UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-425/88-12

Licensee: Georgia Power Company
P.O. Box 4545
Atlanta, GA 30302

Docket Nos.: 50-425 Construction Permit No.: CPPR-109

Facility Name: Vogtle Unit 2

Inspection Conducted: February 17, 1988 - March 31, 1988

Inspectors: C. A. Patterson 4/22/88
for R. J. Schepens, Senior Resident Inspector Date Signed

for C. A. Patterson 4/22/88
C. W. Burger, Resident Inspector Date Signed

C. A. Patterson 4/22/88
C. A. Patterson, Project Engineer Date Signed

Accompanying Personnel: P. A. Balmain

Approved By: M V Sinkule 4/22/88
M. V. Sinkule, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope: This inspection entailed a routine, unannounced resident inspection effort in the area of the preoperational testing and a special announced resident and region inspection effort in the area of Readiness Review Module 4, Mechanical Equipment and Piping.

Results: One violation was identified in the area of system walkdown (Failure to provide adequate instructions to ensure the proper installation of flow elements and orifices).

## REPORT DETAILS

1. Persons Contacted

Licensee Employees

*P. D. Rice, Vice President, Vogtle Project Director
*R. H. Pinson, Vice President, Project Construction
G. Bockhold, General Manager
T. V. Greene, Plant Support Manager
*C. W. Hayes, Vogtle Quality Assurance Manager
*E. D. Groover, Quality Assurance Site Manager - Construction
*S. T. Haltom, Quality Assurance Support Supervisor
D. M. Fiquett, Project Construction Manager
*G. A. McCarley, Project Compliance Coordinator
*C. L. Coursey, Maintenance Superintendent (Startup)
*H. M. Handfinger, Startup Manager
*A. W. Harrelson, Electrical Construction Manager
*R. E. Hollands, Electrical Compliance Supervisor
*C. W. Rau, Mechanical Construction Manager
*J. J. Gilmartin, Mechanical Engineer
L. N. Brooks, Civil Construction Manager
*L. B. Glenn, QC Manager
*R. W. McManus, Readiness Review Manager Lead Mechanical Engineer
*R. C. Sommerfield, Readiness Review
*J. E. Sanders, Assistant. Project Manager
*W. C. Ramsey, Project Engineering Manager
L. D. Harless, Manager, Quality Concerns
*P. T. Ciccanessi, Senior Regulatory Specialist
*M. L. Hobbs, I & C Superintendent
*M. D. Duncan, I & C Supervisor

Other licensee employees contacted included craftsmen, technicians, supervision, engineers, inspectors, and office personnel.

Other Organizations

C. Marcum, Westinghouse Project Manager
D. L. Kinnsch, Project Engineering - Bechtel
*T. E. Richardson, Project Engineering Manager - Bechtel
*D. W. Strohman, Project Quality Assurance Engineer - Bechtel
*A. J. Ayob, VSAMU, Westinghouse, Supervisor
B. Edwards, Site Manager, PPP
J. Miller, Quality Assurance Manager
*D. D. Smith, Construction Engineer - Oglethorpe Power Company

*Attended Exit Interview

2. Exit Interviews - (30703C)

The inspection scope and findings were summarized on March 31, 1988, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection results. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection. Region based NRC exit interviews were attended during the inspection period by a resident inspector. The following items were identified during this inspection:

(Open) Violation, 50-425/88-12-01 "Failure to Provide Adequate Instructions to Ensure the Proper Installation of Flow Elements And Orifices" - Paragraph 5.d.(1)(c).

(Open) Inspector Followup Item, 50-424/88-12-02 "Followup Licensee's Corrective Action Relative To The Identification Of Unit Applicability For Calculations" - Paragraph 5.b.(1).

(Open) Inspector Followup Item, 50-425/88-12-03 "Review Revised Calculation X4C1202V43 Regarding Design Objectives and Conclusions" - Paragraph 5.b.(1).

(Open) Inspector Followup Item, 50-425/88-12-04 "Review Revised Calculation X4C1202V18 Regarding Case 3C Description" - Paragraph 5.b.(1).

(Open) Inspector Followup Item, 50-425/88-12-05 "Review Revised Calculation X4C1202S00F1 Regarding The Evaluation Of Flow Failure Detection & Effect On System Safety Function For Item No's. 85b, 86b, 87b, 88b, 89b, & 90b" - Paragraph 5.c.(1).

3. Licensee Action on Previous Enforcement Matters - (92702)

Not inspected.

4. Preoperational Test Program Implementation/Verification - (70302)(71302)

The inspector reviewed the present implementation of the preoperational test program. Test program attributes inspected included review of administrative requirements, document control, documentation of major test events and deviations to procedures, operating practices, instrumentation calibrations, and correction of problems revealed by testing.

Periodic inspections were conducted of Control Room Operations to assess plant condition and conduct of shift personnel. The inspector observed that Control Room operations were being conducted in an orderly and professional manner. Shift personnel were knowledgeable of plant conditions, i.e., ongoing testing, systems/equipment in or out of service, and alarm/annunciator status. In addition, the inspector observed shift turnovers on various occasions to verify the continuity of plant testing.

operational problems and other pertinent plant information during the turnovers. Control Room logs were reviewed and various entries were discussed with operations personnel.

Periodic facility tours were made to assess equipment and plant conditions, maintenance and preoperational activities in progress. Schedules for program completion and progress reports were routinely monitored. Discussions were held with responsible personnel, as they were available, to determine their knowledge of the preoperational program. The Inspector reviewed numerous operation deviation reports to determine if requirements were met in the areas of documentation, action to resolve, justification, corrective action and approvals. Specific inspections conducted are listed below:

a. Preoperational Tests

(1) Test Witnessing (70312)

The inspector witnessed selected portions of the following preoperational test procedures as they were conducted. The inspection included attendance at briefings held by the test supervisor to observe the coordination and general knowledge of the procedure with the test participants. Overall crew performance was evaluated during testing. A preliminary review of the test results was compared to the inspector's own observations. Problems encountered during performance of the test were verified to be adequately documented, evaluated and dispositioned on a selected basis.

| Procedure No. | NRC Insp. No. | Test Title | Activity Observed |
|---|---|---|---|
| 2-3BG-01,R-0 | 70433 | CVCS Preop | Preop Of Charging Isolation Valve 2HV-8105 |
| 2-3BJ-01,R-0 | 70434 | SI Preop | Intermediate Head SI Cold Leg Flow Balance And Pump Run Out Verification |
| 2-3BJ-03,R-0 | 70434 | SI Preop | Accumulator No. 2 Dump L/D |

5. Readiness Review Module 4 Inspection

The following topics are discussed

Introduction
Review of Commitments
Engineering and Design Review
Safety-Related System Piping Insulation Review
Safety-Related Equipment Installation Review
Safety-Related Valve Installation Review
Conclusions

a. Introduction

This inspection report documents Region II inspection activities relative to the evaluation of Georgia Power Company's (GPC's) Readiness Review Module 4, Mechanical Equipment and Piping. The scope of GPC's Module 4 encompassed the design, procurement, and construction activities regarding safety-related mechanical equipment and piping systems classified as American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, Class 1, 2, and 3, which are included in Unit 2 piping systems and are not a part of the nuclear steam supply system.

Readiness review Module 4 is one in a series of modules being conducted by GPC that provide an evaluation of the design, construction and preoperation testing of the Vogtle Electric Generating Plant Unit 2 to assure its operational readiness in accordance with scheduled plans for obtaining an operating license. Module 4 is intended to describe the method GPC complied with the project commitments found in the Final Safety Analysis Report (FSAR) and is not intended to make further commitments or revise in any way, prior commitments.

The inspection was conducted to aid in determining whether Module 4 provided an acceptable basis for it's reported conclusion - that adequate controls exist to ensure the quality of work and the implementation of FSAR commitments within the scope of mechanical equipment and piping for Vogtle Electric Generating Plant (VEGP) Unit 2. The inspection report contains a description of the inspector's activities and findings.

b. Review of Commitments

This section of the module defines commitments as project obligations to regulatory guides, industry standards, branch technical positions, and other licensing requirements, to the extent defined in the FSAR. This section also identifies the source of the commitments to be

restricted to the FSAR and responses to NRC questions associated with the FSAR. As defined, commitments which were considered by the licensee to be most appropriately categorized in this module were tabulated in a commitment matrix identified in section 3.2 of the module. The licensee identified 248 commitments as being most appropriately categorized in this module.

This section of the module also defines an implementing document as a working level document, either program control or test procedure, that fulfills a construction commitment applicable to a specific activity. Implementing documents were identified for each of the 248 commitments and this information was tabulated in an implementation matrix identified in section 3.2 of the module.

The evaluation of this section consisted of reviewing the commitment and implementation matrices delineated in section 3.2 as discussed below.

(1) Evaluation of The Commitment and Implementation Matrix

Commitments applicable to the Nuclear Service Cooling Water (NSCW) system were selected and reviewed to determine that: 1) All project commitments detailed in licensing documents for the NSCW system had been properly identified, 2) Licensing commitments had been recognized and were addressed in primary design/construction documents and whether responses to those commitments have been included in the appropriate working level documents, and 3) Whether the commitment and implementation matrices are accurate and demonstrate proper implementation of licensing commitments. The following commitments were reviewed for the above noted attributes:

| Ref. No | FSAR Source | Subject | Document/ Feature | Design/Const. Implementation |
|---|---|---|---|---|
| 683.00 | 1.9.2.7.2 | Ultimate Heat Sink | RG 1.27 | DC 1202-A-1.0 |
| 1743.00 | 3.1.5 | PIP'G Sys. Penetrating Cnmt. | 10 CFR 50, APP.J | DC 2415-2.0 |
| 4916.00 | 3.2.2-1 | NSCW Sys. Design | NSCW PIP'G & VLU's Outside Cnmt. ASME III CL3 | DC 1202-3.1E |
| 4917.00 | 3.2.2-1 | NSCW Sys. Design | NSCW PIP's & VLU'S Inside Cnmt. ASME III CL2 | DC 1202-3.1E |

| Ref. No (cont'd) | FSAR Source | Subject | Document/ Feature | Design/Const. Implementation |
|---|---|---|---|---|
| 1778.00 | 3.8.2.1 | Pipe Attached To Cnmt. Wall Sleeves | ASME III, CL2 | X4AQ10-4.1A |
| 1782.00 | 3.8.2.7 | Testing Of CL2 Pipe Assemblies | ASME III, NC-6000 | X4AQ10-8.2 |
| 5026.00 | 3.9.B.1.5.1 | Weld Inspt. P3.3.0.A Accept Criteria | ASME III<br>'77 Edition Thru Winter Addenda '77 | X4AZ01-<br>PPP IX-3-7.0 PPP IX-18 |
| 5349.00 | 3.9.B.3 | ASME III CL 1,2 & 3 Components | CL2 & 3 PIPG NC & ND '74 Edition Thru Summer '75 Addena | DC 1017-2.1 |

| Ref. No | FSAR Source | Subject | Document/ Feature | Design/Const. Implementation |
|---|---|---|---|---|
| 4913.00 | 9.2.1-1 | NSCW Sys. Design | Max. Heat Load During Accident Conditions 349.8 Million BTU/Hour | X4C1202V18 |
| 4914.00 | 9.2.1-1 | NSCW Sys. Design | Min. NSCW From Per Train During Accident Conditions 15,733 GPM | X4C1202V03 |
| 384.00 | 9.2.1-3 | NSCW Equip. Design | NSCW Pumps ASME III, CL3 | DC 1010-T1 |

| Ref. No (cont'd) | FSAR Source | Subject | Document/ Feature | Design/Const. Implementation |
|---|---|---|---|---|
| 3525.00 | 9.2.1.1.1-C | NSCW Sys. Safety Design Basis | Seismic Cat. 1 | DC 1202-3.1E |
| 3749.00 | 9.2.1.1.1-G | NSCW Sys. Safety Basis | Designed To Perform Function Following L.O.C.A. Automatically, Assuming Single Failure Loincident With a L.O.O.P | DC 1202-3.1A |
| 4912.00 | 9.2.1.1.1-H | NSCW Sys. Safety Design Basis | NSCW Designed To Prevent Boiling Cnmt. Coolers During L.O.C.A. | DC 1202-3.1P |
| 3750.00 | 9.2.1.1.1-I | NSCW Sys. Safety Design Basis | Sys. Pressure Greater Than Cnmt. Bldg. Max. Design Pressure | DC 1202-3.1H |
| 4915.00 | 9.2.1.2.B | NSCW Sys. Oper. | NSCW Press. Higher Than Fluid In Cooled Safety-Related Component | DC 1202-3.1H X4C1202V15 |
| 400.00 | 9.2.5 | UHS Design | RG 1.27 | DC 1202-A-1.0 |
| 401.00 | 9.2.5.1 | UHS Towers & Basin Design | Seismic Cat. 1 | DC 1202-A-3.1A |

| Ref. No (cont'd) | FSAR Source | Subject | Document/ Feature | Design/Const. Implementation |
|---|---|---|---|---|
| 3755.00 3542.00 | 9.2.5.1.1.A | UHS Safety Design Basis | Single Failure With L.O.O.P | DC 1202-A-3.1C |
| 418.00 | 9.2.5.1.1.B | UHS Safety Design Basis | RG 1.27 | DC 1202-A-1.0A |
| 3541.00 | 9.2.5.2.2 | UHS Component Description | Fan Motors Powered by Class 1E | DC 1202-A-3.1B |
| 402.00 | 9.2.5.2.4 | UHS Performance | BTP ASB 9-2 | DC 1202-A-1.0 |
| 403.00 | 9.2.5.2.4 | UHS Performance | RG 1.27 | DC 1202-A-1.0 |
| 4777.00 | 9.2.5.2.4 | UHS Performance | BTP RSB 5-1 | DC 1202-A-3.1C |
| 4221.00 | NRC QUES. Q210.11 | NSCW Sys. Cooling Water Supply & Return Piping For Pump Motor Coolers | ASME III, CL3 | DC 1010-T1 |

During the review of the implementation of the above noted commitments, the inspectors had the following comments:

COMMITMENT NO. 3750.00 & 4912.00

Commitment No. 3750.00 states that "the NSCW system is to be designed such that system pressure is greater than containment building maximum design pressure." The design implementation for this commitment is referenced as being contained in DC 1202-3.H. However, the inspector could not verify this to be the case. Therefore, the following question was raised to the licensee: What are the first and second order implementation documents for the subject commitment?

The licensee's response was a follows: It has been assumed that the "Interfacing Heat Transfer Systems" referred to in DC 1202-3.1H included the containment building air coolers, and that the NSCW system serving them would be designed with a higher pressure than the containment atmosphere. Upon further investigation, it has been discovered that the "Interfacing Heat Transfer Systems actually refer to the Component Cooling Water (CCW) and Auxiliary Component Cooling Water (ACCW) Systems. Currently, there is no first order implementation of commitment 3750 in DC 1202. To correct this, design engineering will issue Design Manual Change Notice No. 1202-6 which will add paragraph 3.1R to address a commitment requirement that the NSCW system pressure be greater that the maximum calculated containment atmosphere pressure following a LOCA. FSAR Change Notice No. 559, filed on February 27, 1987, makes the change in paragraph 9.2.1.1.1-I from "Maximum Design Pressure" to maximum calculated pressure. This change notice will be reflected in FSAR Amendment 35. The licensee issued DMCN 1202-6 on March 8, 1988, therefore, this item is considered to be closed.

Regarding the second order implementation, the licensee informed the inspector that it was contained in two design calculations: X4C1202V21, Rev. 2 Verification Of No Boiling In Containment Coolers and X4C1202V43, Rev. 0 NSCW Flow Balance. After further discussions with the licensee on this matter, the licensee informed the inspector that calculations X4C1202V21, X4C1202S19, and X4C1202V09 were originally applicable to both Units 1 and 2. Due to later developments, it was decided to recalculate the pressure drops across the restricting orifices to balance the flows in the Unit 2 NSCW system. Therefore, calculation X4C1202V43 was prepared to apply to Unit 2 only. Revision 1 to this calculation was issued on March 2, 1988, and covers train "B" of the NSCW system. Revision 2 is currently in preparation and will cover train "A".

The inspector questioned the method utilized by the licensee for determining which unit a calculation was applicable to? The licensee stated that the Calculation Control Log (CCL) was the document for determining unit applicability of a calculation. The inspector noted that the current Calculation Control Log (CCL) reflected that calculations X4C1202V21, X4C1202S19, and X4C1202V09 as being applicable to both units. The inspector raised the concern relative to correctness of the Calculation Control Log. Also, the inspector questioned the appropriateness of using this method of documenting unit applicability versus specifying the unit applicability in the calculation so as to provide a positive means for documenting engineering review and sign off of the calculation for Unit II applicability.

The licensee confirmed that when calculation X41202V43 was issued for Unit II, the common calculations (X4C1202V21, X41202S19, and X4C1202V09) were not changed to Unit 1 on the CCL and remained as common. Furthermore, the licensee conducted a review of all mechanical calculations to determine the extent of the problem. This inspection revealed 4 additional calculations with incorrect designators. Therefore, a total of seven out of eleven-hundred-forty six mechanical calculations had the incorrect unit designator on the CCL. Based on the above finding, the licensee has committed to re-review all calculations and insert a cover sheet which will specify the applicable unit designator and will be initialed and dated by the responsible engineer and engineering group supervisor. The inspector informed the licensee that, pending the completion of the above noted corrective action this matter will be identified as Inspector Follow Item 50-425/88-12-02 "Followup Licensee's Corrective Action Relative To The Identification Of Unit Applicability For Calculations."

Calculation X4C1202V43 was identified by the licensee as the working level document for implementing commitment numbers 3750.00, "NSCW system shall be designed such that system pressure is greater that containment building maximum calculated pressure" and 4912.00 "NSCW system shall be designed to prevent boiling in containment coolers during LOCA conditions". The inspector reviewed the calculation and determined that the design did incorporate the subject commitments. However, the objective section of the calculation did not reflect these commitments as objectives therefore the calculation did not contain any conclusions relative to these design objectives. The licensee committed to include these commitments as objectives and state conclusions relative to these design objectives when Revision 2 of the subject calculation is issued. The inspector informed the licensee that, pending the issuance of the revised calculation, this matter will be identified as Inspector Followup Item 50-425/88-12-03 "Review Revised Calculation X4C1202V43 Regarding Design Objectives And Conclusions."

During the review of FSAR sections 2.4.11, 9.2.1, and 9.2.5 the inspector questioned why was the following sentence in FSAR 9.2.1.1.1-J not considered a licensing commitment? "The NSCW System Is Designed To Minimize The Effects Of Water Hammer Forces".

The licensee's response was as follows: This sentence was apparently taken in context with the seventh paragraph of FSAR 9.2.1.2.3 on page 9.2.1-4 in which the features of the NSCW system that minimize the effects of water hammer are described.

In as much as these features appeared to implement the apparent commitment in paragraph 9.2.1.1.1-J, it was interpreted as a descriptive statement when taken together with paragraph 9.2.1.2.3, and thus was not considered a licensing commitment. The inspector considers the licensee's response to be acceptable and thus has no further questions on this matter.

COMMITMENT NO. 4913.00

Calculation X4C1202V18 NSCW/COPATTA 11 Input Data/LOCA 1-Train" was reviewed to determine the adequacy of the implementation of FSAR commitment for a maximum total NSCW heat load of 349.8 million BTU/HR during accident conditions given in FSAR table 9.2.1-1. This commitment was tracked by GPC as readiness review commitment Reference no. 4913.00. Results of all cases studied in this calculation to determine total NSCW heat load were higher than the values given in FSAR Table 9.2.1-1. GPC has initiated FSAR Change Notice 559 to update the table and will include the revised heat load values in FSAR Amendment 35. The inspector also noted that the description of one of the cases (case 3C) dealing with fouling factors in heat exchanger tubes was misleading. The licensee committed to correct this discrepancy in the next revision of the calculation. The inspector informed the licensee that, pending the issuance of the revised calculation, this matter will be identified as Inspector Followup Item 50-425/88-12-04 "Review Revised Calculation X4C1202V18 Regarding Case 3c Description."

COMMITMENT NO. 4914.00

NSCW calculation X4C1202V03 "Verification Of NSCW Constant Heat Loads And Flows" was reviewed to determine the adequacy of the implementation of FSAR commitment for a minimum NSCW flow of 15,733 GPM per train during accident conditions given in Table 9.2.1-1. This commitment was tracked by readiness review commitment reference no. 4914.00.

This calculation was performed to compile the latest available constant heat load and maximum required cooling water flow rate for all equipment cooled by the NSCW system, as well as the component pressure drops.

The inspector reviewed the calculation and noted that the data used was based upon the latest vendor data as of February 27, 1985, In particular, the number for the heat load per train of the standby diesel generator coolers was different than the number in the FSAR Table 9.2.1-1. The vendor number was 17.1 x 10 to the 6 BTU/HR. Since the FSAR had not been updated, the inspector questioned what was being used as the design basis of the plant.

The licensee provided a copy of a FSAR Change Notice No. 631, which identified in January 1988, that the FSAR update was needed. A meeting was conducted on March 9, 1988 with the cognizant personnel concerning calculation reviews, FSAR changes, and licensing personnel to discuss this item. The licensee provided project instructions which required calculations be reviewed for possible FSAR changes. This resolved the programmatic concern of updating the FSAR. The licensee provided a copy of a temporary exemption request from 10 CFR 50.71(e), FSAR annual update, dated January 15, 1988, to the inspector. The licensee is required to update the original FSAR within 24 months of the date of the issuance of the operating licensee. Unit 1 received its low power operating licensee on January 16, 1987, and the updated FSAR is due January 16, 1989. The exemption would defer the submittal of the updated FSAR for units one and two until 12 months after the licensee for unit two expected in February 1989. The particular concern of the standby diesel generator coolers heat load would be incorporated in the update as requested by the exemption.

(2) Evaluation of Commitment Additions/Changes From Unit 1 To Unit 2

The Commitment matrix identified 13 commitments as changes from those presented in the Unit 1 Module. Of these, seven were not included in the Unit report, but were subsequently added by an FSAR amendment and the remaining six were subsequently changed by various FSAR amendments. The inspectors conducted a review of the added commitments to verify proper implementation by a working level document and the commitments which were revised were reviewed to evaluate the significance of the change.

The inspectors reviewed the following commitments which were not included in the Unit 1 report, but were subsequently added by FSAR amendments as noted below:

| Ref. No | FSAR Source | Subject | FSAR Amend | Design/Const. Implementation |
|---|---|---|---|---|
| 5107 | 3.6.2.1.1.B.4 | No Welded Attach. Within 5 Pipe Dias. Of Highest Stress Location On MS & MFW Systems | 30 | DC 1018-3.3.B.3 d.1.a. |

| Ref. No (cont'd) | FSAR Source | Subject | FSAR Amend | Design/Const. Implementation |
|---|---|---|---|---|
| 5108 | 3.6.2.1.1.B.4 | No Welded Attach. Within 3X SQ.RT. Of Highest Stress Location On High Energy Sys. Other Than MS & MFW | 30 | DC 1018-3.3.B.3 d.1.b |
| 5026 | 3.9.1.5.1 | Weld Inspt. Criteria ASME Code | 20 | X4AZ01-P.3.0.A PPP IX-3.7.0 PPP IX-18 |
| 5027 | 3.9.B.5.1 | Weld Inspt. Criteria B31.1 Code | 20 | X4AZ01-P4.3.0.A PPP IX-15-14 PPP IX-18 |
| 5348 | 3.9.B.3 | ASME III, CL I PIP'G Design Per Sub. NB '77 Edition Thru Summer '79 Addenda | 34 | DC 1017-2.1 |
| 5349 | 3.9.B.3 | ASME III, CL II & III PIP'G Design Per Sub. NC & ND '74 Edition Thru Summer '75 Addenda | 34 | DC 1017-2.1 |
| 5091 | 3.11.B.1 | BTP MSB 3-1 Designed To Break Exclusion Criteria MS PIP'G Thru Cnmt. | 25 | DC 1018 - 3.3.B.6 |

The inspectors reviewed the following commitments which were included in the Unit 1 report, but were subsequently changed by various FSAR amendments as noted below:

| Ref. No | FSAR Source | Subject | FSAR Amend | Design/Const. Implementation |
|---|---|---|---|---|
| 711 | 1.9.82.2 | Sumps. For Emerg. Core Cooling & CS Systems | 19 | Adequacy Of CS Pump Available NPSH Recalculated To To Address Additional Factors |
| 2295 | 3.F.4.4 | Propagation Of Flood Waters From Break In 96" CW PIP'G Into Safety-Related Structures Precluded By Design | 16 | Design Basis Pipe Failure Mode Change From A Critical Crack To A Full Circumference Break In The 96" CW PIP'G |
| 2816 | 6.3.2.2.9 | RWST Designed To Seismic Category 1 & Htr. Provided To Maintain Min. Wtr Temp. Of 50% | 17 | Stipulated A Recir Htr. Is Provided To Maintain Min. Wtr. Temp. |
| 4923 | 9.2.2.3.A | Peak Load On CCW Sys. 1-Train Oper. Is 189 x 10 To The 6 BTU/Hour Cold Shutdown Achieved In 34 Hours | 20 | Peak Load On CCW Sys. And Time For Achieving Cold Shutdown Was Revised Upward |
| 3535 | 9.3.3.4.A | Testing Of Pressurized Portions Of Waste Collection Systems Hydroed To 1 1/2 Times DP | 19 | Pressurized Portions Defined As Pump Suction And Discharge PIP'G |

| Ref. No (cont'd) | FSAR Source | Subject | FSAR Amend | Design/Const. Implementation |
|---|---|---|---|---|
| 3834 | 9.3.3.4.A | Non Pressured Portions Of Waste Collection Hydroed At Atm. Press. | 19 | Non-Pressurized Portions Chg'd To Equip. & Floor Drn's In Aux. Bldg., Control F.H, Radwaste Solidification, ARB, RW Transfer, And RW Tunnel Transfer |

c. Engineering and Design Review

(1) Calculation Review

A representative sample of NSCW system calculations were reviewed to determine that objectives, assumptions, numbers and conclusions in the calculation were valid. The following calculations were reviewed:

| Calc. No /Rev | Subject |
|---|---|
| X4C1202S00F1, Rev. 1 | Failure Modes and Effect Analysis - NSCW |
| X4C1202V03, Rev. 1 | Verification Of NSCW Constant Heat Loads and Flows |
| X4C1202V14, Rev. 1 | Ultimate Heat Sink Weather Screening |
| X4C1202V15, Rev. 1 | NSCW - ACCW - CCW Pressure Differential Verification |
| X4C1202V18, Rev. 3 | NSCW/COPATTA - II Input Data/LOCA - 1 Train |
| X4C1202V43, Rev. 1 | NSCW Train "B" Flow Balance |

During the review of calculation No. X4C1202S00F1 (Failure Modes And Effect Analysis For The NSCW System) the inspector questioned the correctness of the conclusion reached in the calculation for the method of failure detection and failure effect on system safety function capability evaluation for failure mode item 85b. (NSCW pump P4-001 discharge bypass line

check valve). Item Nos. 86b, 87b, 88b, 89b, and 90b are also effected. The calculation presently states that if the train "A" bypass line check valve failed open with train "B" in service that this would be indicated by flow indicators and a low header pressure alarm in the control room. This would result in the starting of the train B standby pump.

The licensee reviewed the inspector's comment and concurred that the lower flow conditions would not be detected by the flow indicators in the control room since the indicators are in 500 GPM increments and the amount of flow bypassed would be approximately 200 GPM. In addition, this reduction of flow would not be sufficient to cause the starting of the train "B" standby pump. However, this condition would be detectable in the control room by the high flow alarm annunciator off of FSH 11776 on the train "A" inter tie line. The licensee committed to revise the calculation to reflect the correct method of failure detection and failure effect on system safety function capability for items 85b, 86b, 87b, 88b, 89b, 90b. The inspector informed the licensee that, pending issuance of the revised calculation, this matter will be identified as Inspector Followup Item 50-425/88-12-05 "Review Revised Calculation X4C1202S00F1 Regarding The Evaluation Of Flow Failure Detection & Effect On System Safety Function For Items No's. 85b, 86b, 87b, 88b, 89b, & 90b."

(2) Review Of Code/Seismic Interfaces

A representative sample of Nuclear Safety-Related Systems were selected and reviewed for ASME code and seismic category interfaces. The purpose of this inspection was to verify that the systems were designed to meet seismic category 1 requirements to ensure no loss of function during a safe shutdown earthquake. The inspector reviewed the following system design bases and P and IDs to determine that appropriate ASME code and seismic interfaces were invoked.

| Document No. | Title |
|---|---|
| DC-1203-6 | CCW System Design Bases |
| 2X4DB136,R-13<br>2X4DB137,R-14 | CCW System P & ID<br>Trains A & B |
| DC-1202-5 | NSCW System Design Bases |
| 2X4DB133-1,R-21<br>2X4DB134,R-18<br>2X4DB135,1,R-18 | NSCW System P & ID<br>Train A |

| Document No. (cont'd) | Title |
|---|---|
| DC-1302-5 | AFW System Design Basis |
| 2X4DB161-1,R-19<br>2X4DB161-2,R-18 | AFW System P & ID<br>Trains A & B |

As a result of the above inspection, the inspectors raised the following comments:

NSCW SYSTEM REVIEW

NSCW drain valve 2-1202-U4-129 off of the RHR pump motor cooler shown on P and ID 2X4DB134 reflects incorrect code/seismic break. The inspector confirmed that isometric drawing 2K3-1202-155-01 which reflects the as-installed condition is correct. The licensee informed the inspector that this item was a result of a drafting error during incorporation of a DCN on to the P and ID. Isometric/P and ID reconciliation discovered this drain missing from the P and ID and a DCN was issued against 2X4DB134 on December 22, 1986. When it was incorporated in April 1987 a drafting error was made switching the code/seismic break exactly opposite of the isometric drawing. The licensee considers this to be an isolated case, and to ensure that this is the case, the licensee conducted a review of ten safety related P and IDs relative to the incorporation of 200 DCNs/FERs. No additional incorporation errors were identified during this review. The licensee issued DCN No. 57 to P and ID 2X4DB134 to correct the identified discrepancy on March 28, 1988. The inspector finds the licensee's response to be acceptable, therefore this item is considered to be closed.

Also, during the above inspection, the inspector noted that P and IDs in general don't reflect code/seismic breaks location for all vent, drain, and test connection piping. The licensee acknowledged this and issued DCN No. 12 to P and ID 2X4DB101 which added a note to specify code/seismic locations for the type of corrections noted above. The inspector finds this action taken by the licensee to be acceptable, therefore, this item is considered to be closed.

d. Safety - Related System Piping Installation Review

(1) System Walkdown Inspection

Selected portions of the Nuclear Service Cooling Water (NSCW) System Containment Spray (CS) System and High Head Safety

Injection System, were walked down. The constructed piping systems were compared to the piping and instrumentation diagrams and the fabrication isometric drawings. Examples of items checked were piping configuration, pipe class, weld location, valve location and appearance, orientation, labeling, piping support location, and engagement of threaded fasteners.

(a) NSCW System Walkdown

Train "A" of the NSCW piping system was walked down in the NSCW tower and pump house, connecting tunnel to the auxiliary building, auxiliary building, connecting tunnel to the diesel generating building, diesel generator building, and east of the U-II construction barrier on level 3 of the control building. The inspectors conducted the walkdown inspection with the piping and instrumentation diagram and fabrication isometric drawings to verify that the system was constructed as shown on the current approved revision and in accordance with the piping and instrumentation construction specification X4AZ01. The piping runs inspected were designed and constructed to ASME boiler and pressure vessel code (B and PVC), Section III Class III and seismic Category 1 requirements. The following drawings were used in the walkdown.

| P&ID/ISO/Rev. | Title |
|---|---|
| 2X4DB133-1,R-21 | P&ID NSCW System - Train "A" |
| 2X4DB134,R-18 | P&ID NSCW System - Train "A" |
| 2X4DB135-1,R-18 | P&ID NSCW System - Train "A" |
| 2K5-1202-023-01,R-7 | FAB. ISO - NSCW Supply Header |
| 2K5-1202-031-01,R-7 | FAB. ISO - NSCW Supply Header |
| 2K5-1202-033-01,R-7 | FAB. ISO - NSCW Supply Header |
| 2K5-1202-004-02,R-8 | FAB. ISO - NSCW Supply Header |
| 2K5-1202-004-01,R-6 | FAB. ISO - NSCW Supply Header |
| 2K3-1202-004-05,R-4 | FAB. ISO - NSCW Supply Header |
| 2K3-1202-037-01,R-7 | FAB. ISO - NSCW Supply Header |
| 2K3-1202-181-02,R-5 | FAB. ISO - NSCW Supply Header |
| 2K3-1202-408-01,R-4 | FAB. ISO - NSCW Supply Header |
| 2K5-1202-181-012,R-6 | FAB. ISO - NSCW Return Header |
| 2K5-1202-037-01,R-5 | FAB. ISO - NSCW Supply To DG 1-A |
| 2K5-1202-037-02,R-6 | FAB. ISO - NSCW Supply To DG 1-A |
| 2K5-1202-037-03,R-3 | FAB. ISO - NSCW Supply To DG 1-A |
| 2K5-1202-035-03,R-3 | FAB. ISO - NSCW Return From DG 1-A |
| 2K5-1202-035-01,R-5 | FAB. ISO - NSCW Return From DG 1-A |
| 2K2-1202-104-02,R-9 | FAB. ISO - NSCW To ESF Chiller |
| 2K2-1202-104-03,R-11 | FAB. ISO - NSCW To ESF Chiller |
| 2K2-1202-134-03,R-13 | FAB. ISO - NSCW From ESF Chiller |
| 2K2-1202-134-02,R-6 | FAB. ISO - NSCW From ESF Chiller |

In general for the items reviewed, the piping was found installed in accordance with the drawings. One question was raised for a support location on drawing 2K5-1202-033-01. The drawing showed a support at NODE NO. 241 location between the discharge of the NSCW pump and the pump house wall. However, the support was actually located outside the pump house on the other side of the pump house wall. The licensee stated that the node points on the isometric drawing do not reflect the support location but rather the pipe support drawings which are referenced show the as-installed location. The licensee confirmed that pipe support drawing (V2-1202-023-H004) which was referenced for node point 241 reflected the as-installed condition of the hanger. Therefore, this question was resolved.

(b) Containment Spray System Walkdown

Train "B" of the Containment Spray System was walked down in the auxiliary building, fuel handling building, and containment building. The inspectors conducted the walkdown inspection with the piping and instrumentation diagram and the fabrication isometric drawings to verify that the system was constructed as shown on the current approved revision and in accordance with the piping and instrumentation construction specification X4AZ01. The piping runs inspected were designed and constructed to ASME B and PVC, Section III Class II requirements. The following drawings were used in the walkdown.

| P&ID/ISO/Rev. | Title |
|---|---|
| 2X4DB131,R-14 | P&ID CS System - Train "B" |
| 2K3-1206-019-01,R-6 | FAB.ISO. - Spray Additive TK Piping |
| 2K3-1206-019-03,R-7 | FAB. ISO - Spray Additive TK Piping |
| 2K3-1206-037-01,R-4 | FAB. ISO - Spray Additive TK Piping |
| 2K3-1206-048-01,R-8 | FAB. ISO - Spray Additive TK Piping |
| 2K3-1206-002-01,R-14 | FAB. ISO - CS Suction Piping |
| 2K7-1206-C02-01,R-11 | FAB. ISO - CS Suction Piping |
| 2K3-1206-002-02,R-5 | FAB. ISO - CS Suction Piping |
| 2K3-1206-002-02,R-10 | FAB. ISO - CS Suction Piping |
| 2K3-1206-006-02,R-10 | FAB. ISO - CS Discharge Piping |
| 2K3-1206-006-03,R-5 | FAB. ISO - CS Discharge Piping |
| 2K3-1206-006-04,R-5 | FAB. ISO - CS Discharge Piping |
| 2K7-1206-006-01,R-5 | FAB. ISO - CS Discharge Piping |
| 2K4-1206-008-10,R-4 | FAB. ISO - CS Discharge Piping |

The piping system was found installed per the applicable drawings for those items checked.

(c) High Head Safety Injection System Walkdown

This inspection consisted of a walkdown on the train "A" centrifugal charging suction piping from the RWST and the discharge piping thru the SI discharge valves and into the four reactor coolant loops. The inspectors conducted the walkdown inspection with the piping and instrumentation diagram to verify that the system was constructed as shown on the current, approved revision and in accordance with the piping and instrumentation construction specification X4AZ01. The piping runs inspected were designed and constructed to ASME B & PVC, Section III Class I and II and seismic category 1 requirements. The following drawings were used in the walkdown.

| P&ID/ISO/Rev. | Title |
|---|---|
| 2X4DB116-2,R-15<br>DCN 35 & FCR MFCRB-8751F | Chemical & Volume Control System |
| 2X4DB119,R-15 | Safety Injection System |
| 2X4DB121,R-17<br>DCN 79, FCR's<br>17,860,MFCRB<br>17,741 | Safety Injection System |

During the walkdown, the inspector noted that P and ID 2X4DB119 did not reflect the correct installation of the vent valves on the loop 4 cold leg injection line. The P and IDs reflected that the vent valves were installed inside the shield wall. However, the actual installation as shown on isometric drawing 2K4-1204-077-02,R-4, was outside the shield wall. The licensee has reconciled the P and ID to reflect the correct installation in accordance with the isometric drawing by issuing DCN 29 to P and ID 2X4DB111 and DCN 34 to P and ID 2X4DB119. The inspector considers this item to be satisfactory resolved.

In addition to the above noted discrepancy, the inspector identified that flow elements (FE's) - 0924,0926, and 0927 were installed backwards. These flow elements are located downstream of the SI discharge valves in the SI injection lines to the reactor coolant system cold legs for loops 1, 3, and 4 respectfully.

Several meetings were held with the licensee to discuss the above NRC finding as well as an NRC concern about the possibility for the performance of a preoperational flow

balance test with FEs/FOs installed backwards since there is no prerequisite in preops for test supervisors to check/verify the proper installation of FEs and FOs.

As a result of the above finding, the licensee took appropriate corrective action consisting of but not limited to the following: 1) A walkdown of all FEs/FOs was conducted which identified an additional 17 installed backwards out of a total of 248. 2) PCN #7 was issued to Pullman Power Products procedure IX-5 to specify installation instructions and to require QC verification of orifice plate orientation in relation to flow. 3) Training was conducted of craft personnel on how to install FE's/FO's. 4) FE/FO installations will be limited to trained flush/hydro personnel and 5) Test supervisors are required to verify FE/FO orientation and document it in the test log prior to the performance of a test.

The foregoing in considered to be in violation of 10 CFR Part 50, Appendix B, Criteria V and will be identified as Violation 50-425/88-12-01 "Failure To Provide Adequate Instructions To Ensure The Proper Installation Of Flow Elements And Orifices."

It should be noted that this item was not inspected by the Readiness Review Staff during the performance of Module No. 4 since it was scoped to be inspected in Module No. 20 Instrumentation and Controls.

The reason being that at the time of performance of Module No. 4 flow elements and/or orifices were not installed. Therefore, it would not have been expected for the Readiness Review Staff to have identified this item during the performance of Module No. 4.

(2) Review Of Documentation For Piping Installation

(a) NSCW Supply And Return Header Piping To Diesel Generator (DG-1A)

An inspection was conducted of the train "A" NSCW supply and return header piping to DG-1A piping fabrication sheets to verify the following attributes: Proper material type and certification per piping classification, properly documented code data report for NPP-1 for fabricated nuclear piping subassemblies, proper weld history documentation, and proper non destructive examination (liquid penetrant) Documentation for ASME III, Class 3 piping. Piping fabrication sheets were reviewed for the following spool numbers.

| Spool No. | Fab. Sht. No. | Description |
|---|---|---|
| 2-1202-035-S-01 | 4107 | 10" Return Header Pipe Assembly |
| 2-1202-035-S-02 | 4201 | 10" Return Header Pipe Assembly |
| 2-1202-035-S-03 | 4202 | 10" Return Header Pipe Assembly |
| 2-1202-035-S-04 | 4108 | 10" Return Header Pipe Assembly |
| 2-1202-035-S-05 | 4109 | 10" Return Header Pipe Assembly |
| 2-1202-035-S-06 | 4110 | 10" Return Header Pipe Assembly |
| 2-1202-037-S-01 | 4114 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-02 | 4115 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-03 | 4116 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-04 | 4205 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-05 | 4117 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-06 | 4118 | 10" Supply Header Pipe Assembly |
| 2-1202-037-S-07 | 4119 | 10" Supply Header Pipe Assembly |

(b) NSCW Tower Header and Distributing Piping

Documentation relating to selected portions of the NSCW tower distribution piping supplied by the Marley Cooling Tower Company was reviewed to verify that the piping met the requirements outlined in Construction Specification No. X4AD02 "Specification For Nuclear Service Cooling Towers And Associated Equipment". This specification

states that the design of the cooling tower, equipment, and piping shall be in accordance with ASME Section III, Class 3 and seismic Category 1 requirements. Specific drawings and documents listed below were used to verify that the NSCW Train "A" header (2-1202-007-12) and branch arm assembly (2-1202-007-8) were installed in accordance with these requirements.

Isometric Drawings
2V5-1202-007-01 - Header
2V5-1202-007-02 - Branch Arm Assembly

Weld Process Sheets
007-W-101 - Branch Arm Assembly 8" Butt Weld
007-W-102 - Branch Arm Assembly 8" Butt Weld

Pipe Support Installation Process Sheets
V2-1202-T07-H045 - Header Support Assembly Bracket
V2-1202-T07-H046 - Header Support Assembly
V2-1202-T07-H048 - Branch Arm Saddle Assembly

Bolting Verification Field Process Sheet
Spool 007-S-04 to Vendor

NPP-1 Code Data Reports
AP & E S/N 3692 - Header
AP & E S/N 2903 - Branch Arm Assembly
AP & E S/N 2932 - Branch Arm Assembly

Supplier Quality Verification Documentation Lists
Equipment Tag # 2-1202-W4-001 Distribution Piping And Supports

Equipment Tag # 2-1202-W4-002 Distribution Piping And Supports

Documentation Turnover Package
2-1202-P02

Marley Drawings

| | |
|---|---|
| 78-42913 | Plan View Of Spray System |
| 78-4717 | Spray System Anchorage And Load Points |
| 78-4718 | Load Tables For Spray System |
| 79-41025 | Spray System Installation |
| 79-41026 | Spray System Installation Details |
| 79-41027 | Mechanical Equipment Installation |
| 79-41271 | Branch Arm Saddle Fabrication And Assembly |
| 79-41285 | Header Assembly |
| 79-41425 | Header Support Bracket Assembly |
| 81-4882 | Specifications Required For NSCW Towers |
| 83-2450 | Standard Torque Recommendation For Fasteners |

e. Safety - Related Equipment Installation Review

A representative sample of installed equipment was inspected to verify that the as installed condition was in accordance with the requirements specified in the applicable manufacturer drawing and installation manual, layout drawing, and piping and instrumentation drawing. The following attributes were inspected: proper documentation of installation on field process sheets (i.e. tightening or torquing of anchor bolts as required); proper evidence of equipment maintenance and cleanliness during construction and startup; proper equipment tag number and code plate serial number, proper nozzle location, size and elevation; proper drain, vent, and relief connections; proper handling of equipment; and proper code class. The following equipment was selected on the basis of either being cooled by or part of the Nuclear Service Cooling Water System by the inspector and inspected for the above noted attributes:

| Equip. No. | Description | Specification No. |
|---|---|---|
| 2-1202-P4-001 | NSCW Pump - Train "A" | 2X4AF02-33 |
| 2-1202-P4-005 | NSCW Pump - Train "A" | 2X4AF02-33 |
| 2-1203-E4-001 | CCW Heat Exchanger | 2X4AE01-4 |
| 2-1217-E4-001 | ACCW Heat Exchanger | 2X4AE01-50 |
| 2-1501-A7-001 | CTB Cooling Unit Coils | 2X4AJ16-2 |
| 2-1501-A7-005 | CTB Cooling Unit Coils | 2X4AJ16-2 |
| 2-1511-E7-002 | Reactor Cavity Cooling Unit Coils | 2X4AJ16-4 |
| 2-1515-A7-001 | Containment Aux. Cooling Unit | 2X4AJ16-3 |
| 2-1592-C7-001 | ESF Chiller | 2X4AJ04-11 |

f. Safety - Related Valve Installation Review

A Representative sample of installed valves were inspected to verify that the as installed condition was in accordance with the requirements specified in the applicable piping and instrumentation drawings, isometric drawings, and instrumentation index or valve designation list. The following attributes were inspected: proper valve orientation and flow direction; proper valve sizing and type; proper piping class (i.e. code class, pressure rating, material type, and end connection type); proper tag and serial number; proper piping of instrument air to air operated valves to ensure that valve will fail to the safe position on loss of air pressure; and proper operator sizing to ensure closure against maximum operational differential pressure conditions. The following valves were randomly selected by the inspector and inspected for the above noted attributes:

| Valve No. | Description | Drawing No. | Size/Type |
|---|---|---|---|
| 2HV-780 | Reac Cav & Cnmt Sump HDR ISO | 2X4AR01-375 | 10" Air Oper. Gate |
| HV-2791A | Hydrogen Monitor ISO | 2X5AC07-109 | 3/4" Solenoid Operated Globe |
| 2HV-8030 | PRT Fill ISO | 2X6AA06-255 | 3" Air Operated Diaphragm |
| 2HV-8149C | LTDN Orifice ISO | 2X6AA06-341 | 3" Air Operated Control |
| 2HV-8160 | CVCS LTDN ISO | 2X6AA06-428 | 3" Air Operated Globe |
| 2HV-8986A | RHR Cnmt Sump Pass Sample Train "A" | 2X5AC07-153 | 1" Solenoid Operated |
| 2HV-10466 | RHR Train "B" Suct Line Vent | 2X5AC07-107 | 3/4" Solenoid Operated Globe |
| 2HV-15214 | CVCS Ltdn ISO | 2X5AC01-291 | 3" Air Operated Control |
| 2-1204-U6-003 | SI RWST Purif. Pump Disch o RWST ISO | 2X6AA06-250 | 3" Globe |
| 2-1204-U6-128 | SI RHR To HL Loop 1 | 2X6AA06-389 | 8" Swing Check |
| 2-1204-U4-142 | SI To Cl Loop 4 | 2X5AG08-58 | 2" Needle |
| 2-1205-U6-001 | RHR Train "A" Suct From RWST | 2X6AA06-400 | 12" Swing Check |
| 2-1205-U4-123 | RHR Train "B" Suct From Cnmt Sump | 2X6ARo1-457 | 14" Check |
| 2-1206-U6-017 | CS Train "A" HDR ISO | 2X6AA06-391 | 8" Gate |

| Valve No. (cont'd) | Description | Drawing No. | Size/Type |
|---|---|---|---|
| 2-1206-U6-018 | CS Train "B" HDR ISO | 2X6AA06-391 | 8" Gate |
| 2-1208-U4-417 | CVCS Seal INJ To RCP #4 | 2X5AC08-50 | 1" Needle |
| 2-1901-U4-039 | WPSL CDT HX Outlet HDR | 2X4AR01-355 | 3" Swing Check |

g. Conclusions

The inspectors have concluded based on a review on a representative sample of the commitments designated in section 3.2 of module 4 that the licensee has accurately defined licensing commitments from the FSAR, responses to inspection and enforcement bulletins, and correspondence to the NRC. In addition, the licensee has accurately defined the working level implementing document utilized by site personnel to ensure that these commitments (within the scope of module 4) are invoked during the design and construction phase.

Furthermore, based on independent NRC inspections of randomly selected mechanical equipment, and piping systems, the inspectors have concluded that the hardware inspected was installed per licensing commitments in accordance with Regulatory requirements. Therefore, it is recommended that this module be accepted by the NRC.