

Code Case Development Procedures through the KEPIC-MN Q&A System

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1. Introduction

KEPIC (Korea Electric Power Industry Code) is a detailed technology standard that specifies the methods and procedures for the design, manufacturing, installation, operation, testing, examination and maintenance to ensure the safety, reliability and quality of facilities used for the electric power industry. KEPIC has contributed to the secure safety and reliability of nuclear power generation, as well as to thermal power generation and to the localization of power plant materials ever since its first edition was published in 1995, which has been fully applied to the Korean new nuclear facilities starting from the Shin-Gori Number 1 and 2 power plants and to the UAE Barakah nuclear facility. Meanwhile, other nuclear power plants in operation, including the Gori Numbers 1 and 2, which were constructed by applying overseas standards are now subject to repairs and replacements, in-operation examinations, and testing of the power plant materials.

Not only the continued development of KEPIC, but also consistent distribution and public promotions are crucial for its better availability. Thus, all the queries received via the KEPIC website are handled as per the relevant directions, as the KEPIC Q&A is designed to help users clearly understand the KEPIC requirements. The results are published as an interpretation or a Code Case after a review by the Committee, if necessary.

Accordingly, this article provides the Q&A cases of MN (nuclear mechanical components) performed through the KEPIC Q&A System and introduces the process and procedures for this case development.

2. KEPIC Q&A System

The Q&A System was established and operates as follows, in order to help users clearly understand the KEPIC requirements and to provide quick and accurate responses to any questions arising during the process of an application.

2.1 Procedure for writing a KEPIC Q&A

Essential items (standard and classification symbols, years of issuance, item numbers, table and figure numbers, etc.) shall be completed and the relevant technical materials shall be attached if necessary, for the purpose of understanding the query details, according to the official forms.

A single requirement shall be described per inquiry form. A specific and detailed inquiry shall be completed for any case that requires clarification of the KEPIC requirements or that needs to be urgently defined as an exemption from KEPIC. Relevant technical data shall be attached if necessary, and the inquiry details shall be described in form of "Yes" or "No" questions.

Table.1. Inquiry Form

1. Name	(Signature)	Department			
2. Address (Postal code)	(-)			Tel	
				Fax	
3. KEPIC	Year of Issuance		Sub- Classification	Item and Number	
			Title		
4. Subject					
5. Inquiry Details (Inquire in a question-and-answer form as far as possible, and attachments are acceptable)					
6. Receipt	No.				
	Assistant Administrator	Name		Signature and Date	

2.2 Procedure for the KEPIC Q&A Process

Inquiries received by KEPIC shall be sent to an assistant administrator in charge who will designate another assistant administrator or member to prepare a draft response after a review of the inquiry.

The draft response shall be accessed by a relevant subcommittee and collected by the assistant administrator in charge, who will then prepare the final response and determine whether to release the answer or to proceed with a further review after a discussion with the head of the sub-committee. The response shall be delivered to the enquirer via the KEPIC website.

In addition, interpretations, applicable cases and errata shall be issued regarding the KEPIC Q&A. An interpretation is a response to an inquiry that requires an authoritative interpretation in terms of the systems and technology in the KEPIC requirements, which is not the part of KEPIC and is not a supplement but is reviewed and approved by the committee.

An applicable case is a specific case suggested for a clarification of the KEPIC requirements, as well as new requirements that may be urgently proposed due to the insufficiency of existing KEPIC requirements, which are equivalent to KEPIC and are issued via the approval by a technical committee after a review by the subcommittee.

A Table of Errata shall be issued during the Q&A process related to a mistranslation or other errata.

3. KEPIC-MN Q&A Cases

The KEPIC-MN (nuclear mechanical components) technical standard specifies the requirements for designing, manufacturing, tests and inspections regarding safety-related pressure vessels and their relevant components, supports, and high level waste transfer apparatus and containers. The reference standard is the ASME B&PVC Sec. III which is in fact an international standard for pressure vessels.

There have been a number of inquiries such as the difference between engineering and operational understandings in the KEPIC-MN requirements, the problems arising from the industrial spots, and the application of KEPIC to the constructions of overseas nuclear facilities. Among them, this article will introduce pending issues on the MN field, Table of Errata and the Code Case development.

Case 1) It is related to the welding connection PWHT on a pressure vessel nozzle/line (Elbow)

Nozzle quality: SA541 CL3 (P-NO.3-3), Carbon content: 0.23%, CODE CLASS 1

Elbow quality: SA234 WPB (P-NO, Carbon content: 0.21%, CODE CLASS 2

Welding connection thickness: 0.562IN

Please, let me know if it satisfies the requirements for the exemption from Post Weld Heat Treatment (PWHT) as per Section(2)(e) of KEPIC MNC 4622.8.

MNC 4622.8 is exempted from PWHT of nozzle-to-component welds and branch-to-run pipe welds. A weld connecting a nozzle or branch of a P-No. 1 material to a component or run pipe of a P-No.1 or P-No.3 material which is not-exempt from PWHT has different requirements for partial and full weldings, respectively. Thus, the PWHT shall be exempt only if all the requirements listed relative to each welding method are met. In the pending issue, inquiries are increasing related to the post-simulation heat treatment as well as for PWHT in regard to Case 1.

Case 2) KEPIC MND 2582 defines that screws and axes and the heads of final machined components are subject to a visual examination.

1) Does the head of a final machined component include the head of a pressure vessel?

2) If it does, does the head of a machined component mean the Bevel part of the head that is welded to the shell?

The MND 2582 requirements deal with a visual examination of the bolts, studs and nuts, and the head refers to the head of a component subject to the MND 2582 requirements. Accordingly, the Table of Errata was issued and the technical requirements in the 2000 (applicable to UAE) to 2015 Editions were corrected for Case 2.

Case 3) The length of counterbore for pipe fittings shall be if the weld is subject to preservice inspection according to the requirement of KEPIC 2000 ed., MNB 4250(3). In the cases of elbows this counterbore makes sometime the wall thickness of them reduce less than the minimum wall thickness required by MNB 4250(1). Is there any other alternative requirement in this case?

One of the below can be used in the case that both requirements of counterbore length and the minimum required wall thickness of elbows cannot be satisfied simultaneously.

(1) the detailed analysis on the weld including the region of the counterbore (MNB 3200)

(2) the alteration of the shape of the counterbore

(3) the reduce of the counterbore length
An application of this code case on a specific nuclear power plant under constructing will be needed to get a permit of the regulatory body considering its characteristics and constructing status.

In Case 3, the industrial difficulty was resolved by issuing an applicable case after a discussion with the relevant subcommittee, as the application of the KEPIC requirements was in reality impractical or impossible.

4. KEPIC Code Case Development

4.1 Procedures for the KEPIC Code Case Development

A KEPIC Code Case is proposed by the industrial demand or during the process of Q&A.

It is also proposed to be utilized as a result of R&D. A suggestion for the development validity shall be primarily reviewed by the subcommittee and a draft Code Case shall be prepared if the necessity of its development is acknowledged. The WG, where a number of relevant experts participate, shall be organized during this process if necessary. The draft Code Case shall be reviewed by the subcommittee and obtain the final approval by an technical committee upon the completion of the review. Immediately after the technical committee grants the final approval, the KEPIC Code Case shall be issued and the industry shall

be notified of this via the website, etc. The expiration of a Code Case occurs 5 years from the final approval, and if the Code Case fails to obtain a re-approval from the technical committee before its expiration, it shall be discarded.

4.2 Status of a KEPIC Code Case Development

A total of 197 types of KEPIC Code Cases have been issued on the quality, machine, structure, etc.. Most of them were developed by referring to the ASME B&PVC Code Cases and 6 types were self-developed, including 1 type on nuclear mechanical components.

Table 2. Status of the KEPIC Code Case Self-Development

Serial Number	Title of the Code Case
MN-C-049	Counterbore length of class 1 pipe fittings
QA-C-021-1	Approved by a non-destroying inspector (re-used)
QA-C-113	Approved by the ASME QSC-owned material supplier
QA-C-173	KEPIC symbol measured upon the application of the KEPIC 2000 Edition
SN-C-048	Mechanical Splicing of Reinforcing Bars (KEPIC-SNB 4331.2.2)
SN-C-114	The tensile test requirements for cold roll formed parallel threaded splice at 20°F (-7°C)

5. Conclusions

Our construction capacity of a power plant and operation experience have reached a level of a developed country, based on consistent investments and technical improvements in the electric power industry. In addition, our national competitiveness has been improved through the export of nuclear facilities.

KEPIC has responded to the pending technology issues in the industry by issuing a Code Case, Interpretations, and a Table of Errata through the operation of a Q&A System. This has resulted in the development of technology requirements that are applied to the real world industry, which have ultimately resolved pending nuclear power-related issues, difficulties faced by plant owners, problems involved with latest technological applications, and safety demonstrations in relation to nuclear facilities. In addition, it is considered that this process has contributed to the creation of an economic effect by suggesting the technology requirements most appropriate for domestic and overseas industrial conditions.

In the future, KEPIC will seek to maintain up-to-date technology standards by reflecting the domestic and overseas changes in technology resulting from industrial

demands, new technology developments, R&D results, modifications of overseas standards, etc. and will establish the basis for user enhancements and international KEPIC applications by securing their applicability in terms of domestic and overseas nuclear facilities.

REFERENCES

- [1] KEPIC (Korea Electric Power Industry Code) Code & Standard, 2015 Ed.
- [2] S. Y. Lee, J. H. Kim, KEPIC Code Case Development Procedure and Improvement Plan, KPVP, pp.23-24, 2016