BYRON STATION

INDEPENDENT DESIGN REVIEW FOR COMMONWEALTH EDISON COMPANY

INTERIM REPORT

JUNE 1984

BECHTEL POWER CORPORATION

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FOR
COMMONWEALTH EDISON COMPANY

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This report is submitted on behalf of the IDR team by the Level-1 - Internal Review Committee.

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EXECUTIVE SUMMARY

Background

This report provides the status of the review of high and moderate energy line breaks (HELB/MELB) performed under the Independent Design Review (IDR) for the Byron Generating Station, Units 1 and 2, of Commonwealth Edison Company. It supplements the previous report dated May 1984 by extending it in the review area of HELB/MELB design. Other review areas are not covered in this report.

Under the IDR, Bechtel Power Corporation has been reviewing the Sargent and Lundy Engineers (S&L) design of three selected safety systems for adherence to design requirements, for technical adequacy, for adequacy of the design process, and to draw broader conclusions as appropriate. The systems selected for review are the component cooling water (CCW) system, the essential service water (ESW) system and the 125 Volt (V) dc distribution system.

The review effort reported within included two aspects of the Byron design for HELB/MELB:

1) The adequacy of the protection provided the CCW, ESW, and 125 V dc systems against the effects of HELB both inside containment and in the auxiliary building;
2) The adequacy of the protection provided from the effects of MELB involving the reviewed systems both inside containment and in the auxiliary building.

Plans and Activities

The methodology chosen for review of HELB/MELB effects included an initial review of the selected systems for the adequacy of their protection from pipe whip effects inside containment. The results of this initial pipe whip protection review were reported in Appendices A-2 and B-2 of the May 1984 Interim Report. The balance of the program includes completion of the HELB review (pipe whip and jet effects) and the MELB review (spray/flooding) both inside containment and in the auxiliary building.

Results

HELB (Inside Containment)

The HELB review for pipe whip and jet (impingement) effects on the reviewed systems is essentially complete. The review consisted of evaluating whether the CCW or ESW systems represented potential targets from either pipe whip or jet associated with the FSAR Appendix 3.6 identified HELB locations. No deficiencies in pipe whip protection were noted. In the course of the review, 11 instances of potential direct jet impingement were identified. Of these, 10 involve the CCW system and 1 involves the ESW system. All 11 cases were included in a single potential observation which was subsequently forwarded as an Observation Report to S&L for response. This Observation has been responded to by S&L for 10 out of the 11 cases, and the design was found acceptable for all 10 cases. The Observation is still under review for the remaining case, pending receipt of additional information from S&L. Design process adequacy is also still under review.

This Observation is tentatively not regarded as safety significant, subject to receipt of information from S&L on the one remaining case.

HELB (Auxiliary Building)

The postulated HELB break points identified on a specially-designated set of piping layout drawings provided by S&L have been reviewed. For the postulated breaks reviewed, no deficiencies were noted.

MELB (Inside Containment)

The MELB review has identified no adverse condition for the selected safety systems. The review of MELB effects inside containment is continuing.

MELB (Auxiliary Building)

The MELB review has identified no adverse condition for the selected safety systems. The review of MELB effects in the auxiliary building is continuing.

Conclusions

Until the review is complete, only limited conclusions can be drawn. The review effort covered by this report tends to confirm the adequacy of the design for protection of the Byron Station against HELB/MELB effects for the reviewed systems, both inside containment and in the auxiliary building. A possible exception is one situation involving jet impingement. Pending receipt of additional information on this case, it does not as yet appear to have safety significance.

Section 1

INTRODUCTION

1.1 PURPOSE

Commonwealth Edison Company (CECo) has requested Bechtel Power Corporation (BPC) to conduct an independent design review (IDR) of the Byron Station, Units 1 and 2. Review of HELB/MELB considerations in the design of the selected systems was specifically included in Bechtel's IDR scope. The initial portion of this review effort, as completed through May 31, 1984, was described in the Interim Report dated May 1984. This Interim Report describes the additional work performed (through June 22, 1984) beyond that covered in the May 1984 report. The conclusions reached reflect the results of all HELB/MELB review work performed to date. Further work remains to complete this effort. This work will be described in the Final Report.

The review work described herein was performed in accordance with the Program Plan, dated May 1984, including the approved Quality Assurance program. It is intended to help fulfill the stated purpose of that Plan, i.e., to provide an additional level of confidence in the design by Sargent and Lundy Engineers (S&L) of the Byron Station.

1.2 SCOPE

This IDR scope required a review of the following three systems: component cooling water (CCW), essential service water (ESW) and Class 1E 125 V dc distribution. The system boundaries are as generally described in the FSAR. The review includes consideration of instrumentation and electrical components when considered functionally essential. The HELB/MELB review covers that design work done by S&L as supported by certain Westinghouse analyses. The scope of the HELB/MELB review included (also see Table 1):

- A review of the FSAR-identified HELB locations inside containment for potential HELB effects (pipe whip impact or direct jet impingement) on the CCW and ESW systems -- no portion of the Class 1E 125 V dc distribution system is inside containment;
- A similar review of the three reviewed systems in the auxiliary building[1] for the HELB locations identified by S&L on special piping layout drawings;
- A review both inside containment and in the auxiliary building of potential MELB effects (spray/flooding) from other systems on the reviewed systems; and
- A review inside containment and in the auxiliary building of potential MELB effects on other essential systems from the CCW and ESW systems.

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(1) The review outside containment was limited to the auxiliary building as this is the only portion of the plant external to the containment where high energy lines and the selected safety systems occur in the near vicinity of each other. MELB effects were reviewed in the same building.

TABLE 1

APPLICABILITY OF HELB/MELB CONSIDERATIONS

Key

X = Included in Review Scope

NA = Review not Applicable

	HELB		MELB
	Pipe Whip	Jet Effects	Spray/Flooding
Inside Containment:			
CCW	X(1)	X(1)	X(1)
ESW	X(1)	X(1)	X(1)
125 V dc Dist.	NA	NA	NA
Auxiliary Building:			
CCW	X	X	X
ESW	X	X	X
125 V dc Dist.	X	X	X

(1) No essential instrumentation or power supplies for reviewed systems are inside containment relative to HELB/MELB evaluation.

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This scope of work addressed the following functional areas:

- Identification/implementation of commitments and criteria;
- Design adequacy;
- Adequacy of the S&L design process, including evaluations of engineering judgements and assumptions, use of standard design methods and the adequacy of the documentation of design calculations; and
- Review of S&L's interface with Westinghouse.

Specifically excluded from the scope of this review are the following HELB/MELB considerations:

- Review of stress calculations and specific selection criteria that established break locations and type of break (S&L stress analysis is separately evaluated);
- Review of pressure/temperature calculations establishing post-break design conditions since CCW and ESW systems are not high energy systems; and
- Review of design adequacy of structural elements (e.g., walls) for potential whip, jet, or pressure effects since CCW and ESW systems are not high energy systems.

Construction verification is not included in the scope of the IDR.

The IDR essentially covered S&L design work completed through April 1, 1984, but some S&L work in progress after this date was considered and is identified where used.

1.3 DESCRIPTION OF THE REVIEW AND STATUS

The HELB/MELB portion of the IDR was structured to review design requirements, design adequacy and the design process, and then to make an overall assessment based on the review of the three selected safety systems. Major emphasis has been placed on the adequacy of the design of the final product. Consideration will be given to the implications of a discrepancy in one area upon the adequacy of the design in other areas. The initial review of pipe whip effects inside containment was described in the Interim Report dated May 1984. The review process for this subsequent report has been more extensive, completing the pipe whip review as well as covering jet impingement inside containment and assessing the impact of both of these pipe break dynamic effects in the auxiliary building.

The IDR team performed its own analytical review to evaluate the design adequacy. The methodology of the IDR review was consistent with the Byron FSAR commitments. Break locations were determined from S&L documentation and then each break selected for review (based on estimated risk of adverse effects) was evaluated as to whether the selected review systems represented "targets" for the reviewed break, either as a consequence of pipe whip or as a consequence of the associated jet. Generally accepted evaluation principles were then applied and discrepancies noted. Existing barriers and restraints were considered.

The HELB review inside containment was based on the high energy pipe break and restraint locations provided in FSAR Section 3.6. For the inside containment jet effects review, about 30% (140) of these same break locations were examined. The HELB review in the auxiliary building was based upon HELB locations identified by S&L on a special set of pipe break (PB) piping layout drawings, and also utilized, as appropriate, the HELB zones from FSAR Figures Q-10.40-1 through Q-10.40-5.

The MELB review basically entails determining what safety-related electrical components in the reviewed systems may be flooded or impinged by direct water spray from a postulated MELB. A check would then be made to verify that those components found to be flooded or impinged have been qualified for such an event. In the case of MELB effects on the CCW and ESW systems inside containment, this review did not proceed past a determination that no safety-significant electrical components exist in that portion of these selected safety systems. The MELB review inside containment is still in progress. The review in the auxiliary building determined that the dc system was not impacted by any MELB. The remainder of the MELB review in the auxiliary building is still in progress.

The IDR work covered in this report is described in detail in Appendices A, B, C, and D. The basic scope and methodology of program tasks is given in the Program Plan dated April 1984, as are the team organization, stategies employed, and the quality program. The design process evaluation for the HELB/MELB is covered in Appendix D (Common Requirements).

The status of the areas under review, cross-referenced to the Program Plan, is shown in Table 2. Some of the work should be regarded as still in progress. Where work is shown as not included, it is intended that this be performed prior to completion of the IDR.

In summary, the approximate status of the IDR HELB/MELB review is as follows:

- Potential pipe whip effects inside containment - 95% complete.
- Potential pipe whip effects in the auxiliary building - complete.
- Potential jet effects inside containment - 90% complete.
- Potential jet effects in the auxiliary building - complete.
- Moderate energy line break effects for CCW and ESW systems inside containment - 70% complete.
- Moderate energy line break effects for CCW, ESW, and dc systems in the auxiliary building - 35% complete.

TABLE 2

CROSS-REFERENCE BETWEEN ACTIVITIES IN
PROGRAM PLAN AND JUNE INTERIM REPORT

Key

X - Area included in report
O - Area not included in report

Report Section	Program Plan			
	Design Requirement	Design Adequacy	Design Process	General Assessment
Interim Report (text)				X
Appendix A (CCW System)				
A-1	X			
A-2		X		
A-3			O	
A-4			O	
A-5			O	
A-6			O	
Appendix B (ESW System)				
B-1	X			
B-2		X		
B-3			O	
B-4			O	
B-5			O	
B-6			O	
Appendix C (dc System)				
C-1	X			
C-2		X		
C-3			O	
C-4			O	
C-5			O	
C-6			O	
Appendix D (Common Requirements)				
D-1	X			
D-2		X		
D-3			X	
D-4			X	
D-5			O	
D-6			O	

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Section 2

OBSERVATIONS AND RESOLUTIONS

2.1 OBSERVATION REPORTS

The IDR team has issued one Observation Report (OR) for items covered by this report. The OR is summarized below, its significance noted, and a status of resolution described. The OR has been numbered to correspond to the project file system, which begins numbering when a potential Observation is issued.

2.2 COMPONENT COOLING WATER (CCW) SYSTEM

Observation Report 8.24

Observation:

FSAR Section 3.6.1.3 commits to the protection of certain essential systems following any postulated pipe rupture so as to maintain system functionality. Table 3.6-3 identifies the CCW system as one of these essential systems. The Observation Report identified 10 situations where high energy line breaks may result in direct jet impingement on CCW piping inside containment. S&L was requested to provide justification of commitment compliance and design adequacy for the identified conditions.

The Observation is tentatively not considered safety significant based on the likelihood that further analysis may show that the impinged lines would not fail or, if they did, their failure will not affect CCW system functionality.

Resolution:

S&L has partially responded, addressing 9 of the 10 situations identified as involving direct jet impingement on CCW lines. The response clarified the FSAR intent that only certain portions of the CCW system may be required to remain functional depending on the response required for each potential break.

S&L evaluated the resultant sequence of events after each postulated break addressed, and concluded that the affected portion of the CCW system is not essential for the break postulated.

Based on the additional information provided by S&L, the IDR team has evaluated each of the 9 situations and has accepted the basic S&L conclusions that the existing design is adequate for the situations addressed.

This Observation is still under review for the remaining CCW system situation, pending receipt of additional information from S&L and evaluation of the design process.

2.3 ESSENTIAL SERVICE WATER (ESW) SYSTEM

Observation Report 8.24

Observation:

FSAR Section 3.6.1.3 commits to the protection of certain essential systems following any postulated pipe rupture so as to maintain system functionality. Table 3.6-3 identifies the ESW system as one of these essential systems. The Observation Report identified one situation of potential direct jet impingement on ESW piping inside containment from a postulated feedwater line break. S&L was requested to provide justification of commitment compliance and design adequacy for the identified condition.

The Observation is tentatively not regarded as safety significant based on the likelihood that further analysis may show that the impinged line would not fail or, if it did, the likelihood that the specifically affected portion of the ESW system (i.e., containment cooler coil discharge) is not required for a feedwater line break.

Resolution:

S&L has partially responded, addressing the situation identified as involving direct impingement on an ESW line. The response clarified the FSAR intent that only certain portions of the ESW system may be required to remain functional depending on the response required for each potential break.

S&L evaluated the resultant sequence of events after the postulated break addressed, and concluded that the affected portion of the ESW system is not essential for the break postulated.

Based on the additional information provided by S&L, the IDR team has evaluated the situation and has accepted the basic S&L conclusion that the existing design is adequate for the situation addressed.

This Observation is still under review for the remaining CCW system situation, pending receipt of additional information from S&L and evaluation of the design process (see Section 2.2 of this report).

2.4 DC CLASS 1E DISTRIBUTION SYSTEM

No Observation Reports for items resulting from consideration of HELB/MELB effects on the dc system have been issued.

2.5 COMMON REQUIREMENTS

No Observation Reports for items resulting from consideration of common requirements for HELB/MELB effects on the systems in the IDR scope have been issued.

2.6 GENERAL ASSESSMENTS

Due to the incomplete status of the HELB/MELB review, and of resolution of the single Observation Report generated to date, it is premature to

draw general observations or conclusions at this time. However, based on the review performed thus far, this evaluation has identified no significant deficiencies regarding conformance to licensing commitments/ design requirements. Similarly, in the area of design adequacy, the review of protection provided the selected systems against pipe whip both inside containment and in the auxiliary building as well as that for jet effects outside containment have identified no deficiencies. Inside containment, however, the single situation in OR 8.24 resulting from the review of HELB-associated jet effects on the CCW and ESW systems is still under review. As a result, no conclusions can yet be drawn as to whether there is a discrepancy here and, if so, what the significance may be. Nevertheless, results covered by this report tend to confirm the general design adequacy of the HELB/MELB design of the reviewed systems of the Byron Station based on work to date.

Conclusions relative to the adequacy of the overall design process will be drawn in the Final Report, when it is possible to assess the process on the basis of the total review.

APPENDIX A

COMPONENT COOLING WATER (CCW) SYSTEM

APPENDIX A-1

IDENTIFICATION/IMPLEMENTATION OF COMMITMENTS AND CRITERIA

Plant Design

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB Inside Containment - Pipe Whip			
Essential systems must be protected from pipe whip associated with high energy line break (HELB) at possible break locations (FSAR 3.6)*	S&L "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria" 9/26/75 S&L "Jet Impingement Summary Documentation Report" Byron/Braidwood Report BB-J1-01, Rev. 0, 3/9/84 S&L "Verification of High Energy Line Break Design Approach for Jet Impingement Effects on Safe Shutdown Equipment" Calc. No. 3C8-1033-001, Rev. 1, 3/23/84 S&L Project Instruction PI-BB-38, Rev. 0, "Pipe Whip Restraint Analysis, Design, and Review" Westinghouse (W) Standard Information Package (SIP)/10-1, Section 3-1 "Protection and Separation of Safety Class Equipment" dated 3/78 W Systems Standard 1.12 "System Standard Design Criteria-NSSS Layout Guidelines" dated 10/19/71 W Systems Standard STD-DES-4L-RFS-4L21 "NSSS Piping Layout Criteria for Standard Four Loop Plants" dated 3/71	X	

* The Byron FSAR commitment is to full complaince with the Giambuso letter of 12/72 and also to compliance to the extent possible and practical with the O'Leary letter of 7/73 and the subsequent Branch Technical Positions APCSB 3-1 and MEB 3-1 as to the degree of protection afforded, the various acceptable means of protection and the mechanism of calculation of potential effects (FSAR 3.6.1.1.2).

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Plant Design (Cont)

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB Inside Containment- Jet Impingement			
Essential systems are designed to remain functional against the effects of postulated ruptures in high energy lines resulting in jet impingement, etc. (Note: FSAR Table 3.6-3 identifies the CCWS as an essential system.	Out of the over 140 cases of high energy jets examined, 10 cases have been found where significant high energy jets appear to directly impact on CCW system lines inside containment. These jets may result in CCW pipe rupture. The specific high energy line ruptures and impacted CCW lines are identified in Appendix A-2. An Observation Report has been issued.		X

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Plant Design (Cont)

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB/MELB Outside Containment			
Essential systems must be protected from piping failures associated with high and moderate energy line breaks (HELB/MELB) at possible break locations (FSAR 3.6)	S&L "Survey of Aux. Building High Energy Line Breaks", Calc. No. 3C8-1181-001, Rev. 0, 12/21/81 Westinghouse (W) Standard Information Package (SIP)/10-1, Section 3-1 "Protection & Separation of Safety Class Equipment" dated 3/78 W Systems Standard 1.12 "System Standard Design Criteria-NSSS Layout Guidelines" dated 10/19/71 W Systems Standard STD-DES-4L-RFS-4L21 "NSSS Piping Layout Criteria for Standard Four Loop Plants" dated 3/71 S&L "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria" 9/26/75 S&L "Jet Impingement Summary Documentation Report" Byron/Braidwood Report BB-J1-01, Rev. 0, 3/9/84 S&L "Verification of High Energy Line Break Design Approach for Jet Impingement Effects on Safe Shutdown Equipment." Calc. No. 3C8-1083-001, Rev. 1, 3/23/84 S&L Project Instruction PI-BB-38, Rev. 0, "Pipe Whip Restraint Analysis, Design and Review"	X	

APPENDIX A-2

DESIGN ADEQUACY

Plant Design

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Inside Containment - Pipe Whip				
M-158 Sh. 2 of 2, Rev. K Line No.				
1 CC 54BB-4"	Line not damaged	Reviewed high energy line 1SIQ5DD-6" for pipe whip impact effects on CCW system and found that, if break occurs, pipe will not impact any CCW line.	X	
M-165 Sh. 1 of 2, Rev.L Line No.				
1 CC 50AA-3" 1 CC 38FA-3"	Lines not damaged	Reviewed high energy lines 1SI09AA-10" and 1SI05DA-6" for pipe whip effects on CCW system. FSAR Figure 3.6-39 shows no postulated breaks in close proximity that will cause pipe whip damage to CCW system.	X	
M-168 Sh 1 of 2, Rev. L Line No.				
1 CC 05C-3" 1 CC 38C-6" 1 CC 50AD-3"	Lines not damaged	Reviewed high energy line 1SI09BD-10" for pipe whip effects on CCW system. FSAR Figure 3.6-42 shows no postulated breaks in close proximity that will cause pipe whip damage to CCW system.	X	

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Inside Containment - Pipe Whip (Cont) M156 Sh 2 of 2, Rev. J Line No.				
1 CC 39CB-2"	Line not damaged	Reviewed high energy line 1RC21AB-8" for pipe whip effects on CCW system. FSAR Figure 3.6-34 shows break and restraint locations evaluated.		

Bk. No.	Code*	
B4	B (R-4)	X
B5	B (R-6)	X
B6	B (R-4)	X

*Codes for Review of Documents (Pipe Whip Only)

A. Pipe whip poses no danger (i.e., whips in safe direction, protected by barrier)
B. Pipe whip restraint No. ( ) required to protect essential system
C. System could be damaged by high energy pipe due to lack of existing restraint

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Inside Containment - Pipe Whip (Cont)				
M-167 Sh 1 of 2, Rev. P Line No.				
1 CC 38FC-3" 1 CC 38D-4" 1 CC 508-4"	Lines not damaged	Reviewed high energy line 1SI09AC-10" for pipe whip impact effects on CCW system. FSAR Figure 3.6-41 shows break and restraint locations evaluated. Bk. No. — Code B540A — B (R540B) B540B — B (R555B) Reverse blowdown from the RCS does not occur because of closed check valve.	X X	
M-166 Sh 1 of 2, Rev. K Line No.				
1 CC 38FB-3" 1 CC 50AB-3"	Lines not damaged	Reviewed high energy line 1SI09BB-10" for pipe whip effects on CCW system. FSAR Figure 3.6-40 shows no postulated breaks in close proximity that will cause pipe whip damage to CCW system.	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement	Does not affect any essential portion of CCW system	Reviewed each break location on high energy lines inside containment for jet impingement effects on CCW system piping.		

1. High Energy Line: 1FW03DA-16" (Main Feedwater)
   References: FSAR Figure 3.6-25
   M-155, Sh. 1, Rev. L; Sh. 2, Rev. J
   M-161, Sh. 1, Rev. L; Sh. 2, Rev. L

Bk. No.	Dwgs Reviewed	Code(1)	Target	
B80	M-155 Sh. 1 & 2	D	None	X
B65B	M-155 Sh. 1 & 2	D	None	X
B65A	M-155 Sh. 1 & 2	D	None	X
* B40	M-161 Sh. 1 & 2	E	1CC39CA-2"	X
B20B	M-161 Sh. 1 & 2	D	None	X
B20A	M-161 Sh. 1 & 2	D	None	X
B5A	M-161 Sh. 1 & 2	D	None	X

(1) Codes Representing Summary of Review (Jet Impingement Only):

D. The zone of influence is not nearby to any CCW line
E. Pipe break causes direct jet impingement on CCW line(s).
F. CCW line(s) in vicinity has larger diameter
* Break location recently eliminated

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		2. High Energy Line: 1FW03DB-16" (Main Feedwater) References: FSAR Figure 3.6-26 M-156, Sh. 1, Rev. K; Sh. 2, Rev. J M-162, Sh. 1, Rev. L		

	Bk. No.	Dwgs Reviewed	Code	Target	
	B100	M-156 Sh. 1 & 2	D	None	X
	B85B	M-156 Sh. 1 & 2	D	None	X
	B85A	M-156 Sh. 1 & 2	E	1CC54AB-2"	X
*	B55A	M-162 Sh. 1 & 2	D	None	X
	B30B	M-162 Sh. 1 & 2	D	None	X
	B30A	M-162 Sh. 1 & 2	D	None	X
	B5A	M-162 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Inside Containment - Jet Impingement (Cont)		3. High Energy Line: 1FW03DC-16" (Main Feedwater) References: FSAR Figure 3.6-27 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-163 Sh. 1, Rev. N M-157 Sh. 1, Rev. N; Sh. 2, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target		
B5	M-156 Sh. 1 & 2	D	None	X	
B40A	M-157 Sh. 1 & 2 M-156 Sh. 1 & 2	E	1CC54AB-2"		X
B40B	M-157 Sh. 1 & 2 M-156 Sh. 1 & 2	D	None	X	
* B80A	M-163 Sh. 1 & 2	D	None	X	
* B80B	M-163 Sh. 1 & 2	E	1CC39CC-2"	X	
B110A	M-163 Sh. 1 & 2	E	1CC53AC-3/4"	X	
			1CC38FC-3"	X	
			1CC39BC-2"	X	
			1CC39AC-6"	X	
			1CC50AC-3"	X	
B115	M-163 Sh. 1 & 2	D	None	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		4. High Energy Line: 1FW03DD-16"(Main Feedwater) References: FSAR Figure 3.6-28 M-155 Sh. 1, Rev. L; Sh. 2, Rev. J M-158 Sh. 1, Rev. M; Sh. 2, Rev. K M-161 Sh. 1, Rev. L M-164 Sh. 1, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target	
B5	M-155 Sh. 1 & 2	D	None	X
B35A	M-158 Sh. 1 & 2	E	1CC54AA-2"	X
B35B	M-155 Sh. 1 & 2	E	1CC54BA-4"	X
B80A	M-164 Sh. 1	D	None	X
B95A	M-164 Sh. 1	D	None	X
B95B	M-164 Sh. 1	D	None	X
B110A	M-164 Sh. 1	D	None	X
B110B	M-164 Sh. 1	D	None	X
B110	M-164 Sh. 1	D	None	X

5. High Energy Line: 1FW87CA-6" (Aux. Feedwater)
References: FSAR Figure 3.6-28a
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J

Bk. No.	Dwgs. Reviewed	Code	Target	
B155	M-155 Sh. 1 & 2	D	None	X
B120B	M-155 Sh. 1 & 2	D	None	X
B120A	M-155 Sh. 1 & 2	D	None	X
B5B	Above Elev. 412'	D	None	X
B5A	Above Elev. 412'	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		6. High Energy Line: 1FW87CB-6" (Aux. Feedwater) References: FSAR Figure 3.6-28b M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-162 Sh. 2, Rev. L M-166 Sh. 1, rev. K.		

Bk. No.	Dwgs Reviewed	Code	Target	
B155	M-156 Sh. 1 & 2	D	None	X
B10B	M-156 Sh. 1 M-162 Sh. 1 M-166 Sh. 1	D	None	X
B10A	M-156 Sh. 1 M-162 Sh. 1 M-166 Sh. 1	D	None	X
B5B	M-156 Sh. 1 M-162 Sh. 1 M-166 Sh. 1	D	None	X
B5A	M-156 Sh. 1 M-162 Sh. 1 M-166 Sh. 1	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Inside Containment - Jet Impingement (Cont)		7. High Energy Line: 1FW87CC-6" (Aux. Feedwater) References: FSAR Figure 3.6-28c M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-162 Sh. 1, Rev. L M-166 Sh. 1, Rev. K M-167 Sh. 1, Rev. P		

Bk. No.	Dwgs Reviewed	Code	Target	
B185	M-156 Sh. 1 & 2	D	None	X
B10B	M-162, M-166, M-167 (All Sheet 1)	D	None	X
B10A	M-162, M-166, M-167 (All Sheet 1)	D	None	X
B5B	M-162, M-166, M-167 (All Sheet 1)	D	None	X
B5A	M-162, M-166, M-167 (All Sheet 1)	D	None	X

8. High Energy Line: 1FW87CD-6" (Aux. Feedwater)
References: FSAR Figure 3.6-28d
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J.
M-161 Sh. 1, Rev. L

Bk. No.	Dwgs Reviewed	Code	Target	
B150	M-155 Sh. 1 & 2	D	None	X
B120B	M-155 Sh. 1 & 2	D	None	X
B120A	M-155 Sh. 1 & 2	D	None	X
B110B	M-161 Sh. 1	D	None	X
B110A	M-161 Sh. 1	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		9. High Energy Line: 1MS01AA-30.25" (Main Steam Line A) References: FSAR Figure 3.6-29 M-155 Sh. 1, Rev. L; Sh. 2, Rev. K		

Bk. No.	Dwgs Reviewed	Code	Target	
C8A	M-155 Sh. 1 & 2	D	None	X
C8	M-155 Sh. 1 & 2	D	None	X
C7	M-155 Sh. 1 & 2	D	None	X
C4	Above Elev. 440'	D	None	X
C3	Above Elev. 440'	D	None	X
C2	Above Elev. 440'	D	None	X
C1	Above Elev. 440'	D	None	X

10. High Energy Line: 1MS01AB-30.25" (Main Steam Line B)
References: FSAR Figure 3.6-30
M-156 Sh. 1; Rev. K; Sh. 2, Rev. J.

Bk. No.	Dwgs Reviewed	Code	Target	
C24	M156 Sh. 1 & 2	D	None	X
C23	M156 Sh. 1 & 2	D	None	X
C20	Above Elev. 440'	D	None	X
C19	Above Elev. 440'	D	None	X
C18	Above Elev. 440'	D	None	X
C17	Above Elev. 440'	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		11. High Energy Line: 1MS01AC-30.25" (Main Steam Line C) References: FSAR Figure 3.6-31 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J.		

Bk. No.	Dwgs Reviewed	Code	Target	
C32A	M-156 Sh. 1 & 2	D	None	X
C32	M-156 Sh. 1 & 2	D	None	X
C31	M-156 Sh. 1 & 2	D	None	X
C28	Above Elev. 440'	D	None	X
C27	Above Elev. 440'	D	None	X
C25X	Above Elev. 440'	D	None	X
C25	Above Elev. 440'	D	None	X

12. High Energy Line: 1MS01AD-30.25" (Main Steam Line D)
References: FSAR Figure 3.6-32
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J

Bk. No.	Dwgs Reviewed	Code	Target	
C16A	M-155 Sh. 1 & 2	D	None	X
C16	M-155 Sh. 1 & 2	D	None	X
C15	M-155 Sh. 1 & 2	D	None	X
C12	Above Elev. 440'	D	None	X
C11	Above Elev. 440'	D	None	X
C9X	Above Elev. 440'	D	None	X
C9	Above Elev. 440'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		13. High Energy Line: 1RC21BA-8", 1RC21AA-8" (Reactor Coolant Bypass) References: FSAR Figure 3.6-33 M-155 Sh. 1, Rev. L; Sh. 2, Rev. J.		

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-155 Sh. 1 & 2	D	None	X
B2	M-155 Sh. 1 & 2	D	None	X
B3	M-155 Sh. 1 & 2	D	None	X
B4	M-155 Sh. 1 & 2	D	None	X
B5	M-155 Sh. 1 & 2	D	None	X
B6	M-155 Sh. 1 & 2	D	None	X

14. High Energy Line: 1RC21BB-8", 1RC21AB-8" (Reactor Coolant Bypass)
References: FSAR Figure 3.6-34
M-156 Sh. 1, Rev. K; Sh. 2, Rev. J

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-156 Sh. 1 & 2	D	None	X
B2	M-156 Sh. 1 & 2	D	None	X
B3	M-156 Sh. 1 & 2	D	None	X
B4	M-156 Sh. 1 & 2	D	None	X
B5	M-156 Sh. 1 & 2	D	None	X
B6	M-156 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		15. High Energy Line: 1RC21AC-8", 1RC21BC-8" (Reactor Coolant Bypass) References: FSAR Figure 3.6-35 M-157 Sh. 1, Rev. N; Sh. 2, Rev. L.		

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-157 Sh. 1 & 2	D	None	X
B2	M-157 Sh. 1 & 2	D	None	X
B3	M-157 Sh. 1 & 2	D	None	X
B4	M-157 Sh. 1 & 2	D	None	X
B5	M-157 Sh. 1 & 2	D	None	X
B6	M-157 Sh. 1 & 2	D	None	X

16. High Energy Line: 1RC21AD-8", 1RC21BD-8" (Reactor Coolant Bypass)
References: FSAR Figure 3.6-36
M-157 Sh. 1, Rev. N; Sh. 2, Rev. L

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-157 Sh. 1 & 2	D	None	X
B2	M-157 Sh. 1 & 2	D	None	X
B3	M-157 Sh. 1 & 2	D	None	X
B4	M-157 Sh. 1 & 2	D	None	X
B5	M-157 Sh. 1 & 2	D	None	X
B6	M-157 Sh. 1 & 2	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		17. High Energy Line: 1RC29AA-10", 1SI05DA-6", 1SI09BA-6" 1SI47AA-2" (Safety Injection)		

References: FSAR Figure 3.6-39
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J
M-161 Sh. 1, Rev. L
M-165 Sh. 1, Rev. L; Sh. 2, Rev. K

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-155 Sh. 1 & 2	D	None	X
B15	M-155 Sh. 1 & 2	E	1CC39CA-2"	X
B30	M-155 Sh. 1 & 2	D	None	X
B70A	M-165 Sh. 1 & 2	D	None	X
B70B	M-165 Sh. 1 & 2	D	None	X
B110	Above Elev. 412'	D	None	X
B183	M-165 Sh. 1 & 2	E	1CC50AA-3"	X
B175B	M-165 Sh. 1 & 2	D	None	X
B175A	M-165 Sh. 1 & 2	D	None	X
* B103	M-165 Sh. 1 & 2	F	1CC38D-4"	X
			1CC50C-6"	X
			1CC50B-4"	X
B179	M-165 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		18. High Energy Line: 1RC29AB-10", 1SI09BB-10", 1SI47AB-2", 1SI05DB-6", (Safety Injection) References: FSAR Figure 3.6-40 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-166 Sh. 1, Rev. K		

Bk. No.	Dwgs Reviewed	Code	Target	
B5	M-156 Sh. 1 & 2	D	None	X
B160A	M-156 Sh. 1 & 2	D	None	X
B160B	M-156 Sh. 1 & 2	D	None	X
B35	M-156 Sh. 1 & 2	D	None	X
B275	M-166 Sh. 1	D	None	X
B115	Above Elev. 412'	D	None	X
B108	M-166 Sh. 1	F	1CC50B-4"	X
			1CC38D-4"	X

19. High Energy Line: 1RC29AC-10", 1SI05DC-6", 1SI09BC-10", 1SI47AC-2" (Safety Injection)

References: FSAR Figure 3.6-41
M-157 Sh. 1, Rev. N; Sh. 2, Rev. L
M-167 Sh. 1, Rev. P

Bk. No.	Dwgs Reviewed	Code	Target	
B468	M-157 Sh. 1 & 2	D	None	X
B495	M-157 Sh. 1 & 2	D	None	X
B465A&B	M-157 Sh. 1 & 2	D	None	X
B580	M-157 Sh. 1	F	1CC54AB-4"	X
B540B	M-167 Sh. 1	D	None	X
B540A	M-167 Sh. 1	D	None	X
B564	M-167 Sh. 1	F	1CC50B-4"	X
			1CC38D-4"	X
			1CC05C-3"	X
			1CC03E-3"	X
B570	Above Elev. 412'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
CCW System Inside Containment - Jet Impingement (Cont)		20. High Energy Line: 1RC29AD-10", 1SI05DD-6", 1SI09BD-10" 1SI47AC-2" (Safety Injection)		

References: FSAR Figure 3.6-42
M-158 Sh. 1, Rev. M; Sh. 2, Rev. K
M-168 Sh. 1, Rev. L
M-194 Rev. B

Bk. No.	Dwgs Reviewed	Code	Target	
B625	M-158 Sh. 1 & 2	D	None	X
B655	M-158 Sh. 1 & 2	D	None	X
B560B	M-158 Sh. 1 & 2	E	1CC54BB-4"	X
			1CCEIA-3"	X
B560A	M-158 Sh. 1 & 2	D	None	X
B750B	M-194 Rev. B	D	None	X
B728	M-168 Sh. 1	D	None	X
B740	Above Elev. 412'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip and Jet Impingement				
PB-233-1, Rev. N* Line No.				
0 CC 29B-1-1/2" 0 CC 27B-1-1/2"	Lines not damaged	Reviewed postulated HELB locations and found no effects on CCW system piping	X	
PB-239-1 Rev. S PB-239-2 Rev. E M-308 Sh. 1, Rev. M Line No.				
1 CC 07AA-6" 1 CC 06DA-6" 1 CC 06C-3" 1 CC 07B-3" 1 CC 07AB-6" 1 CC 48AB-3/4"	Lines not damaged	Reviewed postulated HELB locations A114, A115, A116, A123, A129, A130, A131, A132 and found no effects on CCW system piping	X	

* All "PB" drawings were transmitted under cover of S&L letter dated 6/6/84

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip and Jet Impingement (Cont)				
PB-242-1, Rev. M M-304 Sh. 1, Rev. M M-345 Sh. 1, Rev. N Line No.				
1 CC 05E-8" 1 CC 03C-8" 1 CC 05D-3" 1 CC 54F-4"	Lines not damaged	Reviewed postulated HELB location A133 and found no effects on CCW system piping	X	
PB-241-2 Rev. D				
No CCW piping on this drawing			X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip and Jet Impingement (Cont)				
PB-243-4, Rev. E PB-243-6, Rev. E M-311 Sh. 1, Rev. R M-345 Sh. 1, Rev. N Line No.				
1 CC 06DA-6" 1 CC 07AA-6" 1 CC 38A-6" 1 CC 03E-3" 1 CC 05BA-3" 1 CC J4A-3/4" 1 CC 85A-3/4" 1 CC 66AA-1/2" 1 CC 66CA-1/2"	Lines not damaged	Reviewed postulated HELB locations A103, A104, A105, A141 and A142 and found no effects on CCW system piping	X	
PB-263-1 Rev. H				
No CCW piping on this drawing			X	
PB-361-1, Rev. K				
No CCW piping on this drawing			X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip and Jet Impingement (Cont)				
PB-244-2, Rev E				
No CCW piping on this drawing			X	
M-249 Sh. 1, Rev. N M-321 Sh. 1, Rev. K				
No CCW piping on these drawings			X	
PB-255-1, Rev. R Line No.	Lines not damaged	Reviewed postulated HELB location A006 and found no effects on CCW system piping	X	
1 CC 09A-1"				
2 CC 09A-1"				
1 CC 08AA-1"				
1 CC 08AB-1"				
1 CC 08AC-1"				
1 CC 08B-2"				
1 CC 045B-1"				
1 CC 06B-1"				
2 CC 06EC-1"				
1 CC 045A-3/4"				
1 CC 06EA-1"				
1 CC 06EB-1"				

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-M-210-2, Rev. H M-329, Sh 1, Rev. L M-335, Sh 1, Rev. K Line No.				
1 CC 33A-6" 2 CC 33A-6" 1 CC 31B-8" 2 CC 31B-8" 1 CC 35B-8" 2 CC 35B-8" 1 CC D7A-4" 2 CC D7A-4" 1 CC 35A-6" ---------- 1 CC 36A-4" 2 CC 36A-4" 1 CC 32A-2" 2 CC 32A-2" 1 CC 37A-2" 2 CC 37A-2"	Lines not damaged	Reviewed postulated HELB locations A001, A002, A003, A004, & A005 and found no effects on CCW system piping.	X	
1 CC 34AA-3/4" 2 CC 34AA-3/4" 1 CC 34AB-3/4" 2 CC 34AB-3/4" 1 CC 34AC-3/4" 2 CC 34AC-3/4" 1 CC 34B-3/4" 2 CC 34B-3/4"				

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-213-1, Rev. N				
No CCW lines on this drawing			X	
M-224-1, Rev. R Line No.				
1 CC 22A-2" 1 CC 20A-2" 1 CC 17A-3" 2 CC 20A-2" 2 CC 22A-2" 2 CC 17A-3" 2 CC 19AA-3/4"	Line not damaged	Reviewed postulated HELB location A107 and found no effects on CCW system piping.	X	
(Note: While other CCW lines are shown on this drawing, they are all located outside of the positive displacement charging pump room.)				

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-225-1, Rev. R				
No CCW lines on this drawing in the centrifugal charging pump room.			X	
PB-227-1, Rev. M				
No CCW lines on this drawing			X	
PB-M-228-2, Rev. M M-342, Sh. 1, Rev. P M-309, Sh. 1, Rev. P M-228, Sh. 1, Rev. S Line No.				
1 CC 08B-2" 1 CC 13AA-4" 1 CC 13AB-4" 2 CC 13AA-4" 2 CC 13AB-4"	Lines not damaged	Reviewed postulated HELB locationa A148 & A149 and found no effects on CCW system piping.	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
CCW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-229-1, Rev. R PB-229-2, Rev. K PB-229-5, Rev. E M-309, Sh. 1, Rev. P M-342, Sh. 1, Rev P Line No.				
1 CC 13AA-4" 1 CC 13AB-4" 1 CC 59A-16" 1 CC 03A-16" 1 CC 08B-2" 1 CC 05G-16" 1 CC 03B-12" 1 CC 05H-10"	Lines not damaged	Reviewed postulated HELB locations A100 & A102 (PB-229-2) and found no effects on CCW system piping Reviewed postulated HELB locations A109 & A136 (PB-229-1) and found no effects on CCW system piping Reviewed postulated HELB locations A111 & A147 and found no effects on CCW system piping	X	
PB-231-1, Rev. M M-343, Sh. 1, Rev N				
No CCW lines on this drawing				X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
MELB inside Containment	Essential systems remain functional from the effects of MELB on and by CCW system.	IDR team performed analysis using P&ID M-66 sheets 1, 2, 3, & 4 (Revs. AA, W, Z & AE, respectively) and pertinent piping drawings.	X	
	Does not affect any essential portion of CCW system.	The essential components of the CCW system inside containment consist only of the piping pressure boundary. The MELB effects on the CCW piping by other system moderate energy cracks is nil, because the crack's environmental effects, spray and flooding could not damage the CCW piping. The MELB effects by the CCW system on itself are accounted for by various low flow alarms and low surge tank level alarm and CCW pump trip.	X	

APPENDIX B

ESSENTIAL SERVICE WATER (ESW) SYSTEM

APPENDIX B-1

IDENTIFICATION/IMPLEMENTATION OF COMMITMENTS AND CRITERIA

Plant Design

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB Inside Containment - Pipe Whip			
Essential systems must be protected from pipe whip associated with high energy line break (HELB) at possible break locations (FSAR 3.6)*	S&L "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria" 9/26/75 S&L "Jet Impingement Summary Documentation Report" Byron/Braidwood Report BB-J1-01, Rev. 0 3/9/84 S&L "Verification of High Energy Line Break Design Approach for Jet Impingement Effects on Safe Shutdown Equipment" Calc. No. 3C8-1083-001, Rev. 1, 3/23/84 S&L Project Instruction PI-BB-38, Rev. 0, "Pipe Whip Restraint Analysis, Design, and Review" Westinghouse (W) Standard Information Package (SIP)/10-1, Section 3-1 "Protection and Separation of Safety Class Equipment" dated 3/78 W Systems Standard 1.12 "System Standard Design Criteria-NSSS Layout Guidelines" dated 10/19/71 W Systems Standard STD-DES-4L-RFS-4L21 "NSSS Piping Layout Criteria for Standard Four Loop Plants" dated 3/71	X	

* The Byron FSAR commitment is to full complaince with the Giambuso letter of 12/72 and also to compliance to the extent possible and practical with the O'Leary letter of 7/73 and the subsequent Branch Technical Positions APCSB 3-1 and MEB 3-1 as to the degree of protection afforded, the various acceptable means of protection and the mechanism of calculation of potential effects (FSAR 3.6.1.1.2).

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Plant Design (Cont)

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB Inside Containment - Jet Impingment			
Essential systems are designed to remain functional against the effects of postulated rupture in high energy etc. Note: FSAR Table 3.6-3 identifies the ESWS as an essential system.	Out of the over 140 cases of high energy jets examined, 1 case has been found where a significant high energy jet appears to directly impact on ESW system lines inside containment. This jet may result in an ESW pipe rupture. The specific high energy line rupture and impacted ESW line are identified in Appendix B-2. An Observation Report has been issued.		X

Plant Design (Cont)

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB/MELB Outside Containment			
Essential systems must be protected from piping failures associated with high and moderate energy line breaks (HELB/MELB) at possible break locations (FSAR 3.6)	S&L "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria" 9/26/75	X	
	S&L "Jet Impingement Summary Documentation Report" Byron/Braidwood Report BB-J1-01, Rev. 0, 3/9/84		
	S&L "Verification of High Energy Line Break Design Approach for Jet Impingement Effects on Safe Shutdown Equipment" Calc. No. 3C8-1083-001, Rev. 1, 3/23/84		
	S&L "Survey of Aux. Building High Energy Line Breaks" Calc. No. 3C8-1181-001, Rev. 0, 12/21/81		
	S&L Project Instruction PI-BB-38, Rev. 0, "Pipe Whip Restraint Analysis, Design, and Review"		
	Westinghouse (W) Standard Information Package (SIP)/10-1, Section 3-1 "Protection and Separation of Safety Class Equipment" dated 3/78		
	W Systems Standard 1.12 "System Standard Design Criteria-NSSS Layout Guidelines" dated 10/19/71		
	W Systems Standard STD-DES-4L-RFS-4L21 "NSSS Piping Layout Criteria for Standard Four Loop Plants" dated 3/71		

APPENDIX B-2

DESIGN ADEQUACY

Plant Design

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement	Does not affect any essential portion of ESW system	Reviewed each break location on high energy lines inside containment for jet impingement effects on ESW system piping		

1. High Energy Line: 1FW03DA-16" (Main Feedwater)
   References: FSAR Figure 3.6-25
   M-155, Sh. 1, Rev. L; Sh. 2, Rev. J
   M-161, Sh. 1, Rev. L; Sh. 2, Rev. L

Bk. No.	Dwgs Reviewed	Code(1)	Target	
B80	M-155 Sh. 1 & 2	D	None	X
B65B	M-155 Sh. 1 & 2	D	None	X
B65A	M-155 Sh. 1 & 2	D	None	X
* B40	M-161 Sh. 1 & 2	D	None	X
B20B	M-161 Sh. 1 & 2	D	None	X
B20A	M-161 Sh. 1 & 2	D	None	X
B5A	M-161 Sh. 1 & 2	D	None	X

(1)Codes Representing Summary of Review (Jet Impingement Only):

D. The zone of influence is not nearby to any ESW line
E. Pipe break causes direct jet impingement on ESW line(s).
F. ESW line(s) in vicinity has larger diameter
* Break location recently eliminated

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Inside Containment - Jet Impingement (Cont)		2. High Energy Line: 1FW03DB-16" (Main Feedwater) References: FSAR Figure 3.6-26 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-162 Sh. 1, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target	
B100	M-156 Sh. 1 & 2	D	None	X
B85B	M-156 Sh. 1 & 2	D	None	X
B85A	M-156 Sh. 1 & 2	D	None	X
* B55A	M-162 Sh. 1 & 2	D	None	X
B30B	M-162 Sh. 1 & 2	D	None	X
B30A	M-162 Sh. 1 & 2	D	None	X
B5A	M-162 Sh. 1 & 2	D	None	X

3. High Energy Line: IFW03DC-16" (Main Feedwater)
References: FSAR Figure 3.6-27
M-156 Sh. 1, Rev. K; Sh. 2, Rev. J
M-163 Sh. 1, Rev. N
M-157 Sh. 1, Rev. N; Sh. 2, Rev. L

Bk. No.	Dwgs Reviewed	Code	Target	
B5	M-156 Sh. 1 & 2	D	None	X
B40A	M-157 Sh. 1 & 2 M-156 Sh. 1 & 2	E	1SX09AQ-4"	X
* B80A	M-163 Sh. 1 & 2	D	1SX07EA-14"	X
* B80B	M-163 Sh. 1 & 2	D	1SX07EA-14"	X
* B105A	M-163 Sh. 1 & 2	D	1SX07EA-14"	X
B110A	M-163 Sh. 1 & 2	D	1SX07EA-14"	X
B115	M-163 Sh. 1 & 2	D	1SX07EA-14"	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Inside Containment - Jet Impingement (Cont)		4. High Energy Line: 1FW03DD-16" (Main Feedwater) References: FSAR Figure 3.6-28 M-155 Sh. 1, Rev. L; Sh. 2, Rev. J M-158 Sh. 1, Rev. M; Sh. 2, Rev. K M-161 Sh. 1, Rev. L M-164 Sh. 1, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target	
B5	M-155 Sh. 1 & 2	D	None	X
B35A	M-155 Sh. 1 & 2 M-158 Sh. 1 & 2	D	None	X
B35B	M-155 Sh. 1 & 2	D	None	X
* B80A	M-164 Sh. 1	D	None	X
* B95A	M-164 Sh. 1	D	None	X
* B95B	M-164 Sh. 1	D	None	X
* B110A	M-164 Sh. 1	D	None	X
B100B	M-164 Sh. 1	D	None	X
B110	M-164 Sh. 1	D	None	X

5. High Energy Line: 1FW87CA-6" (Aux. Feedwater)
References: FSAR Figure 3.6-28a
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J

Bk. No.	Dwgs Reviewed	Code	Target	
B155	M-155 Sh. 1 & 2	D	None	X
B120B	M-155 Sh. 1 & 2	D	None	X
* B120A	M-155 Sh. 1 & 2	D	None	X
B5B	Above Elev. 412'	D	None	X
B5A	Above Elev. 412'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Inside Containment - Jet Impingement (Cont)		6. High Energy Line: 1FW87CB-6" (Aux. Feedwater) References: FSAR Figure 3.6-28b M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-162 Sh. 1, Rev. L M-166 Sh. 1, Rev. K.		

Bk. No.	Dwgs Reviewed	Code	Target	
B155	M-156 Sh. 1 & 2	D	None	X
B10B	M-156 Sh. 1	D	None	X
	M-162 Sh. 1			
	M-166 Sh. 1			
B10A	M-156 Sh. 1	D	None	X
	M-162 Sh. 1			
	M-166 Sh. 1			
B5B	M-156 Sh. 1	D	None	X
	M-162 Sh. 1			
	M-166 Sh. 1			
B5A	M-156 Sh. 1	D	None	X
	M-162 Sh. 1			
	M-166 Sh. 1			

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		7. High Energy Line: 1FW87CC-6" (Aux. Feedwater) References: FSAR Figure 3.6-28c M-156 Sh. 1, Rev. K; Sh. 2, Rev. J M-162 Sh. 1, Rev. L M-166 Sh. 1, Rev. K M-167 Sh. 1, Rev. P		

Bk. No.	Dwgs Reviewed	Code	Target	
B18S	M-156 Sh. 1 & 2	D	None	X
B10B	M-162 Sh. 1 M-166 Sh. 1 M-167 Sh. 1	D	None	X
B10A	M-162 Sh. 1 M-166 Sh. 1 M-167 Sh. 1	D	None	X
B5B	Above Elev. 412'*	D	None	X
B5A	Above Elev. 412'	D	None	X

* ESW lines have not been routed above Elevation 412' 0"

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		8. High Energy Line: 1FW87CD-6" (Aux. Feedwater) References: FSAR Figure 3.6-28d M-155 Sh. 1, Rev. L; Sh. 2, Rev. J. M-161 Sh. 1, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target	
B150	M-155 Sh. 1 & 2	D	None	X
B120B	M-155 Sh. 1 & 2	D	None	X
B120A	M-155 Sh. 1 & 2	D	None	X
B110B	M-161 Sh. 1	D	None	X
B110A	M-161 Sh. 1	D	None	X
B5A	Above Elev. 412'	D	None	X

9. High Energy Line: 1MS01AA-30.25" (Main Steam)
References: FSAR Figure 3.6-29
M-155 Sh. 1, Rev. L; Sh. 2, Rev. K

Bk. No.	Dwgs Reviewed	Code	Target	
C8A	M-155 Sh. 1 & 2	D	None	X
* C7	M-155 Sh. 1 & 2	D	None	X
C4	Above Elev. 440'	D	None	X
C3	Above Elev. 440'	D	None	X
C2	Above Elev. 440'	D	None	X
C1	Above Elev. 440'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		10. High Energy Line: 1MS01AB-30.25" (Main Steam) References: FSAR Figure 3.6-30 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J.		

	Bk. No.	Dwgs Reviewed	Code	Target	
*	C24	M156 Sh. 1 & 2	D	None	X
	C20	Above Elev. 440'	D	None	X
	C19	Above Elev. 440'	D	None	X
	C18	Above Elev. 440'	D	None	X
	C17	Above Elev. 440'	D	None	X
	C24A	M-156 Sh. 1 & 2	D	None	X

11. High Energy Line: 1MS01AC-30.25" (Main Steam)
References: FSAR Figure 3.6-31
M-156 Sh. 1, Rev. K; Sh. 2, Rev. J.

	Bk. No.	Dwgs Reviewed	Code	Target	
	C32A	M-156 Sh. 1 & 2	D	None	X
*	C31	M-156 Sh. 1 & 2	D	None	X
	C28	Above Elev. 440'	D	None	X
	C27	Above Elev. 440'	D	None	X
	C25X	Above Elev. 440'	D	None	X
	C25	Above Elev. 440'	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		12. High Energy Line: 1MS01AD-30.25" (Main Steam) References: FSAR Figure 3.6-32 M-155 Sh. 1, Rev. L; Sh. 2, Rev. J		

Bk. No.	Dwgs Reviewed	Code	Target	
C16A	M-155 Sh. 1 & 2	D	None	X
* C15	M-155 Sh. 1 & 2	D	None	X
C12	Above Elev. 440'	D	None	X
C11	Above Elev. 440'	D	None	X
C9X	Above Elev. 440'	D	None	X
C9	Above Elev. 440'	D	None	X

13. High Energy Line: 1RC21BA-8", 1RC21AA-8" (Reactor Coolant Bypass)
References: FSAR Figure 3.6-33
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J.

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-155 Sh. 1 & 2	D	None	X
B2	M-155 Sh. 1 & 2	D	None	X
B3	M-155 Sh. 1 & 2	D	None	X
B4	M-155 Sh. 1 & 2	D	None	X
B5	M-155 Sh. 1 & 2	D	None	X
B6	M-155 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		14. High Energy Line: 1RC21BB-8", 1RC21AB-8" (Reactor Coolant Bypass) References: FSAR Figure 3.6-34 M-156 Sh. 1, Rev. K; Sh. 2, Rev. J		

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-156 Sh. 1 & 2	D	None	X
B2	M-156 Sh. 1 & 2	D	None	X
B3	M-156 Sh. 1 & 2	D	None	X
B4	M-156 Sh. 1 & 2	D	None	X
B5	M-156 Sh. 1 & 2	D	None	X
B6	M-156 Sh. 1 & 2	D	None	X

15. High Energy Line: 1RC21AC-8", 1RC21BC-8" (Reactor Coolant Bypass)
References: FSAR Figure 3.6-35
M-157 Sh. 1, Rev. N; Sh. 2, Rev. L.

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-157 Sh. 1 & 2	D	None	X
B2	M-157 Sh. 1 & 2	D	None	X
B3	M-157 Sh. 1 & 2	D	None	X
B4	M-157 Sh. 1 & 2	D	None	X
B5	M-157 Sh. 1 & 2	D	None	X
B6	M-157 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		16. High Energy Line 1RC21AD-8", 1RC21BD-8" (Reactor Coolant Bypass) References: FSAR Figure 3.6-36 M-157 Sh. 1, Rev. N; Sh. 2, Rev. L		

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-157 Sh. 1 & 2	D	None	X
B2	M-157 Sh. 1 & 2	D	None	X
B3	M-157 Sh. 1 & 2	D	None	X
B4	M-157 Sh. 1 & 2	D	None	X
B5	M-157 Sh. 1 & 2	D	None	X
B6	M-157 Sh. 1 & 2	D	None	X

17. High Energy Line: 1RC29AA-10", 1SI05DA-6", 1SI09BA-6" 1SI47AA-2" (Safety Injection)
References: FSAR Figure 3.6-39
M-155 Sh. 1, Rev. L; Sh. 2, Rev. J
M-161 Sh. 1, Rev. L
M-165 Sh. 1, Rev. L; Sh. 2, Rev. K

Bk. No.	Dwgs Reviewed	Code	Target	
B1	M-155 Sh. 1 & 2	D	None	X
B15	M-155 Sh. 1 & 2	D	None	X
B30	M-155 Sh. 1 & 2	D	None	X
B70A & B	M-165 Sh. 1 & 2	D	None	X
B183	M-165 Sh. 1 & 2	D	None	X
B183A	M-165 Sh. 1 & 2	D	None	X
B180B	M-165 Sh. 1 & 2	D	None	X
B175A & B	M-165 Sh. 1 & 2	D	None	X
* B103	M-165 Sh. 1 & 2	D	None	X
B179	M-165 Sh. 1 & 2	D	None	X

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		18. High Energy Line: 1RC29AB-10", 1SI09BB-10", 1SI47AB-2" 1SI05DB-6", (Safety Injection)		

References: FSAR Figure 3.6-40
M-156 Sh. 1, Rev. K; Sh. 2, Rev. J
M-166 Sh. 1, Rev. K

Bk. No.	Dwgs Reviewed	Code	Target	
B5	M-156 Sh. 1 & 2	D	None	X
B20	M-156 Sh. 1 & 2	D	None	X
B160A & B	M-156 Sh. 1 & 2	D	None	X
B35	M-166 Sh. 1	D	None	X
B115	Above Elev. 412'	D	None	X
B108	M-166 Sh. 1	D	None	X
B125A & B	M-156 Sh. 1 & 2	D	None	X

19. High Energy Line: 1RC29AC-10", 1SI05UC-6", 1SI09BC-10" 1SI47AC-2" (Safety Injection)

References: FSAR Figure 3.6-41
M-157 Sh. 1, Rev. N; Sh. 2, Rev. L
M-167 Sh. 1, Rev. P

Bk. No.	Dwgs Reviewed	Code	Target	
B468	M-157 Sh. 1 & 2	D	None	X
B480	M-157 Sh. 1 & 2	D	None	X
B495	M-157 Sh. 1 & 2	D	None	X
B465A & B	M-157 Sh. 1 & 2	D	None	X
B580	M-157 Sh. 1	D	None	X
B540A & B	M-167 Sh. 1	D	None	X
B564	M-167 Sh. 1	D	None	X
B570	Above Elev. 412'	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Inside Containment - Jet Impingement (Cont)		20. High Energy Line: 1RC29AD-10", 1SI05DD-6", 1SI09BD-10" 1SI47AC-2" (Safety Injection) References: FSAR Figure 3.6-42 M-158 Sh. 1, Rev. M; Sh. 2, Rev. K M-168 Sh. 1, Rev. L M-194 Rev. B		

Bk. No.	Dwgs Reviewed	Code	Target	
B625	M-158 Sh. 1 & 2	D	None	X
B640	M-158 Sh. 1 & 2	D	None	X
B655	M-158 Sh. 1 & 2	D	None	X
B560B	M-158 Sh. 1 & 2	D	None	X
B560A	M-158 Sh. 1 & 2	D	None	X
B750B	M-194 Rev. B	D	None	X
B728	M-168 Sh. 1	D	None	X
B740	Above Elev. 412'	D	None	X

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Outside Containment - Pipe Whip & Jet Impingement				
PB-M-210-2, Rev. H*				
M-329 Sh. 1, Rev. L				
M-335 Sh. 1, Rev. K				
No ESW piping on these drawings			X	
PB-213-1, Rev. N				
No ESW piping on this drawing			X	
M-224 (Sh. 1 of 3), Rev. R				
No ESW piping on this drawing in vicinity of HELB			X	
PB-225-1, Rev. R				
M-306 Sh. 1, Rev. L				
Line No.				
1 SX 59BA-2"	Line not damaged	Reviewed postulated HELB location A108 and found no effects on ESW system piping	X	
1 SX 58BA-2"				
1 SX B8A-4"				
1 SX 04EA-3"				
1 SX 48A-1 1/2"				
1 SX 47A-1 1/2"				
1 SX 05BA-3"				
1 SX 05AB-1 1/2"				
1 SX 04FB-1 1/2"				

* All "PB" drawings transmitted under cover of S&L letter dated 6/6/84

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Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-227-1, Rev. M				
No ESW piping on this drawing			X	
PB-M-228-2, Rev. E M-228 Sh. 1, Rev. S Line No.				
1 SX 51AA-2" 1 SX 50AA-2" 1 SX 04DA-6" 1 SX 05CA-6" 1 SX 04DB-6" 1 SX 05CB-6" 1 SX 37AA-2" 1 SX 38AA-2"	Lines not damaged	Reviewed postulated HELB locations A148 and A149 and found no effects on ESW system piping	X	
PB-229-1, Rev. R PB-229-5, Rev. E Line No.				
1 SX 04DA-6" 1 SX 04DB-6" 1 SX 05CA-6" 1 SX 05CB-6"	Lines not damaged	Reviewed postulated HELB locations A109, A111, A136, and A147 and found no effects on ESW system piping	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-229-2, Rev. K M-309 Sh. 1, Rev. P Line No.				
1 SX 05CA-6" 1 SX 05CB-6" 1 SX 04DB-6" 1 SX 04DA-6" 1 SX C1A-4" 1 SX 53AA-3" 1 SX 06AA-16" 1 SX 07GA-16"	Lines not damaged	Reviewed postulated HELB locations A100 & A102 and found no unacceptable effects on ESW system piping	X	
PB-231-1, Rev. M M-343 Sh. 1, Rev. N Line No.				
1 SX 38AB-2" 1 SX 96AB-1-1/2" 1 SX 95A-2" 1 SX 05CB-6" 1 SX 04DB-6" 1 SX 04EB-3" 1 SX 05BB-3" 1 SX 59BB-2" 1 SX 58AB-2" 1 SX 05AC-2" 1 SX 04FC-2"	Lines not damaged	Reviewed postulated HELB locations A110, A150 and A106 and found no effects on ESW system piping	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
ESW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-233-1, Rev. N				
No ESW piping on this drawing			X	
PB-239-1, Rev. S PB-239-2, Rev. E M-308 Sh. 1, Rev. M				
No ESW piping on this drawing			X	
PB-242-1, Rev. M M-304 Sh. 1, Rev. M M-345 Sh. 1, Rev. M Line No.				
1 SX 06AA-16" 1 SX 06AB-16" 1 SX 07GB-16" 1 SX 07GA-16" 1 SX 27DB-10" 1 SX 26AA-10" 1 SX 27DA-10" 1 SX 26AB-10"	Lines not damaged	Reviewed postulated HELB location A133 and found no effects on ESW system piping	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-242-2 Rev. D				
No ESW piping on this drawing			X	
PB-243-4, Rev. E PB-243-6, Rev. E M-311 Sh. 1, Rev. R M-345 Sh. 1, Rev. N Line No.				
1 SX 07GB-16" 1 SX 07GA-16" 1 SX 06AB-16" 1 SX 06AA-16"	Lines not damaged	Reviewed postulated HELB locations A103, A104, A105, A141 and A142 and found no effects on ESW system piping	X	
PB-244-2 Rev. E				
No ESW piping on this drawing			X	
M-249 Sh. 1, Rev. N M-321 Sh. 1, Rev. K Line No.				
2 SX 26AA-10" 2 SX 26AB-10" 2 SX 27DB-10" 2 SX 27DA-10"	Lines not damaged	Reviewed postulated HELB locations A023, A024, A025, A625 and A626 and found no effects on ESW system piping	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
ESW System Outside Containment - Pipe Whip & Jet Impingement (Cont)				
PB-255-1, Rev. R				
No ESW piping on this drawing			X	
PB-263-1, Rev. H				
No ESW piping on this drawing			X	
PB-361-1, Rev. K				
No ESW piping on this drawing			X	

APPENDIX C

DC DISTRIBUTION SYSTEM

APPENDIX C-1

IDENTIFICATION/IMPLEMENTATION OF COMMITMENTS AND CRITERIA

Plant Design

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
HELB/MELB Outside Containment			
Essential systems must be protected from piping failures associated with high and moderate energy line breaks (HELB/MELB) at possible break locations (FSAR 3.6)	S&L "Survey of Aux. Building High Energy Line Breaks", Calc. No. 3C8-1181-001, Rev. 0, 12/21/81	X	
	Westinghouse (W) Standard Information Package (SIP)/10-1, Section 3-1 "Protection & Separation of Safety Class Equipment" dated 3/78		
	W Systems Standard 1.12 "System Standard Design Criteria-NSSS Layout Guidelines" dated 10/19/71		
	W Systems Standard STD-DES-4L-RFS-4L21 "NSSS Piping Layout Criteria for Standard Four Loop Plants" dated 3/71		
	S&L "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria" 9/26/75		
	S&L "Jet Impingement Summary Documentation Report" Byron/Braidwood Report BB-J1-01, Rev. 0, 3/9/84		
	S&L "Verification of High Energy Line Break Design Approach for Jet Impingement Effects on Safe Shutdown Equipment." Calc. No. 3C8-1083-001, Rev. 1, 3/23/84		
	S&L Project Instruction PI-BB-38, Rev. 0, "Pipe Whip Restraint Analysis, Design and Review"		

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APPENDIX C-2

DC DISTRIBUTION SYSTEM

Plant Design

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
HELB Outside Containment	Does not affect any essential portion of Class 1E dc system	There are no high energy lines located in the areas of the plant containing the Class 1E dc system, i.e.; Elevation 451' between columns 7.7-10 and L-Q S&L drawings nos: M-361 Sh. 22, Rev. A, Batt. Rm. 1A M-361 Sh. 27, Rev. B, Batt. Rm. 1B M-361 Sh. 21, Rev. F, Batt. Rm. 2A M-361 Sh. 26, Rev. A, Batt. Rm. 2B	X	
MELB Outside Containment	Does not affect any essential portion of Class 1E dc system	There are no moderate energy lines located in the areas of the plant containing the Class 1E dc system, i.e.; Elevation 451' between columns 7.7-10 and L-Q. S&L drawing nos: M-361 Sh. 22, Rev. A, Batt. Rm. 1A M-361 Sh. 27, Rev. B, Batt. Rm. 1B M-361 Sh. 21, Rev. F, Batt. Rm. 2A M-361 Sh. 26, Rev. A, Batt. Rm. 2B	X	

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APPENDIX D

COMMON SAFETY REQUIREMENTS

APPENDIX D-1

IDENTIFICATION/IMPLEMENTATION OF COMMITMENTS AND CRITERIA

Electrical Layout

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
Design bases for electrical equipment for protection against common hazards - HELB (10CFR50, GDC 2,3,4)	The following drawings were reviewed to determine whether the Byron design meets the licensing commitment concerning HELB. For details refer to Appendix D-2.	X	
Electrical systems and components important to safety shall be protected or designed to withstand the effects of common hazards	1. 6E-0-3651 Rev. J 2. 6E-0-3002 Rev. S 3. 6E-0-3004 Rev. D 4. 6E-0-3304 Rev. AP 5. 6E-0-3305 Rev. BJ 6. 6E-0-3653 Rev. N 7. 6E-0-3031 Rev. Z 8. 6E-0-3032 Rev. S 9. 6E-0-3663 Rev. AE 10. 6E-0-3664 Rev. V 11. 6E-0-3853 Rev. BD 12. PB-M-210-2 Rev. H 13. PB-M-213-1 Rev. N 14. PB-M-229-1 Rev. R 15. PB-M-229-2 Rev. K 16. PB-M-229-5 Rev. E 17. PB-M-228-2 Rev. E 18. PB-242-1 Rev. M 19. PB-243-4 Rev. E 20. PB-243-6 Rev. E 21. PB-244-2 Rev. E 22. PB-239-1 Rev. S 23. PB-239-2 Rev. E 24. PB-255-1 Rev. R 25. M-252 Rev. V 26. M-249 Rev. N 27. PB-263-1 Rev. H 28. PB-227-1 Rev. M 29. 6E-0-3311 Rev. AY 30. 6E-0-3311CT1 Rev. S 31. 6E-0-3311CT2 Rev. R 32. 6E-0-3355 Rev. Y 33. 6E-0-3011 Rev. L	X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X	

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Plant Design

FSAR/Licensing Commitment	Covered By Design Document/Requirement	Acceptability Yes	Acceptability No
All essential systems are protected against loss of function resulting from any potential pipe break.	S&L memorandum "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria," dated 9/26/75	X	
Breaks in high energy lines postulated at terminal ends and at a minimum of two intermediate locations.	S&L memorandum, "Analytical Procedures for Meeting Separation and High/Moderate Energy Line Rupture Criteria," dated 9/26/75 commits project to following Giambuso and O'Leary letter criteria.	X	

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APPENDIX D-2

DESIGN ADEQUACY

Electrical Layout

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments			Acceptability Yes	Acceptability No
HELB Effects on Electrical Components	Electrical portions of the CCW, ESW and dc systems and components important to safety shall be protected or designed to withstand the effects of HELB including pipe whip, jet impingement, and environmental effects without loss of capability to perform their safety functions.	Outside containment, the locations of essential cables and electrical components in ESW, CCW and dc systems were reviewed with respect to pipe break zones as indicated in FSAR Figures Q10.40-1 through -5. Inside containment, electrical cabling and components were not reviewed because a) there are no dc system cables/components located inside containment and b) ESW and CCW electrical components inside containment are not essential components. Review of environmental effects will be covered by environmental qualification reviews of appropriate equipment. References: 1. Byron-1 Fire Zone and Cables Computer Listing dated 5/22/84 2. FSAR Figures Q10.40-1 through -5				
		Cable No. / Associated Equipment		Drawing No.		
HELB Zones: 1A, B		No dc, ESW, or CCW cables		6E-0-3651 Rev. J 6E-0-3002 Rev. S PB-M-210-2 Rev. H	X	
HELB Zones: 2A, B 3A, B		No dc, ESW, or CCW cables		6E-0-3004 Rev. D 6E-0-3304 Rev. AP 6E-0-3305 Rev. BJ 6E-0-3653 Rev. N PB-M-213-1 Rev. N	X	

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Electrical Layout (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
HELB Zones: 4A, 10A		The cables listed are in the HELB zones. However, in all cases, cables are not impacted by a HELB-resultant jet or pipe whip.	X	

Cable No.	Associated Equipment
1SX052	Valve 1SX016A
1SX055	Valve 1SX016B
1SX058	Valve 1SX027A
1SX061	Valve 1SX027B
1SX272	L.O. Aux. Pp 1NS-SX136
1SX278	L.O. Aux. Pp 1SX01PA-C
1SX279	L.O. Aux. Pp 1SX01PA-C
1SX280	L.O. Aux. Pp 1SX01PA-C
1SX284	L.O. Aux. Pp 1SX01PB-C
1SX285	L.O. Aux. Pp 1SX01PB-C
1SX286	L.O. Aux. Pp 1SX01PB-C
1SX304	L.O. Aux. Pp 1SX01PB-C
1SX311	L.O. Aux. Pp 1SX01PA-C
1VA164	ESW Cub. Cooler Div. 11
1VA165	ESW Cub. Cooler Div. 11
1VA166	ESW Cub. Cooler Div. 11
1VA192	ESW Cub. Cooler Div. 11
1VA228	ESW Cub. Cooler Div. 11

The drawings reviewed for HELB zones 4A and 10A are as follows:
6E-0-3653 Rev. N
PB-M-229-1 Rev. R
PB-M-229-2 Rev. K
PB-M-229-5 Rev. E
PB-M-228-2 Rev. E
PB-242-1 Rev. M
PB-243-4 Rev. E
PB-243-6 Rev. E
PB-244-2 Rev. E

Electrical Layout (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments			Acceptability Yes	Acceptability No
		Cable No.	Associated Equipment	Drawing No.		
HELB Zones: 5A, B		No dc, ESW, or CCW cables		Ref. 1, Sh. 16	X	
HELB Zones: 6A, B		No dc, ESW, or CCW cables		Ref. 1, Sh. 17	X	
HELB Zones: 7A, B		No dc, ESW, or CCW cables		Ref. 1, Sh. 18	X	
HELB Zones: 8A, 9A		No dc, ESW, or CCW cables		PB-227-1, Rev. M 6E-0-3311, Rev. AY 6E-0-3311CT1, Rev. S 6E-0-3311CT2, Rev. R 6E-0-3355, Rev. Y 6E-0-3011, Rev. L	X	
HELB Zone: 11A, B, C, D 12A, B		No dc, CCW, or CCW cables		PB-239-1 Rev. S PB-239-2 Rev. E	X	

Electrical Layout (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	No
HELB Zone: 14		HELB Zone 14 as defined by FSAR Figure Q10.40-4 was reduced by an area bordered by columns 11 and 12 and rows L and N.5. This reduced the amount of cables needed to be analyzed and was achieved by reviewing drawing PB-255-1. The following cables are within the borders defined and are not impacted by a HELB-resultant jet or pipe whip.	X	

Cable No.	Associated Equipment
1CC067	MOV-CC9415
1CC127	MOV-CC9473
1SX034	ESW Pump 1A
1SX290	Valve 1SX169A
1VA111	ESW Cub. Cooler
1CC001	CCW Pump-1A
1CC019	CCW Pump-common
1SX001	ESW Pump 1A
1CC041	MOV-CC685
1CC223	Alarm
1SX056	HS SX108
1SX062	HS SX109
1SX247	Alarm
1SX435	SX-426
1SX457	VX-401

The drawings reviewed for HELB Zone 14 are as follows: 6E-0-3663, Rev. AE
PB-255-1, Rev. R

Electrical Layout (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments			Acceptability	
		Cable No.	Associated Equipment	Drawing No.	Yes	No
HELB Zone: 15		No dc, CCW or ESW cables		6E-0-3031, Rev. Z 6E-0-3032, Rev. S 6E-0-3663, Rev. AE M-252, Rev. V	X	
HELB Zones: 16A, B, C		No dc, CCW or ESW cables		Ref. 1 6E-0-3664, Rev. V M-249, Rev. N	X	
HELB Zones: 18A, B, C		No dc, CCW or ESW cables		Ref. 1 6E-0-3353, Rev. BD PB-263-1, Rev. H	X	

Plant Design

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
Ability to go to cold shutdown after a postulated piping failure - jet impingement effects	Essential systems protected against loss of function	Calculation 3C8-1083-001 Rev. 1, dated 2/13/84.	X	
High energy line definition	Lines that during normal plant conditions have either or both the following conditions: 1. Temp. greater than 200°F, or 2. Press. greater than 275 psig	FSAR Figures 3.6-1 through 3.6-12 Reactor building piping drawings dated 5/26/84 with high energy lines shown: M-155 thru M-158 M-161 thru M-176 and M-189 Auxiliary building piping drawings: PB-210-2, PB-213-1, PB-224-1, PB-225-1, PB-227-1, PB-228-2, PB-229-1,2,5, PB-231-1, PB-233-1, PB-239-1,2, PB-241-2, PB-242-1, PB-243-4, PB-243-6, PB-244-2, PB-249-1, PB-255-1, PB-263-1, PB-361-1	X	

Plant Design (Cont)

Areas Reviewed For Adequacy	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
Pipe break locations inside containment	Breaks in high energy lines postulated at terminal ends and at a minimum of two intermediate locations	1. Westinghouse letters CAW-4273 (4/13/82), CAW-4301 (4/20/82) both entitled "Byron Unit 1, Isometrics with Pipe Break Locations". 2. FSAR Figures 3.6-25 through 3.6-78 3. Reactor building piping drawings marked up to show high energy lines and break locations (drawings dated 5/26/84): Dwg./Sh.: M-155/1&2, M-156/1&2, M-157/1&2, M-158/1&2, M-161/1, M-162/1, M-163/1, M-164/1, M-165/1&2, M-166/1&2, M-167/1&2 Dwg./Sh.: M-168/1&2, M-169/1, M-170/1, M-171/1, M-172/1, M-173/1, M-174/1, M-175/1, M-176/1, M-189/1	X	

APPENDIX D-3

ADEQUACY OF DESIGN PROCESS

Plant Design

Design Process Reviewed	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
Use by S&L of Westinghouse generated high energy line break locations in the pipe break effects analysis	Same break locations used in HELBA analysis as shown on W drawings	High energy line breaks are shown on attachment to W letter CAW-6015 of 6/30/83. These locations are shown on FSAR Figures 3.6-25 through 3.6-78. They are also shown on the marked up reactor building piping drawings M-155 to M-189	X	
Identification of moderate energy line break locations outside containment on SX and CCW piping	Locations identified in accordance with FSAR Section 3.6	IOM, "Moderate Energy Piping," dated 10/18/83 from R. D. Gerke to K. J. Green	X	
Pipe whip restraint analysis, design and review process internal to S&L	Process meets criteria in FSAR Section 3.6	S&L Project Instruction PI-BB-38, Rev. 0 dated 12/21/82	X	
Comparing high energy line and safety-related equipment locations to allow determination of potential adverse HELB effects	Identification of high energy lines and safety-related equipment in accordance with FSAR Section 3.6	1. Calc. No. 3C8-1181-001, Rev. 0, 12/21/81 2. Calc. No. 3C8-1083-001, Rev. 1, 3/23/84 3. Report BB-JJ-01, Rev. 0, 3/9/84	X	

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Plant Design (Cont)

Design Process Reviewed	Acceptance Criteria	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
Use by S&L throughout the inside containment high energy line break effects analysis of the high energy lines as defined by FSAR Figures 3.6-1 through 3.6-12	Consistent, accurate, and complete use of the high energy lines as defined by the FSAR figures	Reactor building piping drawings marked up to show high energy line location M-155 Sh. 1 & 2 5/26/84 M-156 Sh. 1 & 2 5/26/84 M-157 Sh. 1 & 2 5/26/84 M-158 Sh. 1 & 2 5/26/84 M-161 Sh. 1 5/26/84 M-162 Sh. 1 5/26/84 M-163 Sh. 1 5/26/84 M-164 Sh. 1 5/26/84 M-165 Sh. 1 & 2 5/26/84 M-166 Sh. 1 & 2 5/26/84 M-167 Sh. 1 & 2 5/26/84 M-168 Sh. 1 & 2 5/26/84 M-169 Sh. 1 5/26/84 M-170 Sh. 1 5/26/84 M-171 Sh. 1 5/26/84 M-173 Sh. 1 5/26/84 M-174 Sh. 1 5/26/84 M-175 Sh. 1 5/26/84 M-176 Sh. 1 5/26/84 M-187 Sh. 1 5/26/84 These recently issued drawings have been reviewed against the similar working copy drawings which were used to perform the HELBA	X	

APPENDIX D-4

DESIGN INTERFACE WITH WESTINGHOUSE

Plant Design

Company	Interface Reviewed	Procedures/Documents Reviewed and Comments	Acceptability Yes	Acceptability No
Westinghouse	Transmittal to S&L of Westinghouse piping isometrics showing pipe break locations and type of pipe breaks on high energy lines	Westinghouse letters to S&L: CAW-4273 4/13/82 CAW-4301 4/20/82 CAW-6015 6/30/83	X	
	Engineering and analysis responsibilities for piping and supports in the Westinghouse scope	"Interface Control Agreement Westinghouse Piping and Structural Evaluation Program for the Byron Station Unit 1 and Unit 2," Rev. 5 dated 10/25/83. Provides responsibility matrices for piping, supports and design documents for systems with Classes A, B, C & D both inside and outside containment	X	

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