent shall be allowed to carry out welding inspection work independently.
- 3.8 Where a welding inspector is required to carry out new welding inspections or use new welding inspection procedures or equipment, appropriate training shall also be provided, and followed by competence assessment.
- 3.9 When a welding inspector has acquired sufficient welding inspection experience in a certain activity, he/she may be trained to make professional judgements in that activity. Inexperienced welding inspectors shall not be allowed to make professional judgements.
- 3.10 Appropriate training shall also be provided to staff members conducting other technical work.
- 3.11 The training system, the training provided and appraisal records of trainee welding inspectors shall be documented.
- 3.12 It is useful to keep a competence log listing which welding inspectors are competent to perform what welding inspections and for what types of welding inspection activities. Supervisors may assign welding inspection jobs to suitable welding inspectors according to this log.
- 3.13 Applicant and accredited welding inspection bodies shall ensure that colour vision and other sensory deficiency of welding inspectors will not affect the validity of welding inspection results.
- 3.14 Welding inspectors shall be properly supervised. Where on-site supervision is impracticable, welding inspection bodies shall establish and implement an effective feedback system to monitor the conduct and performance of welding inspectors.

4 FACILITIES AND EQUIPMENT (HKIAS 003 Clause 6.2)

- 4.1 For equipment which has significant effect on the welding inspection results, it is preferable that the welding inspection body uses the equipment under its control to perform welding inspections and sampling of test pieces. Where this is impracticable, equipment not under its control may be used after the welding inspectors have verified that the equipment is suitable for the purpose, including its measurement range, accuracy and calibration traceability. Records of verification shall be kept, standard verification

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procedures shall be provided and the welding inspectors shall be trained to conduct such verification checks. Where necessary, the welding inspectors shall also be provided with the necessary reference standards or equipment to conduct the verification checks.

- 4.2 When an inspector brings his own equipment, he/she shall perform a verification check on arrival at the site to ensure that its function and calibration have not been affected by transportation. Such checks shall be recorded.
- 4.3 When electronic means are used for the processing, storage and transfer of information, the systems shall satisfy the requirements of HKAS 002, HKIAS 003 and this Supplementary Criteria. Particular attention shall be paid to the validation of software, safety and security of information, maintenance of confidentiality and identity authentication.

5 INSPECTION METHODS AND PROCEDURES (HKIAS 003 Clause 7.1)

- 5.1 Welding inspection bodies shall provide adequate and up-to-date documented welding work instructions to welding inspectors to ensure that all the welding inspections are performed according to the requirements and acceptance criteria of the clients. Proforma worksheets or log books for recording results and other details of welding inspections shall also be provided.
- 5.2 Where a client does not specify a welding inspection specification or the welding specification is incomplete, the welding inspection body shall discuss with the client and agree on a suitable welding specification. The welding inspection specification, whether provided by the client or suggested by the welding inspection body, shall be documented. Where an alleged up-to-date welding inspection specification is provided to the welding inspector on-site, for replacing the welding specification provided by the welding inspection body, the welding inspector shall verify that the updated welding inspection specification is issued by the client and is applicable to the welding inspection to be conducted. A documented procedure governing such cases shall be provided by the welding inspection body.
- 5.3 Welding work instructions provided to welding inspectors shall include the following information:

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- a. What are to be inspected, including the type of welding inspection (e.g. inspection of welding process or others), identification of the types of welds, the quantity of welds, the location where welding inspection is to be performed and the contact person, the welding inspection time and date and any other relevant general information;
- b. The sampling method (if not specified by welding specification or clients), including the sampling plan and the sample size;
- c. The welding inspection method, including characteristics of the welds or welding processes to be examined;
- d. The welding inspection and sampling equipment to be used;
- e. Instructions for recording welding inspection findings;
- f. Details and quantity of any welding samples to be sent back to the welding inspection body for further examinations or testing;
- g. The method for assigning identification marks of welding inspection samples where necessary;
- h. The acceptance criteria of the inspected welding or welding process, including the workmanship standard and classification of observed defects shall be classified; and
- i. Any special requirements and instructions relevant to the welding inspection, e.g. instruction for welding inspection and sampling welded test pieces, environmental condition requirements and preservation of the collected samples.

5.4 Where the environmental conditions affect the welding inspection or sampling results, the welding inspection body shall ensure that they are within the specified limits and are recorded in the welding inspection records. It may be necessary for the welding inspector to bring the necessary monitoring equipment.

5.5 To unify the basis of making professional judgements based on the welding inspection results, the welding inspection body shall establish and document appropriate guidelines.

5.6 All non-destructive and destructive tests associated with any welding inspections shall be carried out by HKAS accredited laboratories or laboratories accredited by mutual recognition arrangement partners of HKAS and the results produced shall be reported in endorsed test reports.

6 HANDLING INSPECTION ITEMS AND SAMPLES (HKIAS 003 Clause 7.2)

6.1 Weld samples and items to be inspected shall be uniquely identified to avoid confusion regarding their identity at any time. Where there is a

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need to identify the exact sources or origins of individual sub-samples, it may be necessary to assign a unique code to each sub-sample and record the details of its origin. These identification codes shall be referenced in the welding inspection records.

Where it is necessary to send weld samples or test pieces to laboratories for testing or retain samples for reference, the welding inspection body shall ensure that they are adequately identified to avoid confusion.

- 6.2 Where there is a need to keep inspected weld samples, e.g. to show what defects have been observed, consent of the owner shall be obtained. The procedures for the disposal of retained weld samples shall also be agreed with the owner. Before disposing, weld samples may have to be destroyed to an extent such that client information confidentiality is maintained.

7 INSPECTION RECORDS (HKIAS 003 Clause 7.3)

- 7.1 Welding inspection records shall include sufficient information to permit satisfactory evaluation of the welding inspection. The record system shall permit the ready retrieval of information supporting the results reported to the client. In general the following items of information shall be kept:
- a. What have been inspected, including the type of inspection (e.g. pre-welding processes), identification and quantity of the inspected welding process or weld samples, the welding inspection location, the identities of the welding inspectors, the inspection time and date where relevant, the identity of the client and any other pertinent information;
 - b. Identification of the welding inspection method, including the inspection plan and sample size, and any deviations from them;
 - c. The identification and specification of the equipment used, where relevant. Where equipment not under the control of the welding inspection body is used for the welding inspection, verification records for the equipment must be kept;
 - d. Environmental conditions during welding inspection, where relevant;
 - e. Clear and unambiguous welding inspection findings, including any findings obtained from samples sent back to the premises of the welding inspection body for further examination and testing and results obtained by any subcontractor. Details of any defects or abnormality (which may not constitute a defect) observed shall be recorded. Diagrams and photographs are sometimes useful;
 - f. Identifications of the source and origin of individual sub-samples from the original weld sample, where necessary;

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- g. Identification of the acceptance and defect classification criteria;
- h. Rationale and basis of any conclusion and professional judgement; and
- i. Evidence that the welding inspection results have undergone all the necessary quality assurance checks, e.g. the identity and signatory of the checking and reviewing staff member.

To enable results checking and verification or to demonstrate the validity of the welding inspection results, more information may have to be recorded. For example, photographs and video image may have to be taken and kept to demonstrate that the weld samples have been correctly taken or to show the details of any observed defects.

For record traceability, it may be useful to include the report number, or an equivalent identification number on every document relating to that welding inspection.

Supplementary information required for the interpretation of the recorded data shall also be kept. Weld samples may be kept for reference.

7.2 Before issuing the final welding inspection result to the client, the welding inspection body shall ensure that all welding inspection results, calculation, data transfer, welding inspection conclusions and professional judgements have been properly checked. Checks shall confirm the following:

- a. The instructions of the clients have been accurately and comprehensively executed;
- b. Proper welding inspection methods or standards have been used;
- c. The welding inspection has been performed by HKIAS Approved Welding Inspectors;
- d. The equipment used are suitable and properly checked and calibrated;
- e. Weld samples have been obtained according to the specifications or standards, including the location, size etc;
- f. Weld samples and where necessary, weld sub-samples have been properly identified;
- g. Data transfer, calculations and conclusions have been correctly made;
- h. The welding inspection findings have been properly recorded and all records are traceable.
- i. All necessary data required for arriving at the conclusion, including results obtained from any laboratory or subcontractor, have been obtained;
- j. Observed welding defects have been properly classified;

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- k. The conclusions have been properly derived from the welding inspection findings;
- l. Any professional judgements have been properly made in accordance with any guidelines issued by the welding inspection body and the basis of the professional judgement has been clearly recorded; and
- m. Information included in welding inspection reports and certificates are correct.

The checker shall sign on the record sheet to authenticate that the results have been properly checked.

8 INSPECTION REPORTS AND INSPECTION CERTIFICATES (HKIAS 003 Clause 7.4)

- 8.1 Where it is necessary to issue interim results on-site, the welding inspection results shall be adequately checked, preferably by a staff member of the welding inspection body other than the one performing the inspection. The checker shall sign the welding inspection record and the interim report to indicate that he/she has carried out the checks. The interim report shall clearly state that the results are not final and may be amended after reviewing by the welding inspection body. The welding inspection body shall ensure that issuing of such an interim document is allowed by the client and it is given only to the person he has designated. The format of the interim report shall be designed to present the results clearly and unambiguously. The welding inspection body shall also ensure that only welding inspectors appraised to be competent to issue interim reports are allowed to do so. They shall also be properly authorised for issuing such reports. Such interim reports shall not bear any HKIAS endorsement.