

# **Technical Consulting Service on Emergency Response Base Building, Seismic Isolation Design and Construction**

**2021. 10.**



## **[APPENDIX A - SCOPE OF SERVICE AND METHOD OF PERFORMANCE]**

### **1. TITLE OF CONSULTATION**

Technical Consulting Service on Emergency Response Base Building, Seismic Isolation Design and Construction

### **2. OBJECTIVES**

The objective of this consulting service is to provide KEPCO E&C with the following scope of services related to design, construction and licensing issues of the seismic-isolated buildings that serve as bases for emergency response (hereafter, the Emergency Response Base Building, ERBB) in the Japanese nuclear power plants. KEPCO E&C will refer to this consultation results for design, construction and licensing of the ERBB to be constructed in the Korean nuclear power plant sites. This consulting service includes the design criteria, design characteristics, maintenance methods, performance monitoring tests, long-term durability monitoring tests and periodic tests of seismic isolation system applied to the Japanese nuclear facilities. Furthermore, the Consultant provides review results on the major issues in licensing process of the Japanese nuclear seismic-isolated structures, Korean industrial code for nuclear seismic isolation system, KEPCO E&C's purchase specifications of seismic isolation devices, and licensing questions raised by the Korean regulation agency. The consultation results may be submitted to the Owner (Korea Hydro and Nuclear Power Company, Ltd.) and to the regulation agency (Korea Institute of Nuclear Safety).

### **3. SCOPE OF SERVICES**

To achieve the above objective, the Consultant shall provide KEPCO E&C with the technical consulting services in the following tasks:

#### **Task 1. Review on Seismic Isolation Design for Nuclear Facilities including ERBB**

- Provide the expert's review document, based on the background of Japanese code, on the major differences between Japanese design codes and Korean/US design codes of seismic isolation system for the nuclear safety-related facilities.
- Provide the review document and its bases for issues in the KEPCO E&C's purchase specification of seismic isolation devices.

- Provide the codes or guidelines applicable to design, construction and maintenance of seismic isolation system in the Japanese nuclear facilities.
- Provide the review document, based on Japanese design experiences, on the selection and arrangement of seismic isolation devices designed by KEPCO E&C and its cooperating parties.
- Provide the Japanese design methodology in practice to consider the variation in mechanical properties of seismic isolation devices, and provide the review document on the KEPCO E&C's parametric analysis for the variation in mechanical properties of seismic isolation devices and KEPCO E&C's incorporation method of the parametric analysis results into the Korean ERBB design.
- Provide the review document on construction and maintenance manuals including installation and replacement of seismic isolation devices.
- Provide the review document on the design considerations and applicable methodologies complied with Japanese design codes regarding the design of seismic-isolated structures such as superstructure basemat, foundation, pedestal, moat wall, hard stop or soft stop.
- Provide the safety verification methodology of essential structures against earthquakes exceeding 0.5g of design basis ground motion, and if necessary, provide comments to design supplementation of the Korean ERBB.
- Provide the review document on special consideration for the space of seismic isolation system to be installed at basement:
  - Design considerations related to gap (clearance to the stop) between the moat wall and the seismic-isolated superstructure (umbilical lines such as piping, electrical cable, etc.)
  - Design considerations to prevent rainwater and leak
  - In case of displacement control system (dampers, etc.) that is applied to the seismic isolation design in the Japanese nuclear facilities, installation purpose and operating principle, etc. of the displacement control system
  - Special considerations to ensure the performance of seismic isolation system (e.g., temperature control equipment, etc.)
- Provide the review document on verification method for long-term performance of seismic isolation device:
  - Test periods and test method for performance verification
  - In case of the test specimen that is manufactured and installed at a seismic isolation floor, design method of the test specimen (size of the test specimen,

- loading method, periodic test method, etc.)
  - If the reduced-scale models are permitted to be used in the tests, the appropriate sizes of the test specimens for each type of seismic isolation devices and the related criteria
  - Items to be evaluated from test results of seismic isolation devices and acceptance criteria for performance verification of seismic isolation devices
  - Monitoring method for long-term durability (performance) evaluation of seismic isolation system. If monitoring is required, measurement items and required equipment, etc.
- Provide the reports or explaining materials for Japanese precedent seismic isolation design and construction.
  - Submit the consultation report (I) for the seismic isolation design of the nuclear facilities including the ERBB.
  - Supplement the consultation report (I) to incorporate the KEPCO E&C's comments and the results of the technical review meetings, if required.

## **Task 2. Review on Emergency Response Base Building Design in Japanese Nuclear Power Plant Sites**

- Provide the design considerations for the ERBBs in the Japanese nuclear power plant sites (including seismic isolation design).
- Provide the special design considerations for the ERBBs in the Japanese nuclear power plant sites (HVAC, electricity, piping, telecommunications, operator residence facilities).
- Provide the major issues in each main process of design, licensing and construction of the ERBBs in the Japanese nuclear power plant sites
- Submit the consultation report (II) for the ERBB design in the Japanese nuclear power plant sites.
- Supplement the consultation report (II) to incorporate the KEPCO E&C's comments and the results of the technical review meetings, if required.

## **Task 3. Review on Licensing Questions from Korean Regulation Agency**

- KEPCO E&C will provide Consultant with the licensing questions raised by Korean

regulation agency. Provide the expert's opinion and feedback, based on Japanese experiences, on those licensing questions.

- Submit consultation report (III) for the review results of the licensing questions
- Supplement consultation report (III) to incorporate the KEPCO E&C's comments and the results of the technical review meetings, if required.

#### **Common(Task I ~ III). Kick-off Meeting and Technical Review Meetings**

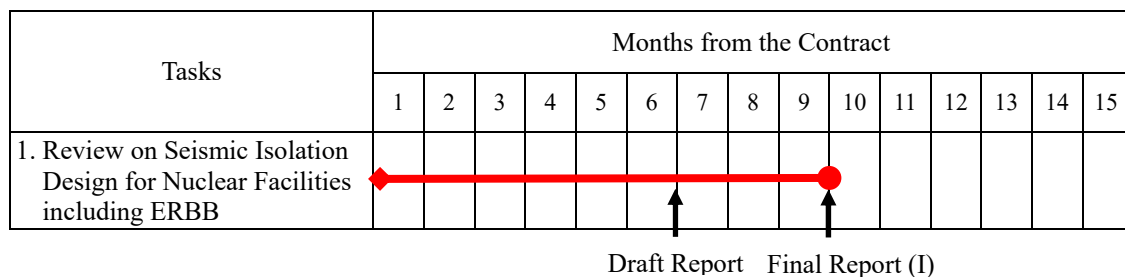
KEPCO E&C engineers will travel to the Consultant to take part in a kick-off meeting for the discussion of consulting service tasks and technical review meetings for the review of the consultation report. In case that these face-to-face meetings are not available, conference call meetings or e-mail communications could be alternatives. The Consultant (**3 Experts indicated in Miscellaneous of this document**) shall participate in the meetings. The kick-off meeting shall be held at the stage of the consultation to be mutually agreed upon. In the meeting, KEPCO E&C will discuss technical issues focused on the clarification and details of consulting tasks with the Consultant. The technical review meetings shall be held after submission of the draft consultation reports dealing with the review, discussion of the consultation report as well as providing the instruction of technical details regarding the seismic isolation design, ERBB design, etc. to the KEPCO E&C engineers.

- Kick-off meeting (2~3 days): Seminar about theoretical background and outline of Japanese seismic isolation design for nuclear facilities, explanation of technical details about consultation works
- Technical review meetings after submission of draft consultation report (2~3 days for each Task): Review, discussion, and modification (if any) of the draft consultation reports, instruction of technical details for the whole consulting results

## **4. METHOD OF PERFORMANCE**

### **Consultation Schedule**

The contract period shall be 15 months from the Execution Date.





- Draft report: within 7 months from the Execution Date
- Final report: within 9 months from the Execution Date

Task 3 Consultation Report (III): within 15 months from the Execution Date (Final report)  
Meeting Minutes for kick-off meeting and technical review meetings: within 1 week after each meeting

References related to Tasks 1, 2 and 3 : Within each submittal date of each final report

### **Miscellaneous**

After the consulting tasks, the Consultant must discard all of the documents, data, etc. provided by KEPCO E&C.

- Experts to perform the Services

<b>Name</b>	<b>Specialty</b>	<b>Grade</b>
JSSI President	Architectural Structure, Seismic Engineering, Seismic Isolation/vibration control Structure etc.	Director
JSSI Advisor	Structural Design, Seismic isolation Structure	Director
JSSI Senior managing director	Structural Design, Seismic isolation Structure	Director