

## Introduction to revision of KEPIC-QAI (Authorized Inspection)

Su-yeon Park<sup>a\*</sup>, Hyun-jae Joo<sup>a</sup>

<sup>a</sup> Korea Electric Power Industry Code (KEPIC) Department, Korea Electric Association (KEA)

\*Corresponding author: narapooh@kepic.org

### 1. Introduction

The technical requirements of KEPIC related to design and inspections for pressure vessels have been developed on the basis of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC), Korea Electric Association (KEA) that is KEPIC maintenance organization is trying to find and improve unreasonable requirements based on the acquired experiences for the continuous construction and operation of NPPs.

In the administrative requirements, KEPIC, unlike ASME, adopted not only mechanical field but also electrical field related to NPPs. Furthermore, the qualifying system for services such as Nondestructive Examination, Heat Treatment, Design and Equipment Qualification Organization was adopted to improve safety and reliability for NPPs.

### 2. KEPIC Certification Program

#### 2.1 Operational background of KEPIC certification program

The KEPIC certification program is a system that the qualified organizations and personnel by KEA (Korea Electric Association) in accordance with KEPIC requirements perform their appropriate code activities for nuclear safety-related items so as to achieve the safety and reliability goals of electric power facilities, especially nuclear power plants. The KEPIC certification program has been established by referring and modifying certification programs of foreign codes and standards which had previously been applied to domestic industries.

- Correcting the problem that unauthorized foreign certification programs in Korea were applied.
- Easy acquisition of certificates and related information through the program operated by domestic certification and accreditation body.
- Economizing costs needed for acquisition and holding of one or more foreign certificates.

#### 2.2 Scope of KEPIC certification program

##### A. Organization Certification

- plant owner & designer, manufacturer, installer & constructor, material organization, and service organization,
- authorized inspection agency (AIA),
- pressure relief device testing laboratory,

##### B. Personnel Qualification

- authorized nuclear inspector/supervisor,
- registered professional engineer (RPE)
- nondestructive inspector.

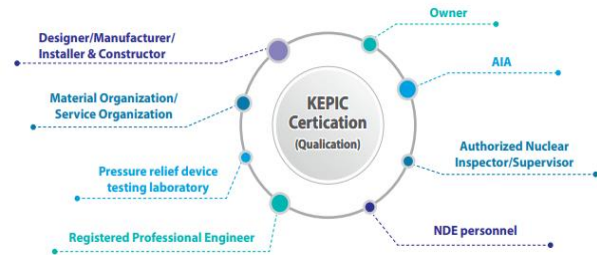


Fig. 1. Scope of KEPIC Certification Program

#### 2.3 Certification for authorized inspection agency/authorized inspector(Supervisor)

The pressure equipment manufacturer and installer shall be inspected by an authorized inspector who is employed by the Authorized Inspection Agency (AIA). It is necessary for Authorized Inspector and Authorized Inspector Supervisor to take the training program and pass the qualifying examination. And then AIA makes application for their registration to KEA. Scopes are KEPIC-MNX, MIX, SNB, MGB, MGE, MBB. KEPIC-QAI is based on the ASME QAI-1 as the main reference standard and refer to the related contents of the NB Rules and Regulations prescribed by the NBBI.

Table I: Comparison of KEPIC and ASME (AIA)

Description	KEPIC	ASME
Applicable Standard	KEPIC-QAI	ASME QAI-1
Organizations	Independent Organization to Owner, Certificate Holder, and Material Organization	-Enforcement Authority -Insurance Company
Accreditation Body	KEA	ASME
Government Acceptance	Accepted by Regulatory Body, if required	State Government Enforcement

Table 2: Comparison of KEPIC and ASME (ANIS/ANI)

Description	KEPIC	ASME
Applicable Standard	KEPIC-QAI	ASME QAI-1
Standard Establishment-Revision	KEA	ASME
Accreditation body	KEA	NBBI
Other Requirements	Similar except for follows	

The main revisions of authorized inspector (supervisor) qualification requirements are as follows.

### 2.3.1 Authorized nuclear inspector supervisor

▪ Basic qualifications and work experience  
- 2015 Ed. : Shall satisfy one of the following requirements:

(a) Graduate of a 4 year accredited engineering or science college or university, plus 5 years of experience in quality assurance, including testing or inspection (or both) of equivalent manufacturing, construction, or installation activities. At least 2 years of this experience should be associated with nuclear facilities; or if not, the individual shall have training sufficient to acquaint him thoroughly with the safety aspects of a nuclear facility.

(b) High school graduate, plus 10 years of experience in general quality assurance or engineering, or equivalent manufacturing, construction, or installation activities. Five years of this experience is required in quality assurance, including testing or inspection (or both) of equivalent construction and installation activities. At least 2 years of this experience should be associated with nuclear facilities; or if not, the individual shall have training sufficient to acquaint him thoroughly with the safety aspects of a nuclear facility.

(c) At least 5 years KEPIC-MN related work, which includes inspection under establishment of these qualifications; administration of shop inspection service under the referenced Sections or experience in applicable Codes and Standards related manufacturing or construction activities.

- 2019 Add. : Shall have qualified as an Authorized Inspector, and subsequently either shall have been engaged for at least two years in KEPIC-MB, KEPIC-MN or KEPIC-MG pressure equipment or shall have been engaged for at least two years as in the administration of shop inspection services under the referenced KEPIC Code.

▪ Knowledge

- 2015 Ed. : Shall have knowledge of KEPIC-MN survey procedures, which shall include the service with at least three nuclear survey teams as a member or as an observer.

- 2019 Add. : Shall have knowledge of KEPIC-MN survey procedures, which shall include either of the following :

(a) Service with at least two KEPIC-MN survey teams as a member or as an observer, or

(b) Servicing as a member or observer on one KEPIC-MN survey team, plus documented satisfactory completion of a course promulgated by KEA on the conduct of nuclear surveys and administration of KEPIC nuclear accreditation programs

▪ Working knowledge

- 2015 Ed. : Shall have a working knowledge of the requirement of KEPIC-MN.

- 2019 Add. : Shall have a working knowledge of the requirement of KEPIC-MN, applicable Code Cases, and reference codes and standards.

### 2.3.2 Authorized nuclear inspector

▪ Knowledge

- 2015 Ed. : Knowledge of the requirements for maintenance and retention of in-transit and permanent records.

- 2019 Add. : Shall have knowledge of the requirements for lifetime and nonpermanent records.

▪ Working knowledge

- 2015 Ed. : Shall have a working knowledge of the requirement of KEPIC-MN Code and Code Cases.

- 2019 Add. : Shall have a working knowledge of the requirement of KEPIC-MN, applicable Code Cases, and reference codes and standards.

▪ Knowledge of health physics

- 2015 Ed. : None

- 2019 Add. : Shall receive health physics training prior to any exposure to occupational related ionizing radiation

### 2.3.3 Authorized nuclear in-service inspector supervisor

▪ Basic qualifications

- 2015 Ed. : None

- 2019 Add. : Shall have qualified as an Authorized Nuclear Inspector Supervisor in accordance with 3.1.1.

▪ Working Knowledge

- 2015 Ed. : None

- 2019 Add. : Shall have a working knowledge of KEPIC-MI, applicable Code Cases, and reference codes and standards.

▪ Knowledge of health physics

- 2015 Ed. : Shall have knowledge of the basic fundamentals of health physics, insofar as permissible exposure to radiation is concerned.

- 2019 Add. : Shall receive health physics training prior to any exposure to occupational related ionizing radiation.

### 2.3.4 Authorized nuclear in-service inspector

▪ Basic qualifications

- 2015 Ed. : None

- 2019 Add. : Shall have qualified as an Authorized Nuclear Inspector.

▪ Knowledge

- 2015 Ed. : None

- 2019 Add. :

- Shall have knowledge of quality assurance requirements and shop and field procedures and processes.

- Shall have the knowledge and ability to evaluate and monitor shop and field procedures and performance.

- Shall have knowledge of the requirements for lifetime and nonpermanent records.

- Working Knowledge

- 2015 Ed. : Shall have a working knowledge of KEPIC-MI, applicable Code Cases, including the requirements for maintenance and retention of records.

- 2019 Add. : Shall have a working knowledge of KEPIC-MI, applicable Code Cases, and reference codes and standards.

- Knowledge of health physics

- 2015 Ed. : Knowledge of basic fundamentals of health physics, including purpose and working principles of the film badge, dosimeter, and radiation monitoring devices.

- 2019 Add. : Shall receive health physics training prior to any exposure to occupational related ionizing radiation.

### 2.3.5 Authorized nuclear inspector supervisor (concrete)

- Basic qualifications

- 2015 Ed. : None

- 2019 Add. : Shall have qualified as an Authorized Nuclear Inspector Supervisor in accordance with 3.1.1.

- Knowledge

- 2015 Ed. : Shall have knowledge of KEPIC-SN nuclear survey procedures, which shall include a service with at least three nuclear survey teams as a member or as an observer.

- 2019 Add. : Shall have knowledge of KEPIC-SN nuclear survey procedures, which shall include a service with at least two nuclear survey teams as a member or as an observer.

- Working knowledge

- 2015 Ed. : Shall have a working knowledge of the requirement of KEPIC-SN.

- 2019 Add. : Shall have a working knowledge of the requirement of KEPIC-SN, applicable Code Cases, and reference codes and standards.

- Knowledge of health physics

- 2015 Ed. : Shall have knowledge of the basic fundamentals of health physics, insofar as permissible exposure to radiation is concerned.

- 2019 Add. : Shall receive health physics training prior to any exposure to occupational related ionizing radiation.

- Work experience

- 2015 Ed. : Shall qualify for consideration by meeting one of the following requirements:

- (a) Graduate of a 4 year accredited engineering or science college or university, plus 5 years of experience

in quality assurance, including testing or inspection (or both) of equivalent fabrication or construction activities. At least 2 years of this experience should be associated with the construction or inspection of concrete structures similar to those used in nuclear facilities.

- (b) High school graduate, plus 10 years of experience in general quality assurance or engineering, or equivalent fabrication or construction activities. Five years of this experience are required in quality assurance, including testing or inspection (or both) of equivalent construction and installation activities. At least 2 years of this experience shall be associated with the construction or inspection of concrete structures equivalent in complexity to those used in nuclear facilities.

- 2019 Add. : Shall have qualified as an Authorized Nuclear Inspector(Concrete) and subsequently shall have been engaged in at least 1 year in design, construction, or inspection of concrete structures similar to those used in nuclear facilities.

### 2.3.6 Authorized nuclear inspector (concrete)

- Basic qualifications and work experience

- 2015 Ed. : Shall meet one of the following requirements.

- (a) A minimum of two years of experience in design, construction, or inspection of major concrete structures;
- (b) Satisfactorily completed an accelerated course acceptable to KEPIC-SN, and the KEA, in the fundamentals of concrete construction and inspection, plus six months of field training in concrete inspection under the Authorized Inspection Agency.

- 2019 Add. : Shall have qualified as an Authorized Nuclear Inspector and either shall have been engaged for at least 1 year in KEPIC-SNB Code related work, such as inspections under the provisions of the KEPIC-SNB Code, or shall have been engaged for at least 1 year as an Inspector Trainee of nuclear items under the direct supervision of an Authorized Nuclear Inspector (Concrete).

- Knowledge

- 2015 Ed. : None

- 2019 Add. :

- Shall have knowledge of quality assurance requirements and shop and field procedures and processes.

- Shall have the knowledge and ability to evaluate and monitor shop and field procedures and performance.

- Shall have a satisfactory degree of experience, knowledge, and background for the inspection of nuclear items, consistent with the complexity of the assignment.

- Shall have knowledge of the requirements for lifetime and nonpermanent records.

- Working knowledge

- 2015 Ed. : Shall have knowledge of the requirements of KEPIC-SN, applicable Code Cases, and other codes

and standards.

- 2019 Add. : Shall have a working knowledge of KEPIC-SNB, applicable Code Cases, and reference codes and standards.

▪ Knowledge of health physics

- 2015 Ed. : None

- 2019 Add. : Shall receive health physics training prior to any exposure to occupational related ionizing radiation.

### **3. Improvement plan for KEPIC Authorized Inspection**

In order to play a role as a more improved and optimized qualification system in the Korean nuclear industry, the KEPIC personnel qualification system improvement plan was introduced as follows. First, according to the KEPIC-QAI (2019 Addenda), a person who wishes to obtain a qualification by an authorized nuclear in-service or authorized nuclear (Concrete) inspector (supervisor) must acquire qualification as a nuclear machine certified inspection (supervisor). In this regard, the following contents have been added to Chapter 14 of KEPIC-11-22 in the operational guidelines as a measure of postponement for qualification renewal.

Authorized nuclear in-service or authorized nuclear (Concrete) inspector (supervisor) who are qualified before July 1, 2020 can apply for renewal until June 30, 2023 even if they don't acquire qualification.
---

Second, the Code of Ethics for Authorized nuclear inspector (supervisor) was enacted and added as attached form of the operational guidelines.

### **4. Concluding Remarks**

The KEPIC-QAI 2019 Addenda has been revised with reference to the 2018 edition of ASME QAI-1. The main revisions are the qualification requirements and duties (additional requirements for electronic diaries) of the Authorized inspector (supervisor). Current issues in the domestic industry, such as the definition of employment, are being reviewed, and the revisions will be reflected in the KEPIC-QAI 2021 addenda and related operating guidelines.

### **REFERENCES**

- [1] KEPIC-QAI (2015 Edition, 2019 Addenda)
- [2] ASME-QAI-1 (2018 Edition)