

DEC 12 1995

50-244

MEMORANDUM FOR: Goutam Bagchi, Chief
Civil Engineering and Geosciences Branch
Division of Engineering

THROUGH: Robert L. Rothman, Section Chief
Structural Engineering Section
Civil Engineering and Geosciences Branch
Division of Engineering

FROM: John S. Ma, Structural Engineer
Structural Engineering section
Civil Engineering and Geosciences Branch
Division of Engineering

SUBJECT: AUDIT REPORT TO GINNA ON STEAM GENERATOR REPLACEMENT PROJECT

On December 7 and 8, 1995 I conducted an audit at the Ginna Nuclear Power Plant site for the steam generator replacement project. The audit results are generally satisfactory. Nevertheless, there are items that the licensee needs to be aware and pay attention to them and they are stated in the audit report.

The audit report is enclosed. A copy of the audit report is sent to Region 1 inspector, who was also on site to conduct an inspection, and the NRC project manager.

Enclosure: As stated

Contact: John S. Ma, 415-2732

DISTRIBUTION:

Central Files

ECGB R/F

DOCUMENT NAME: G:\MA\GINNA.TRI

For previous concurrence
To receive a copy of this document, indicate in the box C=Copy w/o attachment/enclosure E=Copy with attachment/enclosure

OFFICE	ECGB:DE	E	ECGB	E	ECGB:DE	E
NAME	JMa		RRothman <i>dfm</i>		GBagchi	
DATE	12/12/95*		12/12/95		12/12/95*	

OFFICIAL RECORD COPY

9512180144

XA

1/29/96

290021

DF01/1
Public per Al Johnson
1/26/96

STRUCTURAL AUDIT ON THE PROPOSED STEAM GENERATOR REPLACEMENT PROJECT
AT R.E. GINNA NUCLEAR POWER PLANT

1. Purpose of the Audit

The purpose of the audit is to review the adequacy of the licensee's plan for the steam generator replacement project and to convey the NRC staff concerns on any potential problems that could arise related to structural matters.

2. Entrance Meeting

The staff raised two major potential concerns that could have detrimental effects on the plant, if not addressed, and asked the licensee to pay special attention to them. One concern is the impact force on the dome opening by a pendulum type swinging action of the steam generator during lifting. The other concern is a chunk of concrete penetrating the liner and impacting a fuel assembly during jack hammering and removing the dome concrete while the fuel assembly remains in the reactor vessel. The licensee indicated that it understood and shared the staff concerns, and had developed specific procedures to alleviate the concerns. With respect to the steam generator lifting, the licensee described the lifting procedure as a cautious and slow movement in the vertical direction coupled with lateral restraints. With respect to the potential liner penetration problem, the licensee indicated that it would learn the magnitude of the potential problem from the mockup dome operation, and it intended to reduce the energy input for the jackhammer when the jackhammer nears the liner plate.

3. Inspection of the Temporary Structural Steel Platforms and Concrete Dome

A circular steel platform has been erected, with one side being supported on the concrete ring girder and the other side on the concrete dome. The steel platform will be used to support the automated hydraulic jackhammers, craft personnel, and miscellaneous construction equipment and materials. A steel enclosure has also been erected at the exterior face of the circular platform for protecting personnel safety. The staff walked on the platform and considered that the steel platform and its enclosure are properly planned and constructed. The staff also inspected the dome concrete, and found the concrete to be in good condition despite the long term weathering.

4. Witnessing the Jack Hammering Activities on the Mockup Specimen

The mockup specimen is a piece of a cylindrical dome having the same thickness as the Ginna containment dome (2.5 feet) with a steel liner on the under side. The mockup specimen has a single curvature as opposed to the double curvature of the Ginna containment dome. Furthermore, during the jack hammering test the mockup specimen was closely supported and only the portion to be cut was not supported, and this support condition is different from the actual support conditions of the Ginna containment dome. Thus, the load transmission (concrete cracking) path for the jackhammer impact forces was not simulated by the mockup

specimen test. The staff expressed this concern to the licensee. However, the staff did not see concrete cracking near impact points of the jackhammer on the mockup specimen, and this result indicated that the concrete crack propagation due to the impact force of the jackhammer on the mockup specimen is not serious. Whether the same result could be extended to the Ginna containment dome, which has a different geometry and support conditions from the mockup specimen, is still unknown. The staff requested that the licensee to observe concrete cracking and perform crack mapping on the Ginna containment dome when the jackhammer is actually used.

5. Discussion of Technical and Construction Issues

The staff handed written questions on two sheets of paper (see Attachment 1) to the licensee. The licensee responded to the questions briefly in oral form and promised to respond the questions in detail in writing. The staff reviewed a few calculations and construction drawings. As a result of this review, the staff made the following recommendations: (1) for the liner plate prior to welding, the tolerance limit of the forced fit-up in the vertical direction should be as low as possible and specified in the written procedure, (2) results of liner plate analysis for the load case in which the liner plate alone supports the weight of fresh concrete should be provided to show that the membrane as well as out of plane stresses are within allowable limits, and (3) low slump concrete mixes should be used, and concrete casting and vibrating procedures should be developed for refilling the openings in a slope without forms so that concrete honeycomb would be avoided, as it had occurred in the containment dome of Callaway Nuclear Power Plant.

6. Exit Meeting

The staff told the licensee that it was impressed by the careful and thorough planning the licensee had conducted. Nevertheless, the staff told the licensee that it was a little disappointed about the mockup specimen which did not simulate well the actual conditions of the Ginna containment dome. The staff cautioned the licensee again about the serious consequence of the impact of the steam generator to the containment during lifting and asked the licensee to pay special attention to avoid the impact. The licensee's consultant stated that the mockup specimen was constructed by the construction group as a learning tool for construction personnel to find better ways creating and restoring openings on the containment dome, and he regretted that the mockup specimen had not been better designed to include other relevant features. The licensee responded that it understood and appreciated the staff's concerns, and it would continuously refine its procedures to improve the steam generator replacement project.

7. Conclusion

The staff was impressed by the careful and thorough planning conducted by the licensee so far, and the construction activities with respect to the steam generator replacement project are ahead of schedule. The licensee is awaiting to learn many things from operational experience of the mockup specimen, and then specified them into a written procedure for the use of conducting actual dome opening and closing.

Since the mockup specimen does not simulate the actual dome in geometry and support conditions, special attention must be paid in areas that the simulation was lacking. The staff has found the following four items that the licensee should pay special attention for the actual dome activities: (1) during the stage of breaking up the dome concrete by impact force using hydraulic jackhammers, attention must be paid whether cracks have propagated into areas away from construction openings, (2) prior to welding back the steel liner plate, the tolerance limit of the forced fit-up in the vertical direction should be specified, (3) before casting concrete into the openings, the ability of liner plate alone to support the weight of fresh concrete should be demonstrated by analysis, and (4) during casting the concrete into the openings in a slope without forms, the concrete mix and casting and vibrating procedures must be such that concrete honeycomb would be avoided.

Ginna SG Replacement

Regulatory Concerns

ECGB

1. The effect of cutting two transfer openings in the dome on the structural integrity of the containment
 - o Loads and load combinations to be considered
 - o The capability of the dome liner to resist loads after concrete and rebar removed
2. In transporting the SG, there is potential of SG hitting the containment, especially the edge of the openings
3. Assurance of the liner leaktightness after it is reinstalled to close the opening
4. Potential of existence of gaps between the existing concrete around the openings and the new concrete to fill the opening
5. Monitoring of the containment behavior, specifically the closed openings and the vertical tendons, when the containment is subjected to SIT
6. In transporting the SG stability of the roads to sustain the applied loads
7. The potential damage of existing concrete when automatic jackhammer is used to cut the concrete

ISSUES TO BE DISCUSSED

GINNA CONTAINMENT STRUCTURAL MODIFICATION
DESIGN CRITERIA, Revision 4, June 27, 1995

1. DESIGN CRITERIA: When the plant is in a cold shutdown condition with fuel still in the reactor vessel, design criteria permit (on page 7) the use of automated hydraulic and manual jackhammers for concrete excavation operations of the dome.

COMMENT: Should there be a protective depth of concrete, say 5 inches, from the steel liner the jackhammer must stop so that accidental penetrations of steel liners by jackhammers could be avoided?
2. DESIGN CRITERIA: Section 1.8.1 (on page 15) states that "The containment dome shall be evaluated in accordance with its original design codes."

QUESTIONS: Does "the containment dome" indicate the dome configuration with two openings in the dome?

How many kinds and what kinds of evaluations shall be or have been performed?
3. DESIGN CRITERIA: Section 1.8.5.1 (on page 20) states that the finite element model for the containment dome shall be validated by Method 1 and/or Method 2.

QUESTIONS: What is the purpose of this validation? Is the validation for the applicability of a particular computer code or for the accuracy of the mesh configuration of the dome model with or without openings?

Please describe how the validations were or to be performed.
4. DESIGN CRITERIA: Staggering of reinforcing steel bar splices is mentioned in Section 1.12.4.3 (on page 29), but no commitment of splice staggering is stated.

QUESTIONS: If staggering of bar splices is not to be used, how do you assure that the weak sections perpendicular to the splices would not create regional concrete cracking problems?
5. DESIGN CRITERIA: Section 1.24.2.2 (on page 32) states that "SIT shall be conducted to a pressure of 69 psig...be limited to the area of the construction openings."

QUESTIONS: How will the test be conducted locally?