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ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

April 16, 1985

Docket No. 50-461

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

Subject: Clinton Power Station Unit 1
Elimination of Arbitrary Intermediate Pipe Breaks

Dear Mr. Schwencer:

The purpose of this letter is to request exemption from current Nuclear Regulatory Commission (NRC) piping design criteria with respect to arbitrary intermediate pipe breaks. These are breaks which, based on stress analysis, are below the stress limits and/or the cumulative usage factors specified in the current NRC criteria, but are selected to provide a minimum of two breaks between terminal ends. Elimination of arbitrary intermediate pipe breaks at Clinton Power Station (CPS) results in design and construction benefits due to the potential elimination of the associated pipe whip restraints. Also, operational benefits arise from the decreased number of pipe whip restraints to be inspected and maintained for 40 years.

Attached is a detailed explanation and justification for the elimination of arbitrary intermediate pipe breaks at CPS. The following information is presented in it:

1) Current Break Selection Criteria

2) Industry Experience

3) Benefits

4) Alternate Pipe Break Criteria

5) Listing of the Eliminated Pipe Breaks

6) Additional Technical justification

Since the design and construction of pipe whip restraints associated with arbitrary intermediate pipe breaks is nearly complete, Illinois Power Company (IPC) does not anticipate removing any of the installed restraints at this time. IPC is requesting the approval of alternative pipe break criteria to provide the flexibility to remove or not to shim restraints in the future, if deemed necessary.

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IPC requests NRC approval for the application of alternative pipe break criteria as stated in section 5.1 and 5.2 of the attachment which would eliminate the need to postulate arbitrary intermediate pipe breaks. Application of the alternative pipe break criteria will not alter IPC's commitment to quality in the design of safety related structures, systems, and components. The quality assurance program will continue to ensure that safety related structures, systems and components are designed, fabricated, erected and tested to the quality standards appropriate with the safety function to be performed.

Due to the mid-May scheduling of hot operational testing at CPS, immediate attention by the NRC is requested so that IPC can realize maximum benefits afforded by this proposed change to the pipe break criteria. A favorable response is requested by May 9, 1985.

Sincerely yours,

F. A. Spangenberg

F. A. Spangenberg
Director - Nuclear Licensing
and Configuration
Nuclear Station Engineering

Attachment

JDT/lab

cc: B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Office
Illinois Department of Nuclear Safety
Regional Administrator, Region III, USNRC

CLINTON POWER STATION UNIT 1

ARBITRARY INTERMEDIATE PIPE BREAKS

1.0 Introduction

The Nuclear Regulatory Commission (NRC) staff and industry discussions with the Advisory Committee on Reactor Safeguards (ACRS) have indicated general agreement with the elimination of the arbitrary intermediate breaks. Additionally, the NUREG-1061, Volume 3, published in November 1984 recommends that the current NRC criteria be revised to eliminate the requirements for mechanical pipe rupture protection against arbitrary intermediate breaks. Elimination of arbitrary intermediate breaks results in design benefits due to the potential elimination of the associated pipe whip restraints and related provisions currently incorporated in the plant design to mitigate the effects of such pipe breaks. In addition, operational advantages also ensue from the decreased numbers of pipe whip restraints to be inspected and maintained for 40 years.

2.0 Break Selection Criteria

The break selection criteria currently employed by Illinois Power Company (IPC) for the Clinton Power Station Unit 1 (CPS) is based upon NRC Branch Technical Position MEB 3-1 as presented in the Standards Review Plan, Section 3.6.2 This position requires that pipe breaks be postulated at anchored terminal ends and at intermediate locations where, depending on the pipe class, stresses or cumulative usage factors exceed specified limits. If two intermediate locations cannot be determined based on the above because the stresses and cumulative usage factors are below the specified limits, the two highest stress locations are selected.

3.0 Industry Experience

IPC concurs with other nuclear utilities in the belief that current knowledge and experience supports the conclusion that designing for arbitrary intermediate breaks is not justified and that this requirement should be deleted. This conclusion is supported by extensive operating experience in over 80 operating U.S. plants and a number of similar plants overseas in which no piping failures have been known to occur that would suggest the need to design protective features to mitigate the dynamic effects of arbitrary intermediate breaks. Arbitrary intermediate breaks are often postulated at locations where maximum pipe stresses are well below the ASME Code allowables and within a few percent of the stress levels at other points in the same piping system. Mitigating the effects from such breaks with pipe whip restraints results in complicated protective features being provided at arbitrary break locations but does little to enhance overall plant safety.

4.0 Benefits

Elimination of the arbitrary intermediate break locations results in the potential elimination of the associated pipe whip restraints and other structural provisions to mitigate the consequences of these breaks. Significant operational benefits are also realized over the 40-year life of each plant. As identified in NUREG/CR-2136, these benefits accrue in the areas of plant reliability and reduce exposure of plant personnel to radiation during inservice inspection which is complicated by the presence of pipe whip restraints.

4.1 Access

Access during plant operation for maintenance and inservice inspection is improved due to decreased congestion from these restraints and their supporting structural steel. Also, fewer restraints must be removed to gain access for weld inspections. In addition to the decrease in maintenance effort, a corresponding reduction in man-rem exposure can be realized from fewer manhours spent in radiation areas, per ALARA.

4.2 Decrease in Heat Loss

By design, whip restraints fit closely around the high energy piping with gaps typically being on the order of an inch. These restraints and their supporting steel increase the heat loss to the surrounding environment significantly. Also, because thermal movement of the piping system during start-up and shutdown could deform the piping insulation against the fixed whip restraint, the insulation must be cut back in these areas, creating convection gaps adjacent to the restraint, which, also increased heat loss to the environment. This is a contributor to the tendency of many containments to operate at temperatures near technical specification limits. The elimination of whip restraints associated with arbitrary intermediate breaks would reduce heat loss to the containment and reduce containment temperature during power operation.

4.3 Unanticipated Thermal Expansion Stress

Pipe rupture protection devices are designed not to restrict pipe-free thermal expansion, however should these devices come into contact with the pipe itself, unanticipated stresses due to restraint of thermal expansion can be introduced into the piping system. As brought out in ACRS hearings, the potential for this happening is greater than the potential for mechanistic failure at an arbitrary break point. This results in a decrease in the overall reliability of the pipe system. To prevent this, an additional as-built verification step is involved in the design process for each installed pipe whip restraint that requires complex measurements both in the cold and hot position of the pipe. The elimination of arbitrary intermediate breaks would significantly reduce the effort

involved in protecting the piping from the effects of unanticipated thermal expansion stresses at the associated whip restraints.

5.0 Alternative Pipe Break Criteria

IPC proposes the following alternative pipe break criteria.

5.1 ASME Section III Piping Inside Containment

- Piping systems shall be designed to accommodate pipe breaks at anchored terminal ends and locations where the stress or usage factor criteria of MEB 3-1 are exceeded. No arbitrary intermediate pipe breaks will be postulated where the stress and/or usage factor criteria are not exceeded.

- For breaks that must be taken, the design will accommodate pipe whip, jet impingement, and compartment pressurization resulting from mechanistic treatment of the break. Current acceptable methods for limiting break opening, moderate and low energy exclusions, limited duration operation, etc. may still be applied.

- For plant flooding evaluations, environmental qualification of equipment, and structural design of equipment in areas traversed by high energy piping systems, pipe breaks will continue to be postulated in accordance with the present project criteria, i.e., in each area traversed by the high energy piping system, non-mechanistic breaks are postulated at the location that results in the most severe environmental consequences. Therefore, elimination of the arbitrary intermediate pipe breaks does not impact environmental qualification of equipment nor plant structural design.

5.2 ASME Section III and Seismically Designed Non-Section III Piping Outside Containment

- Piping systems shall be designed to accommodate pipe breaks at anchored terminal ends and locations where the stress criteria of MEB 3-1 is exceeded. No arbitrary intermediate pipe breaks will be postulated when the stress criterion is not exceeded.

- For breaks that must be taken, the design will accommodate pipe whip and jet impingement effects resulting from mechanistic treatment of the break. Compartment pressurization and flooding effects from breaks postulated in accordance with MEB 3-1 will be accommodated in the design. Current acceptable methods for limiting break opening, moderate and low energy exclusions, limited duration operation, etc. may still be applied.

- For plant flooding evaluations, environmental qualification of equipment, and structural design of equipment in areas traversed by high energy piping systems, pipe breaks will continue to be postulated in accordance with the present project criteria, i.e., in each area traversed by the high energy piping system, non-mechanistic breaks are postulated at the location that results in the most severe environmental consequences. Therefore, elimination of the arbitrary intermediate pipe breaks does not impact the environmental qualification of equipment nor plant structural design.

6.0 Eliminated Pipe Breaks

Appendix A lists by subsystem Class 1 large bore intermediate pipe breaks which may be eliminated from the design because the stress and usage factor limits have not been exceeded. After approval of this submittal by the NRC, the FSAR will be revised to show which pipe whip restraints are not required. A total of approximately 33 breaks are to be eliminated.

Appendix B lists the ASME Class 1, 2, and 3 small bore piping intermediate break locations that are to be eliminated. A total of approximately 12 breaks are to be eliminated.

The application of the proposed alternative pipe break criteria will result in the deletion of approximately 45 break locations and the potential deletion of 37 pipe whip restraints. However, it should be noted that piping and system design is an iterative process and that postulated break locations could potentially move as the system design and analysis of structures and piping develops over the course of the design and construction process. Owing to the iterative nature of the design process and its potential for affecting postulated break locations, changes affecting high energy systems are continuously monitored and evaluated to determine the impact on break location. IPC proposes to apply these alternative criteria to any potential break locations in the systems identified herein, provided the stresses at those locations are below the break selection threshold, and the operational concerns in Attachments D through F are adequately addressed. This flexibility is necessary to minimize future requests for break elimination as the location of the intermediate break points change during the evolution of the plant design.

6.1 Elimination of Breaks Not Yet Identified

The existing guidelines in MEB 3-1 of the SRP (NUREG-0800) Revision 1 will be met for those piping systems, or portions thereof, which are not included in this submittal. If other piping subsystems included in the systems identified in Table D-1, but not specifically identified in this submittal, subsequently qualify for the conditions described herein, the implementation of the proposed elimination of the arbitrary

intermediate break criteria may be used. If this criteria is to be applied to additional systems not included in Table D-1, those systems will be appropriately identified to the staff.

7.0 Additional Technical Justification

The following appendices provide additional technical information to justify this request. Specific NRC concerns are addressed in Appendices C through G as follows:

1.	Technical justification for elimination of arbitrary intermediate pipe breaks	Appendix C
2.	Provisions for minimizing intergranular stress corrosion cracking in high energy lines	Appendix D
3.	Provisions for minimizing the effects of thermal and vibration induced piping fatigue	Appendix E
4.	Provisions for minimizing water/steam hammer effects	Appendix F
5.	Provisions for minimizing local stresses from welded attachments	Appendix G

8.0 Conclusion

IPC has reviewed the basis for the postulation of intermediate pipe breaks on designated high energy lines and has compared the design stresses and usage factors with the SRP MEB 3-1 Guidelines. On the basis of ASME Code calculations, there is no technical justification for the postulation of arbitrary intermediate pipe breaks. The probability of pipe rupture at the values of stress and usage factors assignable to these intermediate pipe breaks is extremely remote, subsequently this relief should be granted.

Since the design and construction of pipe whip restraints associated with arbitrary intermediate pipe breaks is nearly complete, Illinois Power Company (IPC) does not anticipate removing any of the installed restraints at this time. IPC is requesting the approval of alternative pipe break criteria to provide the flexibility to remove or not to shim restraints in the future, if deemed necessary.

APPENDIX A

Summary of Class 1 Large Bore Piping
Intermediate Break and Pipe Whip Restraint Reductions

System	Subsystem	Intermediate Break Locations	Breaks/ Break ID Eliminated	Potential Pipe Whip Restraints/ Restraint ID Eliminated
Reactor Recirculation	RR Loop A RR Loop B	- Discharge piping branch connection points to the ring header.	8/RD6 RD7 RD8 RD9 (Loop A numbers identical)	8/R356B R357B R358B R359B (Loop A similar to Loop B)
Main Steam	MS-Line A	- Elbow butt welds on 50° elbows prior to containment - Elbow butt weld at top of riser from RPV.	3/MS-C57 MS-C58 MS-C68	4/MS-R24 MS-R25 MS-R26 MS-R27
	MS-Line B	- Isolation valve guide locations. - Elbow butt weld at top of riser from RPV.	2/MS-C1 MS-C19	4/MS-R2 MS-R4 MS-R5 MS-R6
	MS-Line C	- Isolation valve guide locations. - Elbow butt welds at top of riser from RPV .	2/MS-C35 MS-C55	4/MS-R16 MS-R18 MS-R19 MS-R20

APPENDIX A

Summary of Class 1 Large Bore Piping
Intermediate Break and Pipe Whip Restraint Reductions
(continued)

System	Subsystem	Intermediate Break Locations	Breaks/ Break ID Eliminated	Potential Pipe Whip Restraints/ Restraint ID Eliminated
Main Steam	MS-Line D	- Isolation valve guide locations. - Elbow butt weld at top of riser from RPV.	2/MS-C21 MS-C33	4/MS-R10 MS-R11 MS-R12 MS-R13
High Pressure Core Spray	HP-01	- Butt weld at check valve prior to drywell wall. - elbow butt weld at bottom of riser from RPV. - Elbow butt weld at top of riser from RPV.	2/HP-C6 HP-C8	3/HP-R3 HP-R4 HP-R4A
Low Pressure core Spray	LP-01	- Butt welds at check valve and gate valve prior to drywell wall. - Elbow butt welds at bottom and top of riser from RPV.	2/LP-C1A LP-C8	4/LP-R1 LP-R2A LP-R3 LP-R4A
Residual Heat Removal	RH-01	- Butt weld at check valve prior to drywell wall. - Butt weld at gate valve prior to drywell wall. - Elbow butt welds at top of riser from RPV.	3/RH-C1 RH-C8 RH-C9	2/RH-R2 RH-R3

APPENDIX A

Summary of Class 1 Large Bore Piping
Intermediate Break and Pipe Whip Restraint Reductions
(continued)

System	Subsystem	Intermediate Break Locations	Breaks/ Break ID Eliminated	Potential Pipe Whip Restraints/ Restraint ID Eliminated
Residual Heat Removal	RH-03	- Butt weld at check valve prior to drywell wall. - Elbow butt welds at bottom of riser from RPV. - Elbow butt weld at top of riser from RPV.	3/RH-C20 RH-C21 RH-C25	2/RH-R9 RH-R10
	RH-05	- Butt weld at check valve prior to drywell wall. - Butt weld at gate valve prior to drywell wall. - Elbow butt weld at top of riser from RPV.	2/RH-C15 RH-C17	-
	RH-34	- Butt welds at first and second gate valves from the 20" Recirc. header.	1/RH-C32	-
Reactor Core Isolation Cooling	RI-01	- Elbow butt welds at bottom of riser from 24" MS header. - Butt weld at 45° elbow prior to drywell wall.	3/RH-C5 RI-C6 RI-C5A	2/RI-R4 RI-R5
		TOTALS	33	37

APPENDIX B

Summary of Class 1, 2, and 3 Small Bore Piping
Intermediate Break Reductions

System	Subsystem	Intermediate Break Locations ID	No. of Breaks Eliminated	Potential Pipe Whip Restraints Eliminated
Standby Liquid Control	SC-07	SC-C4 SC-C5 SC-C6	3	0
Reactor Water Cleanup	RT-02	RT-C341A RT-C261	2	0
	RT-05	RT-C173A RT-C187A	2	0
Nuclear Boiler Piping	NB-01	NB-C5A NB-C10	2	0
Main Steam Drain	MS-05	MS-C74	1	0
Isolation Valve Seal	IS-03	IS-C5 IS-C8	2	0
		TOTALS	12	0

APPENDIX C

TECHNICAL JUSTIFICATION FOR ELIMINATION OF ARBITRARY INTERMEDIATE BREAKS

The following items provide generic technical justification for the elimination of arbitrary intermediate pipe breaks and their associated pipe whip restraints.

1. Operating procedures and pipe and system designs minimize the possiblity of intergranular stress corrosion cracking, thermal and vibration induced fatique, and water/steam hammer in these lines in which arbitrary pipe breaks are currently postulated. Detailed design provisions for these phenomena are provided in Appendices D, E, and F, respectively.

2. The remaining postulated pipe breaks and whip restraints provide an adequate level of protection in areas containing high energy lines. Potential environmental effects are still considered in the design.

3. Pipe breaks are postulated to occur at locations where, depending on the pipe class, stresses are only 80% of Code allowable or where the cumulative usage factor is only 10% of the allowable 1.0. The arbitrary breaks to be eliminated all exhibit stresses and usage factors below these conservative thresholds.

4. Pipe rupture is recognized in Branch Technical Position MEB 3-1 as being a "rare event which may only occur under unanticipated conditions".

5. Arbitrary intermediate breaks are only postulated to provide additional conservatism in the design. There is no technical justification for postulating these breaks.

6. Elimination of pipe whip restraints associated with the arbitrary breaks will facilitate in-service inspection, reduce heat losses from the restrained piping, and reduce the potential for restraining pipe due to unanticipated thermal growth and seismic motion.

7. Pipe break related equipment qualification (EQ) requirements are not affected by the elimination of the arbitrary breaks. Breaks are postulated non-mechanistically for EQ purposes.

It is concluded that the elimination of arbitrary intermediate breaks is technically justified, based on the preceding reasons.

APPENDIX D

PROVISIONS FOR MINIMIZING STRESS CORROSION CRACKING IN HIGH ENERGY LINES

Industry experience has shown (NUREG-0691) that the potential for intergranular stress corrosion cracking (IGSCC) is less likely if the following conditions are controlled: high residual tensile stresses, susceptible piping material, and a corrosive environment.

With the exception of the reactor recirculation piping, all austenitic stainless steel in contact with the reactor coolant is 316 L stainless steel and, therefore, has less than 0.03% carbon content. The likelihood of IGSCC in stainless steel increases with carbon content. The following additional process controls were applied in addition to material selection;

- All austenitic stainless steel was purchased in the solution heat treated condition in accordance with applicable ASME and ASTM specifications.
- Welding heat input was restricted and interpass temperature was limited to 350°F. High heat welding processes such as block welding and electroslag welding were not permitted. All weld filler metal and castings were required by specification to have a minimum of 5% ferrite.
- Inside diameter grinding of pipe welds was prohibited unless the pipe weld was subsequently solution-annealed.
- Bending of small diameter (2 inch and smaller) piping or tubing were eliminated by using fittings in the solution/annealed condition. Pipes cold bent to cause greater than 2½% strain or to a radius less than 20D ("D" being the pipe or tubing diameter) were solution annealed.
- Pickling of welds not subsequently solution-annealed were prohibited.

These controls were used to avoid severe sensitization and to comply with the intent of Regulatory Guide 1.44, "Control of the Use of Sensitized Stainless Steel."

The reactor recirculation piping is fabricated primarily of 304 stainless steel. Certain portions have been changed to "nuclear grade" type 316 L which contains less than 0.03% carbon. The remainder has had "corrosion-resistant clad" applied in the vicinity of the field welds so that no heat-affected type 304 will be in contact with the coolant. The piping assemblies were all solution annealed after all shop welding and application of the cladding.

Furthermore, NUREG-1061, Volume 3 (November 1984) indicates that thermal fatigue and stress corrosion cracking cannot be absolutely excluded from piping operation and that it may never be possible to either precisely

specify acceptable levels for them or assure analytically that the specific levels would not be exceeded. However, NUREG-1061 indicates that should these unanticipated severe conditions occur, the break would most likely be located at the terminal ends, at connections to components, and at other locations which introduce higher stress concentration or that exceed the stated threshold limits of SRP 3.6.2. Based on these factors, the NUREG-1061, Volume 3, concluded that relaxing the arbitrary intermediate break requirements would not introduce adverse effects.

Table D-1 summarizes the systems in which currently postulated arbitrary intermediate breaks are to be eliminated.

APPENDIX D

TABLE D-1

Elimination of Arbitrary Breaks
Systems Summary

Piping System	Pipe Material	Operating Temp. (,F)	Number of Breaks/ Whip Restraints Deleted
Main Steam	CS	550	11/16
Reactor Recirc	SS	534	8/8
High Pressure Core Spray	CS	550	2/3
Low Pressure Core	CS	550	2/4
Residual Heat Removal	CS/SS	550	9/4
Reactor Core Isolation	CS	550	3/2
Reactor Water Clean-up	CS	534-544/437/ 233/120	4/0
Main Steam Isolation Valve Leakage Control	CS	550	2/0
Nuclear Boiler Piping	CS/SS	549	2/0
Standby Liquid Control	CS/SS	135/80	2/0
			45/37

SS - Stainless Steel
CS - Carbon Steel

APPENDIX E

PROVISIONS TO MINIMIZE THE EFFECTS OF THERMAL AND VIBRATION INDUCED PIPING FATIGUE

I. GENERAL FATIGUE DESIGN CONSIDERATIONS

For Class 1 lines, fatigue considerations are addressed by the cumulative usage factor (CUF). To ensure that piping does not fail due to fatigue, the ASME Code has established the CUF limit at 1.0. By definition, all arbitrary intermediate break locations have CUFs below 0.1.

For Class 2 and 3 lines, fatigue is considered in the allowable stress range check for thermal expansion stresses. This stress is included in the total stress value used to determine postulated break locations. All arbitrary break locations exhibit stresses less than 80% of the code allowables. If the number of thermal cycles is expected to be greater than 7,000, then the allowable stresses are further reduced by an amount dependent on the number of cycles.

II. THERMAL DESIGN CONSIDERATIONS

For Class 1 lines anticipated flow conditions that could result in piping thermal transient stresses are defined. Piping thermal transient stresses are included in cumulative usage factors and documented in stress reports for the piping.

III. VIBRATION DESIGN CONSIDERATIONS

Piping at CPS is designed and supported to minimize transient and steady state vibrations. Preoperational and start-up testing will be performed to ensure that vibration of the piping systems are within allowable limits. The purpose of the program is to ensure that operations piping vibration does not result in exceedances of allowable stress amplitudes nor result in undesirable system responses. The freedom from restraint or snubber lock-up will also be observed; and a cold/hot walkdown will be included.

Plant personnel will be trained to recognize excessive piping vibration so that potential problems can be resolved. In addition, a formal test program, as outlined in the FSAR will be completed to verify the acceptability of the piping steady-state vibration.

APPENDIX F

PROVISION FOR MINIMIZING STEAM/WATER HAMMER EFFECTS

1. Water hammer is prevented in the ECCS discharge lines by maintaining the lines in a full condition. The lines are kept full up to the injection isolation valves by water leg pumps. Beyond the discharge valve the line is not drained when the system is on standby, so the discharge lines will remain full.

The HPCS is a motor-operated system and has no steam supply line.

The steam supply line to the RCIC turbine is maintained at an elevated temperature down to the shutoff valve directly upstream of the turbine by means of a condensing pot arrangement. The steam supply line is sloped downward to allow any moisture in the line to drain off to the condensing pot. The condensing pot drains to the main condenser during normal plant operation and is automatically isolated when the RCIC system is initiated.

The isolation valves on the steam supply line to the RCIC turbine are normally open, and automatically close upon receipt of any one of the following signals;

a) A high pressure drop across a flow device in the Steam supply line equivalent to 300 percent of the steady state steam flow at 1192 psia.

b) A high area temperature, utilizing temperature switches in the leak detection system.

c) A low reactor pressure of 50 psig minimum.

d) A high pressure between the turbine exhaust rupture diaphragms.

These valves may also be remote manually closed. A one-inch bypass with a motor operated shutoff valve is supplied around the inboard steam line isolation valve. This bypass line will be used for pressurizing, draining, and pre-warming the steam line prior to opening the inboard steam line isolation valve.

In order to prevent damage from water hammer, neither steam isolation valve is opened automatically by an initiation signal. Should either or both of these valves be closed, they must be reopened by first closing both valves completely. With both valves closed, the outboard isolation valve can be reopened to allow any moisture in the line to drain. Then moisture ahead of the inboard isolation valve is equalized and the downstream line is warmed by slowly opening the inboard isolation valve bypass valve. Finally, the inboard isolation valve may be reopened without water hammer occuring.

2. The main steam and feedwater systems are expected to experience steam and water hammer loadings, respectively. Analyses are performed for these loadings, and the main steam and feedwater systems are designed to accommodate and minimize effects of these loadings. Main steam piping is analyzed and designed for the effects of isolation valves closures, turbine stop valve closures, and safety relief valve openings. The feedwater piping is analyzed and designed for the effects of check valve closure caused by flow reversal from the RPV after a feedwater pump trip. The main steam and feedwater stress reports include the stresses and usage factors calculated from the analyses of these events.

APPENDIX G

PROVISION FOR MINIMIZING LOCAL STRESSES FROM WELDED ATTACHMENTS

IPC has reviewed all arbitrary intermediate break locations to be eliminated and has determined that in most cases no welded attachments are placed in close proximity to postulated break locations. In four cases, where welded attachments are in proximity to the postulated arbitrary breaks, the local bending stresses induced by the attachment will not affect the stresses at the postulated break point. To ensure that this is the case, the local stresses have been determined and added to the primary stress in the stress report.