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IICS INTERNATIONAL
INSPECTOR CERTIFICATION SCHEME
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# DOCUMENT No. IICS-RI-17-09

# Requirements for the Certification of IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2) in accordance with the requirements of API Std 936 Annex C

1st Edition May 2017

Issued under the authority of the Governing Board for Certification
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## FOREWORD

The International Inspector Certification Scheme (IICS) is a comprehensive scheme which provides for the examination and certification of individuals seeking to demonstrate their knowledge and/or competence in their field of operation. The scope of IICS includes Welding Inspectors, Crane Inspectors, Corrosion engineers, Piping Engineers Plant Inspectors and other certification schemas.

IICS is managed by certification board of TUV Nord Malaysia Sdn. Bhd., which acts as the governing certification body, in keeping with the requirements of the industries served by the scheme.

The current document covers the Certification of IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2).

## CERTIFICATION CRITERIA

The sole criteria for certification are given in the document (and any subsequent amendments) and no other criteria will be applied. Certification is not conditional on the candidate applying for other services from TUV Nord Malaysia Sdn. Bhd., its parent, or any other groups or associations.

# 1 GENERAL

### 1.1. Scope

This document prescribes procedures by which personnel may be examined, and, if successful, certificated for the duties of IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2), as defined in Clause 1.2. The examinations are primarily intended for installation, inspection, testing and repair of refractory linings in the areas of.

- Quality Control
- Physical Property Requirements
- Inspection Documentation
- Material Qualification Testing
- Applicator Qualification & Procedure Testing
- Installation
- As-installed Testing
- Test Specimen Preparation
- Post Installation

### 1.2. Responsibilities of personnel

Typical areas of work activity of personnel for whom IICS Certified Refractory Inspector certifications would be suitable are given below:

#### 1.2.1 IICS 1.3A Certified Associate Refractory Inspector (Level 1)

Under the supervision of a Certified Refractory Inspector:

- Ensure that material and applicator qualification test results are fully documented;
- Monitor qualification, production work, and dry out (when applicable) conducted by the manufacturer(s) and contractor to ensure compliance with job specifications and agreed-to quality practices;
- Notify the respective supervisor or Certified Refractory Inspector of any work deficiencies or potential deficiencies. Notification shall be made according to the job-specific requirements outlined in the procedures.
- Conflicts between the specified execution plan and the actual installation procedures or installed refractory quality results shall be submitted to the respective supervisor or Certified Refractory Inspector for resolution
- Inspect and hammer test installed linings before dry out and after dry out (when possible), and report any anomalies to the respective supervisor or Certified Refractory Inspector.

### 1.2.2 IICS 1.3 Certified Refractory Inspectors (Level 2)

Those given above plus:

- Supervision of Associate Refractory Inspectors in the conduct of above mentioned activities.
- Verification that refractory installation procedures are available, have been approved as required by the appropriate authority and are being employed in production.
- Witnessing of procedure approval tests
  Witnessing the preparation of test pieces and destructive tests, and verifying compliance with appropriate standards and specifications.
- Verification that adequate and valid Applicator Qualification approvals are available, and that only approved Applicators as required are used in production.
- Check and verify that accurate installation and dryout records are being documented by the contractor in accordance with API Std 936;
- Record all nonconformances and/or potential problems
- Preparation of inspection reports

## 1.3 Qualification Requirements for IICS Certification

Job responsibilities and experience criteria for examination eligibility as given below are strictly adhered to and enforced.

### 1.3.1 IICS 1.3A Associate Refractory Inspector (Level 1)

| Candidates | Refractory Technology related Experience as per table 1.3.2 below | Remarks |
|---|---|---|
| • Refractory Applicator Personnel<br>• Refractory Inspection Personnel<br>• Other API inspectors or QC personal | None or<br>Less than 1, 2 or 5 years<br>(see table 1.3.2 below)<br>documented experience | Must attend an IICS approved training course |

### 1.3.2 IICS 1.3 Refractory Inspector (Level 2)

| Level of Education | General Refractory Experience (a) | Specific Experience in Refractory Inspection Activities (b) | Total Minimum Experience Needed |
|---|---|---|---|
| • Bachelor of Science Degree in engineering or technology | 1 year | | 1 year |
| • Diploma or *certificate* in engineering or technology | 1 year | 0 year | 1 year |
| • High school diploma or equivalent | 2 years | 1 years | 3 years |

(a) General Refractory Experience — Refers to installation activities related to refractory work. This may include, but is not be limited to, hands-on experience and engineering design.

(b) Specific Experience in Refractory Inspection Activities — Refers to the quality control elements related to refractory workmanship and/or materials

### 1.3.3 Health/Eyesight

- Recent Eyesight Test Certificate required, as proof of near visual acuity
  (based on Jaeger J1 Eye Chart or equivalent eye test)

## 2. EXAMINATION PROCEDURE

### 2.1 IICS Examination Format

The examination format for the IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2) consists of a written examination, which is designed to test the candidate's knowledge of the syllabus, and applicable codes and standards.

Please refer to Appendix 1 for details of the examination format.

### 2.2 Application for IICS Examination

Candidates will be required to submit an application form. All the information requested must be on these forms. No applications can be considered confirmed until receipt of correctly completed documents. Application forms ask for specific details of work experience and must be verified by current employer. Candidate must provide supervisor's contact information of previous employments or projects, which is meant for verification purposes by exam administrator.

In the event of a false statement being discovered on forms, any examination undertaken will be declared null and void.

Candidates proved to have cheated, or found to have attempted to remove or found to have removed examination material in an IICS examination will not be accepted as a candidate for any IICS examination for a minimum period of five years from the date of the examination where cheating, attempt to remove or removal of examination material, was established to have taken place.

Examination may be taken at any approved Test Centers. List is available on request.

## 3. CATEGORIES OF IICS CERTIFICATION AND FEES

Candidates may apply for one of the following certification categories:

| **Certification** | | | **IICS 1.3A** | | **IICS 1.3** | |
|---|---|---|---|---|---|---|
| **Validity Term** | | | 3 years (RM) | 3 years (USD) | 3 years (RM) | 3 years (USD) |
| **Certification Fee per Candidate (RM)** | **Initial** | IDC Participant | 850 | 250 | 850 | 250 |
| | | Non-IDC Participant | 1,600 | 400 | 1,600 | 400 |
| | **Retest** | | 500 | 150 | 500 | 150 |
| | **Reschedule to another exam window stated by IICS** | | NIL | | | |
| | **Reschedule to a preferred exam window** | | 1,600 | 400 | 1,600 | 400 |
| | **Upgrade** | | 500 | 150 | NIL | |
| | **3-year Renewal** | | NIL | | 500 | 150 |
| | **6-year Recertification** | | NIL | | 850 | 250 |

### 3.1 Initial Certification

Refers to candidate's first attempt in taking the particular IICS Certification.

### 3.2 Retest

Refers to candidate who fail in the initial certification. Candidate may attempt a maximum of two retests within 12-month period from the first scheduled examination date.

### 3.3 Upgrade

Refers to IICS Level 1 Certificate holder who wishes to advance to IICS Level 2 Certification.

Candidate does not need to sit for an examination. Candidate must provide evidence in accordance with Clause 1.3.2. This can be satisfied by submitting a log sheet of relevant work activity covering the period of validity of the certificate.

### 3.4 Three-Year Renewal

Refers to IICS Level 2 Certificate holder who needs to renew his/her certificate before its expiry.

Candidate does not need to sit for an examination. Candidate has to demonstrate that he/she has maintained his/her competence by providing evidence of continuous work activity in refractory inspection. This can be satisfied by submitting a log sheet of relevant work activity covering minimum 2 years' documented experience within the recent 3 years.

The certificate will not be renewed without further test if a substantiated complaint is notified by the Governing Board during the period of its validity. Further instruction and retest may then be required.

### 3.5 Six-Year Recertification

Refers to IICS Level 2 Certificate holder who needs to be recertified beyond six years from the initial examination (or 3 years from a previous three-year renewal).

Candidate has to demonstrate that he/she has maintained his/her competence by providing evidence of continuous work activity in refractory inspection. This can be satisfied by submitting a log sheet of relevant work activity covering minimum 2 years' documented experience within the recent 3 years.

If qualify for 6-year recertification with the complete application, candidate will be required to take an online examination. The 6-year recertification online examination for Refractory Inspector (Level 2) consists of 30 multiple choice questions.

Note: As a guide, 'reasonable continuity' in any given six year period means that absences from work for which the certificate was granted should not exceed one year in one or several periods.

## 4. IICS CERTIFICATION POLICIES

### 4.1 Payment Policy

a) Applications will not be processed until payment is received and applied.

b) Applicants are responsible for all taxes, banking or other service fees, including all applicable withholding taxes.

c) Penalty fee of RM 150 will be imposed on application and payment received after the examination deadline.

## 4.2 Refund Policy

a) All refund requests must be submitted to the approved test center by e-mail within three (3) months from the date of payment.

b) For refund requests made before the application deadline, you will be refunded the initial New Application fee minus RM 150 for processing.

c) For refund requests made after the application deadline, you will be refunded 50% of the initial New Application fee.

d) If you are found to be unqualified, you will be refunded the initial New Application fee minus RM 150 for processing.

e) Reschedule application fees are non-refundable.

f) Refunds will not be issued under the following circumstances:
- If request is made three months or more after your initial payment date
- If request is made less than five days before a scheduled exam appointment, or any time after a scheduled appointment
- If you did not show up for your exam
- If you have already taken your exam

g) Refund requests have to come directly from the paying party, either the candidate or the organization that paid the examination fee (if not paid by candidate).

## 4.3 Examination Policies and Notifications

a) Examination Cycle
- Each candidate is allowed 12 consecutive months to pass an examination.
- This 12-month period begins with the first scheduled examination date.

b) Retest
- Candidate who does not pass the initial examination may attempt a maximum of 2 retests (on those parts of the examination in which success was not achieved) within the allowable 12-month period.
- If candidate is unsuccessful within the allotted 12 months, he/she is required to re-take the full IICS approved training course, followed by a new application for the examination.

c) Reschedule
- If candidate cannot attend the examination as scheduled, he/she has to notify the approved testing center at least 2 weeks prior to examination date.
- Reschedule fee of RM 150 apply and is non-refundable.

d) Examination Results
- Examination results will be emailed to candidate within 2-4 weeks after the examination date.

e) Certificate of Proficiency and Certified Personal ID Card
- A paper certificate and personal ID Card will be issued to the candidate who passed the examination.
- The items will be mailed out to the candidate or the organization that paid the examination fee (if not paid by candidate), approximately 2-4 weeks from announcement date of examination results.
- Penalty fee of RM 350 will be imposed on requests for reissuance of Certificate of Proficiency and/or Certified Personal ID Card.

f) Term of Certification
- Level 1 Certification is valid for three years.
- Level 2 Certification is valid for three years.

g) Renewal or Recertification
- Renewal or Recertification of IICS Certificate must take place not later than 30 days after the date of expiry.
- It is the certificate holder's responsibility to ensure that renewal takes place at the appropriate time.
- Penalty fee of RM 150 will be imposed on renewal or recertification application received more than 30 days after the date of expiry.

### 4.4 Grievances and Appeals

a) Appeals against failure to certify or against non-renewal of the certificate may be made by the inspector or the employer upon application in writing to the Governing Board.

b) The contents of a failed exam will not be disclosed or returned to any candidate.

c) An aggrieved party in a dispute which considers itself to have reasonable grounds for questioning the competency of an IICS qualified person may petition the Governing Board for non-renewal of the certificate. Such a petition must be accompanied by all relevant facts, and if in the opinion of the Board an adequate case has been presented, a full investigation of the circumstances under dispute will be initiated. If the petition is substantiated to the satisfaction of the Board, the certificate will not be renewed without further test.

## 5. RECORDS

TUV NORD (Malaysia) Sdn. Bhd. maintains records of successful and unsuccessful candidates. These records are accessible to the Governing Board or its nominees at all reasonable times.

## 6. REFERENCES

[1] API Std 936, Fourth Edition, June 2014

## 7. ADDRESSES

For further general information contact:

**TUV NORD (Malaysia) Sdn. Bhd.**
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For specific information on examinations and tests and arranging for them to be carried out, please contact the **approved Test Center(s):**

**IDC Training House Sdn. Bhd.**
No 7, Unit 8, Jalan Industri PBP 3,
Taman Industri Pusat Bandar Puchong,
47100 Puchong,
Selangor, MALAYSIA

| | | | |
|---|---|---|---|
| Phone: | +60 (3) 8061 5126 / 8061 | Fax: | +60 (3) 8068 7720 |
| Email: | info@idc-training.com | Website: | www.idc-training.com |

IICS INTERNATIONAL
INSPECTOR CERTIFICATION SCHEME

# Examination Format for the Certification of IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2)

**APPENDIX TO DOCUMENT NO. IICS-RI-17-09**

Appendix 1: Examination Format for IICS 1.3A Certified Associate Refractory Inspector and IICS 1.3 Certified Refractory Inspector

Appendix 2: Exam Body of Knowledge

## APPENDIX 1: EXAMINATION FORMAT & TIMING

### IICS 1.3A Certified Associate Refractory Inspector (Level 1) and IICS 1.3 Certified Refractory Inspector (Level 2)

| Examination Format | Time Allowed | Details |
|---|---|---|
| **Theoretical Part A (Open Book)** | 1.5 hour | 25 multiple choice questions<br>Ability to work with the applicable codes and standards:<br>• API Standard 936, Refractory Installation Quality Control Guidelines – Inspection and Testing Monolithic Refractory Linings and Materials, 4th Edition, June 2014<br>• ASTM (American Society for Testing and Materials) Publications:<br>– C113-14 – Standard Test Method for Reheat Change of Refractory Brick<br>– C133-15 – Standard Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractories<br>– C181-11 – Standard Test Method for Workability Index of Fireclay and High-Alumina Plastic Refractories<br>– C704-15 - Standard Test Method for Abrasion Resistance of Refractory Materials at Room Temperatures |
| **Theoretical Part B (Closed Book)** | 2.5 hours | 75 multiple choice questions<br>• API Standard 936, Refractory Installation Quality Control Guidelines – Inspection and Testing Monolithic Refractory Linings and Materials<br>• ASTM standards as mentioned above |

**Pass mark is 70%. If the overall passing mark couldn't get achieved the individual part, which has been failed shall be retaken.**

## APPENDIX 2: BODY of KNOWLEDGE

Candidates are expected to demonstrate knowledge in the following categories:

### 1. Laboratory Testing Procedures

The test questions may be based on the following topics:

- Terms and definitions
- Test methods (e.g., C704, CCS, PLC, Density) and related calculations
- Material Qualification
- Testing equipment, sample preparation techniques, dimensional requirements for test specimens
- Various materials utilized (for example, plastic, ceramic fiber, anchor, metal fiber, corrosion coatings,)
- Curing and firing procedures
- Acceptance/rejection criteria

### 2. Responsibilities of personnel and documentation requirements. Applicator and Material Qualification

The test questions may be based on the following topics:

- Installation methods (e.g., gunning, casting, ramming, and hand packing)
- Sampling and sample preparation procedures
- Terms and definitions
- Procedures for determining optimal water content and mixing
- Applicable formulation and manufacturing information
- Applicable knowledge of equipment and qualification process
- Applicable test panel/mockup requirements
- Applicable environmental controls
- Surface preparation requirements
- Responsibilities of personnel and documentation requirements

### 3. Installation

The test questions may be based on the following topics:

- Terms and definitions
- Responsibilities of personnel and documentation requirements
- Knowledge of detailed execution plan including design details and quality standards
- Packaging and storage requirements
- Surface preparation and cleanliness requirements
- Anchor: welding, layouts, patterns, materials
- Frequency and methods of production sampling: gunning, casting, hand packing
- Water addition: quantity and temperature, mixing procedures
- Fiber addition: percentage, material, mixing
- Installation environmental controls (minimum and maximum temperatures)
- Gunite procedures and equipment, including variables that affect gunite quality (i.e., air pressure, humidity, temperature, aging, water pressure, water purity, additives)
- Knowledge of flash set
- Casting procedures and equipment (e.g., air vibrator, vibrator frequency, vibrator sizing, forming, setup)
- Ramming / Hand packed procedures and equipment

### 4. Inspection

The test questions may be based on the following topics:

- Terminology, job specifications, application standards
- Inspection and data collection procedures
- Lining design and installation requirements
- Visual and nondestructive test methods and qualification testing methods
- Application/limitation for various inspection techniques (for example, hammer testing, sonic testing, radiography, core sampling, portable abrasion testing)
- Material verification and traceability
- Acceptance and rejection criteria
- Repair procedures
- Curing and dry out procedures
- Inspectors' and contractors' responsibilities
- Record keeping systems and requirements

## 5. Post-Installation

The test questions may be based on the following topics:

- Terms and definitions
- Responsibilities of personnel and documentation requirements
- Knowledge of dry out requirements
- Sealing requirements (for example, water mist, covering, membrane, curing)
- Application and time limits for applying membrane curing compounds
- Environmental conditions required for curing
- Heating equipment, methods and procedures (e.g., gas fired burner, stress relieving heating elements)
- Placement of temperature sensing probes
- Knowledge of manufacturer's recommended heat-up and cool-down schedules
- Applicable heating rates for various classes of refractories
- Lining integrity inspection techniques