2008 AEC-NRC Bilateral Technical Meeting

Regulatory Activities during the Construction Phase of Lungmen Project

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Basic Laws for Regulation

➢Nuclear Reactor Facilities Regulation Act

Article 5

For the construction of nuclear reactor facilities, an application for construction permit shall be filed with the competent authorities, and the construction shall not commence until the application has been reviewed and approved by the competent authorities to meet with the following standards and requirements and the competent authorities have issued a construction permit…

Basic Laws for Regulation(cont)

➢Nuclear Reactor Facilities Regulation Act

Article 6

Even after the completion of construction of nuclear reactor facilities, the facilities shall not be loaded with the nuclear fuel, unless the competent authorities have reviewed and approved its final safety analysis report, and the corrective actions of inspection findings during the construction and the system functional tests thereof have been passed.

Unless the competent authorities have reviewed and approved the power test therefore and then issued an operating license therefore, no nuclear reactor facilities, having been loaded with the nuclear fuel, shall be formally operated.

The valid period of the operating license referred to in the preceding Paragraph shall be forty years at longest, ….

Basic Laws for Regulation(cont)

➢Nuclear Reactor Facilities Regulation Act

Article 14

During the construction or the operation period of nuclear reactor facilities, the competent authorities may dispatch the inspector to inspect the facilities at anytime, and may require the licensee to submit relevant materials; wherein, the licensee shall not evade, interfere with or refuse the same. If there is anything not conform to the prescription or if the public health/safety or environmental ecology may be endangered, the competent authorities shall order the licensee to improve the situation or take any other necessary measures within a prescribed time period. If the situation is serious, the licensee does not improve it nor take necessary measures within the prescribed period, the competent authorities may order the licensee to cease the working on the scene, or operation thereof, or may revoke the license or permit the operation only under a limited power. ….

Goals of The Regulatory Activities during the Construction Phase of LNPS

- To ensure that the safety characteristics and the construction quality set forth in the PSAR are maintained.
- To ensure that ,upon the completion of the construction works,the Lungmen nuclear power plant can be operated under better safety standards,reliable and maintainable conditions than the existing nuclear power plants.

Overview of Regulatory Activities for Construction of LNPS

(1) Routine Inspection

The resident inspection, periodic inspection, and special taskforce inspection

(2) Quality Control Inspection

TPC NED,NSD, and AE--S&W , etc

(3) Quality Inspection of Contractors /Vendors

- **Domestic Contractors /Vendors –New Asia Co., CSBC, and CTCI, etc**
- **Oversea Contractors/Vendors -- Hitachi, IHI, and Toshiba, etc. (Japan)**
  General Electric,DRS, and Invensys , etc. (USA)

Overview of Regulatory Activites for Construction of LNPS (cont.)

(4) Safety Analysis Review

- **Review of 119 follow-up items of PSAR**
- **Review of PSAR Amendments, and**
- **Review of FSAR.**

(5) Lungmen Regulatory Meeting

(6)Other Special Regulatory Activities

- **Review of Seismic Analysis**
- **digital I & C**

Place：Job Site of
Lungmen NPS

Activity：Periodic inspection, & special taskforce inspection

Place：Toshiba/
IHI Factory
(Japan)

Activity：Quality Inspection of Overseas Vendors

Place：CTCI & CSBC
Factory

Activity：Quality Inspection of Domestic Vendors

Activity：Quality Inspection of Digital I&C Vendor

Place：GE and DRS (USA)

Place: Job Site of
Lungmen NPS

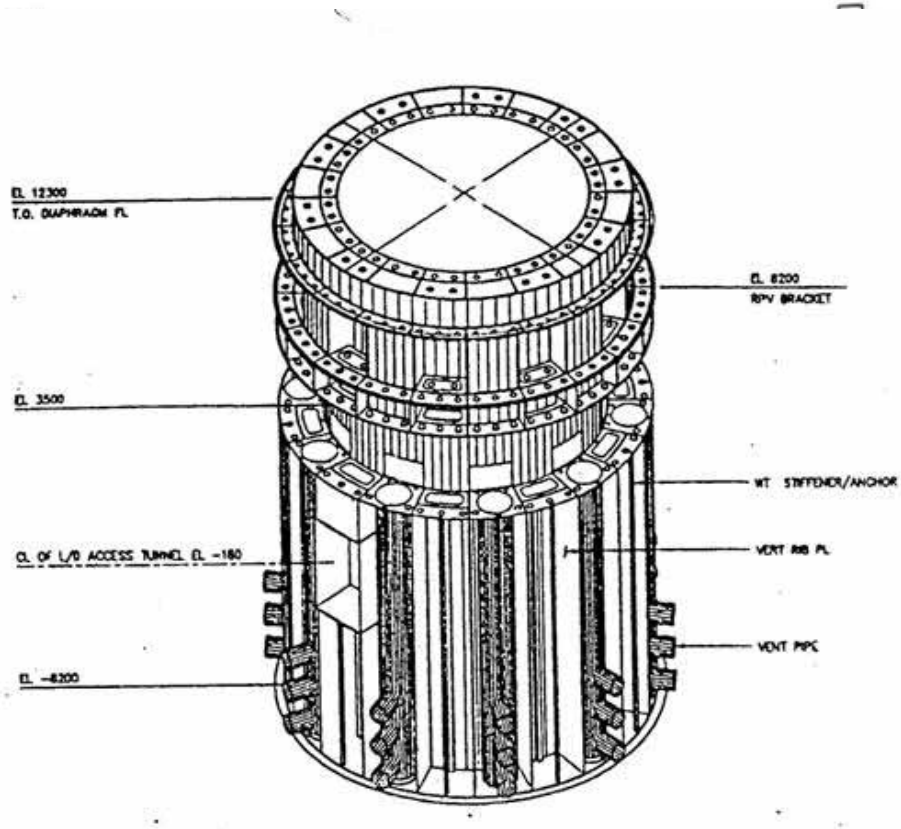
Activity：RPV Internals &
RIP Installation

Examples of Inspection Finding

- Fabrication Quality of Reactor Pedestal
- Clearance between Rebars
- RCCV WALL Shear Bar Hooks

Fabrication Quality of Reactor Pedestal

- The RP is a vertical hollow cylindrical annular steel structure filled with concrete in between, which is a part of internal structure of primary containment of Lungmen NPS and is of Seismic Category I Structure.



RP (w/o outer shell)

5th Layer 1.2m

EL 12300

4th Layer 2.38m

EL 11100

3rd Layer 2.02m

EL 8720

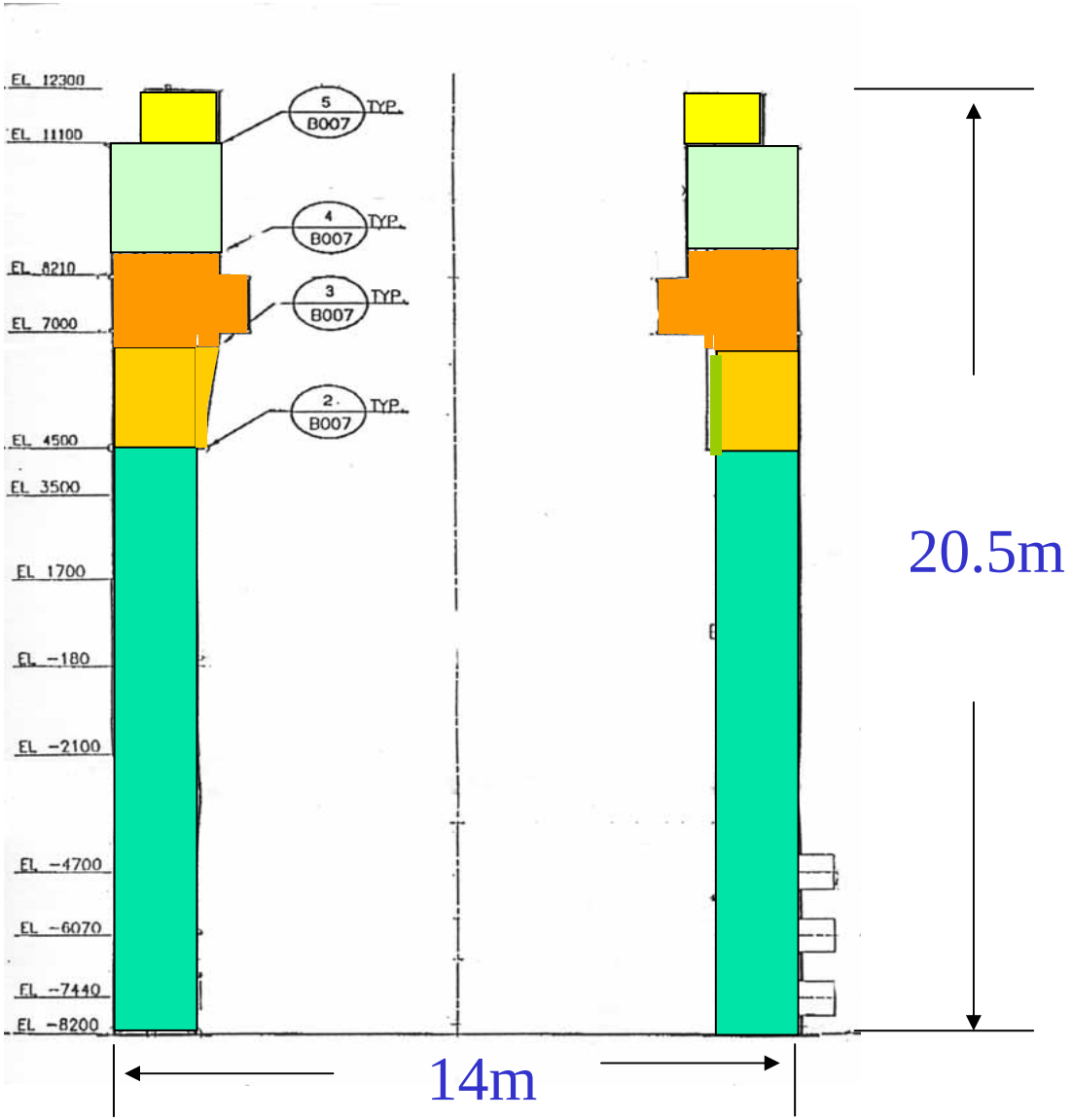
2nd Layer 2.2m

EL 6700

1st Layer 12.7m

EL 4500

EL -8200



Sketch for the Position and Elevation of RP Layers

Fabrication Quality of Reactor Pedestal (cont.)

- In April 2002, AEC noticed the higher strength weld electrodes (E8016-G)for the 2nd to 5th layers were substituted by the lower strength weld electrodes(E71T-1). After examining the welding QA records, in-situ weld visual inspection records, and taking weld samples for chemical analysis, it was concluded that the weld quality did reveal sign of deficiency.
- On May 30, 2002, TPC decided to re-fabricate the 2nd to 5th layers.

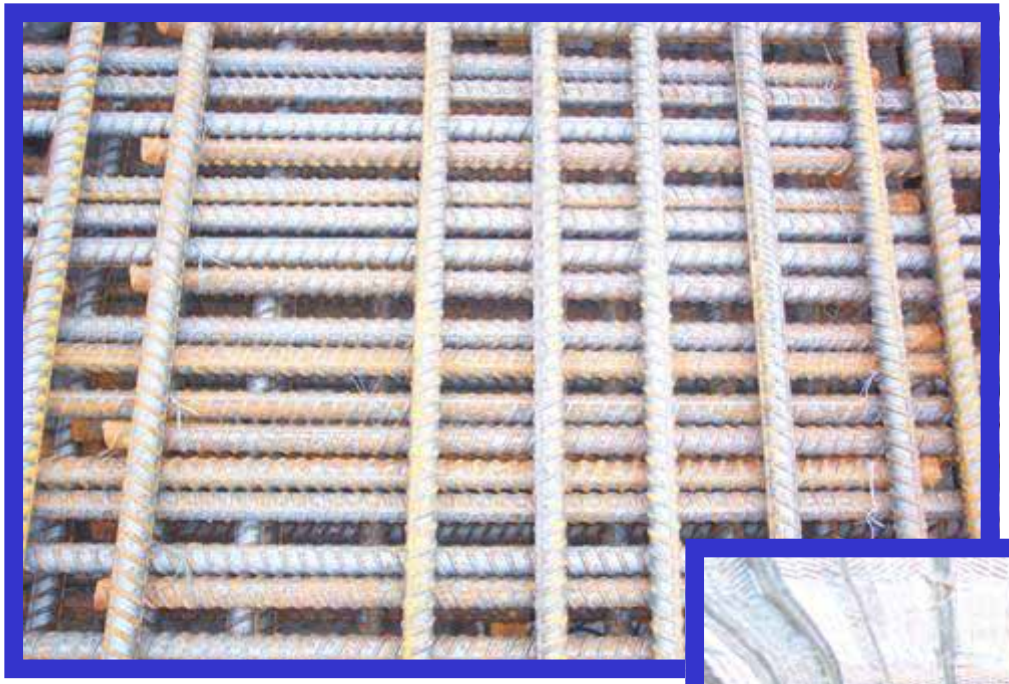
Fabrication Quality of Reactor Pedestal (cont.)

Root Causes of the issue

- CSBC QA system did not perform effectively.
- Filler material control program & welding quality control program was not adequately practised.
- Oversight from New Asia(Main Contractor) & TPC was inadequate.

Clearance between Rebars

- Clearance between rebars issue has been raised by AEC inspector in 2003.
- Several blocks of unit #1 T/B Bldg floor which have completed rebars arrangement and still waiting for concrete placing. Resident inspector found lots of the rebars located at those blocks did not meet ACI code requirements about clearance.
- Request TPC to stop the scheduled concrete placing plan until resolved the issue.



Clearance Between Rebars (ACI 318)

- ≥ diameter of Rebar
- ≥ 1”
- ≥ 1 1/3 aggregate size

Clearance between rebars did not meet ACI code requirement

After Correction

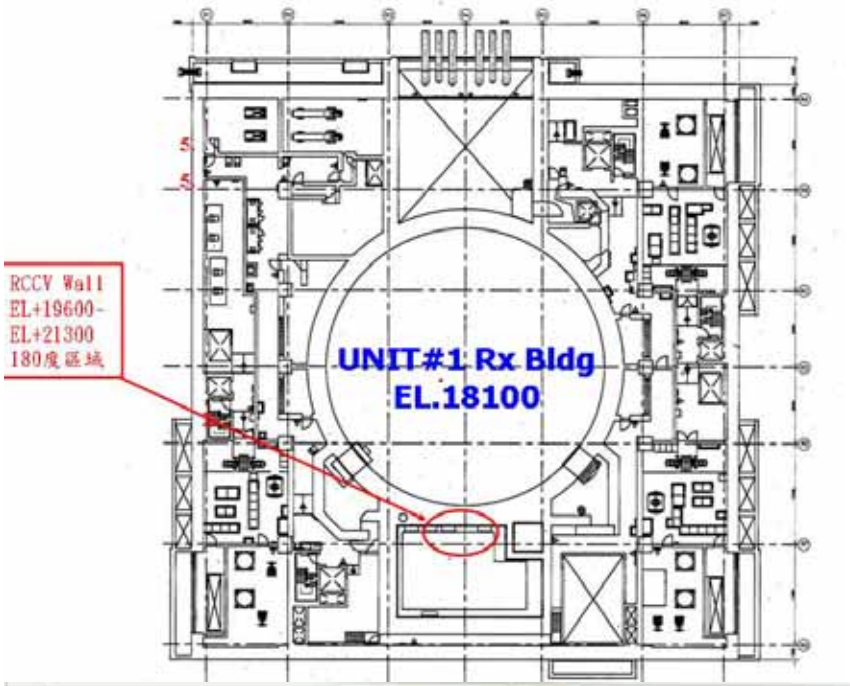
Clearance between Rebars(cont)

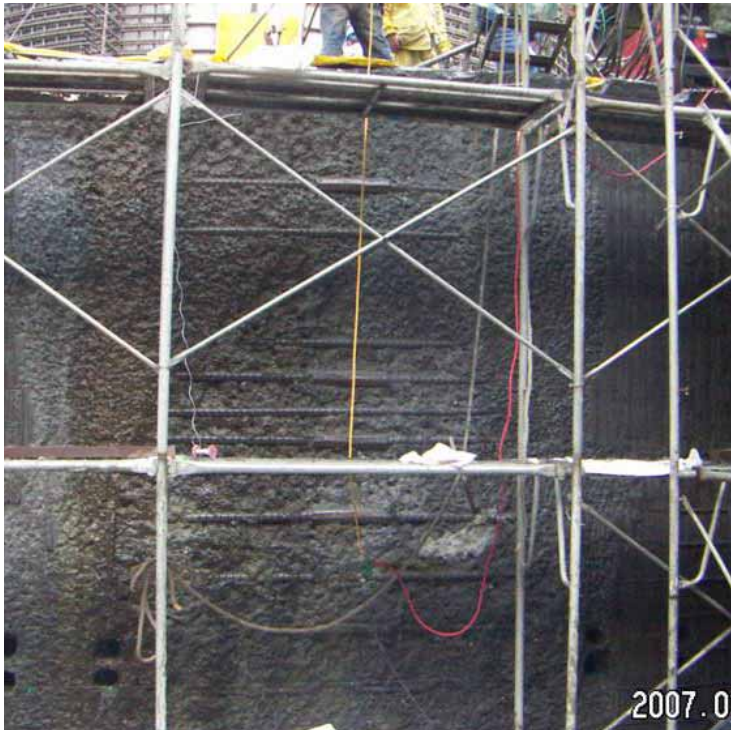
Root Causes of the issue

- **New Asia (Main contractor) did not take prompt corrective action even after this issue had been raised by resident inspector.**
- **Inefficient performance of contractor QC/QA system.**
- **Oversight from TPC was inadequate. TPC staffs/QC just were not actively involved before pre-placement check point.**

RCCV WALL Shear Bar Hooks

- AEC inspector identified Several shear bar hooks of LNPS unit# 1 RCCV wall adjoins to Spent Fool Pool(SFP) had been cut in March 2007 during periodic inspection.
- Those part of RCCV wall had completed their concrete placing. Due to the fitting problem of SFP liner, New Asia decided to chip part of concrete adjacent to SFP off. That would caused several RCCV main rebars(#18) exposed to air . And New Asia further decided to cut 47 # 9 rebar hooks because those hooks could potential interfere with the installation of SPF. Those actions certainly would endanger the strength of RCCV wall structure.
- Severity level-III notice of violation with civil penalty was issued by AEC on May 31, 2007.


RCCV Wall
EL+19600-
EL+21300
180度區域
UNIT#1 Rx Bldg
EL.18100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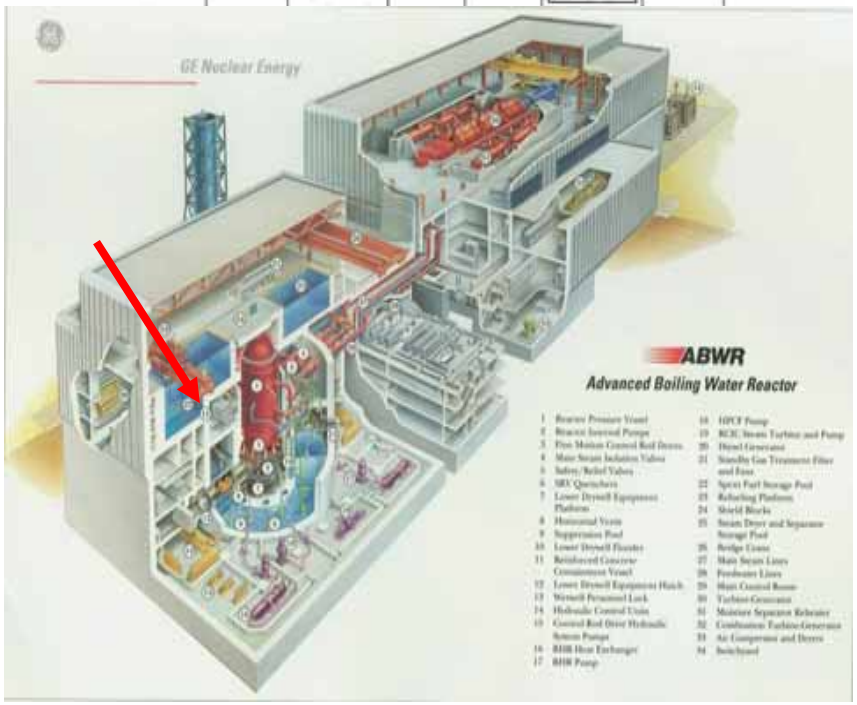
GE Nuclear Energy
ABWR
Advanced Boiling Water Reactor


2007.03.20

Use terminator to Correct

RCCV WALL Shear Bar Hooks (cont)

- **Root Causes of the issue**
  - According to the spec. requirement, Reinforcement bar shall not be cut in the field . Main contractor (New Asia) did not follow the requirement.
  - performance deficiency of contractor QC/QA system. Main contractor did not notify TPC about the SPF liner fitting problem. Also did not issue NCR.
  - Oversight from TPC was inadequate.

Conclusion

- Enhance inspector expertise through on-the-job training is important.
- Active & adequate oversight from utility is key factor to ensure construction quality of a NPP
- Close cooperation among NSSS vendor, AE , contractor and utility is crucial to make the project smoothly.
- We are looking forward to have frequent inspectors exchange visits with USNRC.

Thank You for Your Attention !