U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
REGION IV

Report No. 99900521/80-02 Program No. 51200

Company: Bechtel Power Corporation
Los Angeles Power Division
12400 Imperial Highway
Norwalk, California

Inspection Conducted: April 28 - May 1, 1980

Inspectors: C J Hale /for 5-15-80
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Program Evaluation Section
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Observer: C J Hale /for 5-15-80
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Approved by: C J Hale 5-15-80
C. J. Hale, Chief Date
Program Evaluation Section
Vendor Inspection Branch

Summary

Inspection conducted April 28 - May 1, 1980 (99900521/80-02)

Areas Inspected: Implementation of the requirements of 10 CFR 50, Appendix B, in the area of design inputs and design inspection. The inspection involved fifty-six (56) hours onsite by two (2) NRC inspectors.

Results: In the areas inspected there were no deviations or unresolved items identified.

DETAILS SECTION I

(Prepared by R. H. Brickley)

A. Persons Contacted

N. E. Baldasari, Nuclear Engineer
T. L. Kent, Nuclear Engineer
G. F. Kopchinski, Nuclear Group Supervisor

B. Design Inspection (Protection Against High Energy Line Ruptures in Fluid Systems Outside Containment)

1. Objectives

The objectives of this area of the inspection were to select one or more high energy line systems and determine:

a. The essential systems that are proximate to any portion of the selected high energy line system.

b. That the design analysis report combined with the composite drawing and stress isometric confirm that the integrity of the essential system would not be degraded in the event of a rupture at any location.

c. That break point locations are in accordance with NRC guidelines and have been indicated on the drawings.

d. That, for high energy line fluid systems located in containment penetration areas, the drawings and design basis provide confirmation that NRC criteria have been met.

e. That, for those essential systems that are not protected by either the separation or protective enclosure design methods, the applicable drawings identify the break point locations and the physical design features to protect the essential systems.

f. That the analysis for the postulated break has been performed and documented, assuming the loss of off-site power combined with a single active failure.

2. Method of Accomplishment

The preceding objectives were accomplished by an examination of the following documents of Project No. 10407:

a. Section 3.6 (Protection Against Dynamic Effects Associated With The Postulated Rupture of Piping) of the FSAR.

b. Section 1.6 (Design Criteria for Separation) of Part II of the project Design Criteria Manual.

c. Procedures No. IP-4.2 (Design Calculations) Revision 9, dated 2/15/80; IP-4.3 (Multidiscipline Systems Analysis Review) Revision 5, dated 6/15/79; IP-4.26 (Designing Power Plants By Use of Models) Revision 2, dated 9/6/77; IP-5.6 (Discipline Interface Information Requests) Revision 1, dated 9/16/77; and IP-5.10 (Design Interface Control) Revision 1, dated 1/30/76 of the Project Internal Procedures Manual.

d. Engineering Department Procedures No. EDP-4.36 (Standard Computer Programs) Revision 0, dated 5/13/77; and EDP-4.37 (Design Calculation) Revision 3, dated 8/28/79 of the Engineering Department Procedures Manual.

e. Bechtel Topical Reports No. BN-TOP-2 (Design For Pipe Break Effects) Revision 2, dated 5/74; and BN-TOP-3-A (Tornado and Extreme Wind Design Criteria For Nuclear Power Plants) Revision 3, dated 8/74.

f. Bechtel documents: Licensing Information System Topical Report (High Energy Line Breaks) Issue No. 5b, dated 8/76; (Design Guide For Assumptions And Criteria For Pipe Break Protection Review) Draft Copy, dated 11/79; (LAPD HELB Review Task Force-Event Tree) dated 3/28/80; and Flow Diagram (Evaluation Process) undated.

g. Isometrics No. 13-P-ASF-201 (Aux. Bldg. Isometric-Aux. Steam System to Gas Stripper & Radwaste Bldg) Revision 8, and 13-P-ASF-202 (Aux, Bldg. Isometric-Aux. Steam System Cond. & Supply HDR to Gas Stripper to Seal Inj. HX) Revision 2.

h. Calculations No. 13-NC-PB-000 (Criteria For High Energy Pipe Break (HELB) Jet Impingement Calcualtions) dated 6/19/79, 13-NC-PB-001 (High Energy Line Break-Pipe Whip-Generic Reference Calculation) dated 10/9/79, 13-NC-PB-002 (High Engergy Line Break-Jet Impingement Inside Containment-Generic Reference) dated 12/26/79, 13-NC-PB-003 (Thrust Forces For Pipe Whip Considerations Of High Energy Line Break Analysis) dated 4/11/80, and 13-NC-PB-040 (HELB-Jet Impingement-Aux. Steam Lines in Aux. Bldg) dated 3/10/80.

i. Computer Code (JET 2) and applicable records i.e. Calculation (Code Verification) completed 6/28/79 - checked 7/5/79, IOM (Verification of JET 2 Flow Models) dated 10/25/79, Code Listing, Computer output (Jet Impingement Code A1), and Theory Section (Derivation of Equations for Jet Code).

3. Findings

a. General

(1) The inspector found that the Design Criteria Manual (DCM) had established the criteria for separating safety-related systems from the effects of disabling hazards e.g. pipe breaks which includes jet impingement, steam or liquid flooding, humidity, over pressurization, chemical attack, radiation, and temperatures. The DCM also defined pipe rupture whip, safety-related systems, and techniques of separation i.e. plant arrangement, barriers, spatial separation, and alternatives i.e. additional restraints, hardening design, or temporary system isolation.

Bechtel considers spatial separation from pipe whip to be adequate if safety-related equipment (including cable trays, etc.) of another train or system does not lie within the plane of the pipe jet reaction generated about a plastic hinge at either end restraint. The radius of this plane will be the break location-to-restraint distance.

Bechtel considers a spatial separation for jet impingement forces to be adequate when it can be shown that the force per unit area of impingement (jet expansion half angle equals 10°) is less than that which would damage the most probable safety target.

Where compartments are used, an analysis will be performed of compartment pressures and environmental effects.

(2) The control and performance for HELB activities were found (procedure IP-4.3) to be assigned to a separation review-task force headed by the Nuclear Group Supervisor. The task force consists of one representative from each discipline who is responsible for knowing the separation criteria and relating it to the responsible discipline engineers and designers. The responsible engineer is responsible for assuring separation between trains of safety-related equipment and separation of those trains

from hazard sources. A separation review meeting is to be held for each building elevation. The objective of the task force is to assure that the separation criteria, as specified in Section 1.6 of the Design Criteria Manual, are met.

(3) The project model was found to be a key design tool used by the separation review-task force in assuring that the separation criteria are met. All break locations and type are identified on the lines of the model and used to identify the targets. Procedure IP-4.26 was found to establish specific project requirements and provide for the detailed interface coordination of the various design groups in utilizing the model.

(4) The examination of the calculations listed in paragraph B.2.h above revealed that the first three (3) (i.e. 13-NC-PB-000, 13-NC-PB-001, and 13-NC-PB-002) established the method to be followed and referenced in HELB analysis based on the NRC SRPs. The fourth dealt with HELB inside containment while the last, 13-NC-PB-040, was the only one completed to date on HELB outside containment. This calculation, 13-NC-PB-040, utilized computer code JET 2 and postulated that the breaks would occur at the terminal ends of the line and at each intermediate pipe fitting, welded attachment, and valve (BTP MEB 3.1, paragraph B.1.d (2)). The inspector selected four (4) of the postulated breaks that had the highest calculated jet thrust forces and verified, using the model, that all potential targets could and had been identified. The most significant target was the HPSI vent lines within the 88' level of the Aux. Bldg.. An IOM dated 2/10/80 directed that the line be rerouted to prevent damage from jet impingement forces. Since only one HELB analysis (outside containment) had been available for examination, this inspection module will require additional follow-up.

(5) The examination of the documents identified in paragraphs B.2.a through B.2.f above revealed that Bechtel followed the NRC guidance contained in Standard Review Plans (SRP) 3.6.1 and 3.6.2, and Branch Technical Positions (BTP) APCSB 3-1 and MEB 3-1.

(6) The examination of the documents identified in paragraphs B.2.g and B.2.h above revealed that analysis activities completed thus far followed the requirements contained

in the documents identified in paragraphs B.2.a through B.2.f above and covered the areas identified in objectives a. through c. above.

b. Deviations and Unresolved Items

None identified in this area of the inspection.

c. Follow-up Items

(1) An examination of additional analysis of HELBs outside containment will be conducted during a future inspection.

(2) An inspection of the development, verification, and control of computer codes used in safety-related analysis will be conducted during a future inspection with specific emphasis placed on the code JET 2.

C. Exit Interview

An exit interview was held with management representatives on May 1, 1980. In addition to those individuals indicated by an asterisk in paragraph A of each Details Section, those in attendance were:

J. E. Bashore, Manager, QA
A. Coutoumanos, QA Supervisor
L. G. Hinkelman, Manager, Domestic Operations
W. A. Homer, Manager of Engineering
D. T. Krisha, QA Supervisor
J. V. Morowski, Vice President and Deputy Division Manager

The inspector summarized the scope and findings of the inspection. Management comments were generally for clarification only, or acknowledgement of the statements by the inspector.

DETAILS SECTION II

(Prepared by J. R. Agee)

A. Persons Contacted

*W. G. Bingham - Project Engineering Manager
R. N. Carson - Division Qualification Engineer
S. J. Cereghinio - FSAR Coordinator
G. Deppee - Control Systems Group Supervisor
K. R. Dotterer - Quality Assurance Engineer
M. A. Jeric - Project Engineer
*B. L. Lex - Project Manager
F. W. Matthewson - Engineer
J. L. Quinnelly - Project Quality Engineer
S. A. Shapiro - Nuclear Engineer Group Supervisor
K. J. Stwertnik - Project Quality Engineer
V. N. Tiwari - Electrical Group Supervisor

*Attended the exit interview

B. Design Input

1. Objectives

The objectives of this area of the inspection were to determine that:

a. Procedures have been established and are being implemented that prescribe the system for control of those criteria, parameters, bases, or other design requirements upon which detailed final design is based.

b. Design inputs are specified on a timely basis, their selection reviewed and approved, incorporated into the design documents, and changes in input are justified, reviewed, and apporved.

c. Commitments are properly translated into design inputs, as applicable to the following:

(1) Basic functions

(2) Performance requirements

(3) Regulatory requirements, codes, and standards

(4) Design conditions

(5) Loads

(6) Environmental conditions.

d. Design requirements are specified, when applicable relating to interfaces, materials, mechanical, structural, hydraulic, chemistry, electrical, instrumentation and control, redundancy, accessibility, fire protection, and other requirements that prevent undue risk to the health and safety of the public.

2. Method of Accomplishment

The preceding objectives were accomplished by an examination of the documents listed below, that were used in the review of the following projects:

a. Project No. 9510:

(1) VNP Design Manual, Design Control No. DC-1000-E, General Design Criteria (Electrical), Revision 2, dated December 13, 1977.

(2) Design Manual, Design Control No. DC-1804, AC System 4160 V, including the following one line drawings:

(a) 1X3D-AA-A01A, Revision 7, March 27, 1980.

(b) 2X3D-AA-A01A, Revision 3, March 27, 1980.

(c) AX3D-AA-A01A, Revision 3, March 27, 1980.

(3) Design Control No. DC-1205, Residual Heat Removal System, Revision 1, March 29, 1979.

(4) Design Manual Change Notice (DMCN) for DC-1000-E-1, General Design Criteria, Revision 2, June 21, 1979.

(5) Bechtel version of change to be made to the Safety Analysis Report (SAR) entitled, "Potential Change Internal Evaluation," draft, Revision A, August 1979.

(6) P&ID for Reactor Coolant System, System No. 1201, 1X4DB11, Revision 2, January 15, 1980, and related electrical, main one line drawings including the following:

(a) AX3D-AA-A01A, Revision 7, March 27, 1980

(b) 2X3D-AA-A01A, Revision 3, March 27, 1980

(c) 1X3D-AA-A01A, Revision 7, March 27, 1980

(7) Design Manual, Design Control No. DC-1000-M, General Design Criteria (Mechanical) Revision 2, April 12, 1978, Section 3.4 NRC Rules and Regulations.

(8) PSAR S2-17A3, dated March 2, 1977, which states in part, " . . . By virture of responding to the preceding RGs, the Bechtel quality program is consistent with the following approved ANSI standards . . . N45.2-1971."

(9) Specification for Penetrations for Project No. 9510, Specification No. X3AB03, Revision 1, January 19, 1979.

(10) Vendor Proposal NP 79-18, Containment Electrical Penetrations.

(11) SAR Volume IX, Appendix 3A, Conformance to Safety Guides and Regulations.

b. Project No. 10407

(1) Project Scope Manual, Section 2.0, Systems and Equipment, Revision 8, April 27, 1979, which identified the Class IE and non-Class IE system that were Bechtel's responsibility.

Examples of Class IE systems include;

(a) 4.16 KV Power System

(b) 480 V Switchgear

(c) 480 V MCC System

(d) 125 V DC Power System

(e) Instrument AC Power System

(f) Auxiliary Feedwater System

(2) Engineering Department Procedure (EDP) 4.1 Design Criteria, Revision 2, February 3, 1975.

(3) Design Criteria Manual, Volume II; Detailed Design Criteria, Part III; Auxiliary Feedwater, dated April 4, 1980.

(4) Purchase Order (PO) No. 10407-13-MM-021, Revision 7, November 27, 1977, for Quality Class Q&R Auxiliary Feedwater Pumps.

(5) Calculation number 13-MC-AF-201, Revision 1, dated October 10, 1979, for Auxiliary Feedwater Pump.

(6) EDP 4.37, Design Calculations Revision 3, dated September 28, 1979.

(7) EDP 4.1 Design Criteria, Revision 2, dated February 3, 1975.

3. Findings

a. Project No. 9510

(1) General

(a) According to the project engineer the project contract was signed in June 1974. Codes and standards referenced in the contract documents predate the contract date. Subsequent to the contract date the project was placed in hold but was later released for continuation of design, construction, and procurement of applicable equipment.

Since reactivation of the contract no Preliminary Safety Analysis Report (PSAR) amendments have been issued requiring Bechtel to upgrade systems and equipment designs to the latest revisions of applicable codes and standards; however, Bechtel has and is continuing to reevaluate design data to determine the need to up rade designs to include criteria from the latest revisions of applicable codes and standards, specifically, IEEE standards.

(b) The more salient items observed while reviewing the documents referenced in section 2.a above, include the following:

Paragraph 2.a(1) (Design Control No. DC-1000-E) contains several discrepancies in the identity of certain codes and standards revision dates, example: IEEE standard-317 is referenced as both 317-1972 and 317-1976. The current version of that standard is 317-1976. Bechtel recognized this and other descrepancies and provided a draft revision of the DC-1000-E document for the inspector's review prior to the conclusion of the inspection.

Paragraph 2.a(2) (Design Control No. DC-1804) AC System 4.160 V, with related drawings, referenced applicable codes and standards, RGs, applicable PSAR sections, general design criteria and main system interfaces. This document was approved and signed-off according to the required approval levels. Additional design control documents of the same type, examined in the same manner, included the following:

(1) DC-1203 Component Cooling Water System

(2) DC-1204 Safety Injection System

(3) DC-1302 Auxiliary Feedwater System

(4) DC-1806 DC System Class IE

(5) DC-1807 120 VAC Power System

No areas of questionable concern were identified in these documents.

Paragraph 2.a(4), DMCN 1000-E-1 identifies additional RGs and IEEE standards to become effective December 13, 1977. These are corrections and/or additions to those RGs and IEEE standards addressed in the PSAR November 5, 1973. According to the Bechtel QAE, the Client has decreed that amendments to the PSAR will not be made to address these design criteria changes, therefore changes of this type to be reflected in the SAR will be entered directly into the FSAR. The paragraph 2.a(5) document entitled, "Potential Change Internal Evaluation" is an example of the current method used to identify and track technical criteria changes that will be reflected in the FSAR. This document provided additional interpretation of IEEE standard 317-1976 and RG1.63 for criteria for electrical penetration assemblies.

Paragraph 2.a(8): According to the QAE, the Client has decreed that the project quality program will continue to be based on ANSI Standard N45.2-1971. This identified QA program will be addressed in the FSAR, even though the latest version of that ANSI quality assurance standard is N45.2-1977.

Paragraphs 2.a(9) and 2.a(10): The supplier for electrical penetration assemblies (EPAs) has not completed the qualification test program for its EPAs in compliance with IEEE standard 317-1976 and related standards. This condition is typical of other equipment that has not been fully qualification tested in compliance with applicable IEEE standards.

Paragraph 2.a(11): The PSAR reflect those guides and standards that were effective at the time of the contract date. Bechtel recognizes that revisions and additions to guides and standards have been made and is currently revising applicable sections of the SAR to reflect those changes. The revised data will be included in the FSAR.

(2) Deviations and Unresolved Item

None were identified.

(3) Follow-up Items

None are identified.

b. Project No. 10407

(1) General

Observations made while reviewing the documents referenced in section 2.b above include the following:

Paragraph b(1)(f): The Auxiliary Feedwater System Description had been compiled, reviewed, approved and signed-off by cognizant management personnel. The system had referenced applicable RGs, design criteria, main system interfaces and had been compiled to the format and required contents of EDP 4.1. According to the QAE, the Auxiliary Feedwater flow measuring devices are being upgraded to Class Q, resulting from revision of RG 1.97.

Paragraph b(2): EDP 4.1 provides the general criteria for the format, (preparation, requirements and approval) for preparing design criteria documents. Each of the system descriptions reviewed complied with the requirements of EDP 4.1.

Paragraph b.(5): The original calculations on this calculation sheet had been corrected resulting from calculated changes in piping pressure drops. This resulted in a decrease in pump output requirements. These changes were in a more conservative direction relative to the pump motor and did not affect the motor sizing criteria. The calculations had been reviewed and approved in compliance with Bechtel approval levels and EDP 4.37

(2) Deviations and Unresolved Items

None were identified

(3) Follow-up Item

None are identified