

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-354/88-11

Docket No. 50-354

License No. NPF-57

Licensee: Public Service Electric & Gas Company
Post Office Box 236
Hancocks Bridge, New Jersey 08038

Facility Name: Hope Creek Generating Station

Inspection At: Hancocks Bridge, New Jersey

Inspection Conducted: March 21-25, 1988

Inspectors: *S. K. Chaudhary* 5/18/88
S. K. Chaudhary, Senior Reactor Engineer
MPS, EB, DRS date

for *S. K. Chaudhary* 5/18/88
N. D. Romney, Civil Engineer
Structural Engineering Branch, NRR date

Approved by: *P. K. Baker* 5/19/88
J. R. Strosnider, Chief
MPS, EB, DRS date

Inspection Summary: Inspection on March 21-25, 1988 (Inspection Report No. 50-354/88-11)

Areas Inspected: A special announced inspection by one region based inspector and one NRR civil engineer was conducted at the Hope Creek Generating Station Engineering offices. The inspection covered review of licensee action in response to Mark I containment modification requirements of NUREG-0661. The inspection included review of design analyses, Plant Unique Analysis Reports, modifications to the torus and torus attached piping, and associated quality records.

Results: No violations or deviations were identified. The modification to the torus met the acceptance criteria of NUREG-0661, and licensee commitments in the Plant Unique Analysis Report (PUAR).

Details

1.0 Persons Contacted

Public Service Electric & Gas Company

C. Atkinson, I&C Engineer
M. Coleman, Pipe Support Engineer-Bechtel
*R. Doges, Licensing Engineer
*R. Drewnowski, Manager, Nuclear ME
*A. Giardino, Manager, Station QA
*R. Griffiths, Sr. Principal QA Engineer, HC
M. Idell, Lead Mechanical Engineer
H. Jolly, Senior Staff Engineer
*A. Kao, Supervisor Civil Engineering
J. Kowalewski, QA Engineer
*J. Lawrence, Licensing Engineer
*B. Preston, Manager, Licensing & Regulation
*M. Reeser, Senior Staff Engineer
B. Schuster, Hope Creek Systems Engineer
F. Thomson, Principal Engineer, Licensing

NUTECH

R. A. Lenhart, Manager, System and Nuclear Engineering

U. S. Nuclear Regulatory Commission

G. Meyer, Senior Resident Inspector
D. Allsopp, Resident Inspector

In addition, the inspectors contacted other engineers and management personnel (as their work interfaced with the scope of this inspection). Personnel marked with (*) attended exit meeting at the conclusion of the inspection.

2.0 Inspection Purpose and Scope

The purpose of the inspection was to determine if the licensee had modified the Hope Creek Generating Station containment consistent with commitments to NRC concerning Unresolved Safety Issue (USI) A-7, and that these modifications had been performed using appropriate procedures and with an acceptable level of quality. The scope of this inspection was defined by the instructions contained in the NRC Temporary Instruction (TI) 2515/85.

Technical issues in USI A-7 involved suppression pool hydrodynamic loads on the Mark-I containments. These hydrodynamic loads were not considered in the original design of the containment. The newly identified loads affected the torus shell, support structures, internal structures, and piping attached to torus (torus attached piping, TAP). The issue was addressed by a two-phased approach consisting of a Short Term, and a Long Term program. Licensees with plants having Mark I containment were required to submit to the NRC a Plant Unique Analysis Report (PUAR) to provide a basis for the plant specific modifications. For Hope Creek Generating Station, the NRC staff reviewed the PUAR against acceptance criteria contained in NUREG-0661, and issued a supplemental safety evaluation report (SSER) in 1985.

Because, the Hope Creek plant design was still under development during the USI A-7 resolution phase, most of the additional loading identified by the hydrodynamic phenomenon was taken into account during the final design. For example, instead of providing saddle support and stiffener rings, the torus was designed with 1 inch (1") thick steel plate. Also, the anchor bolts for support columns were designed to accommodate the newly identified uplift forces. The inspector determined that the licensee had submitted the general description of the design changes and they were included in the Final Safety Analysis (FSAR) of the plant. The PUAR developed by the licensee's contractor, NUTECH, gave detailed descriptions and analyses of the changes in design basis and resulting modifications. The major design changes and modifications are listed below.

- Increase in Torus shell plate thickness
- Torus support column anchors
- T-Quencher supports
- Stiffening of Torus piping penetrations
- Downcomer bracing

3.0 Review Criteria

Temporary Instruction (TI) 2515/85 was primarily used to define inspector requirements. The NRC staff SER, licensee PUAR, applicable sections of the final safety analysis report for Hope Creek, and applicable sections of Code of Federal Regulations were also used to define additional inspection requirements and licensee commitments.

4.0 Documentation Review

Prior to the inspection, the inspectors reviewed the docket files (50-354) for pertinent technical information and related licensing correspondence. The PUAR was reviewed to summarize the licensee commitments. Inspectors also reviewed FSAR, NRC staff SER's, previous inspection reports, NUREG-0408, and NUREG-0661. The above docket search

identified information addressing the methodology, acceptance criteria, procedures, specifications, schedules and other programmatic details related to the licensee's approach to resolution of this issue, and responses to the NRC initiatives.

During the inspection at the licensee's engineering offices at the plant site, the inspectors reviewed modification design calculations, design and installation/fabrication drawings and procedures, engineering specifications, quality assurance and quality control records, and additional correspondences. (Calculations and other record reviewed for this effort are listed in attachment 1 to this report.)

The inspector also reviewed photographs of the progress of the modification of the torus. Although the photographs were not apart of quality assurance record and/or controlled document, they did provide evidence of the modification and the construction process. The photographs indicated acceptable workmanship in installations, and conformance to as-built drawings. Previous NRC inspection reports were reviewed to determine the extent of the NRC inspection in this area and any significant observation and/or findings. The reports are tabulated in Table 4.1. Other documents reviewed are listed in attachment 1 to this report.

Table 4.1

<u>NRC IR NO.</u>	<u>AREAS COVERED</u>	<u>REMARKS</u>
83-12	"As-built" reconciliation of Torus spray header support arms. (NUTECH stress reports.)	Acceptable
83-17	QA/QC activities; ASME Code welding; CMTRs; Welder qualification; of completed work, downcomer pipe, T-quencher arms, pipe welding, and attachment to Torus.	Acceptable
83-18	ASME, Section XI pneumatic retest of Torus for meeting 10 CFR 50. Appendix J requirements.	Acceptable
84-02	Observation of work in progress - welding, QC inspection, weld rod control, fit-up and fabrication of steel members.	<u>4 concerns</u> 1. drawing approval 2. arc strikes 3. housekeeping 4. temporary welded attachment Above concerns were acceptably resolved
84-05	Connection of SRV vent lines to T-quenchers	Acceptable

5.0 Review Licensee Administrative Controls, Quality Assurance, and Quality Control.

The inspector reviewed documentation, and held discussions with licensee engineers and management personnel to evaluate the licensee's effort in assuring quality during construction/erection phase of the suppression chamber.

By review of records (including previous NRC inspection reports), the inspector determined the following:

1. The licensee's overall construction QA program was applicable to the portions of work performed by the constructor, Bechtel Power Corporation.
2. Additional specific modifications which were performed by Chicago Bridge and Iron company (CBI) were covered by an approved quality assurance program of CBI.
3. CBI work was generally limited to the modification of Torus internals, e.g., T-quenchers, SRV lines and supports, and reinforcement of nozzle penetrations.

The inspector reviewed the licensee and CBI QA records to determine the adequacy of scope, and technical and administrative controls exercised over the work. The review covered the areas of welding procedures; NDE procedure and results; nonconformance control; qualification and certification of welding, NDE and inspection personnel; certified material test reports; and surveillance reports by licensee and Bechtel QA Personnel. The licensee's audit of the CBI quality assurance program was also reviewed for scope, depth, and any significant findings. The documents reviewed for this purpose are listed in Attachment 1 to this report.

Based on the above review and discussion with licensee personnel, the inspector determined that the administrative controls exercised by the licensee, constructor, and the contractor (CBI) was sufficient to assure proper implementation of the quality assurance program for this effort. The contractor held an ASME "N" stamp with an approved QA manual; used qualified welding and NDE Procedures; had an adequate staff of qualified craftsmen and inspection personnel; and the licensee's and Bechtel's audits and surveillances verified that the contractor's QA program was effectively implemented.

The records were readily retrievable. During the inspection, the records were still available in hard copy form, although the licensee had converted the records to microfilm. The inspector also verified that Nutech's QA program was approved by the licensee. The design analyses and calculations had been independently checked and verified by

individuals other than the preparer and effective interface control was maintained. Design calculations and other pertinent documents were readily retrievable, and the licensee had maintained these documents on site in his controlled records management system.

No violation or deviation was identified.

6.0 Design Review

The engineering services for plant unique analysis for hydrodynamic loads and the resulting design changes and modifications were performed by Nutech Engineers of San Jose, California.

The inspectors reviewed selected design specifications, design calculations, design drawings, and fabrication and installation drawings of modification to the torus and associated piping and supports. The specific design documents reviewed are listed in Attachment 2 to this report. The review was performed to determine the technical adequacy of analysis, design control measures established by the licensee and the contractor, and compliance of analyses and design to the requirements of NUREG-0061. The details of the review are as follows:

The inspector reviewed the Nutech calculations for the suppression chamber and T-Quencher supports. These calculations determined, in part, the critical load cases on these structures for various modes of plant operation and postulated accident conditions. The load cases considered were in accordance with the requirements of NUREG 0661.

The design of the modifications to the torus, torus support columns, vent headers, downcomers and SRV T-Quencher supports were reviewed. This review included a comparison of the location and magnitude of the maximum computed stresses in key structural elements with the appropriate allowable stresses as defined in Section III of the ASME Boiler and Pressure Vessel Code. This comparison indicated an appropriate use of code allowables. The design of critical welds was also examined and was found to be acceptable.

The vent header calculation which concluded that a vent header deflector shield was not required for Hope Creek was reviewed. This review included an assessment of the correlation that was made between the pool swell loads used in the vent header analysis and those determined by the plant specific GE 1/4 Scale and 1/12 Scale model tests. There was an acceptable correlation between the model tests and those loads used in the calculations. The pool swell loads, when appropriately combined with other loads, produced stresses in the vent header structural elements that were within allowable limits without the addition of a deflector shield. Calculations were reviewed for consideration of loads resulting from the relative displacements between the point where the SRV piping penetrates the vents and the point of structural support at the torus ring beams also were found acceptable.

The design drawings prepared by Nutech incorporating the suppression chamber modifications were reviewed for agreement with the design calculations and were found acceptable. The fabrication and erection drawings prepared by Chicago Bridge & Iron Company (CB&I) were compared with the Nutech design drawings. This comparison indicated an acceptable agreement between the design drawings and the fabrication drawings.

Comparison between the fabrication drawings and the "as-built" condition was determined from construction photographs. A walkdown of the suppression chamber was not possible because of a recent spill of contaminated water and resulting high radiation levels.

In addition, the inspector determined from the CB&I drawings that: a suppression pool temperature monitoring system was installed; suppression chamber piping penetrations were stiffened; and downcomer bracing was installed.

No deficiencies or violation were identified.

7.0 Operability and Conformance to Technical Specification (TS) of the Temperature Monitoring System

The inspector reviewed the modifications to suppression pool temperature monitoring system including the technical specifications to confirm the following:

- The placement and number of temperature monitoring devices were in accordance with the PUAR commitments.
- Suppression pool temperatures were indicated in the control room.
- Instrumentation alarm setpoints had been established consistent with TS pool temperature limits.
- Control room instrumentation was adequate to assure that requirements could be met.

Based on the above review and visual examinations of the control room instrumentation panel, the inspector determined the following:

- The controlled drawings indicated that two independent channels powered by class 1E vital power buses have been installed.
- The suppression pool temperature was indicated in the control room by strip chart indications.

- The alarm setpoints were 95°F, 105°F, 110°F for different modes of operations. For modes 1 and 3 the limit of average temperature was 95°F. The maximum temperature alarm was set to 120°F with MSIVs closed following a scram.
- The above instrumentation and setpoints were consistent with PUAR commitments and TS requirements.

The inspector determined that the design and installation of the temperature monitoring system had been accomplished in accordance with licensee commitments and TS requirements.

No violations or deviations were identified.

8.0 Exit Interview

An exit meeting was conducted on March 25, 1988 at the engineering offices at site by the inspectors. Attendees at the meeting are listed in paragraph 1 of this report. The inspectors summarized the purpose, scope, and findings of the inspection. No written material was provided to the licensee during this inspection. The licensee representative did not indicate that this inspection involved any proprietary information.

ATTACHMENT 1

Records Reviewed:

1. Hope Creek Plant Unique Analysis Report (PUAR)
2. NRC-Request For Additional Information (RAI) dated 11/16/84
3. CBI Nuclear QA Manual-Div. 1, Issue #2, 7/7/83
4. CBI Welding Procedure Specifications (WPS)

Standard -	GWPS-GTAW,	Rev. 13	-	3/3/83
E8018C1/31645	GWPS-SMAW,	Rev., 0	-	6/27/83
E309/31645	GWPS-SMAW,	Rev., 0	-	6/24/83
ER309/E309/3165	GWPS-SMAW,	Rev., 0	-	6/24/83
E308L/31645	GWPS-SMAW,	Rev., 0		6/27/83
ER308L/E308L/31645	GWPS-GTAW,	Rev., 0		6/27/83
ER308L/31645	GWPS-GTAW,	Rev., 0		6/27/83
Standard -	GWPS-SMAW,	Rev., 14		2/8/83
ER70S-2/31645 -	GWPS-SMAW,	Rev., 0		6/17/83
E7018/31645 -	GWPS-SMAW,	Rev., 0		7/26/83
ER70S-2/E7018/31645	SMAW/GTAW,	Rev., 0		6/27/83
5. Bechtel QC Surveillance Reports of CBI work, 1983-1985
6. PSE&G QA Surveillance Reports, Nov-Dec. 1983
7. Specification BPC-02-101, Rev 0: "Design Specs for SRV Discharge T-Quencher Supports."
8. Specification BPC-02-102, Rev. 0, "Design Specification for Suppression Chamber Modifications."
9. Specification BPC-01-321, Rev. 0, "Design Specifications for Suppression Chamber Piping Penetrations Reinforcement."

10. CBI Audit Findings. F-1/31645, Jan 5/1985 (Folder#3.0)
11. CBI Magnetic Particle Examination Reports (Folder#7.4)
12. CBI Material Verification Summary Sheet (Folder#5.1)
13. CBI Repair Check Lists (Folder#8.6.1)
14. CBI Nonconformance Control List (Folder#8.6.2)
15. CBI Nondestructive Examination Personnel Qualifications (Folder#8.12)
Restraint Number-431; 262; 132; 64; 611; 1199.
16. PSE&G Audit Report #H-326; dated 6/15/84.
17. Letter G. Moulton, BCI to A. Giardino, PSE&G, dated 6/21/84
18. Bechtel Construction QC Manual, Copy 081 Vol. 19-20.
19. PSE&G Quality Assurance Manual, Vol-4, Book 1-4.
-QA Proc. 2-1, HC QA Program, Rev. 8, 10/17/83, and 9, dated 2/1/85
-QA Proc. 2-7, Qualification and Certification of Personnel,
Rev. 12-6/24/85
-QA Proc. 7-11, Suppliers Quality Manual Review, Rev. 1,
-QA Proc. 8-1, Material Identification and Control, Rev. 1
20. CBI Welding Procedure Qualification (PQR) Reports:
PQR # 2012, SMAW for SA537-2
PQR # 2411, SMAW for SA537-CL-2
2525, SMAW for A240-304
2533, GTAW for SA333GR-6
2650, GTAW/SMAW for SA240-304
2925, SMAW for SA516-70
3185, GTAW for SA312-304
3250, SMAW for SA516-6270/70

CBI Contract QA Manual, Set No. 3

INSPECTION DATE	DOCUMENT AUTHOR	DOC. CATALOG	DOCUMENT IDENT #	DOCUMENT PREPARED	DESCRIPTION
21-Mar-88	Bechtel	Spec	C-J2		Technical Specification for Primary Containment
21-Mar-88	Nutech	Spec	BPC-02-102	01-Oct-82	Des. Spec. for Suppression Chamber Modifications
21-Mar-88	Nutech	Spec	BPC-02-101	01-Oct-82	Des. Spec. for SRV Discharge T-Quencher Supports
22-Mar-88	Nutech	Calc	11.2201.1103	10-Sep-83	Stress Anal. of Torus & Supports; Des. of Welds
22-Mar-88	Nutech	Calc	11.2201.1211	17-Jan-84	1/32 Supp. Chamber Modeling Calc & Motion Gener.
22-Mar-88	Nutech	Calc	11.2201.1101	15-Sep-82	Modeling of Mod. Parts of 1/32 Hope Creek Model
22-Mar-88	Nutech	Dwg	BPC-02-202	28-Jan-86	Suppression Chamber Modification, Sheets 1-4
22-Mar-88	Nutech	Dwg	BPC-02-201	18-Jan-84	SRV T-Quencher Supports, Sheets 1-4
22-Mar-88	Nutech	Calc	11.2201.1415	03-Feb-83	SRV/T-Quencher Load Combination & Analysis
23-Mar-88	Nutech	Dwg	BPC-01-0205	30-Mar-84	Suppression Chamber Penetration Modifications
23-Mar-88	Nutech	Calc	11.2201.1111	24-Jan-84	Suppression Chamber Monorail calcs.
23-Mar-88	Nutech	Calc	11.2201.1311	09-Jan-84	1/32 Vent system F.E.M Analysis Calculations
23-Mar-88	CB&I	Dwg	8 to 25	01-Aug-83	Sup. Chamber Mod. Det. for Ring Girders & Columns
23-Mar-88	Nutech	Calc	11.2201.1214	17-Jan-84	1/32 Suppression Chamber Load Comb. & Fatigue Eval
23-Mar-88	CB&I	Dwg	75	02-Nov-83	Thermowells
23-Mar-88	Nutech	Calc	11.2201.1121	11-May-84	Catwalk Analysis Calculations
24-Mar-88	CB&I	Dwg	30 to 38	????	Ring Girder Stiffener Beam Details
24-Mar-88	Bechtel	Dwg	C-0485	????	Foundation Mat Reinforcing Details, Sht. 5
24-Mar-88	Bechtel	Dwg	C-0452	????	Foundation Mat Plan - Area 14
25-Mar-88	Bechtel	Calc	C 621-30 (Q)	02-Jul-85	Base Mat Torus Uplift Check

Schedule of Penetrations Reviewed During Inspection #88-11
March 21 thru 25, 1988

PENET NUMBER	PENET DIAMETER	PENETRATION DESCRIPTION
P208	6 in.	Reinforced Nozzle with plates
P212A	18 in.	Reinforced nozzle with gusset plates
P212B	18 in.	Reinforced nozzle with gusset plates
P213A	10 in.	Reinforced Nozzle with plates
P213B	10 in.	Reinforced Nozzle with plates
P217A	10 in.	Reinforced Nozzle with plates
P217B	10 in.	Reinforced Nozzle with plates
P222	8 in.	Reinforced nozzle with plates
P210	4 in.	Reinforced nozzle with sleeve
J207	1 in.	Reinforced nozzle with sleeve