

# Harmonisation of Personnel Certification Schemes for Non-destructive Testing in the Asia-Pacific region

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**Abstract.** Requisite in the compliance with international standards for personnel certification schemes such as the latest standard ISO9712:2005 is a need for the scheme itself to conform to the requirements of ISO17024:2003 – Conformity Assessment – General Requirements for Bodies Operating Certification of Persons. The objective of ISO17024 is to provide globally accepted benchmarks that will provide the basis for harmonisation of personnel certification schemes world-wide.

The importance of harmonisation of certification schemes to international standards therefore has not been lost on the developing countries in the S.E Asia region. As a matter of priority the International Atomic Energy Agency (IAEA), through the United Nations Development Program (UNDP), has hosted a number of technical meetings of member states in the S.E Asia region, under the Regional Cooperation Agreement (RCA), to work towards harmonisation of non-destructive testing personnel certification schemes in these countries.

**Keywords.** Certification, Non-destructive Testing, Personnel, Harmonisation, Compliance, Requirement.

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## 1. Introduction

AINDT initially became involved in the United Nations Development Program (UNDP) in 1980 to assist emerging nations in the South East Asia region in the training of non-destructive testing personnel. This was later extended through the auspices of UNDP and the International Atomic Energy Agency (IAEA) to similar countries in Central and South America. Through this involvement a consensus grew between some of our nearest trading partners that the way forward in terms of certification was to adopt the guidelines being developed by ISO-TC135 SC7 for a new international standard (ISO 9712) for the certification of non-destructive testing personnel. In this context they favored world harmonisation and the benefits that it would bring with respect to trade and international recognition.

The ISO standard was subsequently accepted on a universal basis by many countries aligned to ICNDT including many in the S.E Asia region and major players in certification such as Japan, Canada, USA and the UK even though some of these countries were of the opinion that certain provisions of ISO 9712:1992 were less than optimum. The European Federation of Non-Destructive Testing, for instance, preferred to use its own Euro-Norm standard, EN 473, for certification of NDT personnel and the U.S was still heavily committed to ASNT – TC 1A.

To overcome the deficiencies in ISO 9712 a revision of the international standard began in 1995, culminating in the second issue of ISO 9712 in May 1999. Even then, the European Federation for Non-Destructive Testing (EFNDT) was not satisfied with the amendments and signaled that a further revision of EN 473 Non-destructive testing – Qualification and Certification

of NDT Personnel would be undertaken and this was then adopted by EFNDT member countries following its publication in 2000.

Although similar in many respects to ISO 9712:1999, it was generally recognised that EN 473 still provided a more stringent set of requirements than the ISO document. Essentially, ISO 9712 only provided minimum levels of technical competency for certified personnel whereas EN 473 required a higher level of skill for such personnel to be certified for the examination of nozzle and node welds in the oil and gas and pressure vessel industries, for instance.

In October 1999, therefore, at an ISO meeting in Vancouver, Canada, it was decided that what was needed was a truly global standard NDT standard – a fusion of ISO 9712 and EN 473 with the best of other recognised standards, such as the American Society for Non-destructive Testing's (ASNT) SNT – TC1A personnel certification scheme. At the heart of this new standard, ISO 9712:2005, was a requirement that the certification process itself should be accredited and shall conform to the requirements of ISO17024:2003.

This view was expressed at a meeting of delegates of the International Committee for Non-Destructive Testing (ICNDT) at the 16<sup>th</sup> World Conference on Non-destructive Testing in Montreal in 2004.

The developing nations of S.E Asia have always been at the fringe of this activity, often without the resources to implement personnel certification schemes that meet ISO requirements, particularly third party accreditation. Accordingly, member states of the IAEA/RCA (Regional Co-operational Agreement) met in Sri Lanka in 2005 to make progress towards achieving mutual recognition of each others certification schemes. This process is well underway with an objective of meeting this target by 2012. However, many difficulties lie in the way of achieving this objective.

## **2. Australia's Role in World Harmonisation**

From an Australian viewpoint it was recognised that it was not only important to support world harmonisation, but it was equally important to align itself with certain of the requirements of EN 473 in order to maintain access of Australian manufactured products and that of its certificated personnel to the European market.

Initially, the Australian Institute for Non-Destructive Testing (AINDT), under the guidelines of the APEC/Industry Collaboration scheme, then pursued a grant from the Department of Industry, Science and Research (DSIR) to fund the establishment of a fully recognised quality assurance system. This achievement was achieved on 8 May 2002 when it was announced by JAS/ANZ that AINDT had been granted accreditation for its certification scheme in accordance with EN 45013. The next stage was to seek recognition of this and a submission was made to the European Federation for Non-Destructive Testing for acceptance of the AINDT scheme. Australia then became one of the first non-European countries to be approved by EFNDT when the Secretary of EFNDT WCG signed a Mutual Recognition Agreement (MRA) between AINDT and EFNDT and a Certificate of Registration was issued on 26 June 2003.

In a more recent development through another Federal Government grant from the Department of Industry and Trade Relations (DITR), the Australian Institute for Non-Destructive Testing was successful in upgrading its examination requirements and its certification infrastructure to conform to the European Pressure Equipment Directive (PED). This was part of a continuing effort to gain recognition for Australian certificated personnel and their place in the international community. An agreement to implement the provisions of the PED was signed with the British Institute of NDT in July 2004. This approval represented a major achievement for NDT personnel in Australia and for the Australian pressure equipment manufacturing industry by assisting local manufacturers to gain contracts for the supply of pressure equipment into the European market.

These developments and improvements to AINDT's national certification scheme placed it in an ideal position to respond to the provisions of the new ISO 9712 standard when it was published in 2005 and to move quickly from a quality system that met EN 45013 to one that satisfied fully the requirements of the international standard, ISO 17024:2003. This milestone was

achieved in September 2005 when the Institute was accredited by JAS/ANZ. As a result Australia could lay claim to have become one of the first countries in the world to comply with ISO 9712:2005. Since then 1085 certificates have been issued by AINDT for certified personnel in non-destructive testing to the new standard.

### **3. Harmonisation in South East Asia**

The path to harmonisation began at a meeting held in Bangladesh in 2001 under the auspices of IAEA and included representation by the following Regional Cooperation Agreement (RCA) member countries below.

Australia  
Bangladesh  
China  
India  
Indonesia  
Japan  
Malaysia  
Mongolia  
Myanmar  
New Zealand  
Pakistan  
Philippines  
Singapore  
South Korea  
Sri Lanka  
Thailand  
Vietnam

This meeting was the forerunner to a subsequent technical meeting and workshop held in Colombo, Sri Lanka, in August 2005, where it was resolved that all member states under the Regional Cooperation Agreement would work towards compliance and harmonisation of their respective personnel certification schemes in accordance with ISO 17024:2003. However, it was clear from this technical meeting that many of the RCA countries still had some considerable distance to go in terms of establishing a quality system that would meet the requirements of ISO 17024:2003. In fact many of the countries had only a rudimentary quality system, if at all.

Despite the difficulties faced by the participating member countries there was a clear intent though, on everyone's part, to achieve harmonisation and recognition of certification schemes for non-destructive testing personnel in the region. Almost all countries have since signed a Mutual Recognition Agreement (MRA) to work towards this objective and this agreement was ratified at a recent meeting of the member states in Auckland in November 2006. It was also agreed that the member states should implement a quality system on a progressive basis with the aim of all countries having a national certification scheme complying with ISO 17024 by 2012.

### **4. Difficulties in Achieving Harmonisation To ISO 17024:2003**

Despite popular belief, ISO 17024 is more complex than one may think. Initially, it is deceptively simple. However, certain key words contained within the standard requires that a complex and detailed quality system is in place in order to ensure complete traceability of all actions undertaken during the process of certification. The terms validity, compliance, evaluation and surveillance are necessary adjuncts to a system that is multi-layered, multi-directional and requires a considerable

degree of cross-referencing to records, documentation and other information, including development and maintenance of the scheme. For instance, the examination process is at the heart of the certification process itself and everything from the generation of questions to the conduct of examinations, duties of the examiner, marking of examination papers, insurance cover, rights of appeal and so on, have to be documented and linked in such a way that the process is conducted in a transparent and consistent manner from examination to examination.

Closing the loop is the term that best describes how to make certain that the quality system complies fully with ISO 17024. If we look at a “simple” case of holding examinations for instance, just what are some of the essential factors that have to be addressed by the quality system (assuming that the preliminaries of notifying the candidate of the examination and that examination papers or practical samples have already been done)?

- Are the examination centre facilities adequate? Has the Examination Centre been audited before approval? The QA system must provide proof of this and of on-going surveillance.
- Does the examination centre have insurance liability for candidates and examiners? Again, proof of this is required.
- Security of examination papers and test samples? Security of both has to be established to the satisfaction of the certification body as well as the accrediting authority.
- In the case of Authorised Qualifying Body’s (AQB’s) has the examiner played any part in the training of the applicant? Does he have a conflict of interest? Assurance of a complete separation between training and examination must be provided. In other words the trainer cannot examine the applicant.
- Is the examiner competent to supervise the examination? Proof that the examiner is competent and meets the requirements of ISO 9712:2005 must be given.
- Has surveillance been carried out on the examiner to assess his competence during an examination? The competence of the examiner through an ongoing audit program has to be carried out. How often, who does it and what audit procedure is followed, must also be part of the information that is to be provided in a document to assess what the competence requirements of the examiner, invigilator or assessor are.
- Does the examiner have an instruction sheet for the conduct of the examination? It is important that at every examination the person conducting the examination has a detailed list of guidelines covering the conduct of the exam – is it open book or closed book for example; or whether or not the applicant can use their own equipment; what the duration of the examination is, etc?
- How does the examiner know that the person sitting the examination is the correct candidate? Identification in the form of a photograph has to be provided to the person conducting the examination to confirm the identity of the candidate.
- Does the examiner have a standard marking guide for assessing a candidate during an examination (practical examination only)? Instruction sheets for various NDT sectors are required and marking weightings indicated
- Does the examiner have a standard marking sheet to check answers in theory examinations? A standard marking sheet for each separate examination must be provided with the correct answers.
- Is there a process of review during the marking of examinations to ensure that initial marking is correct? What is the process of that review and are papers moderated by a second person. A document should be provided to describe the process of reviewing examination marks and verification that a paper has been moderated must be provided.
- Does the Certification Board have a process in place to get feedback from the applicant on the conduct of the examination? Candidate questionnaires shall be issued on a periodic basis to assess conduct of examinations.
- Are the examination questions and papers fair? Surveillance in the form of checking pass/failure rates for examination questions/papers should be put in place.

- In what way are the candidate's results and qualifications assessed before certification is finally granted? This process in which this is done and the operations of any committee assessing the candidate must be fully documented, including the competency of the persons on the committee who make these decisions.
- Is there a process of appeal for the candidate regarding examination results? There must be appeal process in place and this must be made perfectly clear to candidate at the time of application.

The above list, although not exhaustive, serves to illustrate that a considerable amount of detail and documentation needs to be incorporated into the quality management system to “close the loop” so to speak and to meet the requirements of any quality audit by an international third party accreditation organisation affiliated to the International Accreditation Federation (IAF). Incidentally, most trading nations have established systems to accredit technically competent and reliable inspection, measurement, testing, and certification organisations.

These accreditation authorities are usually government-owned or government-endorsed and operate free from commercial influence. Accreditation authorities in forty-one economies, including Australia, have established an international network of Mutual Recognition Arrangements (MRA's) whereby each country agrees to recognise accreditations granted by another as equivalent to their own. These agreements are the basis for the recognition of personnel certification schemes under the banner of the international standards, ISO 9712 and ISO 17024.

Currently, many of the countries in SE Asia do have third-party accreditation authorities who can accredit certification schemes in those countries. Some of the countries in the region, however, do not have organisations affiliated to IAF who can accredit their personnel certification schemes. It is also an established fact that many countries in the region do not have a quality system that will fulfill ISO 17024 requirements.

As mentioned earlier, several countries in the SE Asian region only have a quality system that follows basic guidelines, reliant mainly on clauses extracted from earlier versions of ISO 9712. These, therefore, fall far short of the requirements of a fully integrated quality management system and the extent of work required to achieve this will, naturally, be quite extensive. Opinion would suggest that these countries would be hesitant to do this without a firm guide or model on which to base their quality management system. One country, Pakistan, has sought the assistance of Australia in developing its existing quality system to meet ISO 17024 and a joint project was carried out in Australia in October 2006. As a result, the National Centre for NDT in Pakistan, under the auspices of the Pakistan Atomic Energy Commission, will be able to construct a quality management system to ISO 17024 relatively quickly, by the end of 2007.

Other, developed countries, such as Indonesia, China, India and the Philippines, do have quality systems that are of a high standard. It is expected that further refinement and fine-tuning of their quality systems would help achieve full international accreditation to IAF guidelines in a short time-frame. In order to get a consistent outcome it would be best to have a uniform set of guidelines for such countries to follow to achieve a successful outcome.

## **5. Other Influencing Factors in Achieving Harmonisation**

One of the most significant clauses in ISO 17024 states “the Certification Body shall have a documented structure which safeguards impartiality, including provisions to ensure the impartiality of the operations of the Certification Body. This structure shall enable the participation of all parties significantly concerned in the development of policies and principles, regarding the content and functioning of the certification system, without any particular interest predominating.”

The key word impartiality and the expression “without any particular interest predominating” has to be demonstrated quite clearly in the composition of the Board itself. In ensuring that that its certification board is completely impartial and is representative of a broad

spectrum of interests AINDT's National Certification Board consists of the following members from various industry sectors that have a vital interest in the development and maintenance of a certification scheme for inspection personnel: -

Chairman  
Honorary Secretary  
Chairman of Panel of Examiners  
Certified Persons representative  
Condition Monitoring representative  
National Association of Testing Authorities representative (NATA)  
Standards Australia representative  
Oil and Chemical representative  
NDT Training Industry representative  
Welding Industry representative (WTIA)  
Aerospace representative  
NDT Industry representative  
CBIP representative (NZ)

Whilst the breadth of the NDT industry in Australia allows a diversified certification board with complete impartiality this is not the case in many of the developing RCA member countries in SE Asia. Several of these countries, such as Bangladesh, Mongolia, Myanmar and Vietnam have a narrow industrial base from which to constitute an independent certification board and certification scheme.

In Mongolia's case, for example, the main focus on NDT is testing of permanent way and rolling stock for the Trans-Siberian Railway. The requirement, therefore, by Russian authorities, is that such non-destructive testing is carried out only by certified personnel. Despite the difficulties in establishing a fully accredited certification scheme in Mongolia there is a clear commitment by this country to achieve harmonisation of its personnel certification scheme in line with that of others in SE Asia, and with Russia as well. The difficulty of forming an impartial certification board is not as great as it seems and even under these narrow circumstances it would be possible to select a board that represents a sufficient number of interests that would allow it to demonstrate its complete impartiality.

One of the main difficulties faced in the SE Asia region in achieving harmonisation is that many certification bodies represent only certain factional interests and are not truly independent or impartial. For instance, the Atomic Energy industry in several countries has a controlling interest in the training and certification of NDT personnel. Since they are free from other competing interests they are often the only certification board in that country. These national certification boards tend to consist of factional interests to the exclusion of a wider range of participation from other interested parties.

Although this has an effect on the impartiality of these boards it is heartening to note that there is a strong awareness that changes will be required to the culture of these organisations to have greater representation from other stakeholders in the certification of personnel. To some extent this should not be difficult to achieve. Changing the culture may take a little longer.

The most important factor that inhibits harmonisation of certification schemes, both within the SE Asia region and outside of it, is that powerful industry groups, including the pressure vessel and atomic energy sectors, require a demonstrated level of skill much higher than that produced by ISO 9712. This will always be the case, since certification to ISO 9712 will only give assurance that the skill of an NDT operator has reached a certain level. Demonstration of skills at a higher level is therefore called for in applications where failure of plant and equipment has serious implications.

Experience has shown that the level of skill of operators in ultrasonic testing of welds, certified in accordance with ISO 9712, is quite high and with further training ultrasonic testers can achieve the necessary skills to test nozzle and node welds in applications such as pressure

equipment, oil platforms and drilling rigs. It is important that regional certification schemes do have a provision for special categories of testing personnel and this can be achieved by the provision of endorsements for testing of welds, for instance, in more complex weld geometries. In this way the specific requirements of major power utilities, including also atomic energy and oil and gas facilities, can be addressed by certificated personnel who have come through the ISO 9712 qualification system.

The most imminent threat at this stage is in the development of other authoritative standards that differ from the universally accepted international standards of ISO 9712/ISO 17024. In particular, EN 473 continues to move the “goal posts” each time a new version of ISO 9712 is published. To the consternation of the international community representing non-destructive testing there is further anecdotal evidence that the next version of EN 473 will be markedly differ to that of ISO 9712 thus creating divisions between the European Federation and the rest of the world, just as unanimity was being achieved between all member countries of the International Committee for Non-destructive Testing (ICNDT) for adoption of ISO 9712 on a universal basis.

## **6. Conclusions**

There are impediments to harmonisation of personnel certification schemes in SE Asia and to member countries of the regional cooperation agreement. However, with the excellent support of IAEA there is a strong sense of purpose that this can be achieved by 2012 with all countries having quality management systems in place that conform with ISO 17024. This will provide the basis for recognition between these countries of each others certification schemes and certificated personnel.

To achieve this it will be necessary to provide uniform guidelines that will provide a high degree of conformity between each countries quality systems. With respect to the lesser developed countries a significant degree of effort will be required to assist them develop their quality systems.

It will also be necessary for some countries to make significant changes to the make up of their certification boards in order to comply with the requirements of ISO 17024, in particular to ensure that they are completely impartial in their decision making process.

From an international perspective there is almost complete agreement that ISO 9712.2005 is the basis for the certification of non-destructive testing personnel. This is the closest that the international NDT community has come to in the harmonisation of the certification process. The publication of a new version of EN 473 has the potential to disrupt the degree of consensus that has been achieved but will not affect the road to progress of one of the largest trading blocks in the world, SE Asia and the Asia Pacific region.