

EXPIRES 04/30/98

**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 (1-B 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.

FACILITY NAME (1) Millstone Nuclear Power Station Unit 2		DOCKET NUMBER (2) 05000336	PAGE (3) 1 OF 4
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TITLE (4)  
Failed Hydraulic Snubber and Degraded Pipe Supports on Refueling Water Storage Tank System Supply Piping

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
05	14	95	95	019	02	01	31	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9) 6	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
	20.2201(b)	20.2203(a)(2)(v)	<input checked="" type="checkbox"/>	50.73(a)(2)(i)	50.73(a)(2)(viii)					
POWER LEVEL (10) 000	20.2203(a)(1)	20.2203(a)(3)(i)		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)

NAME R. T. Laudenat, MP2 Nuclear Licensing Manager	TELEPHONE NUMBER (include Area Code) (860) 444-5248
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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 May 14, 1995 at 19:00, it was identified that a hydraulic snubber located on the shutdown cooling system piping had been inoperable for greater than the time allowed by Technical Specification 3.7.8. During a walkdown of the snubber, it was discovered that the snubber had rotated on its axis and a threaded rod on the extension piece of the snubber was bent to the extent that it may have impaired the operability of the snubber. Additional walkdowns and inspections have identified degradation of other supports on the refueling water storage tank (RWST) supply piping to the safety injection pumps and the containment spray pumps.

The cause of the bent threaded extension rod was concluded to be a localized externally applied load. The source of the load that resulted in the bent rod could not be determined. Degradation of other supports on the RWST supply piping have been attributed to dynamic loading of the piping and supports due to water hammer. Water hammer could occur on a partially voided piping system following the start of the safety injection pumps or the opening of the RWST outlet valves.

As a result of this event, several corrective actions have been taken. Walkdowns and inspections have been performed to identify the full extent of related damage. An analysis of the affected piping has been initiated. Actions will be taken to ensure that the RWST piping is returned to full design compliance.

This supplement is a complete revision. No revision bars are indicated in the text.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

I. Description of Event

On May 14, 1995 at 19:00, it was identified that a hydraulic snubber [SNB] located on the shutdown cooling (SDC) system piping had been inoperable for greater than the time allowed by Technical Specification 3.7.8. At the time of discovery of this event, the unit was in Mode 6 at 0 percent power.

A trouble report had been initiated on May 11, 1995 due to leaking hydraulic fluid from the vent port of the hydraulic snubber for support 402009. This support is located on the refueling water storage tank (RWST) supply piping for the 'A' low pressure safety injection (LPSI) [BP] pump. Hydraulic fluid leaking from a vent port is normally considered a minor maintenance item that may be attributed to an excessive amount of fluid in the reservoir. At the time that the trouble report was initiated, no operability concern was identified since no additional abnormalities were recorded. On May 14, 1995 during a walkdown of the snubber, it was discovered that the snubber had rotated on its axis causing the hydraulic fluid supply reservoir to be located below the valve assembly. It was also discovered that a threaded rod on the extension piece of the snubber was bent to the extent that it may have impaired the operability of the snubber. Based on the condition of the snubber, the shift manager concluded that the snubber support was inoperable.

An engineering evaluation of the inoperable snubber was performed to determine the cause of the bent threaded extension rod. An investigation of the weak link of the support (the hydraulic snubber assembly) found no further damage or any evidence of excessive loading. The most probable cause of the bent threaded extension rod was concluded to be a localized externally applied load, rather than a piping induced axial load on the rod. The source of the load that resulted in the bent rod could not be determined. The snubber was functionally tested in its as found condition on May 17, 1995. The results of the test indicated that the snubber was operable. The extension rod was replaced on May 18, 1995 and the snubber was returned to operable status on May 19, 1995 at 1230.

Technical Specification 3.7.8 requires that inoperable snubbers be restored to operability within 72 hours or the attached system must be declared inoperable. Since more than 72 hours had transpired from the established time of discovery of the inoperable hydraulic snubber for support 402009, the SDC cooling system was also declared inoperable and the associated Technical Specification (3.9.8.1) was entered. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), any operation or condition prohibited by the plant's Technical Specifications.

In order to assist in the evaluation of the inoperable snubber for support 402009 and determine the extent of the condition, a nearby mechanical snubber (402008) was functionally tested on June 15, 1996. This snubber failed the functional test. An evaluation of the snubber identified failed internal snubber components that suggested a minimum impact load of approximately 3,000 to 5,000 pounds had caused the failure. The magnitude and direction of these forces indicate that the source of the functional failure was a fluid system transient resulting in a water hammer event. During the period that snubber support 402008 was inoperable and snubber support 402009 had a bent rod, it was concluded that neither system operation nor the structural integrity of the piping system had been degraded. A replacement snubber was installed for support 402008. A follow up evaluation of the SDC system with the snubber in a failed, locked position confirmed system operability. Liquid penetrant examinations of critical welds that may have experienced dynamic loading (if present) were performed to confirm structural adequacy of the SDC system. These examinations found no indications in the inspected welds.

During a system readiness walkdown conducted on June 28, 1996 for the RWST piping, damage was discovered on the anchorage for an axial pipe support. As a result of this additional finding, further investigations were conducted in conjunction with a review of historical records of previous similar support damage on the RWST, high pressure safety injection (HPSI) [BQ], and LPSI suction piping. Current investigations indicate that the probable initiating cause was voids within this piping system. Water hammer could occur on a partially voided

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piping system following the start of the safety injection pumps or the opening of the RWST outlet valves. Procedural changes had been made in 1986-87 which significantly reduced the likelihood of unanticipated voids in this system. Recent procedural changes have been implemented to further reduce the likelihood of water hammer events in the RWST supply piping.

Engineering walkdowns of both trains of the RWST supply piping to identify the full extent of related damage were completed on September 10, 1996. Additional ASME Section XI inspections of selected piping and supports were completed on October 29, 1996. These walkdowns and inspections identified several degraded pipe supports as well as three locations where the pipe was noticeably flattened against pipe support shims. These conditions are consistent with damage that would occur due to water hammer. A review of associated pipe stress calculations of record indicated that, from a cumulative standpoint, both trains of the RWST supply piping, although degraded, remained operable.

Additionally, an analysis of the suction piping from the RWST to the HPSI, LPSI, and containment spray pumps is being performed to quantify water hammer loads generated due to various piping void assumptions. Data obtained from this analysis will be utilized in the pipe stress and support analyses that will fully address the consequences of the postulated events to establish a correlation between the analytical and field inspection findings. Preliminary results indicate that significant loads occur throughout the system when either of the RWST outlet valves are electrically opened which rapidly fills the downstream piping. Additionally, the predicted loads appear consistent with the degraded support conditions identified during the walkdowns and inspections that have been completed.

As part of the reviews described above, several discrepancies have been noted between the design and as-built conditions. These include discrepancies with five Hilti concrete anchor bolts, a mislocated support, and nonconservative support specific discrepancies (for example, two-sided versus four-sided welds). In these cases, analyses of the as-found conditions indicate that the piping would remain operable although in a degraded condition. These discrepancies would be expected to have been identified and corrected as part of the previous reviews performed in response to NRC Inspection and Enforcement Bulletin (IEB) 79-02, "Piping Support Base Plate Designs Using Concrete Expansion Anchor Bolts," and IEB 79-14, "Seismic Analyses for As-Built Safety-Related Piping Systems."

II. Cause of Event

The cause of the bent threaded extension rod was concluded to be a localized externally applied load. The source of the load that resulted in the bent rod could not be determined.

Degradation of other supports on the RWST supply piping have been attributed to dynamic loading of the piping and supports due to water hammer. Water hammer could occur on a partially voided piping system following the start of the safety injection pumps or the opening of the RWST outlet valves.

III. Analysis of Event

The RWST is an atmospheric tank which stores borated water during normal operation and is the initial source of suction for the HPSI and LPSI pumps and the containment spray pumps. The RWST is provided with two separate, independent outlet headers, each of which supplies borated water to each grouping of engineered safety feature pumps. The SDC system is designed to reduce the temperature of the reactor coolant in post shutdown periods to the refueling temperature. The system uses portions of other systems including the reactor coolant system, safety injection system, and containment spray system.

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The degradation and discrepancies identified in this LER have been reviewed to determine their affect on the system function. Although the piping and supports were found in a degraded condition, the affected system piping was still operable. Therefore, this event is not considered to be safety significant.

IV. Corrective Action

As a result of this event, the following corrective actions have been, or will be, performed.

1. The bent threaded extension rod for support 402009 was replaced on May 18, 1995 and the snubber was restored to its original design condition.
2. The mechanical snubber for support 402008 was replaced following the functional failure.
3. Liquid penetrant examinations of critical welds that may have experienced dynamic loading (if present) were performed to confirm structural adequacy of the shutdown cooling system. These examinations found no indications in the inspected welds.
4. Operating procedures have been reviewed to identify any additional requirements needed for regulating system operations to mitigate water hammer events. These reviews have been completed and appropriate procedure revisions have been implemented.
5. Engineering walkdowns of both trains of the RWST supply piping to identify the full extent of related damage were completed on September 10, 1996. Additional ASME Section XI inspections of piping and supports were completed on October 29, 1996.
6. An analysis of the suction piping from the RWST to the high pressure and low pressure safety injection pumps and the containment spray pumps is being performed to quantify water hammer loads generated due to various piping void assumptions. Data obtained from this analysis will be utilized in the pipe stress and support analyses that will fully address the consequences of the postulated events to establish a correlation between the analytical and field inspection findings. These analyses will be completed prior to restart of the unit from the current outage.
7. Actions will be taken to ensure that the RWST piping is returned to full design compliance. Repairs and modifications will be completed to resolve the discrepancies identified with the piping, supports, and anchors. Documentation inconsistencies will be resolved as part of this effort. Analyses will be performed to ensure that the as-built configuration of the piping and supports can withstand the design stresses for the system. These actions will be completed prior to restart of the unit from the current outage.
8. An investigation is currently in progress to evaluate the results of the previous IEB 79-02 and 79-14 reviews with respect to the support discrepancies identified in this LER. Based on the results of this investigation, other corrective actions will be initiated as appropriate.

V. Additional Information

Similar Events

No similar events were identified involving bend rods on snubbers or failed supports due to water hammer.

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX].