

**Technical Consultation on the evaluations of the structural
integrity of the containment penetrated
equipment/penetration organic material at the severe accident
and the permanent closure of Airlocks**

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KEPCO ENGINEERING & CONSTRUCTION COMPANY, INC

[SCOPE OF SERVICES AND METHOD OF PERFORMANCE]

1.0 PURPOSE

- 1) This technical consultation is related to the accident management plan. The purpose of this technical consultation is to confirm that the structural integrity and leak-tightness of the reactor containment building is guaranteed under pressure and temperature conditions in the event of the severe accident in which the core melts beyond the design basis accident.
- 2) Personnel Airlock, Equipment Hatch, Emergency Exit Airlock and Fuel Transfer Tube in the reactor containment building shall be evaluated for structural integrity under severe accident pressure and temperature conditions in accordance with The American Society of Mechanical Engineers Code (ASME Section III, Div. 1 Subsection NE) equivalent to Korea Electric Power Industry Code (KEPIC MNE) as requested by Regulatory Authority.
- 3) Non-structural elements of reactor containment penetrations shall be evaluated for structural integrity and leak-tightness under severe accident pressure and temperature conditions.
- 4) This technical consultation is to evaluate the possibility of permanent closure of Airlocks that are flooded due to the rise in the flood level of reactor building according to the implementation of the accident management strategy in the event of severe accident
- 5) All technical consultation results are submitted to the business owner (KHNP, Korea Hydro & Nuclear Power Co Ltd.) and Regulatory Authority (KINS, Korea Institute of Nuclear Safety).

2.0 TECHNICAL SCOPE OF WORK

The Contractor shall provide the following engineering services to KEPCO E&C as described in the following tasks:

Task 1: Evaluating the structural integrity of containment penetrated equipment and Organic Material Evaluation for Kori Unit 2

- 1) Review the design reports for existing containment penetrated equipment and create the Finite Element Analysis (FEA) for evaluation of the equipment for Kori Unit 2
- 2) The structural integrity of containment penetrated equipment (Equipment Hatch, Personnel Airlock, Emergency Airlock, Fuel Transfer Tube) under severe accident temperature and pressure are evaluated by finite element analysis. Organic materials are also evaluated by using Arrhenius equation or other method.

Task 2: Develop Method for permanent Closure of Airlocks

- 1) The only issue to be addressed is the leak tightness of Airlocks during the extended flooded condition. It is our understanding that, except the leak tightness, the subject Airlocks has been qualified for all applicable severe and severe accident temperatures and pressures including

any concurrent pressure load due to containment flooding.

- Target Power Plants

- APR1400 (Shin-Hanul 1,2 / Shin-Kori 3,4)
- OPR1000 (Hanul 3,4 /5,6, Hanbit 3,4/5,6, Shin-Wolsong 1,2, Shin-Kori 1,2)
- WH-2 Loop (Kori 2),
- WH-3 Loop (Kori 3,4, Hanbit 1,2)
- CANDU (Wolsong 2 / 3,4)
- Framatome (Hanul 1,2)

- Subject Items

- Airlocks

Task 3: Kick-off Meeting and Technical Review meeting(TRM)

- 1) A kick-off meeting via video-conference will be held after Contract signing to review project scope and approach.
- 2) For Technical Review Meeting (TRM) for all Draft Reports of Task 1&2, KEPCO E&C will dispatch their personnel to S&L's office to discuss their comments on the reports and other specific items. The meeting will have the duration of five (5) working days maximum.

Task 4: Submittal of Final Design Reports

The Contractor will incorporate agreed upon resolutions to KEPCO E&C comments on all Draft Reports of Task 1&2 and issue all Final Reports for Task 1&2. All native files will be transferred to KEPCO E&C.








Task 5: Technical Services for Licensing Support (TSLs)

- 1) The Contractor shall provide technical services for additional licensing-related technical support to the activities that are being performed by KEPCO E&C.
- 2) The activities would be technical responses to questions from KINS (Korea Institute of Nuclear Safety) and/or preparing back up documentation

3.0 METHOD OF PERFORMANCE

Consulting Schedule

The consulting schedule for the basic tasks (Task 1 to 5) shall be until 7 months from the Execution Date of the Contract, as follow:

Tasks	Months after the Execution Date						
	1	2	3	4	5	6	7
Tasks 1 - Draft Report							
Tasks 2 - Draft Report & Sketches							
Task 3 - Kick off & TRM							
Task 4 - Final Report(Task 1)							
Task 4 - Final Report & Sketches(Task 2)							
Task 5 - Technical Services							

Method of Performance

- After the Contract, the Contractor shall start the consulting service in accordance with the schedule presented in Consulting Schedule.
- Task 1 : KEPCO E&C will provide reference documents and data for FEA model development, and soundness evaluation performed by The Contractor.
- Task 2 : KEPCO E&C will provide reference documents and data for consulting, and The Contractor develops a permanent closure method.
- Task 3 : Kick-off meeting is held via video-conferences call and final meeting (TRM) is held via face-to-face meetings according to the consulting schedule. Technical consultation on the contents of the draft reports through Technical Review Meeting.
- Task 4 : The Contractor shall reflect KEPCO E&C's review comments and discussions, and submit all Final Reports & Sketches.
- Task 5 : Through work order, the Contractor shall provide technical services for licensing-related activities that are being performed by KEPCO E&C.

Deliverables

1) Task 1 ,2 & 4

- Draft Reports : within 3 months(Task 1), 3.5 months(Task 2) after the Execution Date
 - Evaluation Reports on the Reactor Containment Penetrated Equipment in Kori Unit 2
 - Evaluation Reports on the Non-structural Elements of Reactor Containment Penetration in Kori Unit 2
 - Evaluation Reports & Sketches on the development method of permanent closure Airlocks in APR1400, OPR1000, WH-2Loop, WH-3Loop, CANDU, Framatome
- Final Reports : within 5.5months(Task 1), 6 months(Task 2) after the Execution Date
 - Evaluation Reports on the Reactor Containment Penetrated Equipment in target power plant
 - Evaluation Reports on the Non-structural Elements of Reactor Containment Penetration in target power plant
 - Evaluation Reports & Sketches on the development method of permanent closure Airlocks in target power plants

2) Task 3

- Kick-off Meeting
 - Presentation material and meeting minutes within 1 week after the meeting
- Final Meeting (TRM)
 - Presentation material and meeting minutes within 1 week after the meeting

3) Task 5

- Technical Responses to licensing related questions specified in the Work Order

Attachment - Work Order From**WORK ORDER**

To :

I, the undersigned, hereby authorize this Work Order under which you shall provide the required Services described below in accordance with the terms and conditions of the agreement.

Project	Work Order No.	Issue Date	Remark

Grade/rate/MH/\$ Budget :

Assignment Start Date :

Assignment Duration :

Scope of Work :
Safety-related

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Delivery Requirement :

Any Other Special Requirement :

Name(s) of Personnel to Carry Out the Work :

References :

Initiated by KEPCO E&C GS

Discipline :

Name :

Signature :

Coordination

Position

Name

Signature

APM

Authorized by KEPCO E&C PM

(Name)

(Signature)

(Date)