

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH IT-8-F33, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TITLE (4)  
**Pipe Break Exclusion Zones Differ From Those Provided in The Final Safety Analysis Report**

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
06	05	97	97	-- 036 --	01	10	31	97	FACILITY NAME	DOCKET NUMBER	
OPERATING MODE (9)		5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)								
POWER LEVEL (10)		000	20.2201(b)			20.2203(a)(2)(v)			<input checked="" type="checkbox"/> 50.73(a)(2)(i)	50.73(a)(2)(viii)	
			20.2203(a)(1)			20.2203(a)(3)(i)			<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	50.73(a)(2)(x)	
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71	
			20.2203(a)(2)(ii)			20.2203(a)(4)			50.73(a)(2)(iv)	OTHER	
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)		

**LICENSEE CONTACT FOR THIS LER (12)**

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**COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)**

C USE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

<b>SUPPLEMENTAL REPORT EXPECTED (14)</b>			<b>EXPECTED SUBMISSION DATE (15)</b>		MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE).	<input checked="" type="checkbox"/> NO						

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 5, 1997, with the Unit in Mode 5, the Configuration Management Program Final Safety Analysis Report (FSAR) verification identified that incorrect stress analysis limits may have been used in the design of moderate-energy fluid system piping. Also, the effects of a design change which changed the Containment design from sub-atmospheric to atmospheric on Containment leakage integrity were not evaluated. These two conditions were determined to be reportable on June 9, 1997. On October 1, 1997, it was determined that the failure to include in the ISI program some weld locations (for high and certain moderate-energy lines) within penetration areas required to be identified as break exclusion areas (BEA's) was reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition or event prohibited by the plant's Technical Specifications.

The cause for not applying the correct stress limits in the design of moderate-energy piping, was inadequate communication within the Architect/Engineer (A/E) organization during the original design. The cause for not reviewing the effects on Containment integrity of changing from a sub-atmospheric to an atmospheric design was inadequate technical review within the utility engineering and A/E organizations during operation.

There were no adverse safety consequences from these conditions. These conditions are significant in that a through wall pipe crack would result in exceeding the leakage assumptions utilized in dose assessment calculations.

Pipe stress calculations will be reconciled to the proper allowable stresses. The FSAR and design documents will be updated. The ISI program will be updated to include weld inspection for the defined BEA's.

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I. Description of Event

On June 5, 1997, with the Unit in Mode 5, the Configuration Management Program Final Safety Analysis Report (FSAR) verification identified that incorrect stress analysis limits may have been used in the design of moderate-energy fluid system piping. Also, the effects of a design change which changed the Containment design from sub-atmospheric to atmospheric (or slightly positive) in the long-term (i.e., greater than 24 hours post-accident) on Containment leakage integrity were found not to have been evaluated. These two historical conditions were determined to be reportable on June 9, 1997, pursuant to 10 CFR 50.73(a)(2)(ii)(B) as conditions outside the design basis. On October 1, 1997, it was determined that the failure to include in the ISI program some weld locations (for high-energy and certain moderate-energy lines) within containment penetration areas that were required to be identified as break exclusion areas was reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition or event prohibited by the plant's Technical Specifications.

The Nuclear Regulatory Commission (NRC) Standard Review Plan (SRP), Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated With The Postulated Rupture of Piping," and Branch Technical Position (BTP) Mechanical Equipment Branch (MEB) 3-1, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," provide design requirements for high-energy and moderate-energy fluid system piping. BTP MEB 3-1 Sections B.1.b and B.2.b, state that for "fluid system piping in containment penetration areas, [that] breaks and cracks need not be postulated in those portions of piping from the containment wall to and including the inboard or outboard containment isolation valves, provided they meet" the applicable requirements of Section III of the American Society of Mechanical Engineers (ASME) Code, and other additional requirements. These areas are referred to as pipe break exclusion areas (BEAs) for high-energy fluid system piping and through wall leakage crack exclusion areas (also referred to as BEAs) for moderate-energy fluid system piping. The Final Safety Analysis Report (FSAR) Chapter 3, "Section 3.6, "Protection Against Dynamic Effects Associated with the Postulated Ruptures of Piping," invokes the criteria of the SRP Section 3.6.2, and BTP MEB 3-1 Section B.1.b and B.2.b for the analysis of some fluid piping systems

To invoke the criteria specified in the SRP Section 3.6.2 and BTP MEB 3-1, the piping system must be designed to the conservative stress limits specified in the SRP and the BTP. In order to define a high-energy line break exclusion area, the BTP (committed to through the FSAR) requires that an augmented In-Service Inspection program, in accordance with the requirements of 10 CFR 50.55a(g)(6)(ii), be implemented and inspection performed in accordance with Section XI of the ASME Code. For moderate-energy piping for containment penetration areas which take exception to General Design Criteria (GDC) 54 through 57, augmented ISI is required to be performed in accordance with FSAR Section 6.2.4.2, "System Design."

The original plant design was for a sub-atmospheric Containment. For a sub-atmospheric Containment design, it is necessary to ensure that in-leakage due to a postulated passive failure in a containment penetration boundary does not challenge maintaining the Containment sub-atmospheric post-Design Basis Accident (DBA). In January 1991, a design change eliminated the sub-atmospheric design in favor of an atmospheric design. The change from a sub-atmospheric to atmospheric Containment design results in the long-term (i.e., greater than 24 hours post-accident) pressure response changing from sub-atmospheric to atmospheric (or slightly positive). Therefore, the in-leakage concern for passive failure was replaced with an out-leakage concern.

The reportable conditions are:

- Prior to the design change, long-term passive failure in Containment penetration areas for the Emergency Core Cooling Systems (ECCS), Quench Spray System (QSS), and Recirculation Spray System (RSS), Hydrogen

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Recombiner System (HCS) and Containment Atmospheric Monitoring (CMS) was not required to be postulated because pipe break exclusion areas were invoked. However, the correct stress limits were not applied in the design of this moderate-energy piping. The stress analyses used limits that apply for high-energy fluid piping systems. However, the stress analysis limits for the design of moderate-energy fluid piping systems are less than those of high-energy fluid piping systems. Consequently, credit for BEAs for the moderate energy fluid system piping cannot be taken. Therefore, a through wall crack between the Containment wall and the outboard isolation valve would have to be postulated which could result in in-leakage and loss of the design sub-atmospheric Containment pressure in the event of an accident. This is a reportable condition that existed from initial startup to the implementation of the Containment design change. This historical condition is reportable pursuant to 10 CFR 50.73(a)(2)(ii)(B) as a condition outside the design basis.

- The Containment design change did not evaluate the impact on Containment isolation integrity. This design change reversed the existing Containment leakage design basis concern from in-leakage into the sub-atmospheric Containment to the more conventional concern of out-leakage, post-accident, in the long-term. Originally, BEA's were invoked to prevent in-leakage for the sub-atmospheric Containment design for systems which potentially communicate with Containment and that utilize a check valve for their inboard containment isolation valve. The isolation capability of the various containment systems was not reviewed when the Containment design was changed from sub-atmospheric to atmospheric. Additional BEA's should have been invoked for certain containment penetrations to prevent out-leakage. Consequently, Containment isolation subsequent to a through wall leakage crack in the containment penetration area for certain moderate-energy systems may not be assured.

This is a reportable condition that existed from implementation of the Containment sub-atmospheric to atmospheric design change to the present and is reportable pursuant to 10 CFR 50.73(a)(2)(ii)(B) as a condition outside the design basis.

- On June 5, 1997, the CMP FSAR verification also identified that some high-energy and moderate-energy piping systems welds had not been incorporated within the ISI program. Several high-energy and moderate-energy line break areas were identified by design engineering but were not communicated to the ISI organization, and hence, were not included in the augmented ISI program from the program inception. Consequently, containment isolation post-DBA was not assured for these penetrations.

It was also identified on June 5, 1997, as part of the CMP, that when the Containment design change eliminated the sub-atmospheric design in favor of an atmospheric design, additional moderate-energy BEA's should have been identified (and some BEA's deleted). FSAR Section 6.2.4.2, requires that in order to take exception to GDC 54 through 57 for certain moderate-energy systems, that BEA's be invoked and augmented ISI be performed. These moderate-energy BEA's were not identified to the ISI organization and hence, were not included in the augmented ISI program. Consequently, containment isolation post-DBA was not assured for these penetrations.

On September 15, 1997, the Engineering Subcommittee of the Nuclear Safety Assessment Board (NSAB) identified during a review of Condition Reports that they considered the failure to perform augmented ISI (in accordance with the requirements of Section XI of the ASME Code) for welds located within unidentified high-energy line break exclusion areas to be a violation of Technical Specification 4.0.5. Augmented Inservice Inspections are outside the requirements of ASME Section XI, hence though this condition might be a program deficiency, it was not believed to be a reportable event. This condition had been identified but not considered reportable by the June 9, 1997, reportability evaluation. The threshold for reportability was thought to be the actual detection of a flaw in accordance with the guidance provided in Part 9900 of the NRC Inspection Manual, Section 6.14, "Flaw Evaluation," issued as part of Generic Letter (GL) 91-18, "Information to Licensees Regarding Two NRC Inspection

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Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." On October 1, 1997, it was determined that the failure to include in the ISI program some weld locations (for high-energy and certain moderate-energy lines) within containment penetration areas that were required to be identified as break exclusion areas was reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition or event prohibited by the plant's Technical Specifications. This condition existed from initial startup until the present.

These conditions were discovered when the unit was in Mode 5, in an extended cold shutdown, and as a result no immediate operator action was required. Detailed records of the reviews of the individual system requirements, stress analysis packages and calculations are available at the Millstone Station.

II. Cause of Event

The cause for not applying the correct stress limits in the design of moderate-energy piping, was inadequate communication within the Architect/Engineer organization during original design in distinguishing between the stress limits for high-energy and moderate-energy systems.

The second event involved not reviewing the effects on Containment isolation system integrity of changing from a sub-atmospheric to an atmospheric Containment design. The cause of this event was inadequate technical review within the utility engineering and Architect/Engineer organizations during operation. This resulted in a failure to identify some of the applicable break exclusion areas, consequently these locations were not included in the In-Service Inspection program.

The apparent cause for not including the proper scope for high-energy and the applicable moderate-energy break exclusion areas in the augmented ISI program was inadequate communication between the Architect/Engineer and the utility engineering organizations during original design.

These are historical events identified as part of the Configuration Management Program review process.

The cause for not identifying and reporting the Technical Specification violation was a misinterpretation as to the applicability of the guidance of Generic Letter 91-18.

III. Analysis of Event

An engineering review is being performed for each condition identified through the Configuration Management Program review. The proper stress analysis acceptance criteria are being determined for each system. A review is being performed of the acceptance criteria used in each affected pipe stress analysis calculation. As part of this review, break exclusion areas are being verified (or redesignated) and the rationale for invoking each pipe break exclusion area is being reevaluated and documented. The Stress Data Packages (SDP's) are being updated to clearly convey the pipe break exclusion area requirements for the particular systems. Also, the applicability and scope of the augmented ISI program is being reviewed to ensure high-energy and appropriate moderate-energy line break exclusion areas are included.

There were no adverse safety consequences from these conditions, in that the unit has not experienced a pipe break or through wall leakage crack within the Break Exclusion Areas. However, this condition is significant in that a through wall pipe crack would result in exceeding the leakage assumptions utilized in the dose assessment calculations.

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IV. Corrective Action

Recurrence of these type of conditions is not expected due to enhancements in the design control process made since their occurrence. Chapter 8 of the Design Control Manual requires detailed technical reviews of vendor calculations.

The following corrective actions will be taken:

1. Completion of the updates to the Final Safety Analysis Report to reflect the correct design information for break exclusion areas and associated stress analyses has been revised from September 30, 1997, to prior to entry into Mode 4.
2. Pipe stress calculations will be reconciled to the proper allowable stresses for the applicable containment penetrations and design documents will be revised accordingly to clearly address pipe break exclusion areas prior to entry into Mode 4.
3. The Containment Isolation System will be restored to compliance with the Final Safety Analysis Report prior to entry into Mode 4.
4. The augmented Inservice Inspection Program applied to break exclusion areas will be updated to incorporate the inspection requirements and inspection locations determined from the engineering reviews prior to entry into the sixth refuel outage.
5. Augmented Inservice Inspection will be performed for the break exclusion areas identified within the revised program in accordance with ASME Section XI requirements by the end of the sixth refuel outage.
6. Criteria for determination of reportable events will be reviewed with those members of the Licensing staff responsible for the determination of reportable events and members of the Engineering staff associated with this event by November 26, 1997.

V. Additional Information

None

Similar Events

LERs discussing inadequate design control related conditions are identified below. Various elements of the Configuration Management Program are being conducted to detect design and licensing basis problems, which includes the Final Safety Analysis Report. The LERs are:

- LER 96-045-00 "Electrical Separation Design Conflict with FSAR."
- LER 97-015-00 "Potential Vortexing of Recirculation Spray System Pumps."
- LER 96-007-02 "Containment Recirculation Spray, Quench Spray, and Safety Injection Systems Outside Design Basis Due to Design Errors."

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- LER 97-010-00 "Electrical Calculation Discrepancies in Minimum Voltage Analysis for Class 1E Electrical Systems."
- LER 97-011-00 "Hydrogen Recombiner Heaters Potentially Outside of Design Basis Under Degraded Voltage Conditions."

Manufacturer Data

EIIS System Code

- Chemical and Volume Control System.....CB
- Post DBA Hydrogen Recombiner.....BB
- Containment Recirculation Spray System.....BE
- Quench Spray System.....BE
- Containment Vacuum Pump Suction System.....BF
- Containment Atmosphere Monitoring.....IK
- High Pressure Safety Injection System.....BQ
- Low Pressure Safety Injection System.....BP

EIIS Component Code

- Penetration.....PEN
- Pipe (Spool).....PSP