

LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50 0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MAIL ROOM), 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) Beaver Valley Power Station Unit 1	DOCKET NUMBER (2) 05000334	PAGE (3) 1 OF 4
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TITLE
Small Bore Piping Support Design Deficiencies

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
10	17	97	97	035	01	08	31	98	N/A	

OPERATING MODE (9)	POWER LEVEL (10)	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
5		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
	0%	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	x OTHER
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Voluntary LER
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME R. A. Hruby, Director, Design Basis Engineering	TELEPHONE NUMBER (include Area Code) (412) 393-5705
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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
B	AB	SPT	N/A	N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (if yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limited to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 3, 1997, at Beaver Valley Power Station Unit 1, various original Stone and Webster Engineering Corporation pipe support design deficiencies on small bore piping (2 inch and smaller lines) were identified during an engineering review. It was identified that a sliding support was disengaged from its guide on a 2 inch line that comprises the "B" Reactor Coolant System (RCS) loop drain piping. This sliding support was restored to the proper configuration. Engineering reviewed sliding supports for safety-related small bore lines and modified some additional sliding supports to ensure they would meet design requirements.

Additional evaluation of RCS loop drain small bore pipe supports identified that the design of some bar type anchors was not meeting code requirements. Subsequently, anchors of this style on other small bore safety-related piping were also reviewed and modifications were made for those supports identified during the reviews which were determined to be outside their AISC (support) and ANSI (piping) code design requirements. This condition is not applicable to Unit 2.

Reportability determinations have identified no requirement for a 10CFR50.73 report. The original report was made November 14, 1997 as a voluntary LER to describe identified small bore piping support design concerns and to outline the follow-up investigative approach and associated corrective actions. Assessments were performed to identify any inoperable supports in accordance with Generic Letter 91-18. The apparent cause of this event was inadequate original design by the architect engineer.

A comprehensive evaluation, which included an operability review of the safety-related small bore piping and supports was performed and documented in a Topical Report on December 15, 1997 and a Basis for Continued Operation on December 17, 1997. A summary of the findings of that evaluation is included in this supplement. The final disposition of the identified small bore piping issues will be addressed under the Corrective Action Program.

The actual safety significance of this event is low, since comprehensive evaluations performed indicate that, as a consequence of ty-related small bore piping support design deficiencies, none of the lines would experience pipe stresses or support loading of a gnitude that would result in an inoperable condition or a condition that significantly compromises plant safety. An evaluation performed pursuant to 10CFR Part 21 identified no substantial safety hazard associated with this event. Based upon this information, there were no safety implications to the health and safety of the public as a result of this event.

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

PLANT AND SYSTEM IDENTIFICATION

Westinghouse Pressurized Water Reactor (PWR)

Reactor Coolant System {AB}

Chemical and Volume Control System (CVCS) {CB}

Pipe Support {SPT}

* Energy Industry Identification System (EIIS), system and component function identifier codes appear in the text as (SS/CCC).

DESCRIPTION OF EVENT

On June 3, 1997, at Beaver Valley Power Station Unit 1, various original Stone and Webster Engineering Corporation pipe support {SPT} design deficiencies on small bore piping (2 inch and smaller lines) were identified during an engineering review. This condition was documented in Condition Report (CR) 970999. It was identified that a sliding support was disengaged from its guide on a 2 inch line that comprises the "B" Reactor Coolant System (RCS) {AB} loop drain piping. This sliding support was restored to its proper configuration. Engineering reviewed sliding supports for safety-related small bore lines and modified some additional sliding supports to ensure they would meet design requirements. Additional evaluation of RCS loop drain small bore pipe supports identified that the design of some bar type anchors was not meeting code requirements. Subsequently, anchors of this style on other small bore safety-related piping were also reviewed and modifications were made for those supports identified during the reviews which were determined to be outside their AISC (support) and ANSI (piping) code design requirements. This condition is not applicable to Unit 2.

On October 17, 1997, at 1030 hours, continuing investigations associated with the extent of condition evaluation of the small bore piping support concerns identified that three (3) bar anchor supports on the Chemical and Volume Control System (CVCS) {CB} were inadequate such that the resulting pipe stresses or support loading were beyond the ANSI B31.1 code limits and possibly the ASME Appendix F operability limits allowed by Generic Letter (GL) 91-18. This was documented in CR 971875. On October 17, 1997, at 1246 hours, with Unit 1 shutdown and defueled, this condition was conservatively reported to the NRC in a 4 hour report pursuant to the requirements of 10CFR50.72(b)(2)(i). Subsequently, however, the lines associated with these bar anchors were re-evaluated by use of a model that assumed the degraded supports were not present (which would be a bounding worst-case condition). This re-evaluation concluded that none of the lines would experience pipe stresses or support loadings of a magnitude that would result in an inoperable condition.

Initially reported small bore piping issues focused on "sliding" supports and "bar" type anchors. Although the identified conditions were determined not to be reportable, a voluntary LER was submitted November 14, 1997 documenting evaluation results and corrective actions taken up until that date. The results of additional evaluations were to be provided in a supplement to the LER. Subsequent to the initial submittal, a comprehensive extent of condition evaluation of Unit 1 safety-related small bore piping was performed. Additional conditions which represent deviations from the current design bases and which have the potential to cause stress levels in the affected piping and supports to be in excess of the design limits were also included in this evaluation. The specific conditions, as documented in CR 972079 on November 5, 1997, were identified as follows: 1) Installed valves in small bore piping systems with weights that were heavier than accounted for in the original plant design; 2) Piping supports in small bore piping systems inadequately designed to meet rated load capacity ("decal" loads), which did not meet system design requirements; 3) Interaction of non-safety related small bore piping with safety related piping at interfaces ("Q-breaks") which were not adequately supported for in the original plant design. Engineering evaluation of these additional conditions and the overall review of safety-related small bore piping concluded that the piping within the scope of the review remains operable.

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		97	035	01	

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

CAUSE OF EVENT

The apparent cause of this event was inadequate original design by the architect engineer.

ANALYSIS OF EVENT

The design of small bore piping is described in UFSAR Section B.2.1.10. The 1967 ANSI B31.1 code requires that the piping stress for integral welded attachments be evaluated. Local stresses at integral welded attachments (IWA) are required to meet a specified limit. These limits are applicable to the pipe and the weld. The overall pipe stress, including localized effects of the support attachments are required to meet those equations as delineated in UFSAR Section B.2.1.5, "Piping Stress Limits."

Small bore pipe supports were designed to constrain the pipe in either one, two, or three translational directions, depending on the required support function per the pipe stress requirements. The standard or "decal" loads were established relative to pipe size. The support designs are required to meet the AISC Code, 7th Edition. The support designer had several standard pipe support designs to select from. One such standard design consisted of bar style anchors. With appropriate support spacing and function to meet the required piping stress limits, the loads generated on the supports would generally be within the "decal" or load rating of the support.

Sliding supports were generally used in applications where large thermal movements were expected. This type of support could be used to constrain the pipe in either one or two directions, while allowing unrestricted pipe movement in the "guided" direction. Therefore, these supports should remain within their guides under expected thermal movements.

Bar type anchor supports are comprised of two parallel plates that attach directly to the pipe wall, at the centerline of the pipe. The plates are fillet welded at both the pipe attachment point and at the base of the plate to the structural steel or supporting frame. The welds will act to constrain the piping in translational and rotational directions. The anchors were designed for forces in three translational directions only.

Non-conforming Conditions

- 1) A sliding support was found to be disengaged from its guide. This condition seems to have occurred over several thermal cycles (i.e., plant heatups or cooldowns) such that the support had, in effect, "walked" out of its guide. The standard guide design does not employ travel stops to preclude this.
- 2) Bar type anchor supports for 2 inch and 1.5 inch piping were determined by engineering review to have inadequate attributes as specified in the associated pipe support sketch, and the support capacity had to be derated. The attributes include plate size, thickness, weld sizes and the certified material to be used for the bars. The anchors were originally designed for translational forces only. In reality, this type of support has the capacity to resist moments, however a low capacity to resist moments exists in certain directions.
- 3) Installed valves in small bore piping systems were identified with weights that were heavier than accounted for in the original plant design.
- 4) Piping supports in small bore piping systems were identified that were inadequately designed to meet rated load capacity ("decal" loads), which did not meet system design requirements.
- 5) Interactions of non-safety related small bore piping with safety related piping at interfaces ("Q-breaks") were identified which were not adequately accounted for in the original plant design

Both the initial and follow-up evaluations and analyses by Engineering utilized the criteria of Generic Letter 91-18 to evaluate the identified non-conforming conditions.

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CORRECTIVE ACTIONS

A comprehensive evaluation, which included an operability review of the safety-related small bore piping and supports was performed and documented in a Topical Report on December 15, 1997 and a Basis for Continued Operation on December 17, 1997. The final disposition of the identified small bore piping issues will be addressed under the Corrective Action Program.

REPORTABILITY

Three (3) bar anchors on the Chemical and Volume Control System (CVCS) were inadequate such that the resulting pipe stresses or support loading were beyond the ANSI B31.1 code limits and possibly the ASME Appendix F operability limits allowed by Generic Letter (GL) 91-18. On October 17, 1997, at 1246 hours, with Unit 1 shutdown and defueled, this condition was conservatively reported to the NRC in a 4 hour report pursuant to the requirements of 10CFR50.72(b)(2)(i). Subsequently, however, the lines associated with these bar anchors were reanalyzed by use of a model that assumed the degraded supports were not present (which would be a bounding worst-case condition). This evaluation concluded that none of the three lines would experience pipe stresses or support loading of a magnitude that would result in an inoperable condition. As described above, a follow-up evaluation, with an expanded scope to include all safety-related small bore piping, identified some additional nonconforming conditions. However, both the initial and follow-up evaluations concluded that the piping within the scope of the reviews was operable. Therefore, it has been determined that a reportable condition pursuant to the reporting requirements of 10CFR50.73 was not identified. This report is being made as a voluntary LER.

valuation has concluded that the identified conditions do not represent a substantial safety hazard and therefore are not reportable pursuant to the requirements of 10CFR Part 21.

SAFETY IMPLICATIONS

The actual safety significance of this event is low, since evaluations performed indicate that, as a consequence of safety-related small bore piping support design deficiencies, none of the lines would experience pipe stresses or support loading of a magnitude that would result in an inoperable condition or a condition that significantly compromises plant safety. There are no safety implications to the health and safety of the public as a result of this event.

SIMILAR EVENTS

A review of Licensee Event Reports for the past two years identified the following similar events involving piping and support design issues :

1. LER 1-96-009-01, "Containment Penetrations Not In Accordance with Design Basis," January 27, 1997.
2. LER 1-96-010-00, "Containment Piping Supports Not in Accordance with the Design Basis." September 11, 1996.