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July 02, 1984

United States Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. George W. Knighton, Chief
Licensing Branch 3
Office of Nuclear Reactor Regulation

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
Open Item/Response

Gentlemen:

The Mechanical Engineering Branch Audit was held from April 3 to April 5, 1984, and has been formally documented by letter 2NRC-4-052 from E. J. Woolever to G. W. Knighton, dated May 7, 1984. Eleven open items have been identified in this documentation and in your minutes of the audit which were issued on June 4, 1984.

This letter forwards additional information on these items. Attachment 1 summarizes the present status of all 11 items. Attachments 2 through 6 provide responses or related information on the following five questions (draft SER open item numbers are shown in parentheses): 210.12 (26), 210.31 (40), 210.32 (39), 210.34 (42) and 210.37. This information will be incorporated into FSAR Amendments 7 and 8. Please let us know if this information is acceptable and if the staff agrees with the closed or confirmatory status indicated for each item in Attachment 1.

During the audit, the NRC reviewers indicated a need to review the responses submitted for the following four questions: 210.27 (26), 210.28, 210.34 (42), and 210.39. Please inform us of the status of this review.

DUQUESNE LIGHT COMPANY

By E. J. Woolever
E. J. Woolever
Vice President

SUBSCRIBED AND SWORN TO BEFORE ME THIS 2nd DAY OF July, 1984.

Elva G. Lesondak
Notary Public
ELVA G. LESONDAK, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

JJS/wjs
Attachment

cc: Mr. G. Walton, NRC Resident Inspector (w/a)
Mr. E. A. Licitra, Project Manager (w/a)
Ms. M. Ley, Project Manager, (w/a)

3001
1/1

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On this 2nd day of July, 1984, before me, a Notary Public in and for said Commonwealth and County, personally appeared E. J. Woolever, who being duly sworn, deposed and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge.

Elva G. Lesondak
Notary Public

ELVA G. LESONDAK, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

ATTACHMENT 1

Status of MEB Open Items

210.10 (28)* This question is concerned with pipe-to-pipe impact. This subject has been addressed in the response submitted at the audit. In the audit, the question of the effects of jet impingement arose. This subject is addressed in Question 210.12. Question 210.10 (28) should be considered closed.

210.12 (26) A revised response is provided as Attachment 2. It now includes additional description of the jet impingement acceptance criteria. Tables which show how the effects of jet impingement will be incorporated with those from pipe whip are also included in Attachment 2. This item should now be considered confirmatory.

210.27 (36) NRC indicated a need to review the response submitted at the audit.

210.28 NRC indicated a need to review the response submitted at the audit.

210.31 (40) A revised response is provided as Attachment 3. This item should now be considered confirmatory.

210.32 (39) A revised response is provided as Attachment 4. It now includes the results of the functional capability study. This item should now be considered closed.

210.34 (42) NRC Indicated a need to review the response submitted at the audit. Tables 3.9B-14, 15, and 16 referred to in the response to Question 210.34 have been revised and are provided in Attachment 5. Tables 3.9B-14 and 15 now include the jet impingement loads. The response to Question 210.34 was previously revised to clarify the buckling criteria employed by Westinghouse for linear type auxiliary equipment supports (Refer to 2NRC-4-052 dated May 7, 1984). A draft of the ASME Code Baseline Document is being submitted under separate cover. This item should now be considered confirmatory.

210.37 A revised response is provided as Attachment 6. This item should now be considered closed.

210.39 NRC indicated a need to review the response submitted at the audit.

210.40 The Preservice Inspection Program is being submitted under separate cover. The valve listing is scheduled for six months later. This item remains open.

210.41 (43) The Inservice Inspection Program submittal is scheduled for June 1985. This item remains open.

*Draft SER Open Item numbers are shown in parentheses

NRC Letter: February 9, 1984

Question 210.12

Tables concerning jet impingement effects could not be found. Provide these tables.

Response:

The required information concerning jet impingement effects will be provided with the assessment of other jet impingement effects for all high energy systems where breaks are postulated, which is scheduled to be submitted by July 1985.

The submittal dates for the various buildings are the same as those provided in the response to Question 210.9, Amendment 7.

The tables for jet impingement effects will be integrated with those for pipe whip effects (refer to Question 210.9) and the table format will be provided at a later date.

Acceptance criteria for jet impingement targets are provided in the form of load combinations and design allowables in Section 3.8.3 for structures, and in Sections 3.6B.1.3.2.3 and 3.9 for piping.

Other components identified as essential targets for jet impingement will be shielded from the fluid jets whenever possible. Where shielding of these components cannot be provided, acceptance criteria will be determined and provided in the appropriate sections addressing those components.

NOTE: The following tables will be included in Amendment 8.

NOTES TO FIGURES 3.6B-12A THROUGH FIGURE 3.6B-12C

Line Designation	ASME Code Class	Breaks					Pipe Whip		Jet Impingement		
		Designation	Type(1)	Reason for Postulation(2)	Stress (psi)(3)	Blow-down(4)	Restraint Designation	Restraint Type(5)	Jet Type	Shield Designation	Shield Type(6)
2FWS-016-12-2	2	2FWS-001-C-C	C	TE	18,836	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later
		2FWS-002-A-C	C	IP	17,412	S	2FWS-PRR844A	LS	Later	Later	Later
							2FWS-PRR844C	LS			
							2FWS-PRR845	LS			
							2FWS-PRR802	LS			
						P	2FWS-PRR841	LS	Later	Later	Later
							2FWS-PRR803	LS			
							2FWS-PRR835	LS			
							2FWS-PRR843	LS			
							2FWS-PRR804A	LS			
							2FWS-PRR804B	LS			
		2FWS-003-A-C	C	IP	18,430	S	2FWS-PRR805	LS	Later	Later	Later
							2FWS-PRR804A	LS			
							2FWS-PRR804B	LS			
							2FWS-PRR843	LS			
							2FWS-PRR835	LS			
							2FWS-PRR803	LS			
						P	2FWS-PRR842	LS	Later	Later	Later
		2FWS-004-A-C	C	TE	13,977	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later
2FWS-016-22-2	2	2FWS-005-C-C	C	TE	16,711	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later
		2FWS-006-C-C	C	IP	22,885	S	2FWS-PRR821	LS	Later	Later	Later
						P	2FWS-PRR822	LS	Later	Later	Later
							2FWS-PRR823	LS			
							2FWS-PRR824	LS			
		2FWS-007-A-C	C	IP	16,907	S	2FWS-PRR824	LS	Later	Later	Later
							2FWS-PRR823	LS			
							2FWS-PRR822	LS			
						P	-	-	Later	Later	Later
		2FWS-008-A-C	C	TE	14,585	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later

NOTES TO FIGURES 3.6B-12A THROUGH FIGURE 3.6B-12C (Cont)

Designation Line	ASME Code Class	Breaks					Pipe Whip		Jet Impingement		
		Designation	Type(1)	Reason for Postulation(2)	Stress (psi)(3)	Blowdown(4)	Restraint Designation	Restraint Type(5)	Jet Type	Shield Designation	Shield Type(6)
2FWS-016-17-2	2	2FWS-009-C-C	C	TE	21,442	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later
		2FWS-010-C-C	C	IP	27,725	S	-	-	Later	Later	Later
						P	2FWS-PRR811	RB	Later	Later	Later
		2FWS-011-C-C	C	IP	26,950	S	2FWS-PRR813 2FWS-PRR840	LS RB	Later	Later	Later
						P	2FWS-PRR814	LS	Later	Later	Later
		2FWS-012-A-C	C	TE	18,526	S	-	-	Later	Later	Later
						P	-	-	Later	Later	Later

NOTES:

1. Break Type:

   C - Circumferential Break
   L - Longitudinal Break

2. Reason for Postulation:

   TE - Terminal End
   IP - Intermediate break point satisfying the requirement of a minimum of two intermediate break points
   EA - Total Additive Stress (sum of Eq. 9 and 10) exceeds allowable value

3. Allowables (Refer to Section 3.6B.2.1.2.1)

   Total Additive Stress (sum of Eq. 9 and 10) $\leq 0.8\ (1.2_H + S_A) = 37{,}800$ psi

4. Blowdown:

   C - Blowdown from containment side
   P - Blowdown from penetration side

5. Restraint Type:

   RB - Rigid Bumper
   LS - Laminated Strap

6. Shield Type:

   FP - Flat Plate
   CP - Curved Plate
   CL - Cylindrical

NOTES TO FIGURES 3.6B-13A AND 3.6B-13B

Line Designation	ASME Code Class	Breaks: Designation	Type(1)	Reason for Postulation(2)	Stress (psi)(3)	Blow-down(4)	Pipe Whip: Restraint Designation	Restraint Type(5)	Jet Impingement: Jet Type	Shield Designation	Shield Type(6)
2-FWS-016-10-4	Non-Nuclear Seismically Supported	2FWS-013-0-C	C	TE	-	C	-	-	Later	Later	Later
						T	-	-	Later	Later	Later
		2FWS-014-0-C	C	IP	26,281	C	-	-	Later	Later	Later
						T	-	-	Later	Later	Later
		2FWS-015-0-C	C	IP	32,202	C	2FWS-PRR846	RB	Later	Later	Later
							2FWS-PRR807	RB			
							2FWS-PRR808	RB			
							2FWS-PRR810	PC			
							2FWS-PRR832	PC			
							2FWS-P[illegible]13	PC			
						T	-	-	Later	Later	Later
2-FWS-016-15-4	Non-Nuclear Seismically Supported	2FWS-016-0-C	C	TE	-	C	-	-	Later	Later	Later
						T	-	-	Later	Later	Later
		2FWS-017-0-C	C	IP	28,653	C	-	-	Later	Later	Later
						T	-	-	Later	Later	Later
		2FWS-018-0-C	C	IP	35,335	C	2FWS-PRR847	RB	Later	Later	Later
							2FWS-PRR816	RB			
							2FWS-PRR819	PC			
							2FWS-PRR820	PC			
						T	-	-	Later	Later	Later
2-FWS-016-20-4	Non-Nuclear Seismically Supported	2FWS-019-0-C	C	TE	-	C	-	-	Later	Later	Later
						T	-	-	Later	Later	Later
		2FWS-020-0-C	C	IP	28,681	C	2FWS-PRR848	RB	Later	Later	Later
							2FWS-PRR826	RB			
							2FWS-PRR829	PC			
							2FWS-PRR830	PC			
						T	-	-	Later	Later	Later
		2FWS-021-0-C	C	IP	36,982	C	2FWS-PRR848	RB	Later	Later	Later
							2FWS-PRR826	RB			
							2FWS-PRR827	RB			
							2FWS-PRR829	PC			
							2FWS-PRR830	PC			
							2FWS-PRR831	PC			
						T	-	-	Later	Later	Later

NOTES TO FIGURES 3.6B-13A AND 3.6B-13B (Cont)

<u>NOTES</u>:

1. Break Type:

   C - Circumferential Break
   L - Longitudinal Break

2. Reason for Postulation:

   TE - Terminal End
   IP - Intermediate break point satisfying the requirement of a minimum of two intermediate break points
   EA - Total Additive Stress (sum of Eq. 9 and 10) exceeds allowable value

3. Allowables (Refer to Section 3.6B.2.1.2.1)

   Total Additive Stress (sum of Eq. 9 and 10) $\leq 0.8\ (1.2_{H} + S_A) = 37{,}800$ psi

4. Blowdown:

   C - Blowdown from containment side
   T - Blowdown from turbine building side

5. Restraint Type:

   RB - Rigid Bumper
   PC - Pipe Crush Bumper

6. Shield Type:

   FP - Flat Plate
   CP - Curved Plate
   CL - Cylindrical

NOTES TO FIGURE 3.6B-14A AND FIGURE 3.6B-14B

		Breaks					Pipe Whip		Jet Impingement		
Line Designation	ASME Code Class	Designation	Type (1)	Reason for Postulation (2)	Stress (psi) (3)	Blow-down (4)	Restraint Designation	Restraint Type (5)	Jet Type	Shield Designation	Shield Type (6)
2-MSS-032-1-4	Non-Nuclear Seismically Supported	2MSS-013-0-C	C	IP	24,211	C	2MSS-PRR830	RB	Later	Later	Later
							2MSS-PRR831	RB			
							2MSS-PRR832	RB			
							2MSS-PRR833	RB			
							2MSS-PRR834	RB			
							2MSS-PRR835	RB			
						T	-	-	Later	Later	Later
		2MSS-014-0-C	C	IP	23,447	C	2MSS-PRR831	RB	Later	Later	Later
							2MSS-PRR832	RB			
							2MSS-PRR833	RB			
							2MSS-PRR834	RB			
							2MSS-PRR835	RB			
							2MSS-PRR836	LS			
						T	2MSS-PRR837	LS	Later	Later	Later
		2MSS-015-0-C	C	TE	-	C	2MSS-PRR837	LS	Later	Later	Later
						T	-	-	Later	Later	Later
2-MSS-032-2-4	Non-Nuclear Seismically Supported	2MSS-016-0-C	C	IP	29,258	C	2MSS-PRR840	RB	Later	Later	Later
							2MSS-PRR841	RB			
							2MSS-PRR842	RB			
							2MSS-PRR843	RB			
							2MSS-PRR844	RB			
							2MSS-PRR845	RB			
						T	-	-	Later	Later	Later
		2MSS-017-0-C	C	IP	31,790	C	2MSS-PRR841	RB	Later	Later	Later
							2MSS-PRR842	RB			
							2MSS-PRR843	RB			
							2MSS-PRR845	RB			
							2MSS-PRR845	RB			
							2MSS-PRR846	LS			
						T	2MSS-PRR-847	LS	Later	Later	Later
		2MSS-018-0-C	C	TE	-	C	2MSS-PRR847	LS	Later	Later	Later
						T	-	-	Later	Later	Later

NOTES TO FIGURE 3.6B-14A AND FIGURE 3.6B-14B (Cont)

		Breaks					Pipe Whip		Jet Impingement		
Line Designation	ASME Code Class	Designation	Type (1)	Reason for Postulation (2)	Stress (psi) (3)	Blowdown (4)	Restraint Designation	Restraint Type (5)	Jet Type	Shield Designation	Shield Type (6)
2-MSS-032-3-4	Non-Nuclear Seismically Supported	2MSS-019-0-C	C	IP	26,322	C	2MSS-PRR850	RB	Later	Later	Later
							2MSS-PRR851	RB			
							2MSS-PRR852	RB			
							2MSS-PRR853	RB			
							2MSS-PRR854	RB			
							2MSS-PRR855	RB			
						T	-	-	Later	Later	Later
		2MSS-020-0-C	C	IP	27,432	C	2MSS-PRR851	RB	Later	Later	Later
							2MSS-PRR852	RB			
							2MSS-PRR853	RB			
							2MSS-PRR854	RB			
							2MSS-PRR855	RB			
							2MSS-PRR856	LS			
						T	2MSS-PRR857	LS	Later	Later	Later
		2MSS-021-0-C	C	TE	-	C	2MSS-PRR857	LS	Later	Later	Later
						T	-	-	Later	Later	Later

NOTES:

1. Break Type:

   C - Circumferential Break
   L - Longitudinal Break

2. Reason for Postulation:

   TE - Terminal End
   IP - Intermediate break point satisfying the requirement of a minimum of two intermediate break locations
   EA - Total Additive Stress (sum of Eq. 9 and 10) exceeds allowable value

3. Allowables (Refer to Section 3.6B.2.1.2.1)

   Total Additive Stress (sum of Eq. 9 and 10) $\leq 0.8\ (1.2_h + S_A) = 37{,}800$ psi

4. Blowdown:

   C - Blowdown from containment side
   T - Blowdown from turbine building side

5. Restraint Type:

   RB - Rigid Bumper
   LS - Laminated Strap

6. Shield Type:

   FP - Flat Plate
   CP - Curved Plate
   CL - Cylindrical

NRC Letter: February 9, 1984

Question 210.31 (Section 3.9.3)

The staff finds that there is insufficient information describing the design of safety-related HVAC ductwork and supports. Provide the design basis used for qualifying the HVAC ductwork and support structural integrity.

Response:

Design of Ducts

Ductwork is not structurally designed, however, it generally follows SMACNA as a design basis. Testing on representative duct spans are being performed to verify the adequacy of the above.

Design of Duct Supports

Seismic duct supports are designed to rigid range criteria which has been verified through on-site testing. A final test report is being developed and will be available with further details by September 1, 1984.

NRC Letter: February 9, 1984

Question 210.32 (Section 3.9.3)

Provide the basis for assuring that ASME Code Class 1, 2, and 3 piping systems are capable of performing their safety function under all plant conditions. Describe the methodology used to assure the functional capability of essential piping systems when service limits C or D are specified.

Response:

ASME III Classes 1, 2 and 3 piping systems are designed for all plant conditions in accordance with the ASME III code requirements as shown in Tables 3.9B-5, 3.9B-8, 3.9B-9, 3.9B-11, and 3.9B-14.

Numerous operating fluid transient events have occurred in operating nuclear power plants (NUREG-0582 and NUREG/CR-2059). Many of these events caused code allowable stresses to be exceeded, and some were severe enough to significantly damage piping and pipe supports. None of these events resulted in a loss of functional capability where the integrity of the pressure boundary was maintained. Other experiences, such as the effects of the 1979 Imperial Valley earthquake on the El Centro Steam Plant (NUREG/CR-1665), which did not cause any loss of functional capability although design to withstand earthquake was minimal and the earthquake was of high intensity, indicate that functional capability is, again, not a practical concern.

The difference between operating experience and academic concern is in part explained by a study of seismic design margins for piping (NUREG/CR-2137) where lower bound margins of 1.4 or greater indicated significant reserve strength when designed to ASME III rules. In addition, stresses are dominated by stress intensification factors which address fatigue strength of local areas, but are not indicative of the general state of stress in the piping system. Although ASME Level D stress limits theoretically permit gross yielding of piping while only protecting the pressure boundary, practical experience indicates otherwise. Failures of the pressure boundary have occurred due to unanticipated loads (e.g., waterhammer, vibration, etc) or corrosion/erosion, but gross yielding of an intact pressure boundary has not led to a loss of functional capability.

The practice of reducing code allowable stresses to preclude theoretical gross yielding for very low probability loads may in fact reduce the overall safety and reliability of the piping system. Lower allowable stresses are achieved by additional pipe supports, and usually snubbers (which reduce dynamic stresses without increasing thermal or deadweight stresses), resulting in a stiffer system with higher stresses during normal plant operation, but theoretically lower stresses for the low probability design events applicable to Level D stress limits which are dynamic in nature. Additional pipe supports, particularly snubbers, and increased piping stiffness are often cited (e.g., NUREG/CR-2136 and S. H. Bush letter to N. J. Palladino of August 20, 1981) as sources of potential failures due to limiting access for maintenance and inservice inspection, difficulty in installation and proper adjustment, and higher stresses during normal plant operation.

The Staff requested additional justification for assuring that functional capability is maintained for piping systems subject to service conditions C and D. Although it is BVPS-2's position that the ASME III code requirements provide inherent conservatism such that functional capability is not a practical concern, an evaluation was performed to further investigate this matter.

The question of functional capability addresses primary loads on piping systems for Level C and D service conditions. A review of the load combinations for the various service conditions is helpful in understanding the BVPS-2 specific situation. For all practical purposes, the difference between Level B and D is the OBE loading versus the SSE loading. The LOCA load in the faulted condition is not considered because DLC has requested an exemption from postulating breaks in the reactor coolant main loop piping. Service Level C includes pipe whip and jet impingement effects which are rarely required to be analyzed due to system redundancy and separation in the plant layout. Therefore, pipe design is governed either by Level B or D for primary loads.

A review of the amplified response spectra (ARS) used for the OBE and SSE indicates additional conservatism in piping design for BVPS-2. The OBE utilizes 1/2-percent damping while the SSE utilizes 1-percent damping, which is certainly conservative with respect to the current Regulatory Guide position. The difference in damping results in a situation in which the OBE tends to govern design (i.e., service Level B stress governs design).

The use of low damping and the fact that the Level B service condition typically governs pipe design for primary loads provides assurance that functional capability is not a practical concern for BVPS-2.

As additional justification for assuring that functional capability is not a practical concern, a sample review of certain critical systems was performed utilizing the functional capability criteria suggested by the NRC Staff during the April 1984 meeting at SWEC. Since the functional capability concern deals primarily with the SSE and accident conditions, those systems most critical to mitigate the consequences of an accident and to reach and maintain a safe shutdown condition were chosen for the review. The sample consisted of all pipe stress problems comprising the low head safety injection and high head safety injection systems inside the reactor containment building.

The details of the review are contained in Attachment Q210.32-A. The results substantiate the assumptions made above regarding the practicality of the matter. In every case, the pipe stress problems passed the functional capability criteria by substantial margins. Since the systems reviewed cover a variety of pipe sizes, these conclusions can also be applied to the balance of Seismic Category I piping. Consequently, no further action on this issue is deemed necessary.

Attachment Q210.32-A

Introduction

For the BVPS-2 project, both the low head safety injection and high head safety injection systems are already designed and/or constructed. The original design basis was to the ASME Section III, 1971 Code, including the Addenda through Winter 1972. This investigation required reevaluation of existing calculated stresses by applying new stress indices and modified allowables.

Criteria

The functional capability criteria deemed acceptable by the NRC Staff and utilized in this investigation consisted of the stress combinations, stress indices, and allowables contained in ASME Section III, 1983 Code for Class 1 and Classes 2/3 Piping. Since the concern is the development of a plastic hinge with a resulting reduction in flow area, the investigation only evaluated the primary stress terms that constitute Equation (9). The limits imposed on stress were the lesser of 1.8 S_y or 2.25 S_m for Class 1 piping, and 1.8 S_y or 2.25 S_h for Class 2/3 Piping.

For elbows, branch connections, and restraint locations on straight pipe, the calculated Level D (faulted condition) stresses were modified by the B indices of Equation (9) and compared to the appropriate functional capability limit.

Results

Of the stress problems reviewed, there were no piping components which failed the functional capability criteria. In fact, substantial margins exist. The high stressed component was only 66 percent of the function cability allowable, and the average was approximately 25 percent of the functional cabability allowable.

NRC Letter: February 9, 1984

Question 210.34 (Section 3.9.3)

The staff review of FSAR Section 3.9B.3.4 and 3.9N.3.4 finds that there is insufficient information regarding the design of component supports. Per SRP Section 3.9.3, our review includes an assessment of design and structural integrity of the supports. The review addresses three types of supports: (1) plate and shell, (2) linear, and (3) component standard types. For each of the above three types of supports, provide the following information (as applicable) for our review.

(a) Describe (for typical support details) which part of the support is designed and constructed as component supports and which part is designed and constructed as building steel (NF vs. AISC jurisdictional boundaries)

(b) Provide the complete basis used for the design and construction of both the component support and the building steel up to the building structure. Include the applicable codes and standards used in the design, procurement, installation, examination, and inspection.

(c) Provide the loads, load combinations, and stress limits used for the component support up to the building structure.

(d) Provide the deformation limits used for the component support.

(e) Describe the buckling criteria used for the design of component support.

Response:

The BVPS-2 is a non-ASME III, NF plant when addressing design and construction of component supports. A very small percentage of components have supports designed and constructed to ASME III, NF requirements, but this is due to the purchase order date for the components. The vast majority of component supports are not designed to ASME III, NF requirements and are not required to be.

The specific responses to the questions are provided in three separate parts. Part 1 addresses Westinghouse supplied component supports, Part 2 addresses SWEC designed/supplied component supports, and Part 3 addresses piping component supports.

Part I - Westinghouse Supplied Component Supports

Westinghouse has supplied supports only for those Class 2 and 3 components also supplied by Westinghouse to which the supports are attached. This equipment is divided into two groups.

NOTE: Response is the same as submitted in Letter 2NRC-4-052 dated May 7, 1984. Tables 3.9B-14 and 3.9B-15 include jet impingement loads.

The first group consists of auxiliary tanks and heat exchangers. The supports for these components are of two types; linear and, for the most part, plate and shell type supports. The supports for the tanks and heat exchangers meet either the requirements of Subsection NF of the ASME Code or the requirements of the AISC Code depending on the procurement date of the component. Components procured prior to the inclusion of Subsection NF into the ASME Code were designed to the AISC Code requirements. A listing of the tanks and heat exchangers and the codes to which the respective supports were designed is available if needed.

The second group consists of Class 2 and 3 auxiliary pumps. The supports for these pumps are plate and shell and, for the most part, linear-type supports. The auxiliary pump supports are designed by the pump manufacturer to pressure boundary stress limits, with the exception of the boric acid transfer pumps, the supports for which are designed to the limits of the AISC Code.

The loads and loading combinations of the supports for the auxiliary equipment supplied by Westinghouse are the same as those of the supported component. These loads and combinations are given in FSAR Table 3.9N-4.

Deformation of the tanks and heat exchangers is accounted for through the use of the stress limits of AISC or ASME, NF. These limits ensure the supports remain elastic, thereby preventing permanent deformation. Additionally, the supports for active pumps must not deform such that specified critical clearances are maintained so that the pump remains operable. These clearances are specified in the pump specification.

Buckling is prevented by limiting compressive stresses for linear-type auxiliary equipment supports under loadings from all service conditions to the limits of AISC Section 1.5 or ASME Appendix XVII-2210. These limits, which are identical, are based on the Column Research Council (CRC) buckling curve for centrally loaded columns. A variable factor of safety, based on column length and section material properties, provides adequate margin to the critical buckling values of the CRC curve. A discussion of the buckling criteria for plate and shell type supports is as follows.

Buckling Criteria for Plate and Shell Type Supports

Plate and shell type supports for Class 2 and 3 auxiliary equipment are evaluated for buckling and instability through selective use of the criteria of Appendix XVII, Subarticle XVII-2200 and Subsection NC, Subparagraph NC-3133.6 of Section III of ASME Code.

Subparagraph NC-3133.6 gives methods for calculating the maximum allowable compressive stress in cylindrical shells subjected to axial and loading that produce longitudinal compression stresses in the shell.

Subarticle XVII-2200 gives requirements for structural steel members including allowable compressive loads based on slenderness ratios and interaction equations for combined stresses.

Use of the above requirements, in addition to those of Subsection NF, in the design of plate and shell type supports for Westinghouse supplied auxiliary equipment, ensures the dimensional stability of the support throughout the range of applied loadings.

In accordance with the request of the MEB staff, a discussion on how allowable buckling stresses are calculated for linear-type supports are included in this response. In addition, FSAR Section 3.9N.3.4, Component Supports, has been revised to reflect the discussion on Class 2 and 3 auxiliary equipment support types and design criteria.

Component Supports (Section 3.9N.3.4)

Westinghouse has supplied supports only for those Class 2 and 3 components also supplied by Westinghouse to which the supports are attached. The loads and loading combinations of the supports are the same as those of the supported component. These loads and combinations are given in FSAR Talbe 3.9N-4.

The Class 2 and 3 auxiliary equipment supplied by Westinghouse is grouped into two general categories. One group consists of tanks and heat exchangers. The other group is auxiliary pumps. Design criteria for the supports for these components are discussed below.

Tanks and Heat Exchangers (Section 3.9N.3.4.1)

The supports for auxiliary tanks and heat exchangers are of two types: linear and, for the most part, plate and shell type supports. The supports meet either the requirements of Subsection NF of the ASME Code or the requirements of the AISC Code, depending on the procurement date of the component. Components procured prior to the inclusion of Subsection NF into the ASME Code were designed to the AISC Code requirements.

Auxiliary Pumps (Section 3.9N.3.4.2)

The supports for Class 2 and 3 auxiliary pumps are plate and shell and, for the most part, linear-type supports. The supports are designed by the pump manufacturer to pressure boundary stress limits, with the exception of the boric acid transfer pumps, the supports for which are designed to the limits of the AISC Code.

Part II - SWEC Supplied/Designed Component Supports

(a) The SWEC supplied component supports are for the most part supplied with its component. Component supports supplied with the equipment are designed and constructed in accordance with AISC Code or ASME III, NF requirements. ASME III components constructed to ASME III, 1971 Edition through Summer 1973 Addenda or earlier have supports designed to AISC. After Summer 1973, supports are in accordance with NF requirements.

The loads, load combinations, and stress limits for the SWEC supplied component supports are identified in Table 3.9B-16, Amendment 7.

All equipment supports are designed to elastic limits. Deformation limits are not used.

AISC jurisdiction is assigned to embedments or building steel to which the supports are attached. The anchorage design criteria is described in the response provided for Question 210.35.

(b) The SWEC designed equipment component supports are designed using AISC Code allowables or the allowables of ASME III, NF as guidance, even though the requirements of ASME III, NF were not mandatory for these supports due to the procurement date of the components.

The loads, load combinations, and stress limits for the primary equipment supports are identified in Table 5.4-21 and the remaining equipment supports in Table 3.9B-16, Amendment 7.

All equipment supports are designed to elastic limits. Deformation limits are not used.

The buckling criteria for the equipment supports are in accordance with the AISC Code.

AISC jurisdiction is assigned to the embedments or building steel to which the supports are attached. The anchorage design is described in the response provided for Question 210.35.

Part III - Piping Component Supports

Except for integral welded attachments defined in Section 3.9B.3.4.2, pipe supports are not designed or constructed to ASME III requirements because their design and procurement proceeded ASME III, NF. Therefore, plate and shell type designations are not applicable.

The response to items (a) through (e) of Question 210.34, as applicable to pipe supports, are:

(1) All pipe supports are designed as described in Tables 3.9B-14 and 3.9B-15, Amendment 7. AISC jurisdiction is assigned to embedments or building steel to which the pipe supports are attached.

(2) Pipe supports meet the criteria of the AISC Code ANSI B31.1 Code and Tables 3.9B-14 and 3.9B-15, Amendment 7. When pipe

supports include integral attachments to pressure retaining boundaries, the integral welded attachments are designed, fabricated, installed, and inspected in accordance with the criteria stated in Section 3.9B.3.4.2.1.

(3) Loads and load combinations used to design pipe supports are described in Tables 3.9B-14 and 3.9B-15, Amendment 7. The allowables are based on the AISC Code. The loads, load combinations and the corresponding allowables for designing integral attachments to the pressure boundary are described in Section 3.9B.3.4.2.1.

(4) All pipe supports are designed to elastic limits. Deformation limits are not used.

(5) Buckling criteria for pipe supports are in accordance with the AISC Code.

Summary

Component supports for BVPS-2 are not designed or constructed to ASME III, NF requirements for the majority of components. SWEC will specifically identify supports designed and constructed to NF requirements in the ASME Code Baseline Document which is due to be issued in June 1984. This ASME Code Baseline Document will be referenced in and become part of the FSAR.

TABLE 3.9B-14

LOAD COMBINATIONS FOR PIPE SUPPORTS EXCEPT QSS, RSS, AND SIS [3,4,5,6]

Plant Operating Condition	Load Combinations	Allowable Tensile Stress [2,7]
Normal/Upset	D + T + R + R" + S[1,8]	0.6 S_y
	D + E + H + T + R + A + W + S [9]	0.8 S_y
Emergency	D + H + Y	0.8 S_y
Faulted	D + E' + H + Y'	0.8 S_y

NOTES:

1. For definition of terms, see Table 3.9B-11.

2. Buckling criterion for pipe supports is in accordance with the AISC Code.

3. Generally, an enveloped design load is used, thus producing a conservative load combination. The above load combination and limits may be used when specific loading methods are needed.

4. Refer to Table 3.9B-15 for allowable tensile stress values for QSS, RSS, and SIS systems.

5. QSS, RSS, and SIS systems correspond to:

   QSS - Quench spray system
   RSS - Recirculation spray system
   SIS - Safety injection system

6. For pipe support designs on instrumentation tubing, thermal loads and seismic loads are evaluated separately if the instrument line is normally dead-ended (i.e., no flow).

7. The above allowables are the basic tensile stress allowables. All other requirements of the AISC Code related to member stresses are satisfied.

8. During containment pressure test, only system thermal conditions that occur during the test need be considered.

9. Wind loads (W) are not considered acting concurrently with OBE inertia effects (E) and OBE anchor movements (A).

TABLE 3.9B-15

LOAD COMBINATIONS FOR PIPE SUPPORTS FOR QSS, RSS, AND SIS (3,4,5)

Plant Operating Condition	Load Combinations	Allowable Tensile (2,6) Stress
Normal/Upset	D + T + R + R" + S(1,7)	0.6 S_y
	D + E + H + T + R + A + W + S(8)	0.8 S_y
Emergency	D + H + Y	0.8 S_y
Faulted	D + E' + H + Y' T + R' + A' + X	0.8 S_y 0.8 S_y

NOTES:

1. For definition of terms, see Table 3.9B-11.

2. Buckling criterion for pipe supports is in accordance with the AISC Code.

3. Generally, an enveloped design load is used, thus producing a conservative load combination. The above load combination and limits may be used when specific loading methods are needed.

4. QSS, RSS, and SIS Systems correspond to:

   QSS - Quench Spray System
   RSS - Recirculation Spray System
   SIS - Safety Injection System

5. For pipe support designs on instrumentation tubing, thermal loads and seismic loads are evaluated separately if the instrument line is normally dead-ended (i.e., no flow).

6. The above allowables are the basic tensile stress allowables. All other requirements of the AISC Code related to member stresses are satisfied.

7. During containment pressure test, only system thermal conditions that occur during the test need be considered.

8. Wind loads (W) are not considered acting concurrently with OBE inertia effects (E) and OBE anchor movements (A).

TABLE 3.9B-16

LOADS, LOAD COMBINATIONS, AND STRESS LIMITS FOR S&W DESIGNED AND SUPPLIED EQUIPMENT SUPPORTS

Plant Design or Operating Condition	Loads and Loading Combinations	Stress Limits	Reference Source
Normal	Deadweight of Component and Supports Temperature Pressure Mechanical (Piping) Loads***	Structural Members Tension and Bending (F_t) = $0.6S_y$ Shear (F_v) = $0.4S_y$ Bolts (Either above or:) Tension (F_t) = Su/2 Shear (F_v) = 0.62Su/3	ASME III Subsection NF Subart: NF-3100 NF-3230 Article XVII-2000 Table NF-3272.1-1 (Above used as a guide)
Upset	Normal and OBE	Same as normal	Same as normal
Emergency	Not applicable*	-	-
Faulted	Normal and SSE	Structural Members Lesser of: $1.2\ (S_y/F_t)$ or $.7\ (S_u/F_t)$** Bolts 0.7 Su/Ft<Sy	ASME III Subsection NF Appendix F Subart: F-1370 (Above used as a guide)

NOTES:
*As stated in Section 3.9B.1-1.
**Used only when faulted stresses exceed normal/upset allowables (conservative).
S_y is specified minimum material yield strength at temperature.
S_u is specified minimum material ultimate strength at temperature.
For bolting materials 0.7 S_u is less than S_y.
***Includes thermal expansion and anchor point motion loads.

QUESTION 210.37

Due to a long history of problems dealing with inoperable and incorrectly installed snubbers, and due to the potential safety significance of failed snubbers in safety-related systems and components, it is requested that maintenance records for snubbers be documented as follows:

Preservice Examination

A preservice examination should be made on all snubbers listed in Tables 3.7-4a and 3.7-4b of Standard Technical Specification 3/4.7.9. This examination should be made after snubber installation, but not more than six months prior to initial system preoperational testing and should, as a minimum, verify the following:

(1) There are no visible signs of damage or impaired operability as a result of storage, handling, or installation.

(2) The snubber location, orientation, position setting, and configuration (attachments, extensions, etc.) are according to design drawings and specifications.

(3) Snubbers are not seized, frozen, or jammed.

(4) Adequate swing clearance is provided to allow snubber movement.

(5) If applicable, fluid is to the recommended level and is not leaking from the snubber system.

(6) Structural connections such as pins, fasteners, and other connecting hardware such as lock nuts, tabs, wire, and cotter pins are installed correctly.

If the period between the initial preservice examination and initial system preoperational test exceeds six months due to unexpected situations, reexamination of Items 1, 4, and 5 shall be performed. Snubbers which are installed incorrectly or otherwise fail to meet the above requirements must be repaired or replaced and reexamined in accordance with the above criterion.

Preoperational Testing

During preoperational testing, snubber thermal movements for systems whose operating temperature exceeds 250°F should be verified as follows:

(a) During initial system heatup and cooldown, at specified temperature intervals for any system which attains operating temperature, verify the snubber expected thermal movement.

(b) For those systems which do not attain operating temperature, verify via observation and/or calculation that the snubber will accommodate the projected thermal movement.

NOTE: This response will be included in Amendment 8.

QUESTION 210.37

Preoperational Testing (Cont'd.)

(c) Verify the snubber swing clearance at specified heatup and cooldown intervals. Any discrepancies or inconsistencies shall be evaluated for cause and corrected prior to proceeding to the next specified intervals.

The above described operability program for snubbers should be included and documented by the Preservice Inspection and Preoperational Test Programs.

The preservice inspection must be a prerequisite for the preoperational testing of snubber thermal motion. This test program should be specified in Chapter 14 of the FSAR.

RESPONSE

A Preservice Inspection Integrated Program for BVPS-2 is being developed for submittal to the NRC in June 1984. This Program identifies the "ASME Section XI Preservice Inspection Plan for Snubbers", including the Preservice Examination and Preoperational Testing of all snubbers except those installed on non-safety related systems for which their failure or failure of the system they are installed would have no adverse effect on any safety-related system.

The Snubber Plan requires "Preservice Examination" of the snubbers no more than six months prior to initial system preoperational testing. As a minimum, the six (6) criteria, as described in the NRC question above, will be used. Manual stroking of the snubbers either in place or detached, will be performed to assure they are not seized, frozen, or jammed (Criterion No. 3) and will be limited to snubber sizes that can be manually handled.

The Snubber Plan will also perform "Preoperational Testing" to verify thermal movements of the snubbers for systems whose operating temperature exceeds 250°F. The criterion "a" through "c", as described in the above NRC question, will be used as a minimum basis for testing. The Preservice Examination will be a prerequisite for the preoperational testing for thermal motion. In the event that the period between initial preservice examination and preoperational testing exceeds 6 months, reexamination under Criterion 1, 4, and 5 of the preservice examination will be performed.

The Snubber Plan is expected to be complete by September 1984 and will be available at the site for review. Per NRC Generic Letter 84-13, dated May 3, 1984, the Technical Specification for snubbers will no longer contain Tables 3.7-4a and 3.7-4b. Therefore, we are taking exception to the NRC reference to these Tables. The Snubber Plan, however, will contain a listing of all the snubbers that will require Preservice Examination and Preoperational Testing. The FSAR will also be revised to include the Preservice Inspection and Testing in Chapter 14. This change will be incorporated in FSAR Amendement No. 8.

Although it is not a ASME Section XI Code requirement, nor a BVPS-2 Licensing Commitment, the Snubber Plan includes preinstallation examination and testing, wherein snubbers received at the site prior to August 1983 will be retested to assure their operability.