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PNP 2012-087

October 30, 2012

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Proposed Alternative – Request for Relief from Immediate ASME Code Flaw Repair of Service Water System Manual Valve MV-SW136

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(a)(3)(ii), Entergy Nuclear Operations, Inc. (ENO) hereby requests NRC approval of the Request for Relief for a Proposed Alternative for the Palisades Nuclear Plant (PNP). This alternative is for the current fourth 10-year inservice inspection interval.

This Request for Relief is submitted because a through-wall flaw was discovered in a service water system, 4-inch cast carbon steel valve body within an ASME Class 3 system. ENO has performed an operability evaluation of the through-wall flaw and determined that the valve continues to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure. Immediate repair or replacement of the valve would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Summary of Commitments

This letter identifies three new commitments and no revisions to existing commitments. Refer to Attachment 2.

A047
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 30, 2012.

Sincerely,

ajv/jse

Attachments:
1. Proposed Alternative
2. List of Regulatory Commitments
3. Operability Evaluation No. CR-PLP-2012-06365

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ATTACHMENT 1

ENTERGY NUCLEAR OPERATIONS, INC.
PALISADES NUCLEAR PLANT

PROPOSED ALTERNATIVE
in Accordance with 10 CFR 50.55a(a)(3)(ii)
Hardship or Unusual Difficulty Without Compensating
Increase in Level of Quality and Safety

1. ASME Code Component(s) Affected / Applicable Code Edition

Components / Numbers:	Service water system manual valve MV-SW136, American Society of Mechanical Engineers (ASME) Class 3, manually operated globe valve manufactured by Crane, SA-216 Grade WCB cast carbon steel material
Code of Record:	ASME Section XI, 2001 Edition through 2003 Addenda as amended by 10 CFR 50.55a
Description:	Service water manual valve MV-SW136, located on the discharge side of component cooling water (CCW) heat exchanger E-54B
Unit / Inspection Interval:	Palisades Nuclear Plant / Fourth 10-Year Interval

2. Applicable Code Requirements

The ASME Boiler and Pressure Vessel Code, Rules for Inservice Inspection of Nuclear Power Plant Components, Section XI, 2001 Edition through 2003 Addenda, as amended by 10 CFR 50.55a.

Valve MV-SW136 is part of the ASME Code Class 3 portion of the service water system and has a through-wall leak. The request for relief applies to the requirements of ASME Code Section XI, 2001 Edition through 2003 Addenda, Article IWD-3000, which establishes acceptance standards (IWD-3500) and provides analytical evaluation criteria (IWD-3600) for flaws identified during performance of inservice inspections and tests. In the 2001 Edition through 2003 addenda, IWD-3500 and IWD-3610 default respectively to IWC-3500 and IWC-3610. IWC-3610 defaults to IWB-3610. IWB-3610 does not include analytical evaluation criteria for acceptance of through-wall flaws in pressure retaining base material of ferritic valves.

Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Class 3 Piping, Section XI, Division I," which has been conditionally approved by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," provides analytical evaluation rules for temporary acceptance

of flaws in piping. However, Code Case N-513-3 does not apply to through-wall flaws located in the pressure retaining base material of a valve. Paragraphs 1(a) and 1(a)(1) of Code Case N-513-3 state:

> "These requirements apply to the ASME Section III, ANSI B31.1, and ANSI B31.7 piping classified by the Owner as Class 2 or 3. The provisions of this Case do not apply to the following: pumps, valves, expansion joints and heat exchangers."

3. Reason for Request

On September 20, 2012, leakage was identified from the insulated four inch manual valve MV-SW136, "Component Cooling Water Heat Exchanger E-54B Service Water Outlet CV-0826 Bypass," with an active drip. The insulation was removed from the piping and the valve body was identified as having a pin hole leak. The service water leak rate from the pin hole leak was measured to be approximately 10 mL/min. The valve is located immediately downstream of CCW heat exchanger E-54B temperature control valve CV-0822.

Initial volumetric ultrasonic testing (UT) of the body of valve MV-SW136 was performed. The body of the valve is made of cast steel with a measured nominal thickness of 0.5 inches. The pin hole leak is located approximately one inch from the toe of the flange weld, near the valve outlet. Ultrasonic testing on a 0.5 inch by 0.5 inch grid was completed by ultrasonic testing in the area surrounding the pin hole leak and the minimum wall thickness identified was 0.214 inch at the location of the pin hole.

Additional UT of the valve, covering the circumference of the valve body, was performed. Wall thinning was identified at two additional locations, near the inlet of the valve body. The thickness of the first area ranged from 0.114 inch to 0.155 inch, and the thickness of the second area ranged from 0.085 inch to 0.131 inch. There was no leakage observed at either of these locations. The as-found thickness of the valve body at these two locations is greater than the required minimum wall thickness.

No other leakage was visually observed elsewhere in the service water system discharge piping from CCW heat exchangers E-54A and B.

NRC Inspection Manual 9900: Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality of Safety" (dated April 16, 2008), Appendix C, "Specific Operability Issues," Item C.11, "Flaw Evaluation," addresses evaluations of ASME Class 2 and Class 3 system components with through-wall flaws. When ASME Class 2 or Class 3 components do not meet ASME Code acceptance standards, the requirements of a NRC-endorsed ASME Code Case, or NRC approved alternative, then a determination of whether the degraded or nonconforming condition results in a Technical Specification required system, structure, or component being inoperable is required.

This section of the manual also states that whenever a flaw does not meet ASME Code or construction code acceptance standards or the requirements of an NRC endorsed ASME code case, a relief request needs to be submitted in a timely manner after completing the operability determination process documentation.

An operability evaluation for MV-SW136 was performed (see Attachment 3). The operability evaluation is based on the approach given in ASME Boiler and Pressure Vessel Code, Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," January 26, 2009. Code Case N-513-3 was conditionally approved by the NRC in Regulatory Guide 1.147. This Code Case contains requirements that may be used for the evaluation of through-wall flaws in Class 2 or 3 piping only, but is not intended for the evaluation of flaws in valve bodies.

The pin hole leak is located on the downstream side of MV-SW136. The valve is on a four inch diameter bypass line that connects upstream to a 16 inch diameter service water discharge line from the CCW heat exchanger E-54B and connects downstream to a 24 inch service water discharge header that flows directly to Lake Michigan. The bypass line contains CCW heat exchanger E-54B temperature control valve CV-0822, which is maintained in a throttled position to regulate flow through the upstream CCW heat exchanger E-54B during normal operation. MV-SW136 provides an isolation function for the upstream CV-0822. Since MV-SW136 is on the discharge side of the CCW heat exchanger, which goes directly to Lake Michigan, leakage from the valve has no effect on the supply of service water to required loads.

Valve MV-SW136 is located in the CCW room. The flooding analysis for the CCW room postulates failure of an 18 inch pipeline within the room, and concludes that no equipment required for safety plant shutdown would be affected by the maximum flood levels within the room from the piping failure. Any leakage from the four-inch MV-SW136 would be bounded by the discharge from the postulated 18 inch pipe break.

Valve MV-SW136 is not isolable. The valve can be isolated from the upstream portion of the service water system but not from the downstream portion of the system, which discharges to Lake Michigan. Performing a Code repair/replacement activity now to correct the flaw discovered in MV-SW136 flaw would create a hardship based on the potential risks associated with unit cycling and emergent equipment issues incurred during shutdown and startup evolutions.

No compensating increase in the level of quality and safety would be gained by immediate repair of the flaws. The operability evaluation of the through-wall flaw determined that the valve continues to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure. Attached to the operability evaluation are two engineering analysis that address thinning of the valve body in the vicinity of the pin hole leak and at two locations where additional wall thinning was revealed during UT examinations.

4. Proposed Alternative and Basis for Use

The request for relief applies to the requirements of ASME Code Section XI, 2001 Edition through 2003 Addenda. As noted in Section 2 of this request, Article IWD-3000, establishes acceptance standards (IWD-3500) and provides analytical evaluation criteria (IWD-3600) for flaws identified during performance of inservice inspections and tests. However, these Code revisions do not include analytical evaluation criteria for acceptance of through-wall flaws in pressure retaining base material of ferritic valves. While Code Case N-513-3 provides analytical evaluation criteria to accept through-wall flaws in low energy class 2 and 3 piping, the Code Case does not apply to valves.

ENO evaluated the as-found condition of the valve and proposes to temporarily accept the condition of the valve to allow continued operation instead of performing a repair/replacement activity (see Attachment 3). The as-found condition was evaluated using the provisions of the approved alternative Code Case N-513-3, except that paragraph 1(a)(1) of the Code Case states that the provisions of the Code Case do not apply specifically to valves. The evaluations concluded, in part, that the through-wall flaw is stable and the valve will not fail catastrophically under design loading conditions, and that the wall thinning identified at two additional locations is acceptable because the thinnest location remains above the required minimum wall thickness.

Although the provisions of Code Case N-513-3 do not apply to valves, the other aspects of the Code Case were followed or were shown to be not applicable.

This proposed alternative to use Code Case N-513-3 is based on ENO performing the following actions.

1. ENO will perform a daily visual walkdown of manual valve MV-SW136 to confirm analysis from UT examinations remains valid (i.e., no new significant leakage) in accordance with Section 2(f) of Code Case N-513-3. This walkdown may be completed by monitoring via a catch basin installed beneath MV-SW136.

2. ENO will perform a monthly UT examination of the three areas of manual valve MV-SW136 with identified wall thinning to validate the flaw analysis completed in support of the operability evaluation in accordance with Section 2(e) of ASME Code Case N-513-3.

3. ENO will repair or replace manual valve MV-SW136 no later than when either

   (1) the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, in accordance with Section 2(h) of Code Case N-513-3, or

   (2) during the next scheduled outage, in accordance with Section 2(h) of Code Case N-513-3, or

(3) the through-wall flaw leak rate reaches one gpm and prompt action to reduce leakage to below one gpm is not effective,

whichever occurs first.

The next scheduled outage is the refueling outage planned to begin in October 2013.

4. ENO performed an extent of condition UT examination at a minimum of five of the most susceptible and accessible locations within 30 days in accordance with Section 5(a) of Code Case N-513-3.

   The five locations examined were manual valve MV-SW278 (Diesel Generator 1-1 Service Water Outlet), manual valve MV-SW279 (Diesel Generator 1-2 Service Water Outlet), manual valve MV-SW135 (CCW Heat Exchanger E-54A Service Water Outlet CV-0823 Bypass), control valve CV-0823 (CCW Heat Exchanger E-54A Service Water Outlet), and control valve CV-0826 (CCW Heat Exchanger E-54B Service Water Outlet). These five valves were chosen based on exposure to throttled flow and the susceptibility of their valve body materials to cavitation.

   The UT examinations did not identify any evidence of wall thinning at the locations examined.

Basis: Attachment 3, "Operability Evaluation No. CR-PLP-2012-06365," is the basis for considering the valve operable but degraded/non-conforming with compensatory measures. The operability evaluation and its attached documentation provide the basis for the requested relief from Code Case requirements.

5. Duration of Proposed Alternative

The requested Code relief shall be used until Code repair/replacement activities are performed on the valve body either during the next scheduled outage or when the predicted flaw size exceeds acceptance criteria or when the through-wall flaw leak rate reaches one gpm and prompt action to reduce leakage to below one gpm is not effective. The next scheduled outage is the refueling outage planned to begin in October 2013.

6. Precedent

This relief request is similar in nature to the relief request listed below, which was authorized by the NRC and involved a through-wall flaw in an ASME Class valve that was evaluated using guidance in Code Case N-513.

McGuire Nuclear Station, Unit 1, March 26, 2008, Accession Number ML080580577.

ATTACHMENT 2

LIST OF REGULATORY COMMITMENTS

One page follows

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy Nuclear Operations, Inc. (ENO) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check One)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
ENO will perform a daily visual walkdown of manual valve MV-SW136 to confirm analysis from UT examinations remains valid (i.e., no new significant leakage in accordance with Section 2(f) of ASME Code Case N-513-3). This walkdown may be completed by monitoring via a catch basin installed beneath MV-SW136.	X		The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in October 2013.
ENO will perform a monthly UT examination of the three areas of manual valve MV-SW136 with identified wall thinning to validate the flaw analysis completed in support of the operability evaluation in accordance with Section 2(e) of ASME Code Case N-513-3.	X		The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in October 2013.
ENO will repair or replace manual valve MV-SW136 no later than when either (1) the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria, in accordance with Section 2(h) of Code Case N-513-3, or (2) during the next scheduled outage, in accordance with Section 2(h) of Code Case N-513-3, or (3) the through-wall flaw leak rate reaches one gpm and prompt action to reduce leakage to below one gpm is not effective, whichever occurs first. The next scheduled outage is the refueling outage planned to begin in October 2013.	X		The next refueling outage, or upon repair or replacement of the valve, whichever occurs first. The next refueling outage is scheduled to begin in October 2013.

ATTACHMENT 3

OPERABILITY EVALUATION NO.

CR-PLP-2012-06365

48 pages follow

Operability Evaluation Page 1 of 46

1. Condition Report No./Operability Evaluation No. CR-PLP-2012-06365
2. Summary of Operability Evaluation:

The Service Water System, while degraded, continues to be able to fulfill its Safety Function to remove heat loads from the Plant under all conditions, and it will not suddenly or catastrophically fail and/or jeopardize other Safety Related Equipment in the Component Cooling Water Room as a result of the pin hole leak and inlet wall thinning in MV-SW136.

Understanding, the through wall pin hole leak is evaluated in the non-planar fashion and the two areas identified with wall thinning are above the design requirements; there is no concern with the valve failing catastrophically.

The evaluation is based upon NRC Inspection manual 9900 guidance, significant operating experience, and flaw evaluations using guidance from ASME Code Case N-513-3. Because the code case is not applicable to valves, a Relief Request will be submitted to the NRC (CR-PLP-2012-06323 CA-2).

The flaw evaluations conclude that the wall thinning on the inlet portion of the valve is greater then the calculated minimum wall and therefore acceptable. The through wall leak was also evaluated and determined to be less than the allowable flaw length.

Since the through-wall flaw of MV-SW136 was found structurally acceptable by UT examinations and subsequent analysis, immediate repair of the flaw is not required. Additionally because Code Case N-513-3 is not applicable to valves, relief request must be granted from the NRC. Operating Experience from plants in Region 2 have seen similar conditions and have been granted relief (McGuire 2007). Because compensatory measures to confirm the analysis conditions used in the evaluation have been developed, the operability status of MV-SW136 is recommended to be OPERABLE-COMP MEAS.

3. Basis for Operability Evaluation attached. ☒
4. Are there any other affected SSCs? ☒ No ☐ Yes

5. Validity of the Immediate Operability Determination: (valid or invalid and why)
The Immediate Operability Determination of the Service Water System is accurate.

A leak in MV-SW136 in the Component Cooling Water Room has no impact on the operation of the Service Water System discharge, since this is the section of open-ended pipe that discharges to the Make-up Basin. It is only an issue from a Code Compliance standpoint. The greater potential impact from a leak in this portion of the piping has to do with the potential flooding in the Component Cooling Water Room, and thus the operability of the Component Cooling Water (CCW) pumps. Flooding evaluation previously performed is bounding.

6. Recommendation:

☐ NOT APPLICABLE	☐ OPERABLE
☐ OPERABLE-DNC	☒ OPERABLE-COMP MEAS
☐ INOPERABLE	☐ EQUIPMENT FUNCTIONAL
☐ EQUIPMENT NON-FUNCTIONAL	☐ NOT REQUIRED

7. Identify any Limitations, Long Term Actions and/or Compensatory Measures to maintain Operability:
☐ N/A ☒ Yes (List WO, CA, tracking no., etc.)

1. Perform monthly UT examination bounding the three identified thinned locations to validate the flaw analysis completed in the Structural Integrity Reports. WR 284493

2. Perform daily visual walkdown to confirm analysis from NDE examinations remain valid (i.e. No New significant leakage in accordance with Section 2(f) of N-513-3). This can be completed through remote camera connection to observe "leakage" by monitoring the catch basin for increased flow. Operations to verify during rounds of the Component Cooling Water Room that the Service Water leakage is contained by the catch basin, and not leaking on other equipment. Quantitative analysis not needed, a future developed ODMI will develop necessary trigger points (CR-PLP-2012-06323 CA-8).

3. Submit relief request to the Nuclear Regulatory Commission in accordance with NRC Inspection Manual Part 9900: Technical Guidance "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety." (CR-PLP-2012-06323 CA 2)

4. Perform extent of condition NDE examination at a minimum of five susceptible locations within 30 days in accordance with ASME Code Case N-513-3. Owners: Programs Engineering. Due Date: 10/20/2012 (CR-PLP-2012-06365 CA 2)

Process Applicability Determination and subsequent reviews have been completed for Compensatory Measures required to maintain or restore Operability ☒ Yes ☐ No ☐ N/A PAD-12-0347

Approvals:

Prepared By (Name/Date): Derek DeBusscher 9-28-2012

Additional Reviews (Assign thru CA Process) By (Name/Date): Aaron Verzwyvelt / 9-28-2012 CA No.

Additional Reviews (Assign thru CA Process) By (Name/Date) _____ CA No. _____

Engineering Manager Approval By (Complete only if not entered in PCRS) (Print/Sign/Date) Jody Haumersen 9-28-2012

Shift Manager (Complete only if not entered in PCRS) (Print/Sign/Date) 9/28/12 9/28/12

Send a copy of the Operability Evaluation to the System Engineer for use in the System Health Report.

(Attach additional pages as necessary)

ATTACHMENT 9.6 OPERABILITY EVALUATION BASIS

1. Summary Statements

- *Succinctly state the Degraded or Nonconforming Condition in clear, concise terminology. Summarize the results of the evaluation, succinctly stating the Operability recommendation.*

  On September 20, 2012, NRC personnel identified leakage from the insulated 4" manual valve MV-SW136, "E-54B SW OUTLET CV-0826 BYPASS" with an active drip of 2 to 3 dpm. The insulation was removed from the piping and the valve body was identified as having a pin hole leak. The pin hole leak is releasing Service Water into the Component Cooling Water room at approximately 10 mL/min. This valve and associated piping are ASME Class 3. CR-PLP-2012-06323 was initiated.

  During extent of condition efforts, Ultrasonic Testing (UT) examinations were completed within the capabilty of the equipment on the entire valve. Wall thinning was identified on the inlet of the valve body with the remaining material thickness as low as 0.085 inches. CR-PLP-2012-06365 was intiated.

- *Identify the safety function of the system being reviewed.*

  The Service Water System (SWS) provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation or a normal shutdown, the SWS provides this function for various safety related and non-safety related components. The segment under consideration discharges into the open-ended service water return line to Lake Michigan.

  There are two SWS trains, each associated with a Safeguards Electrical Train which are described in Technical Specification 3.8.9, "Distribution Systems - Operating." The SWS train associated with the Left Safeguards Train consists of one SWS pump (P-7B), associated piping, valves, and controls for the equipment to perform their safety function. The SWS train associated with the Right Safeguards Train consists of two SWS pumps (P-7A, P-7C), associated piping, valves, and controls for the equipment to perform their safety function.

  Per TS 3.7.8, Service Water System (SWS), LCO 3.7.8, Two SWS trains shall be OPERABLE in Modes 1, 2, 3, and 4.

  In Modes 1, 2, 3, and 4, the SWS System is a normally operating system, which is required to support the OPERABILITY of the equipment serviced by the SWS and required to be OPERABLE in these Modes. In Modes 5 and 6, the OPERABILITY requirements of the SWS are determined by the systems it supports.

- *The basis for determination of Operability.*

  NRC Inspection Manual 9900: Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality of Safety," Appendix C, "Specific Operability Issues," Item C.11, "Flaw Evaluation" addresses evaluations of ASME Class 2 and Class 3 SSCs with through-wall flaws. When ASME Class 2 or Class 3 components do not meet ASME Code acceptance standards, the requirements of an NRC endorsed ASME Code Case, or NRC approved alternative, then a determination of whether the degraded or nonconforming condition results in a TS required SSC being inoperable is required. In order to determine the operability of the SSC, the degradation mechanism must be visually discernable or there must be substantial operating experience with the identified degradation mechanism in the affected system.

  In addition, the NRC issued Generic Letter (GL) 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping," permits licensees to consider either the "through-wall flaw" or the "wall thinning" flaw evaluation approach when assessing the structural integrity of moderate energy piping with identified flaws. Whenever a flaw does not meet ASME Code or construction code acceptance standards or the requirements of an NRC

endorsed ASME code case, a relief request needs to be submitted in a timely manner after completing the operability determination process documentation.

Palisades has significant Operating Experience with MV-SW136. In 1993, the MV-SW136 weld to outlet flange location was identified as leaking. Final internal visual inspection of the piping indicated wall thickness degradation due to flow cavitation resulting from MV-SW136 and/or CV-0822 (CCW HT EXCHANGER E-54B TEMP CONTROL) throttling. Degradation was also found on the valve body of MV-SW136. The valve was replaced during the 1995 Refueling Outage; reference AMMS Work Orders 24511363, 24511872, and 24100653 (CR-PLP-1993-00072).

Additionally, in October 1999, a through wall leak was identified on the body of the MV-SW136 in a similar location to the current occurrence. The valve was replaced during the refueling outage in which it was identified under AMMS WO 24913115. During that repair the valve was inspected: "while significant erosion was present to cause the pin hole, it did not appear severe enough to cause significant potential for catastrophic failure" (CR-PLP-1999-00690).

Therefore, Palisades has substantial operating experience with the identified degradation mechanism affecting MV-SW136.

A structural evaluation was performed using the guidance from Generic Letter (GL) 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping," which permits licensees to consider either the "through-wall flaw" or the "wall thinning" flaw evaluation approach when assessing the structural integrity of moderate energy piping with identified through-wall flaws.

Two evaluations were completed for clarity between the through wall leak on the outlet of MV-SW136 and the wall thinning on the inlet. PLP-RPT-12-00140 was completed for the through wall leak on the outlet of the valve. PLP-RPT-12-00139 accepts the evaluation completed on the wall thinning on the inlet of the valve.

Although ASME Code Case N-513-3, Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or Class 3 Piping Section XI, Division 1," does not apply to valves, the guidance and calculations provided in the code case were used to bound the flaws.

The through wall evaluation utilized section 3.2 "Nonplanar Flaws" subsection C for a branch reinforcement method as well as subsection D which provides an alternative calculation method. Section 3.2(d) provides guidance on bounding the nonplanar flaw by using two independent flaws, one axial and one circumferential. The two independent planar flaw evaluations were determined to be more conservative than the branch reinforcement method of section 3.2(c). The calculations stemming from section 3.2(d), as such, was used as the acceptance criteria. However both calculations show the MV-SW136 through-wall flaw is stable and will not fail catastrophically under design loading including FSAR Chapter 14 conditions.

Additionally, Code Case N-513-3 was used to bound the wall thinning regions of the inlet of MV-SW136. Section 3.2(b) was utilized to determine a minimum wall thickness. The calculation concludes that the current thinnest wall region (0.085") is acceptable per the code case N-513-3 Section 3.2(b) as long as it remains above the calculated minimum wall of 0.020"

Compensatory measures were devised with guidance from Code Case N-513-3. Reference Section 6 of this Operability basis.

Since the through-wall flaw of MV-SW136 was found structurally acceptable by UT examinations and subsequent analysis, immediate repair of the flaw is not required. Additionally because Code Case N-513-3 is not applicable to valves, relief request must be granted from the NRC. Operating Experience from plants in Region 2 have seen similar conditions and have been granted relief (McGuire 2007). Because compensatory measures to confirm the analysis conditions used in the evaluation have been developed, the operability status of MV-SW136 is recommended to be OPERABLE-COMP MEAS.

A relief request is being developed for not meeting ASME Code or construction code acceptance standards or the requirements of an NRC endorsed ASME code case and will be submitted in a timely manner. (CR-PLP-2012-06323 CA-2)

Replacement of MV-SW136 shall be performed no later than when the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria or the next scheduled (refueling) outage whichever occurs first. Refer to the section 6 for more information.

- *If so, a definitive statement that the system is capable of performing its Specified Safety Function.*

The Service Water System, while degraded, continues to be able to fulfill its Safety Function to remove heat loads from the Plant under all conditions, and it will not suddenly or catastrophically fail and/or jeopardize other Safety Related Equipment in the Component Cooling Water Room as a result of the pin hole leak in MV-SW136.

Understanding, the through wall pin hole leak is evaluated in the non-planar fashion and the two areas identified with wall thinning are above the design requirements; there is no concern with the valve failing catastrophically.

2. References

List all procedures, specifications, standards, codes, calculations, drawings, regulatory documents, etc., including revision numbers that were used in the evaluation.

1. FSAR Section 9.1, Rev. 25
2. Technical Specification LCO 3.7.8, Amend. 199
3. Piping and Instrument Diagram – Service Water System, M-208, Sheet 1A, Revision 62
4. Piping Isometric Drawing M-101, Sheet 2744, Revision 10
5. Piping Class Sheet, Class HB, Drawing M-260, Sheet 1/HB, Revision 34
6. Piping Class Summary, Class HB-23, Drawing M-259, Page 24, Revision 22
7. Valve Drawing, VEN-M121 Sheet 65
8. Condition Report CR-PLP-1993-00072
9. Condition Report CR-PLP-1999-00690
10. Condition Report CR-PLP-2011-07085
11. Condition Report CR-PLP-2011-03207
12. Condition Report CR-PLP-2012-05813
13. Condition Report CR-PLP-2012-06323
14. Condition Report CR-PLP-2012-06365
15. Work Order 327249, "MV-SW136 HAS A PINHOLE LEAK THROUGH THE VALVE BODY WALL"
16. Report PAL-UT-12-050, Work Order 327249 task 2, 'UT Erosion/Corrosion Examination', MV-SW136 valve body
17. ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1"
18. NRC Inspection Manual Part 9900: Technical Guidance "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety."
19. PAD 12-0344
20. EC 39820 "Immediate Operability Recommendation for CR-PLP-2012-06323, MV-SW136 leak in valve body"
21. EC 39850 "Flaw Tolerance and Wall Thinning Evaluations for as-found condition of M-SW136, E-54B SW Outlet CV-0826 Bypass to Support Operability Evaluation"
22. PLP-RPT-12-00140 SIA Report No. 1201055.401 "Flaw Tolerance Evaluation of Leaking MV-SW136 Service Water Valve Body"
23. FSAR Chapter 14
24. NRC Generic Letter 90-05 "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping"
25. EN-OP-104, Operability Determination Process
26. Technical Specification 3.8.9
27. EA-C-PAL-95-1526-01, "Internal Flooding Evaluation for Plant Areas Outside of Containment"
28. PLP-RPT-12-00139, SIA Report No. 1201055.402 "Evaluation of Inlet Side Thinning of the MV-SW136 Service Water Valve Body"

29. Report PAL-UT-12-051, Work Order 327249 task 8, 'UT Erosion/Corrosion Examination', MV-SW136 valve body

3. Detailed Problem Statements

- *Clearly identify and discuss each item of Degraded or Nonconforming Condition.*

Condition report CR-PLP-2012-06323 (Reference 13) on September 20, 2012 identified leakage from the insulated and lagged 4 inch Service Water Bypass Line from Component Cooling Water Heat Exchanger high capacity valve, CV-0826, downstream from E-54B Temperature Control Valve, CV-0822. Upon removal of the insulation, a pin hole leak was identified on the valve body of MV-SW136, E-54B SW OUTLET CV-0826 BYPASS. MV-SW136 is a 4" globe valve with slip on flanges that are welded. The pin hole location is in the heat affected zone of the slip on flange, but within the valve body.

On 9/20/12, the plant non-destructive examination (NDE) personnel examined the MV-SW136 valve body which is immediately downstream of CCW Heat Exchanger E-54B Temperature Control Valve (TCV) CV-0822. The valve body is made of cast steel with a measured nominal thickness of 0.5 inches.

The pin hole leak is approximately one inch from the toe of the flange weld. A 0.5 inch by 0.5 inch grid was completed by the inspector and a minimum wall thickness identified via UT was 0.214 inch at the location of the pin hole. (Reference 15, Attachment 3).

Subsequent UT measurements were taken on 9/25/12 to support the relief request (CR-PLP-2012-06323 CA-2). Ultrasonic measurements were taken encompassing the entirety of the valve. However due to physical and visual restrictions, an equally spaced grid was not achievable. During this evolution, wall thinning was identified at two locations, not including the pin hole leak on the outlet of the valve. (Reference 28, Attachment 4)

Two indications were seen on the inlet of the valve body. The first area located from the A-AH locations ranged from 0.114" to 0.155" The second area located at the W-Z locations ranged from 0.085" to 0.131."

The thinnest wall location is 0.085" at the inlet of the valve body at approximately the 4 o'clock position. There is no through wall leak at this location, nor the A-AH thinned location. (Reference 28, Attachment 4)

- *Describe the Specified Safety Function performed by the equipment.*

The Service Water System is designed to supply lake water as the cooling medium (Ultimate Heat Sink) for removal of waste heat from the nuclear plant and steam plant auxiliary systems during normal, shutdown or emergency conditions. The Critical Service Water piping system consists of two main supply lines; one serving the Component Cooling heat exchangers, one serving the Containment Air Coolers.

The discharge piping system consists primarily of a 16-inch line from the Containment Air Coolers and a 16-inch line from the Component Cooling heat exchangers. These two discharge lines are joined into a single 24-inch discharge line that routes water through the West Engineered Safeguards room, thereby preventing flooding of the below-grade room by the Service Water discharge line. After the single 24-inch discharge line receives the service water from the engineered safeguards pumps seal coolers and the engineering safeguards room air coolers, the line is run underground to the discharge structure.

The remaining service water loads, including the emergency diesel generator lube oil and jacket water coolers, control room HVAC, instrument air compressor aftercoolers, auxiliary building air-conditioning condensers and noncritical equipment return headers are discharged into a common 16-inch header. This header runs underground from the lube oil room to join the common 24-inch discharge return line that is routed to the cooling tower makeup basin.

The observed leak is located immediately downstream of MV-SW136 located on the valve body. The valve is flanged to a spool piece which connects to the 24" discharge header which flows to Lake Michigan. The function of the valve is to provide isolation of CV-0822. CV-0822 is in a throttled position to regulate flow through the CCW Hx during normal operation. In an accident scenario, CV-0822 is designed to close thus closing the supply of water to MV-SW136. Due to the configuration of the piping, the 4" bypass line connects to the discharge header below the 16" outlet of E-54B. The leak is located on the discharge line and therefore would not impact the supply of Service Water to required loads. Because all applicable heat loads have been applied, this condition is primarily a code compliance issue rather then a nuclear safety issue.

- *Describe any background of events leading to the Degraded or Nonconforming Condition, include times, dates, documents, personnel, etc. involved with related circumstances.*

Palisades has significant Operating Experience with MV-SW136. In 1993, the MV-SW136 weld location was identified as leaking. Final internal visual inspection of the piping indicated wall thickness degradation due to flow cavitation resulting from MV-SW136 and/or CV-0822 throttling. Degradation was also found on the valve body of MV-SW136. The valve was replaced during the 1995 Refueling Outage; reference AMMS Work Orders 24511363, 24511872, and 24100653. (CR-PLP-1993-00072)

In October 1999, a through wall leak was identified on the body of the MV-SW136 in a similar location. The valve was replaced during the refueling outage in which it was identified under AMMS WO 24913115. During that repair the valve was inspected: "while significant erosion was present to cause the pin hole, it did not appear severe enough to cause significant potential for catastrophic failure." (CR-PLP-1999-00690)

In December 2011, minimal temperature differential was identified across E-54A CCW Hx. The apparent cause and radiography of the valve confirmed that MV-SW135, the outlet isolation of CV-0821, was damaged causing a failure of the gate valve. This failure mechanism damaged the internals of the manual valve causing it to close, thereby reducing flow. It was attributed to the cavitation due to being downstream of the constantly throttled valve, CV-0821. (CR-PLP-2011-07085)

Additionally, piping downstream of throttled valves has contributed to Palisades' Operating Experience. The piping downstream of CV-0824, SW from Containment, and CV-0823, CCW Hx E-54A SW Outlet, have recently shown pin hole leaks. During 1R22, the piping downstream of CV-0824 was replaced with cavitation resistant material under WO 282307 (CR-PLP-2011-03207). During the forced outage for CRD-24 repairs (August 2012), the piping downstream of CV-0823 was temporarily repaired under WO 324812 per code case N-661 and will be returned to OPERABLE status in 1R23 (CR-PLP-2012-05813). Both through wall leak sites were attributed to cavitation downstream of throttled valves, similar to MV-SW136 which is directly downstream of the throttled CV-0822.

- *Describe by what means and when the potential Degraded or Nonconforming Condition was discovered.*

The NRC Resident inspector identified pooling of water in the CCW room. Upon further investigation by the Shift Manager water was identified leaking in the location of MV-SW136 at 1510. Condition report CR-PLP-2012-06323 (Reference 13) on September 20 2012, identified leakage from the insulated and lagged 4 inch Service Water Bypass Line from Component Cooling Water Heat Exchanger High Capacity valve CV-0826, downstream from E-54B Temperature Control Valve, CV-0822. Upon removal of the insulation, a pin hole leak was identified on the valve body of MV-SW136, E-54B SW OUTLET CV-0826 BYPASS. The Operability of CR-PLP-2012-06323 was completed on September 22, 2012 and was classified as OPERABLE-COMP MEAS.

On September 25, 2012, additional UT examinations were completed on the entire valve body of MV-SW136 in order to support the relief request needed per Inspection Manual 9900. The UT data indicated wall thinning on the inlet of the valve body within 1" of the flange to valve weld. The measured thicknesses ranged from 0.085" to greater than 0.5."

- *Describe the failure mechanism.*

Cavitation induced erosion is a known problem in the Service Water System at Palisades. In 2011, cavitation induced erosion caused pin hole leaks downstream of CV-0824, Service Water From Containment, near the heat affected zone of a downstream weld (CR-PLP-2011-03207 Reference 11). Several examples of cavitation induced erosion are documented in the background section.

For the present occurrence, NDE data indicated localized corrosion/erosion locations which are characteristic of cavitation. Three locations were identified as having significant wall thinning, two on the inlet of the valve MV-SW136, and one through-wall of the outlet of the valve body.

In 1999, cavitation induced erosion caused small pin hole leak to develop within the valve body of MV-SW136. This current event associated with MV-SW136 appears similar to the 1999 event. Similarly, in 2011, MV-SW135, the sister valve of MV-SW136 was identified as failed due to cavitation induced erosion (Reference 10). From the ACE performed under CR-PLP-2011-03207 (Reference 11):

> *"Cavitation involves the formation of entrained gas in a process fluid due to a sudden pressure reduction; such as, may occur downstream of a throttled valve. The entrained gas bubbles collapse as fluid pressure increases. The dissipation of energy caused by the gas bubble collapse causes an erosive effect on system piping material."*

CV-0822 is designed as a throttled valve. CV-0822 has two main functions, throttled for flow, and closed. The temperature control valves regulate Service Water flow through the CCW Hx during normal Operations. This provides a constant throttled condition, and as such, cavitation downstream of the valve. Immediately downstream of the valve is MV-SW136. This throttled flow passes through CV-0822 and produces the corrosion/erosion leading to the bounded locations.

4. Assumptions

- *Specifically state all assumptions made in the engineering evaluation.*

1) The current event is similar to past events and as such has similar causes

2) A relief request will be submitted in a timely manner for all three flaws in accordance with NRC Inspection Manual 9900 for not meeting ASME Code or construction code acceptance standards or the requirements of an NRC endorsed ASME code case.

3) A 110 psi value was used for the calculations performed. This is conservative as the maximum pressure this valve would experience is substantially less.

5. Engineering Evaluation

Provide an evaluation for each item in the detailed problem statements.

- *The evaluation summary should clearly indicate if the component can perform its specified TS function and the basis thereof.*

As shown in the Structural Integrity Reports (Reference 22 and 28), there is no current structural concern with the valve. There are no indications that the valve may catastrophically fail. The safety function of MV-SW136 is to act as a class boundary of the Service Water System. The valve has no active function. A similar area of degradation in the valve body was seen in 1999. Thus, the Service Water System, while degraded, continues to be able to fulfill its Safety Function to remove heat loads from the Plant under all conditions, and it will not fail and/or jeopardize other Safety Related Equipment.

- *If walk downs or inspections were conducted, details should be provided here or referenced in the attachment section, including names, dates, criteria and specific results.*

On 9/20/12, the plant non-destructive examination (NDE) personnel examined the MV-SW136 valve body which is immediately downstream of CCW Heat Exchanger E-54B Temperature Control Valve (TCV) CV-0822. The valve body is made of cast steel with a measured nominal thickness of 0.5 inches. A UT Inspection was done with a 0.5 inch by 0.5 inch grid in a 3x3 in section bounding the through wall flaw. The minimum thickness found was 0.214"

On September 25, 2012, additional UT examinations were completed on the entire valve body of MV-SW136 in order to support the relief request needed per Inspection Manual 9900. The UT data indicated wall thinning on the inlet of the valve body within 1" of the flange to valve weld. The lowest measured thickness was 0.085."

Per Section 2(a), a flaw geometry shall be characterized by volumetric inspection methods of by physical measurement. Ultrasonic Testing measured wall thickness indicative of cavitation induced erosions based on Palisades significant operating experience.

- *Describe the basis for recommending the systems OPERABLE (i.e., analysis, test or partial test, operator experience or technical judgment). If Engineering Judgment is used, a sound basis must be documented.*

Operability is based upon the guidance from NRC Inspection Manual 9900, significant operating experience, and the analysis of the structural integrity of the valve using code case N-513-3 as guidance.

Inspection Manual 9900

Per 9900, "While ASME Section XI does not specifically provide flaw acceptance standards for components other then those specified in Table IWX-2500-1, its methods and standards may be applied to other components when appropriate as determined by the licensee."

In response to declaring a Class 2 or 3 components operable: "the degradation mechanism must be discernable from visual examination, or there must be substantial operating experience with the identified degradation mechanism in the affected system. "

Operating Experience

Palisades has significant Operating Experience in the Service Water System with cavitation induced erosion. EC 39820 was provided as input into the Immediate Operability determination for CR-PLP-2012-06323 with detailed information regarding several class 3 piping sections and specific operating experience on MV-SW136 leaks.

Per section C.11 and C.12 of Inspection Manual 9900: "In performing the prompt operability determination, the licensee must evaluate the structural integrity of the leaking component using actual geometry of the through wall flaw characterized or bounded with volumetric examination methods." Ultrasonic Testing measured wall thickness indicative of cavitation induced erosions based on Palisades significant operating experience.

ASME Code Case N-513-3

Because the valve body leakage is not within the bounds of a specific ASME or NRC approved code, a relief request must be submitted in a timely manner per Inspection Manual 9900. In order to provide a basis of Operability, the flaw location must be monitored. NRC approved ASME Code Case N-513-3 was used as guidance flaw evaluations.

Per the UT testing completed per WO 327249-02 and WO 327249-08, MV-SW136 has three locations with significant wall thinning, one being a through wall leak.

Area 1, will be referenced as inlet A-AH, has a minimum wall of 0.114"
Area 2, will be referenced as inlet W-Z, has a minimum wall of 0.085"
Area 3, will be referenced as outlet through wall leak, has a minimum wall of 0.214"

In order to bound all conditions and determine structural integrity of MV-SW136 Code Case N-513-3 was used. All three conditions represent non-planar flaws and such were analyzed using section 3.2 of Code Case N-513-3.

Inlet A-AH and Inlet W-Z were treated as separate flaws based upon section 3.2(a) which requires that if the wall thickness exceeds t_{min} the flaws should be combined. The Inlet A-AH thinned region is not predicted to wear less than t_{min} and thus the thinned regions were not combined. Per section 3.2(b) the minimum wall thickness (t_{min}) to maintain design requirements was calculated to be 0.020 inches. In accordance with Section 3.2(b) of N-513-3, a nonplanar flaw is acceptable as long as the remaining wall thickness is greater than or equal to t_{min}.

Because the remaining wall thickness of both the Inlet A-AH region (0.114") and the Inlet W-Z (0.085") region are greater then t_{min} of 0.020 inches, the current condition is acceptable. (Reference 28)

Two methods of evaluation, both acceptable per Code Case N-513-3, were chosen to evaluate the through wall leak on the outlet of the valve body.

The outlet through wall leak was evaluated using section 3.2(c) using the branch reinforcement method for a through wall leak in a thinning area. Alternatively, Section 3.2(d) was originally chosen to bound the condition using two planar flaws in conjunction. (This method was implored for CR-PLP-2012-06323)

The results of the branch reinforcement evaluation per section 3.2(c) was conservative by assuming uniform thinning across the valve body of the predicted minimum thickness surrounding the thinned through wall area. The resulting allowable through wall circular opening using the branch reinforcement methodology is 4 inches.

Two independent planar evaluations were conducted as directed by section 3.2(d), one axial and one circumferential. The allowable flaw lengths were calculated using the predicted thinnest wall of 0.125", which is based on the wear rate of the valve while in service. The circumferential allowable flaw length is 2.13" while the allowable axial flaw length is 3.00"

For the outlet through wall leak, based on UT measurements, the metal loss was estimated to be 0.089 inches from now until December 2013. Periodic monitoring will ensure that the metal loss at the wall thinning region does not go below t_{min}. It should be noted that even if the metal loss rate were to exceed the predicted rate, the structural integrity of MV-SW136 is maintained as long as the degraded area with a thickness below 0.125" is bounded by the corresponding allowable through wall lengths (2.1" circ/3.00" axial).

Structural integrity of the valve is shown through the flaw evaluation completed in PLP-RPT-12-00139 and PLP-RPT-12-00140. These reports show the localized corrosion/erosion of the valve is not significant to the point at which a catastrophic failure would occur.

Since the degraded condition also involves compensatory measures to maintain operability this condition is recommended as OPERABLE-COMP MEAS.

- *Evaluate the Immediate Operability Determination for this condition and confirm or refute its validity.*

Per EN-OP-104, "*To determine if an ASME Class 2 or 3 SSC with a flaw is OPERABLE in an Immediate Determination, the degradation mechanism must be readily apparent. To be readily apparent, the degradation mechanism must be discernable from visual examination (as external corrosion or wear) or there must be substantial operating experience with the identified degradation mechanism in the affected SSC.*"

The Operability Determination for CR-PLP-2012-06365 declared the Service Water System OPERABLE-OP EVAL. The Immediate Operability states:

"The Service Water System is required per Technical Specification LCO 3.7.8 "Service Water System." Applicable in Modes 1, 2, 3 and 4. The less than nominal pipe wall thickness locations are located immediately upstream of MV-SW136, B CCW HX TCV outlet isolation, and are class 3 piping. This condition is similar to the example given in EN-OP-104, revision 6, attachment 9.1, item 28, requiring an OP-EVAL. Engineering's input is that there is high confidence that the minimum required thickness will be well below actual wall thickness. Engineering is requesting an analysis be performed to determine the minimum required wall thickness required for system integrity. Preliminary results will be available within the next 12 hours and will be relied upon for the OP-EVAL. Reasonable assurance exists that the system remains operable, which is the immediate determination. No immediate reportability criteria exceeded by this condition.

Refer to the attached required form from EN-OP-104, attachment 9.2, based on a determination of OP-EVAL. The evaluation is due from engineering by 2300 on 9/26/12.

The overall assessment of the Service Water System is accurate, however one point should be clarified.

In the attachment 9.2, several references are made to pipe wall thinning and condition [28] of EN-OP-104. Condition [28] refers to pipe wall and not valve bodies. The design aspects of the valve are different than a piping run. The 87% reference is typical of Flow Accelerated Corrosion, but is not an applicable value for this condition and thus is not credited as acceptance criteria.

Additionally, a leak in MV-SW136 in the Component Cooling Water Room has no impact on the operation of the Service Water System discharge, since this is the section of open-ended pipe that discharges to the Make-up Basin. It is only an issue from a Code Compliance standpoint. The greater potential impact from a leak in this portion of the piping has to do with the potential flooding in the Component Cooling Water Room, and thus the operability of the Component Cooling Water (CCW) pumps.

Calculation EA-C-PAL-95-1526-01, "Internal Flooding Evaluation for Plant Areas Outside of Containment" evaluates the Component Cooling Water room for postulated internal flooding events. The bounding pipe break for the CCW room is not the 4" Service Water line, but rather the EB-9-18" Feedwater line. The water level will reach a maximum level of 20" within the CCW room based on the bounding conditions. No equipment required for safe shutdown will be affected by this flood level. The CCW pumps are considered to be flooded at 20.5". The "Jail House" door between the CCW room and the Turbine Building is configured in way that a hinged swing gate to relieve potential flooding in the CCW room. There is minimal threat with respect to room flooding should a leak suddenly propagate to an unmanageable volume.

6. Compensatory Measures

Describe and recommend any Compensatory Measures needed to:

- *Maintain or enhance an OPERABLE but Degraded or Nonconforming SSC's capability to perform its Specified Safety Functions. [RIS2005-20] This includes any periodic monitoring or testing to demonstrate continued operability.*

While not directly applicable to this condition, because of the valve body leak, the Operability Evaluation and structural analysis is based on the content from ASME Code Case N-513-3. As such the Compensatory Measures were chosen with guidance from the Code Case.

1. Perform monthly UT examination bounding the three identified thinned locations to validate the flaw analysis completed in the Structural Integrity Reports. WR 284493

2. Perform daily visual walkdown to confirm analysis from NDE examinations remain valid (i.e. No New significant leakage in accordance with Section 2(f) of N-513-3). This can be completed through remote camera connection to observe "leakage" by monitoring the catch basin for increased flow. Operations to verify during rounds of the Component Cooling Water Room that the Service Water leakage is contained by the catch basin, and

not leaking on other equipment. Quantitative analysis not needed, a future developed ODMI will develop necessary trigger points (CR-PLP-2012-06323 CA-8).

3. Submit relief request to the Nuclear Regulatory Commission in accordance with NRC Inspection Manual Part 9900: Technical Guidance "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety." (CR-PLP-2012-06323 CA 2)

4. Perform extent of condition NDE examination at a minimum of five susceptible locations within 30 days in accordance with ASME Code Case N-513-3. Owners: Programs Engineering. Due Date: 10/20/2012 (CR-PLP-2012-06365 CA 2)

- *Restore INOPERABLE SSCs to an OPERABLE but Degraded or Nonconforming status. [RIS2005-20]*

  None

- *Restore operating margins [RIS2005-20]*

  None

- *Compensate for a Degraded or Nonconforming Condition [RIS2005-20]*

  None

- *Allow corrective maintenance to be performed [RIS2005-20]*

  None

- *Provide for a time limit for future Operability based on the results of an Operability Evaluation.*

  Per Code Case N-513-3, repair or replacement shall be performed no later then when the predicted flaw size from either periodic inspection or by flaw growth analysis exceeds the acceptance criteria or the next scheduled (refueling) outage (1R23), which ever occurs first.

  However, a predicted flaw growth rate was completed by Structural Integrity Associates as part of their evaluation. An extrapolation was completed using nominal wall thickness, based upon the months in service. Since MV-SW136 does not see flow during Shutdown cooling operations, these months were excluded from the predictive calculation. The evaluation dictates that the pressure retention capabilities of the thinned region may be exceeded in approximately 11 months of continuous service. While this evaluation does predict the thinnest location to go through-wall near the end of the evaluation period, it is recognized that the analysis herein is conservative. Inlet A-AH region is not predicted to go through wall or below t_{min}, nor is the outlet leak predicted to grow beyond its acceptance criteria.

  Because of the service conditions of this valve, this valve sees varying flow dependent on lake temperature. Therefore, a linear extrapolation, while not completely accurate, provides an estimation of the flaw growth rate. It must be noted that removing the degradation mechanism, cavitation due to turbulent flow, may extend the life of the valve. Additionally, monthly UT measurement will provide the determination on when the valve may exceed its minimum wall thickness.

  For the inlet wall thinning, if the thickness of the thinnest location does become less than t_{min} or even through-wall, the evaluation performed for the leaking pin hole on the outlet side of the valve (detailed in SI Report Number 1201055.401/ PLP-RPT-12-00140) may be used to make an immediate operability decision. This could then be followed by a similar evaluation to justify continued operation.

- *Confer with the SM and persons in other departments to determine any procedures that may be needed to be created or modified to perform the Compensatory Measures. Refer to the guidance*

in section 5.9 [7] of this procedure for crediting operator actions as Compensatory Measures for operability.

Shift Manager and Engineering departments were consulted on the need to create or modify procedures and no additional procedures or changes were identified.

7. Long Term Actions

- *In some cases it may be possible to identify the appropriate long-term corrective action or LTCA (as defined in EN-LI-102, Corrective Action Process). If so, describe this and provide the status or schedule if available. As with all 10 CFR 50 Appendix B conditions adverse to quality, the schedule for corrective actions should be commensurate with importance to safety of the Degraded or Nonconforming Condition. Also, identify if any further detailed engineering evaluation is required. Describe the aspects that need further investigation. If possible, provide an estimated completion date. If Long Term Corrective Action was previously planned for other reason(s), then revise the action (WR, CA, etc.) to reference this CR. Such revision provides linkage to prevent cancellation or deferral without proper review. If a new Long Term Corrective Action Item is created record the work order, work request or other plant specific tracking number(s). In addition, record the CR Number (and due date as applicable) in the work order, work request or other plant specific tracking system "Description Field" to provide a link in order to prevent cancellation or deferral without proper review and revision (if necessary) of the actions from this Operability Evaluation.*

    1) Work Order 327249 will replace MV-SW136 in the next refueling outage 1R23.

8. Attachments

Provide any attachments necessary to substantiate the evaluation.

1) PLP-RPT-12- 00140 Structural Integrity Report on Outlet Through Wall
2) PLP-RPT-12- 00139 Structural Integrity Report on Inlet Wall Thinning
3) WO 327249-02, PAL-UT-12-050 Supplemental Report
4) WO 327249-08, PAL UT-12-051 Supplemental Report
5) PAD 12-0347

Engineering Report No. PLP-RPT-12-00140 Rev 0
Page 1 of 13

Entergy

ENTERGY NUCLEAR
Engineering Report Cover Sheet

Engineering Report Title:
Flaw Tolerance Evaluation of Leaking MV-SW136 Service Water Valve Body

Engineering Report Type:

New ☒ Revision ☐ Cancelled ☐ Superseded ☐
Superseded by: _____

Applicable Site(s)

IP1	☐	IP2	☐	IP3	☐	JAF	☐	PNPS	☐	VY	☐	WPO	☐
ANO1	☐	ANO2	☐	ECH	☐	GGNS	☐	RBS	☐	WF3	☐	PLP	☒

EC No. 39850

Report Origin: ☐ Entergy ☒ Vendor
Vendor Document No.: 1201055.401.R1

Quality-Related: ☒ Yes ☐ No

Prepared by: Structural Integrity Associates, Inc. Date: 9/27/12
Responsible Engineer (Print Name/Sign)

Design Verified: Structural Integrity Associates, Inc. Date: 9/27/12
Design Verifier (if required) (Print Name/Sign)

Reviewed by: Steven Overway / Steven O'Norway Date: 9/28/12
Reviewer (Print Name/Sign)

Approved by: Jacob Milliken / Jacob Milliken Date: 9/28/12
Supervisor / Manager (Print Name/Sign)

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September 27, 2012
Report No. 1201055.401.R1
Quality Program: ☒ Nuclear ☐ Commercial

Mr. Dennis Fitzgibbon
Entergy Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Hwy
Covert, MI 49043-9505

Subject: Flaw Tolerance Evaluation of Leaking MV-SW136 Service Water Valve Body

References:
1. ASME Boiler and Pressure Vessel Code, Section XI and Section II, 2001 Edition with 2003 Addenda.
2. ASME Boiler and Pressure Vessel Code, Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," January 26, 2009.
3. **pc-CRACK™**, Version 4.0.1.0, Structural Integrity Associates, December 14, 2011.
4. Design Input from Entergy, "UT Data and Stress Report," SI File No. 1201055-201.
5. Power Piping ANSI B31.1 – 1973 with Summer 1973 Addenda.

Dear Dennis:

This summary report documents the flaw tolerance evaluation of the MV-SW136 Service Water valve body (outlet side) of the Palisades Nuclear Plant to determine the allowable through-wall flaws that would meet ASME B&PV Code, Section XI stability requirements. It is understood that Section XI does not specifically address through-wall flaws. The evaluation results summarized herein are based on verified analyses which utilize many conservative assumptions.

1.0 INTRODUCTION

Leakage was recently discovered on the outlet side of the MV-SW136 Service Water valve body at Palisades Nuclear Plant. UT examination results showed that the leak emanated from a pin hole at a localized thinned wall region assumed, based on past history, to be due to cavitation induced erosion at the inside surface of the carbon steel valve. The pin hole leak is shown in Figure 1.

The objective of this calculation is to perform fracture mechanics analyses to determine the maximum through-wall flaw sizes that meet the ASME B&PV Code, Section XI allowable flaw criteria in terms of structural stability.

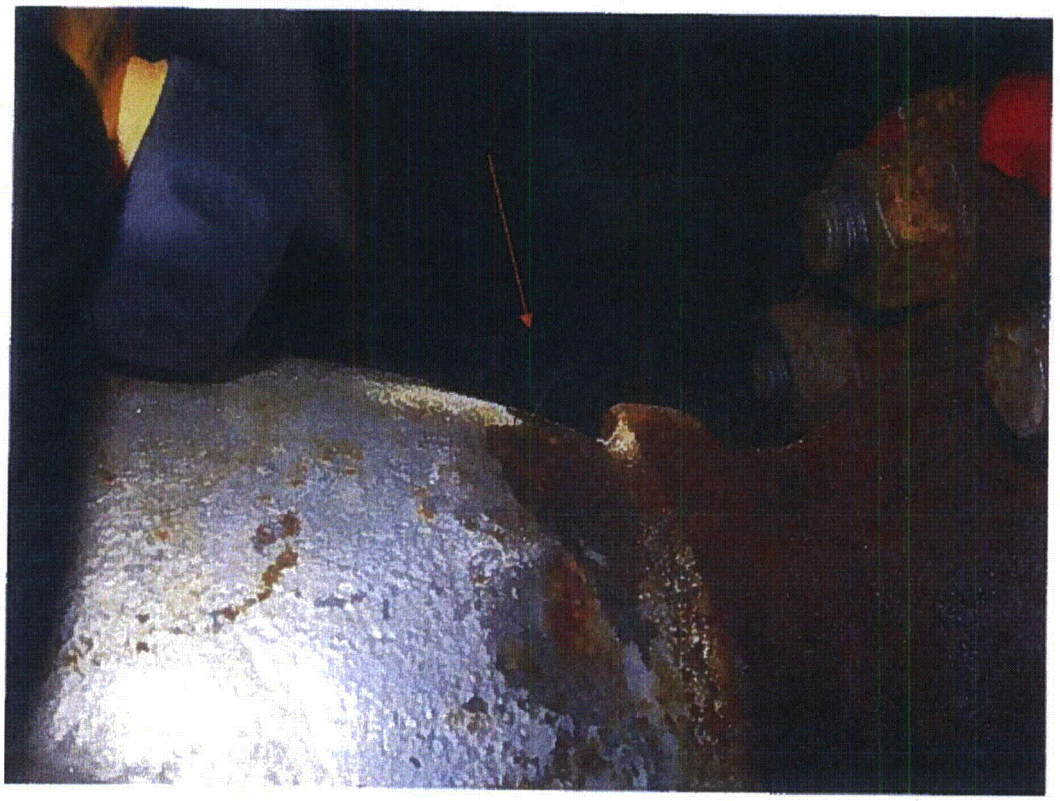


Figure 1: Photograph of Leak at MV-SW136 Valve

2.0 TECHNICAL APPROACH

The evaluation was performed using the procedures of Section XI of the ASME Code [1] and the general approach given in Code Case N-513-3 [2] for a nonplanar through-wall flaw. The MV-SW136 Service Water valve is a Class 3 component design per ANSI B31.1 (built to the ANSI B16.34 standard) and ASME Section XI criteria may be conservatively applied to ANSI B31.1 piping components. Following the recommendations of Section 3.2(d) in Code Case N-513-3, to evaluate the through-wall nonplanar flaw, two independent planar flaws, one in the axial direction and the other oriented in the circumferential direction are postulated. Critical and allowable flaw sizes are calculated for the postulated through-wall axial and circumferential flaws in the valve body to assess the structural integrity of the valve. Alternatively, a nonplanar through-wall flaw may be evaluated using a branch reinforcement approach as described in Section 3.2(c) of Code Case N-513-3. The approach results in an allowable through-wall circular opening of diameter d_{adj}. This evaluation is performed in addition to the planar characterization method.

3.0 FLAW EVALUATION

3.1 Component Dimensions

The MV-SW136 Service Water valve is connected to 4" Schedule 40 piping [4]. The leak occurs in the valve body but near the pipe joint. Therefore, the nominal dimensions of the piping are used in this evaluation:

- Nominal Pipe Size: 4" SCH. 40
- Pipe Outside Diameter: 4.5"
- Nominal Pipe Thickness, t_n: 0.237"

Since the leak is located in the valve body, the wall thickness at the thinned location is nominally larger than the 0.237" nominal pipe thickness, as shown by the UT results summarized in Figure 2 [4]. Additional UT measurements at the inlet side of the valve resulted in a minimum recorded thickness of 0.085" [4]. In order to assess the effects of the remaining wall thickness in the region around the pin hole, additional analyses are performed with the thickness of the valve set to:

- t_p = 0.125" which corresponds to the predicted end-of-evaluation period minimum thickness
- t_{meas} = 0.214" which corresponds to the minimum measured thickness, and
- t_{avg} = 0.35" which corresponds to the mean thickness in the thinned region

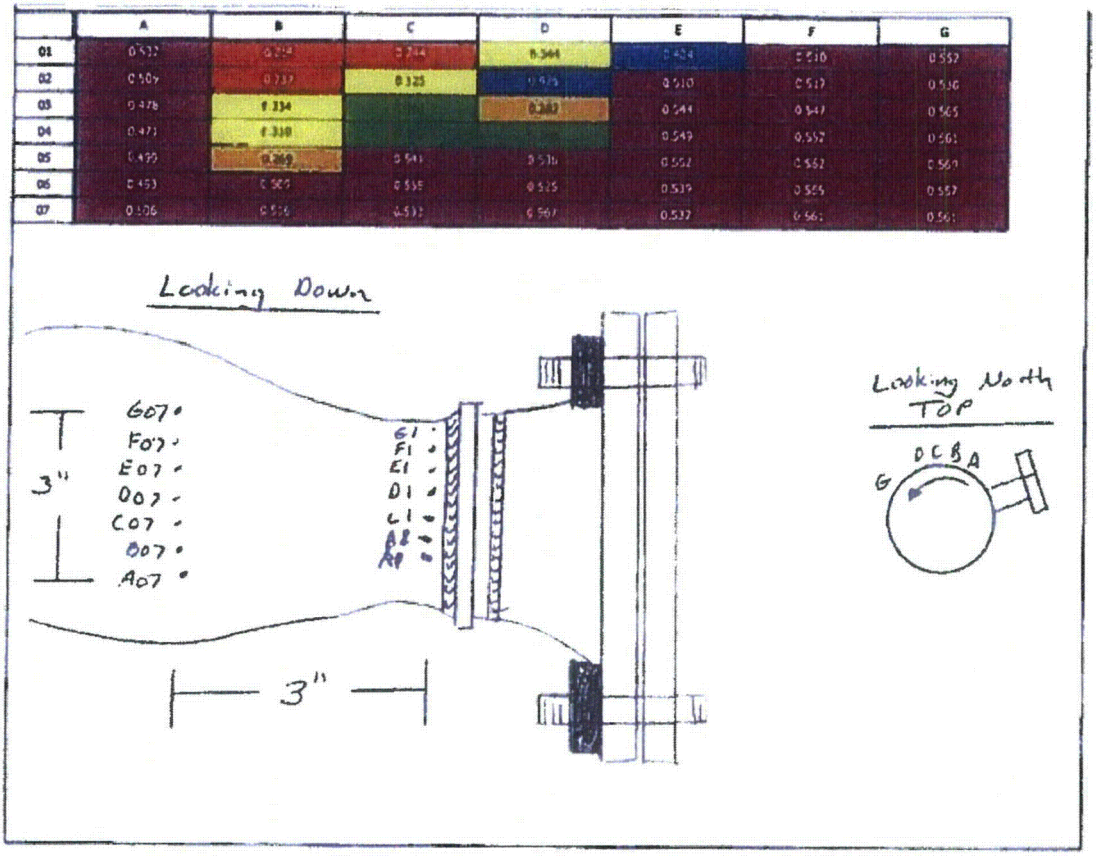


Figure 2: UT Examination Results for Outlet Side of MV-SW136 Valve

3.2 Design and Operating Conditions

The design and operating conditions of the Service Water piping system containing the MV-SW136 valve are as follows [4]:

Design Conditions:

- Design pressure = 100 psi
- Design temperature = 300°F

Operating Conditions:

- Normal Operating pressure = 65 psi
- Normal Operating temperature = 32°F to 114°F

A bounding maximum pressure of 110 psi is used in this evaluation.

3.3 Materials and Material Properties

The material of the different components of the MV-SW136 Service Water valve is specified as SA-216 Grade WCB [4]. The allowable stress for this material at the operating temperature is 14 ksi [5].

For the fracture mechanics evaluation, the modulus of elasticity is taken at the average normal operating temperature of 73°F: E=29,400 ksi. The modulus of elasticity varies from 29,600 ksi at 32°F to 29,200 at 114°F. This relatively small variation will not significantly affect the results of the fracture mechanics evaluation.

3.4 Applied Stresses

The stress report of the Service Water piping line containing the MV-SW136 valve considered Pressure, Deadweight, OBE, SSE and Accident Mode Thermal loading for two cases labeled "Active Supports" and "Inactive Supports" and an enveloping case labeled "Active and Inactive Supports" [4]. The loads from the bounding enveloping case were selected at the node representing the MV-SW136 for this evaluation. The loads are presented in Table 1 along with the calculated resultant axial stresses for the nominal pipe wall thickness of 0.237". Axial stresses are computed similarly for the other wall thicknesses considered in this evaluation.

Table 1: Applied Axial Stresses

Load	P (psig)	MX (in-lb)	MY (in-lb)	MZ (in-lb)	σ_m (ksi)	σ_b (ksi)
Pressure	110	0	0	0	0.441	0.000
DW	--	4,356	252	4,092	-	1.861
Thermal	--	-12	-576	612	-	0.261
OBE	--	1,764	2,088	912	-	0.896
SSE	--	3,528	4,176	1,824	-	1.793

Since an axial flaw is also postulated, the hoop stress is needed for the fracture mechanics evaluation. The hoop stress due to the internal pressure is calculated as follows:

$$\sigma_{hoop} = \frac{P \cdot \left(r_{outside}^2 + r_{inside}^2\right)}{\left(r_{outside}^2 - r_{inside}^2\right)}$$

where,

P = internal pressure
r_{inside} = inside radius of the cylinder
$r_{outside}$ = outside radius of the cylinder

Thus, using a bounding operating pressure of 110 psi, the following hoop stresses are applied in the axial flaw analyses:

Table 2: Applied Hoop Stresses

Wall Thickness (in)	0.125	0.214	0.237	0.350
Hoop Stress (ksi)	1.927	1.104	0.992	0.657

3.5 Stress Intensity Factors

Stress intensity factors are calculated for the postulated axial and circumferential through-wall flaws using fracture mechanics crack models of an axial or circumferential flaw in a pressurized cylinder. The stress intensity factors are determined using the **pc-CRACK™** [3] fracture mechanics software. The flaw models are shown in Figure 3 for the axial through-wall flaw and in Figure 4 for the circumferential through-wall flaw. The stress results derived in Section 3.4 are input to the program to determine the stress intensity factors for each of the postulated flaws.

Crack Model: 310 - Through-Wall Axial Crack in Pressurized Cylinder

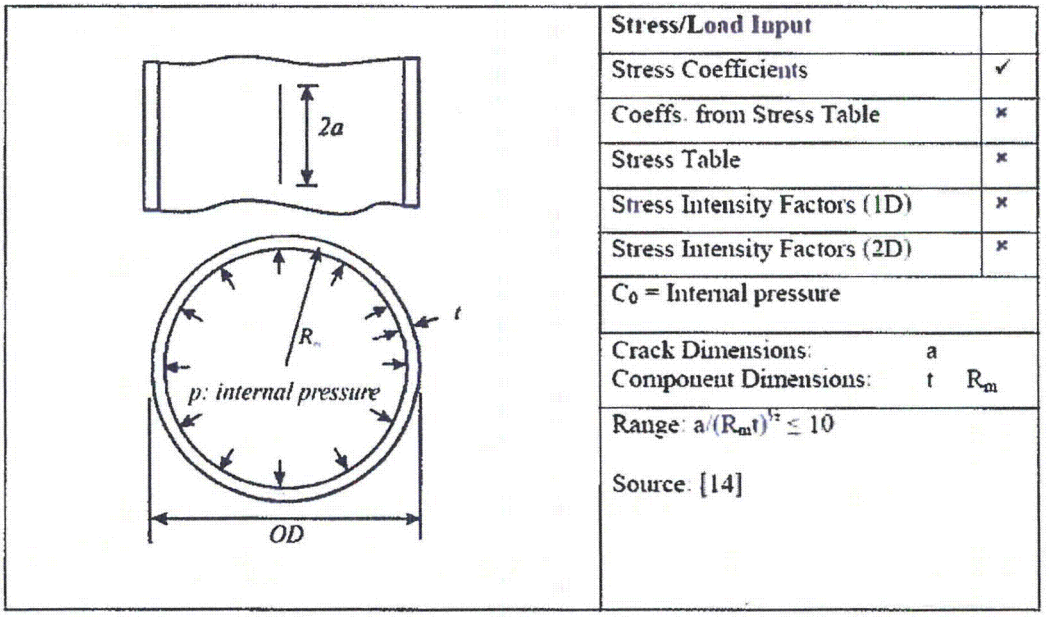
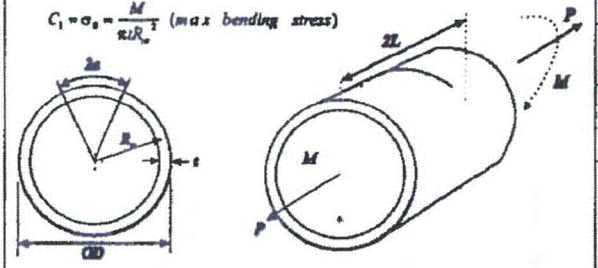


Figure 3: Fracture Mechanics Model for Axial Through-Wall Flaw

Crack Model: 311 - Through-Wall Circumferential Crack in Cylinder Under Tension And Bending



Stress/Load Input	
Stress Coefficients	✓
Coeffs. from Stress Table	×
Stress Table	×
Stress Intensity Factors (1D)	×
Stress Intensity Factors (2D)	×
C_0 = Membrane Stress C_1 = Max. Bending Stress	
Crack Dimensions: a Component Dimensions: t R_m	
Range: $1.5 < R_m/t \leq 100$ $a/(\pi R_m) < 0.611$ Source: [13]	

Figure 4: Fracture Mechanics Model for Circumferential Through-Wall Flaw

3.6 Fracture Toughness

For the ferritic material of the MV-SW136 Service Water valve, the fracture toughness can be obtained using the guidelines in Appendix C of Section XI of the ASME Code [1]. The material toughness, J_{Ic}, values for ferritic steel base metals and weldments for axial and circumferential flaws are provided in Table C-8322-1 and Table C-8321-1 of ASME Code, Section XI, Appendix C, respectively. Since the normal operating temperature of the system varies from 32°F to 114°F, it is conservatively assumed to be below the upper-shelf temperature of the ferritic material and the J_{Ic} for temperatures below the upper-shelf temperature for ferritic steel base metal is used:

$$J_{Ic} = 45 \text{ in-lb/in}^2$$

Thus, using the fracture toughness, the stress intensity factor can be calculated as:

$$K_{Ic} = (J_{Ic}E'/1000)^{0.5} = 38.1 \text{ ksi-}\sqrt{\text{in}}$$

where,

$E' = E/(1-\nu^2)$
E = Young's modulus = 29,400 ksi
ν = Poisson ratio = 0.3

Applying the appropriate structural factors for the different service levels specified in Appendix C of Section XI [2], yields the allowable stress intensity factor, K_{allow}, for each service level. Hence, for example, with a 2.7 structural factor, K_{allow} of 14.1 ksi-$\sqrt{\text{in}}$ is obtained for Service Level A.

3.7 Predicted End-of-Evaluation Thickness

While the MV-SW136 valve was replaced in May 2006, i.e., approximately 76 months ago, it is isolated and does not see flow during shutdown cooling. Palisades has conservatively estimated this isolation time at 180 days (6 months). Thus, the metal loss rate is based on 70 months of in-service time. Based on the UT results, an average valve body thickness of 0.5" is representative at the downstream (outlet) side of the valve. The minimum recorded thicknesses in the UT reports are 0.214" and 0.085" at the outlet and inlet side of the valve, respectively.

Using the valve average thickness and the thickness at the thinnest location at the valve inlet, 0.085", the metal loss rate is calculated to be approximately 5.9 mils per month, assuming a linear rate during the 70 months of operation. Based on this rate, the total metal loss for the 15-month evaluation period ending in December 2013 is 0.089". Hence, at the outlet side of the valve, the thickness at the thinnest location is predicted to be 0.125" in December 2013 and, the wall thinning region is predicted to not become through-wall at the end of the evaluation period.

The predicted thickness profile in the region of the pin hole in December 2013 is determined by subtracting the predicted total metal loss from the thicknesses of the UT data shown in Figure 2. The predicted thickness profile is presented in Table 3.

Table 3: Predicted End-of-Evaluation Period Thickness Profile

		Circumferential Direction						
		A	B	C	D	E	F	G
Axial Direction	01	0.443	0.125	0.155	0.255	0.315	0.421	0.463
	02	0.420	0.148	0.236	0.337	0.421	0.428	0.443
	03	0.389	0.245	0.272	0.193	0.455	0.458	0.476
	04	0.382	0.221	0.263	0.279	0.460	0.463	0.472
	05	0.410	0.180	0.452	0.417	0.463	0.473	0.480
	06	0.404	0.420	0.469	0.436	0.450	0.476	0.468
	07	0.419	0.427	0.444	0.478	0.443	0.472	0.472

Note: Grid size is 0.5" by 0.5".

3.8 Branch Reinforcement Evaluation

As an alternative to the planar characterization approach used above to evaluate the nonplanar through-wall flaw, a branch reinforcement method as described in Section 3.2(c) of Code Case N-513-3 may be employed. Figure 5 illustrates the overall approach. The values of t_{adj} and d_{adj} (defined in Figure 5), must satisfy Equation 8 of N-513-3:

$$d_{adj} \le \frac{1.5\sqrt{Rt_{adj}}(t_{adj} - t_{min})}{t_{min}}$$

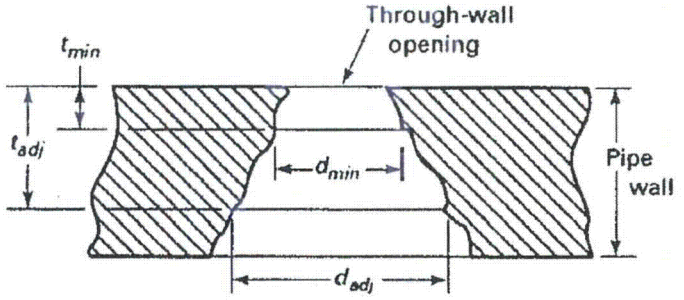
where,

R = mean radius
t_{min} = minimum wall thickness required for pressure loading.

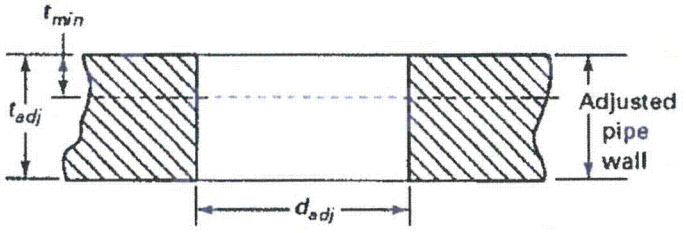
Note that R for the valve body is based on the ID of a 4-inch SCH. 40 pipe and the measured average valve body thickness. That is, R = [(4.5 - 2 x 0.237) + 0.50]/2 = 2.26". Also, t_{min} is defined by Equation 4 in N-513-3 and is calculated as 0.020" in SI Letter Report No. 1201055.402.

The value of t_{adj} may be conservatively taken as 0.315" – the minimum thickness measurement from Table 3 surrounding the localized thinned region (i.e., the valve body is assumed uniformly thinned at 0.315" surrounding the localized thinned region). Solving for N-513-3 Equation 8 gives the following limit on d_{adj}:

$$d_{adj} \le 18.7"$$



(a) Adjusted Wall Thickness



(b) Equivalent Hole Representation

Figure 5: Illustration of Branch Reinforcement Approach

In addition, the remaining ligament average thickness, $t_{c,avg}$, over the degraded area bounded by d_{adj} must satisfy Equation 9 of N-513-3:

$$t_{c,avg} \geq 0.353 d_{adj} \sqrt{\frac{P}{S}}$$

where,
P = operating pressure
S = allowable stress.

Typically, the determination of $t_{c,avg}$ is limiting when calculating d_{adj}. Thus, $t_{c,avg}$ will be established and d_{adj} will be backed out of N-513-3 Equation 9 and then checked against the N-513-3 Equation 8 limit. It is conservative to use the minimum predicted thickness in the localized thinned region as $t_{c,avg}$. From Table 3, $t_{c,avg} = 0.125"$. Using Equation 9 and solving for a maximum d_{adj}:

$$d_{adj} = \frac{t_{c,avg}}{0.353}\sqrt{\frac{S}{P}} = \frac{0.125}{0.353}\sqrt{\frac{14000}{110}} = 4.0"$$

Since d_{adj} also satisfies the N-513-3 Equation 8 limit of 18.7", the resulting allowable through-wall circular opening using the branch reinforcement methodology is 4.0".

4.0 RESULTS

The allowable and critical flaw sizes are determined by comparing the calculated stress intensity factors to the valve material allowable stress intensity factor, K_{allow} and fracture toughness, K_{Ic}, respectively. The resulting allowable and critical through-wall flaw sizes for different wall thicknesses are presented in Table 4.

Table 4: Allowable and Critical Flaw Lengths

Valve Uniform Thickness	Circumferential Flaw		Axial Flaw	
	Allowable	Critical	Allowable	Critical
0.125 (predicted thinnest - 2013)	2.13"	3.51"	3.00"	6.65"
0.214 (thinnest - 2012)	3.59"	5.24"	5.45"	12.90"
0.237" (pipe nominal)	3.90"	5.54"	6.11"	>14.21"
0.35" (average between valve nominal and thinnest)	5.03"	6.28"	9.52"	>17.04"

In addition, an allowable through-wall circular opening of 4.0" resulted from a branch reinforcement evaluation for the predicted wall thickness profile given in Table 3.

5.0 CONCLUSIONS

Fracture mechanics analyses were performed to evaluate the flaw tolerance of the MV-SW136 Service Water valve at Palisades Nuclear Plant with postulated through-wall flaws. The analyses conservatively assumed uniformly thinned piping, thereby not including the additional strength provided by the remaining wall around the thinned region.

The allowable through-wall circumferential flaw length of the valve was determined to be 2.13 inches and the allowable through-wall axial flaw length was determined to be 3.00 inches based on the minimum predicted thickness (0.125 inch) at the thinned region. The corresponding critical through-wall flaw lengths are 3.51 inches for the circumferential flaw and 6.65 inches for the axial flaw.

Considering a uniformly thinned valve with an average thickness of 0.35 inch, the allowable circumferential and axial flaw lengths increase considerably to 5.03 inches and 9.52 inches, respectively. The corresponding critical flaw lengths are greater than 6.28 inches for the circumferential flaw and over 17.04 inches for the axial flaw. These results show that the calculated allowable and critical flaw lengths using the predicted minimum thickness as the uniform thickness are very conservative.

In addition, a branch reinforcement methodology was employed resulting in an allowable through-wall circular opening of 4.0 inches assuming a uniformly thinned valve body of 0.315 inch surrounding the localized thinned region.

Based on UT examinations, the metal loss was estimated to be 0.089 inch from now until December 2013. Thus, the region of wall thinning with predicted thickness below 0.125 inch is less than 1.0 inch in each direction. Conservatively assuming a uniform valve thickness of 0.125 inch, the calculated allowable planar through-wall flaws are larger than the dimensions of the predicted wall thinning area. Therefore, the degradation reported in the MV-SW136 valve is acceptable for continued operation until December 2013.

Periodic monitoring will ensure that the metal loss rate at the wall thinning region does not exceed the predicted rate used in this evaluation and that the pin hole does not exceed 4.0 inches in diameter. It should be noted that even if the metal loss rate were to exceed the predicted rate, the structural integrity of the MV-SW136 valve is maintained as long as the degraded area with thickness below 0.125 inch is bounded by the corresponding allowable through-wall flaw lengths.

Please contact us if you have any questions. Thank you.

Prepared by:

09/27/2012
Date

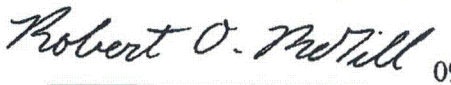
G. Angah Miessi
Associate

Verified by:

09/27/2012
Date

Peihua Jing, Ph.D.
Senior Engineer

Approved by:



09/27/2012
Date

Robert O. McGill, P.E.
Senior Associate

Engineering Report No. PLP-RPT-12-00139 Rev 0
Page 1 of 7

Entergy

ENTERGY NUCLEAR
Engineering Report Cover Sheet

Engineering Report Title:
Evaluation of Inlet Side Thinning of the MV-SW136 Service Water Valve Body

Engineering Report Type:

New ☒ Revision ☐ Cancelled ☐ Superseded ☐
Superseded by: _____

Applicable Site(s)

IP1	☐	IP2	☐	IP3	☐	JAF	☐	PNPS	☐	VY	☐
WPO	☐	ANO1	☐	ANO2	☐	ECH	☐	GGNS	☐	RBS	☐
WF3	☐	PLP	☒								

EC No. 39850

Report Origin: ☐ Entergy ☒ Vendor
Vendor Document No.: 1201055.402.R0

Quality-Related: ☒ Yes ☐ No

Prepared by: Structural Integrity Associates, Inc. Date: 9/27/12
Responsible Engineer (Print Name/Sign)

Design Verified: Structural Integrity Associates, Inc. Date: 9/27/12
Design Verifier (if required) (Print Name/Sign)

Reviewed by: Steven Overway / Steven O verway Date: 9/28/12
Reviewer (Print Name/Sign)

Approved by: Jacob Milliken / Jacob Milliken Date: 9/28/12
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September 27, 2012
Report No. 1201055.402.R0
Quality Program: ☒ Nuclear ☐ Commercial

Mr. Dennis Fitzgibbon
Entergy Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Hwy
Covert, MI 49043-9505

Subject: Evaluation of Inlet Side Thinning of the MV-SW136 Service Water Valve Body

Reference:
1. ASME Boiler and Pressure Vessel Code, Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," January 26, 2009.
2. Palisades Plant Drawing, CAT No. 143 ½ XU Class 150 Bolted Bonnet Globe Valve, VEN-M121, Sheet 65, Rev. 1, SI File Number 1201055.201.
3. Entergy UT Erosion/Corrosion Examination Report, No. PAL-UT-12-051, SI File Number 1201055.201.
4. Palisades Nuclear Plant Piping Class Summary, M-259-HB-Sheet 24 of 118, SI File Number 121055.201.
5. Power Piping ANSI B31.1 – 1973 with Summer 1973 Addenda.
6. ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition with 2003 Addenda.

Dear Dennis:

This summary report documents the evaluation of recently discovered thinning on the inlet side of the MV-SW136 Service Water valve body at the Palisades Nuclear Plant. MV-SW136 is the same valve where leakage was previously observed on the outlet side of the valve.

1.0 INTRODUCTION

Leakage was recently discovered in the MV-SW136 Service Water valve body at the Palisades Nuclear Plant. UT examination results showed that the leak emanated from a pin hole at a localized thinned wall region on the outlet side of the valve. Based on past history, the thinning was assumed to be cavitation induced erosion at the inside surface of the carbon steel valve. Subsequent inspection of the inlet side of the valve showed two separate areas of localized thinning. These areas of thinning are remote from the pin hole leak on the opposite side of the valve and may be evaluated independently.

The objective of this calculation is to disposition the areas of localized thinning until valve replacement.

2.0 TECHNICAL APPROACH

The evaluation was performed using guidance from Code Case N-513-3 [1] for a nonplanar part-wall flaw (consistent with guidance employed for dispositioning the pin hole leak). The MV-SW136 Service Water valve is a Class 3 component design per ANSI B31.1 built to the ANSI B16.34 standard.

3.0 THINNING EVALUATION

3.1 Component Dimensions

The MV-SW136 Service Water valve inlet is bored to match 4" Schedule 40 piping [2]. The thinning is located in the valve body but near the welded joint. Therefore, the nominal dimensions of 4-inch pipe are used in this evaluation:

- Nominal Pipe Size: 4" SCH. 40
- Pipe Outside Diameter: 4.5"
- Nominal Pipe Thickness, t_n: 0.237"
- Pipe Inside Diameter: 4.026"

Since the thinning is located in the valve body, the valve body thickness is added to the 4-inch pipe inside diameter to determine the valve body outside diameter. Based on the UT results [3], an average valve body thickness of 0.5" is representative at the upstream (inlet) side of the valve.

The valve body outside diameter = 4.026 + 0.50 + 0.50 = 5.026"

3.2 Design and Operating Conditions

The design and operating conditions of the Service Water piping system containing the MV-SW136 valve are as follows [4]:

Design Conditions:

- Design pressure = 100 psi
- Design temperature = 300°F

Operating Conditions:

- Normal Operating pressure = 65 psi
- Normal Operating temperature = 32°F to 114°F

A bounding pressure of 110 psi is conservatively used in this evaluation.

Report No.: PAL-UT-12-051
Page: 3 of 3

Summary No. N/A

Examiner:	Deeds Jr., Paul E.	Level: III EOI	Reviewer:		Date:
Examiner	N/A	Level: N/A	Site Review:		Date:
Other:	N/A	Level: N/A	ANII Review:		Date:

Comments:

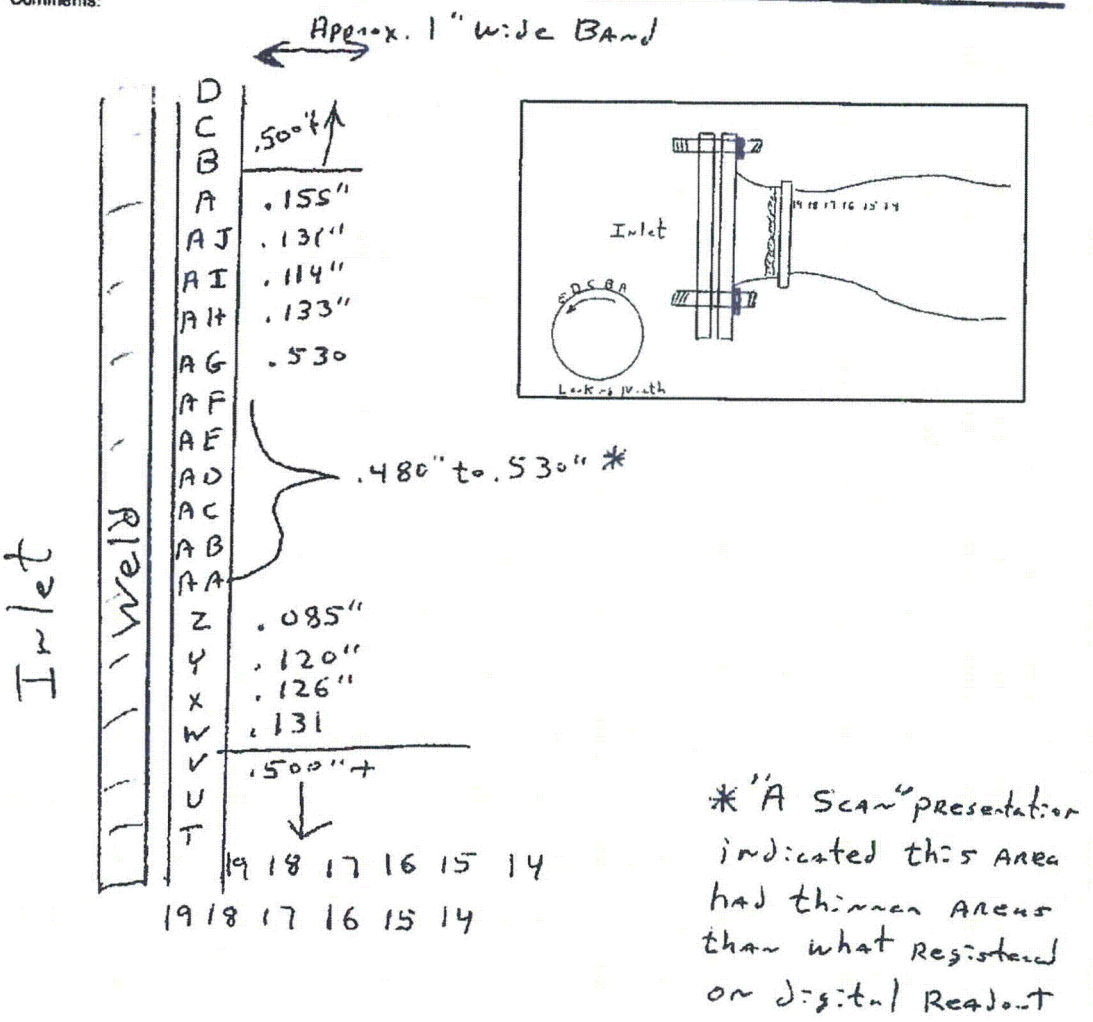


Figure 1: UT Examination Results for MV-SW136 Valve Inlet [3]

3.3 Materials and Material Properties

The material of the different components of the MV-SW136 Service Water valve is specified as SA-216 Grade WCB [2]. The allowable stress for this material at the normal operating temperature is 14 ksi [5].

3.4 Minimum Wall Thickness

The minimum wall thickness, t_{min}, is calculated from Equation 4 of Code Case N-513-3:

$$t_{min} = \frac{pD_o}{2(S + 0.4p)}$$

where:
p = maximum operating pressure
D_o = outside diameter
S = allowable stress.

Based on the inputs given above, t_{min} = 0.020 inch.

In accordance with Paragraph 3.2(b) of N-513-3, a nonplanar flaw is acceptable as long as the predicted wall thickness, t_p, is greater than or equal to t_{min}.

3.5 Predicted End-of-Evaluation Thickness

While the MV-SW136 valve was replaced in May 2006, i.e., approximately 76 months ago, it is isolated and does not see flow during shutdown cooling. Palisades has conservatively estimated this isolation time at 180 days (6 months). Thus, the metal loss rate is based on 70 months of in-service time. Using the valve average thickness (0.5") and the thickness at the thinnest location, 0.085" (see Figure 1), the metal loss rate is calculated to be approximately 5.9 mils per month, assuming a linear rate.

Based on this rate, the total metal loss for the 15-month evaluation period ending in December 2013 is 0.089". Hence, the thinnest location is predicted to be through-wall near the end of the evaluation period and after 11 months, t_p is predicted to be 0.020" (at t_{min}). Note that the thinnest location is within the lower thinned region near the bottom of the valve body (see Figure 1) and the upper thinned region is predicted to remain greater than t_{min} at the end of the evaluation period (0.114 - 0.089 = 0.025" > 0.020").

4.0 RESULTS AND CONCLUSIONS

The thickness at the thinnest location is predicted to go through-wall near the end of the evaluation period (December 2013) and t_{min} is predicted to be reached in about 11 months while the valve is in service. Note that the thinnest location is within the lower thinned region near the bottom of the valve body (see Figure 1) and the upper thinned region is predicted to remain greater than t_{min} at the end of the evaluation period.

In accordance with Code Case N-513-3 Paragraph 3.2(b), a nonplanar flaw is acceptable as long as the predicted wall thickness, t_p, is greater than or equal to t_{min}. Thus, this acceptance criterion is predicted to be met for 11 months of continuous valve service. While this evaluation does predict the thinnest location to go through-wall near the end of the evaluation period, it is recognized that the analysis herein is conservative.

Implementation of Code Case N-513-3 requires periodic inspections as described in Paragraph 2(e). The inspection interval is defined as no longer than 30 days. If a flaw growth analysis is performed, the inspection interval may be extended to no more than 90 days to verify the flaw growth rate predictions.

It is recommended that the results from the periodic inspections be used to further refine t_p of the thinnest location during the valve operation prior to replacement. If the thickness of the thinnest location does become less than t_{min} or even through-wall, the evaluation performed for the leaking pin hole on the outlet side of the valve (detailed in SI Report Number 1201055.401) may be used to make an immediate operability decision. This could then be followed by a similar evaluation to justify continued operation.

5.0 ADHERENCE TO CODE CASE N-513-3

Although the provisions of Code Case N-513-3 do not apply specifically to valves, all other aspects of the evaluation procedures, acceptance criteria and general requirements are followed herein or are shown not applicable. Details of this adherence are given below:

1. Scope: While nonplanar flaw evaluation in valves is outside the scope of N-513-3, see Paragraph 1(a)1, the methods are judged reasonable and treated conservatively for this specific application. The subject valve is Class 3 with operating conditions meeting the Code Case definition of moderate energy defined in Paragraph 1(b). Paragraph 1(c) is not applicable. The consequences of the leakage are being addressed by the plant as stated in Paragraph 1(d). An evaluation period of 15 months has been established meeting the limit stated in Paragraph 1(e).

2. Procedure: The localized thinning discovered at the valve inlet has been fully characterized by volumetric UT measurements and has been classified as nonplanar [see Paragraphs 2(a) and 2(b)]. Two separate areas of localized thinning were identified and because one of the thinned regions is not predicted to fall below t_{min} during the evaluation period, flaw combination, discussed in Paragraph 2(c), is not required. Flaw evaluation is discussed below consistent with Paragraph 2(d). Periodic inspections will be conducted consistent with paragraph 2(e). The results from these inspections will be used to refine the predicted metal loss rate calculated herein. Paragraph 2(f) is not applicable. Paragraphs 2(g) and 2(h) will be addressed if necessary during the evaluation period.

3. Flaw Evaluation: Section 3.2 is applicable for this evaluation since the thinning has been classified as nonplanar (Section 3.1 is not applicable). Since the upper thinned region is not predicted to reach t_{min} during the evaluation period, flaw combination in accordance

with Paragraph 3.2(a) is not required. Since the thinning is part-wall, Paragraph 3.2(b) is employed. In accordance with 3.2(b), the nonplanar thinning is acceptable provided t_p is greater than or equal to t_{min}. This is predicted to be true for at least 11 months of in-service time. A flaw growth analysis was conducted consistent with Section 3.3 based on the installation date of the valve, operational history and recent UT thickness measurements (stress corrosion cracking is not active). Periodic inspection during this time period will provide the opportunity to refine the metal loss rate used in this evaluation which is believed conservative. Section 3.4 is not applicable.

4. Acceptance Criteria: This section states that nonplanar part through-wall flaws are acceptable where $t_p \geq t_{aloc}$. While not specifically clear in N-513-3, t_{aloc} is defined as an allowable local thickness less than t_{min} and it is conservative to assume t_{aloc} equal to t_{min}. Thus, the acceptance criteria of Section 4 are currently met and predicted to be met for the next 11 months of valve in-service time ($t_p = 0.020" \geq 0.020" = t_{min}$).

5. Augmented Examination: To be addressed as necessary by the plant.

6. Nomenclature: This evaluation uses consistent N-513-3 nomenclature.

7. Applicability: Code Case N-513-3 is applicable based on the Section XI Code of Record at Palisades [6].

Please contact us if you have any questions. Thank you.

Prepared by:

Robert O. McGill

09/27/2012

Robert O. McGill, P.E.
Senior Associate

Date

Verified by:

Miessi AG

09/27/2012

G. Angah Miessi
Associate

Date

Approved by:

Robert O. McGill

09/27/2012

Robert O. McGill, P.E.
Senior Associate

Date

Entergy

UT Erosion/Corrosion Examination

Site/Unit:	PAL / 1	Procedure:	CEP-NDE-0505	Outage No.:	N/A
Summary No.:	N/A	Procedure Rev.:	4	Report No.:	PAL-UT-12-050
Workscope:	BOP	Work Order No.:	327249-02	Page:	1 of 3

Code: N/A Cat./Item: N/A Location: 590' CCW

Drawing No.: VEN-M121 SHT 65 REV 1 Description: Bolted bonnet globe valve

System ID: SWS

Component ID: MV-SW136 Size/Length: N/P Thickness/Diameter: 0.450"/4"

Limitations: None Component File No.: N/A Start Time: 2105 Finish Time: 2200

Calibration Information

Calibration Thickness (In)		Calibration Times / Initials		
.250	*0.100	Start:	2100	MAO
.500	*0.200	Verify:	N/A	N/A
.750	*0.300	Verify:	N/A	N/A
1.000	*0.400	Verify:	N/A	N/A
*0.040	*0.500	Final:	2200	MAO

Partitioning Information

Component	Begin/Col/Row	Ending/Col/Row
M. UPST Ext.	N/A	N/A
Main UPST.	N/A	N/A
Main	A01	G07
Main DNST.	N/A	N/A
M. DNST Ext.	N/A	N/A
Branch	N/A	N/A
Branch Ext.	N/A	N/A

Component Information

Component Geometry: Globe Valve

Outside Diameter: N/P Grid Size: 0.5" x 0.5"

Max. Thickness: 0.569" Min. Thickness: 0.214"

Nominal Thickness: 0.450" Tmin.: N/P

Min. Thickness Location: B01

Max. Thickness Location: G05

Instrument:

Manufacturer: Panametrics

Model: 37-DL Plus

Serial No.: 071564812

Gain: 53 Db

Range: 1"

Transducer:

Manufacturer: Panametrics

Serial No.: 624012

Size: 0.312" Freq.: 5.0 MHz

Model: D791

# of Elements: Dual

Reference/Simulator Block:

Serial No.: 07-4044

Type: 4-Step Block

Ref./Simulator Block Temp.: 73 °F

Material/Component Temp.: 80 °F

Temp. Tool:

Manufacturer: Traceable

Serial No.: 016899

Couplant:

Type: Ultragel II

Batch No.: 07143

Comments/Obstructions: Reading at D01 was directly on the pin hole leak. Pin hole leak is 0.50" from the toe of the weld.

Results: Accept ☐ Reject ☐ Info ☑ **Comments: * C/S 6-step calibration block S/N A25493 was also used for the exam.**

Examiner	Level IIL	Signature	Date	Reviewer	Signature	Date
Olafson, Mark A.		Mark Olafson	9/20/2012	Deeds Jr., Paul E	PEDJ	9/24/12
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				N/A		
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				N/A		

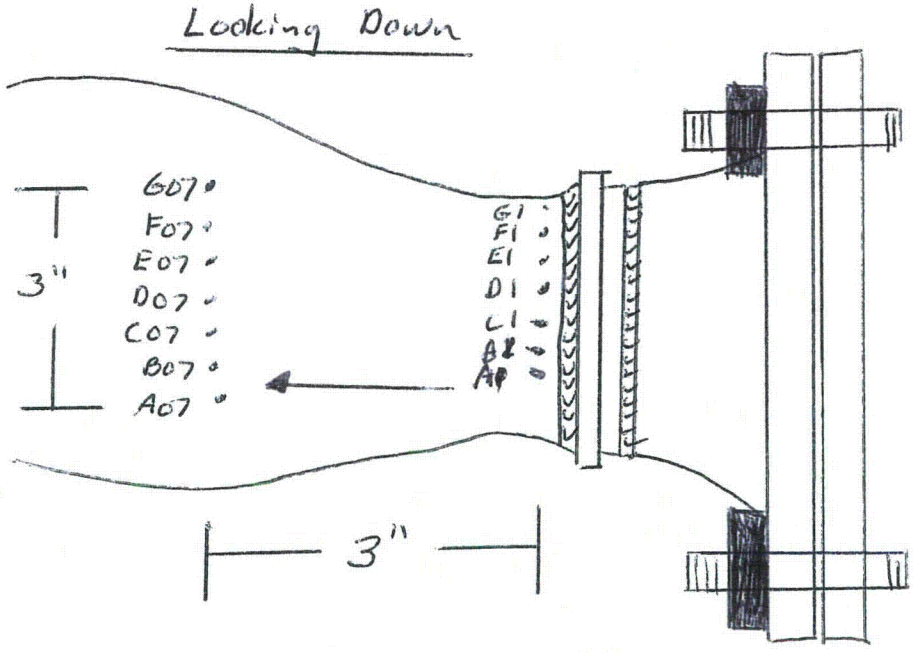
WO# 00327249-02
Report No.: PAL-UT-12-050
Page 2 of 3

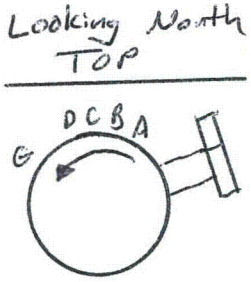
COLOR CODED DATA GRID

PANAMETRICS-NDT Ultrasonic Thickness Gage

The Survey Name:	MV-SW136	Survey Date:	9/20/2012 10:31:56 PM
Survey Description:	VALVE BODY	Survey Mode:	THICKNESS
Survey Type:	2D GRID	Erase Protection:	FALSE
Location Note:	PAL	Inspector ID:	MAO

	A	B	C	D	E	F	G
01	0.532	0.214	0.244	0.344	0.404	0.510	0.552
02	0.509	0.237	0.325	0.426	0.510	0.517	0.530
03	0.478	0.334	0.361	0.282	0.544	0.547	0.565
04	0.471	0.310	0.352	0.388	0.549	0.552	0.561
05	0.499	0.269	0.541	0.506	0.552	0.562	0.569
06	0.493	0.509	0.558	0.525	0.539	0.565	0.557
07	0.508	0.516	0.533	0.567	0.532	0.561	0.561





Color Legend:

Over Range	
Not Used	
Not Used	0.450
0.401 - 0.450	0.400
0.351 - 0.400	0.350
0.301 - 0.350	0.300
0.251 - 0.300	0.250
0.000 - 0.250	0.000
Under Range	
Row or Column Statistics	

Total Statistics:

Maximum	0.569
Minimum	0.214
Average	0.473

Entergy

Supplemental Report

Report No.: PAL-UT-12-050

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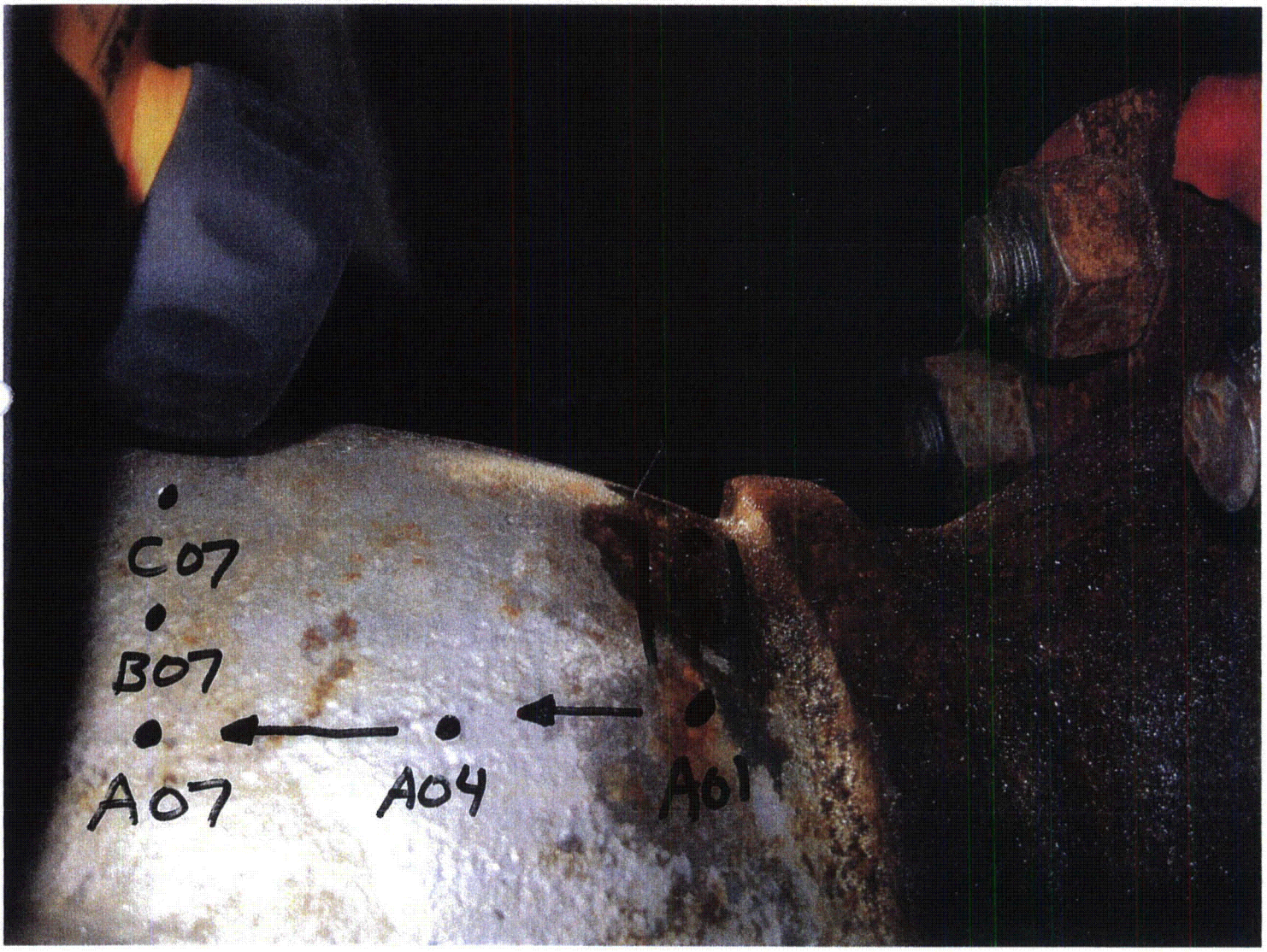
Summary No.: N/A

Sketch or Photo: J:\Engineering\ACTION PLANS\SW MV-136 Valve Leak Sep 20 2012\Pictures\MV-136 Leak in Valve Body Sep 20 2012 010.jpg



UT Erosion/Corrosion Examination

Site/Unit:	PAL / 1	Procedure:	CEP-NDE-0505	Outage No.:	N/A
Summary No.:	N/A	Procedure Rev.:	4	Report No.:	PAL-UT-12-051
Workscope:	BOP	Work Order No.:	327249-08	Page:	1 of 3

Code:	N/A	Cat./Item:	N/A	Location:	590' CCW
Drawing No.:	VEN-M121 SHT 65 REV 1	Description:	Bolted bonnet globe valve		
System ID:	SWS				
Component ID:	MV-SW136	Size/Length:	N/P	Thickness/Diameter:	0.450"/4"
Limitations:	None	Component File No.:	N/A	Start Time: 2200	Finish Time: 0200

Calibration Information

Calibration Thickness (In)		Calibration Times / Initials		
.250	*0.100	Start:	2200	PED
.500	*0.200	Verify:	~~1230~~ 0033	PED
.750	*0.300	Verify:	N/A	N/A
1.000	*0.400	Verify:	N/A	N/A
*0.040	*0.500	Final:	0200	PED

Partitioning Information

Component	Begin/Col/Row	Ending/Col/Row
M. UPST Ext.	N/A	N/A
Main UPST.	N/A	N/A
Main	A01	AJ18
Main DNST.	N/A	N/A
M. DNST Ext.	N/A	N/A
Branch	N/A	N/A
Branch Ext.	N/A	N/A

Component Information

Component Geometry:	Globe Valve		
Outside Diameter:	N/P	Grid Size:	N/A
Max. Thickness:	.700"+"	Min. Thickness:	0.085"
Nominal Thickness:	0.450"	Tmin.:	N/A
Min. Thickness Location:	Z18		
Max. Thickness Location:	Valve Bottom		

Instrument:

Manufacturer:	Panametrics
Model:	37-DL Plus
Serial No.:	071565212
Gain:	58 Db
Range:	1"

Transducer:

Manufacturer:	Panametrics		
Serial No.:	655243		
Size:	0.5"	Freq.:	5.0 MHz
Model:	D790-SM		
# of Elements:	Dual		

Reference/Simulator Block:

Serial No.:	07-4044
Type:	4-Step Block
Ref./Simulator Block Temp.:	77 °F
Material/Component Temp.:	81 °F

Temp. Tool:

Manufacturer:	PTC
Serial No.:	100129

Couplant:

Type:	Ultragel II
Batch No.:	07143

Comments/Obstructions: Grid not used due to physical and visual restrictions. .283" 5 MHZ Transdcer SN 607862 used on flange

Results: Accept ☐ Reject ☐ Info ☑ Comments: * C/S 6-step calibration block S/N A25492 was also used for these exams.

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Deeds Jr., Paul E.	III EOI	P E Deeds Jr	9/25/2012	Mark Olafson	Mark Olafson	10/04/2012
Examiner	Level	Signature	Date	Site Review	Signature	Date
N/A	N/A			N/A		
Other	Level	Signature	Date	ANII Review	Signature	Date
N/A	N/A			N/A		

Entergy

Supplemental Report

Report No.: PAL-UT-12-051

PE- 9/20

Summary No.: N/A

Examiner:	Deeds Jr., Paul E. PED	Level:	III EOI	Reviewer:	Mark Olofson Mark Olofson	Date:	10/04/2012
Examiner:	N/A	Level:	N/A	Site Review:	N/A	Date:	
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:	

Comments:

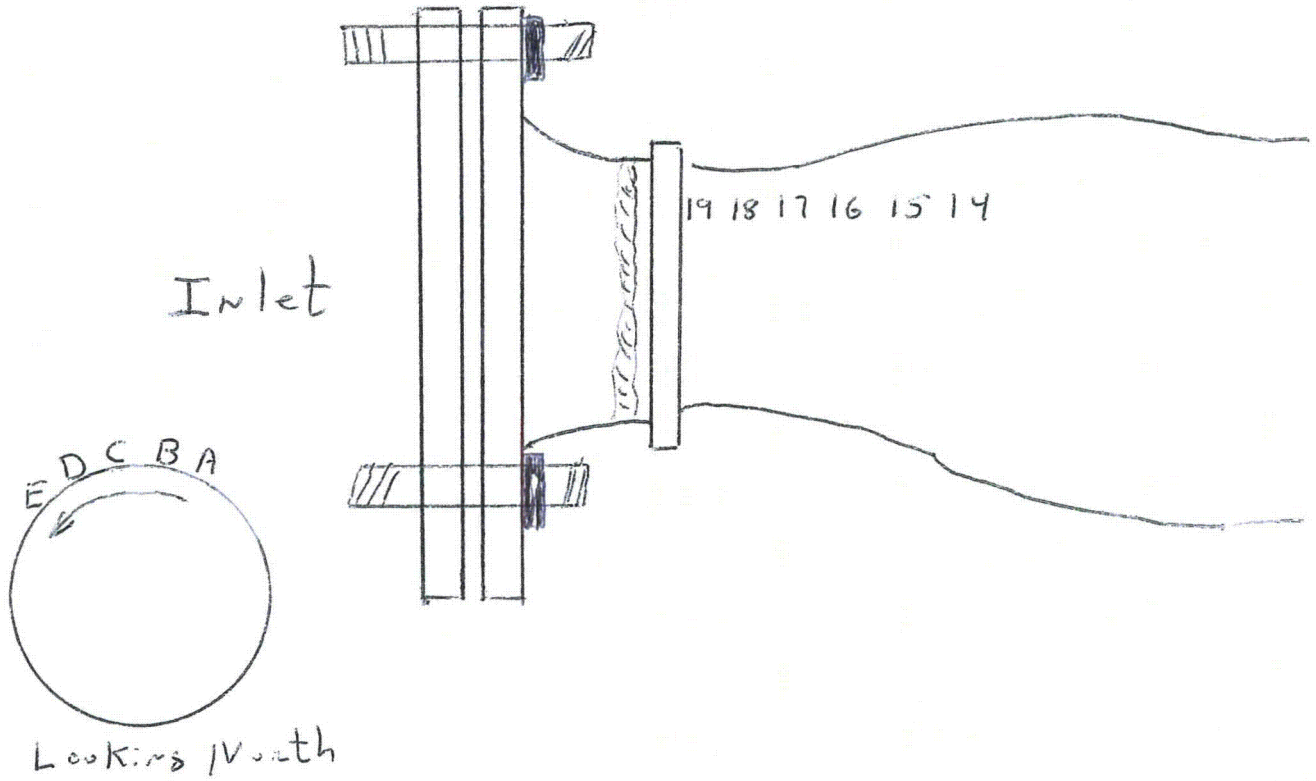
Due to physical and visual restrictions which made it impossible to accurately grid the valve and obtain UT thickness readings at each of those grid locations; an ultrasonic scan of the accessable areas of the valve and downstream flange funnel pipe were performed. See the sketch below for specific results.

In general, the valve body thickness was greater than .500" overall.

Specifically, a band approximately 1" wide from locations at approximately W18 to A18 at the inlet end showed indications of wall loss. The thinnest reading taken was .085" at approximately location Z18. Although that band showed readings of .480" to .530" between AA18 amd AG18, the A scan presentation showed low amplitude signals that indicated thinning, although a lower number could not be obtained with the digital thickness gauge..

Similar low amplitude signals were noted at various locations around the outlet, circumferentially beyond the area previously ultrasonically examinined, although no readings lower than .300" were noted.

The ultrasonic scan of the outlet flange funnel pipe found no ultrasonic readings to be lower than .305". A .283" 5 MHZ transducer was used to obtain better access to that fitting. That transducer was not used on the valve body, as it did not providet enough ultrasonic sound penetration into the cast valve bodyt.



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Supplemental Report

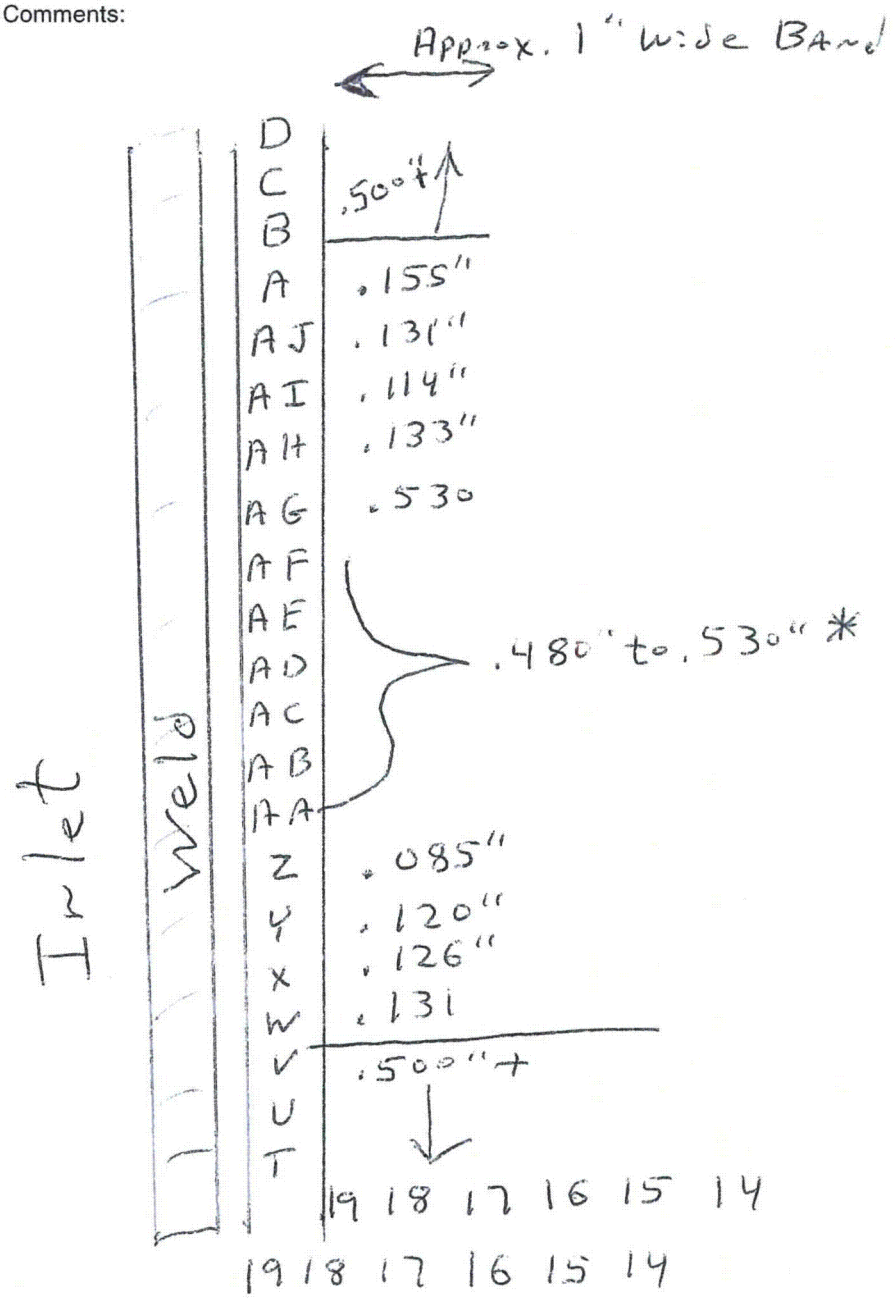
Report No.: **PAL-UT-12-051**

Page: **3** of **3**

Summary No.: **N/A**

Examiner:	**Deeds Jr., Paul E.**	Level:	**III EOI**	Reviewer:	Mark Oksar	Date:	10/04/2012
Examiner:	**N/A**	Level:	**N/A**	Site Review:	N/A	Date:	
Other:	**N/A**	Level:	**N/A**	ANII Review:	N/A	Date:	

Comments:



* "A Scan" presentation indicated this area had thinner areas than what Registered on digital Readout

UT Erosion/Corrosion Examination

Site/Unit:	PAL / 1	Procedure:	CEP-NDE-0505	Outage No.:	N/A
Summary No.:	N/A	Procedure Rev.:	4	Report No.:	PAL-UT-12-052
Workscope:	BOP	Work Order No.:	327249-08	Page:	1 of 2

Code:	N/A	Cat./Item:	N/A	Location:	590' CCW
Drawing No.:	VEN-M121 SHT 65 REV 1	Description:	Bolted Bonnet Globe Valve - Inlet Flanged Funnel Pipe		
System ID:	SWS				
Component ID:	MV-SW136	Size/Length:	N/A	Thickness/Diameter:	0.450"/4"
Limitations:	None	Component File No.:	N/A	Start Time: 1400	Finish Time: 1515

Calibration Information

Calibration Thickness (In)		Calibration Times / Initials		
.250	*0.100	Start: 1400	PED	
.500	*0.200	Verify: N/A	N/A	
.750	*0.300	Verify: N/A	N/A	
1.000	*0.400	Verify: N/A	N/A	
*0.040	*0.500	Final: 1515	PED	

Partitioning Information

Component	Begin/Col/Row	Ending/Col/Row
M. UPST Ext.	N/A	N/A
Main UPST.	N/A	N/A
Main	A01	AJ18
Main DNST.	N/A	N/A
M. DNST Ext.	N/A	N/A
Branch	N/A	N/A
Branch Ext.	N/A	N/A

Component Information

Component Geometry: Globe Valve Flange
Outside Diameter: Varies Grid Size: N/A
Max. Thickness: N/A Min. Thickness: 0.298
Nominal Thickness: Varies Tmin.: N/A
Min. Thickness Location: N/A
Max. Thickness Location: N/A

Instrument:
Manufacturer: Panametrics
Model: 37-DL Plus
Serial No.: 071565212
Gain: 58 Db
Range: 1"

Transducer:
Manufacturer: Panametrics
Serial No.: 607862
Size: 0.283 Freq.: 5.0 MHz
Model: D794
# of Elements: Dual

Reference/Simulator Block:
Serial No.: 07-4044
Type: 4-Step Block
Ref./Simulator Block Temp.: 73 °F
Material/Component Temp.: 81 °F

Temp. Tool:
Manufacturer: PTC
Serial No.: 100129

Couplant:
Type: Ultragel II
Batch No.: 07143

Comments/Obstructions: Physical and visual restrictions. Continuous scan of taper from weld for lowest reading by quadrant.

Results: Accept ☐ Reject ☐ Info ☑ Comments: * C/S 6-step calibration block S/N A25492 was also used for these exams.

Examiner	Level III EOI	Signature	Date	Reviewer		Signature	Date
Deeds Jr., Paul E.		P E Deeds Jr	9/26/2012	Olafson, Mark		Mark Olafson	10/04/2012
Examiner	Level N/A	Signature	Date	Site Review		Signature	Date
N/A				N/A			
Other	Level N/A	Signature	Date	ANII Review		Signature	Date
N/A				N/A			

Entergy

Supplemental Report

Report No.: **PAL-UT-12-052**

Page: **2** of **2**

Summary No.: **N/A**

Examiner: **Deeds Jr., Paul E.** PED 9/26/12 Level: **III EOI** Reviewer: Mark Olafson Mark Olafson Date: 10/04/2012

Examiner: **N/A** Level: **N/A** Site Review: N/A Date:

Other: **N/A** Level: **N/A** ANII Review: N/A Date:

Comments:

The continuous ultrasonci scan of the inlet flange funnel pipe found no ultrasonic readings to be lower than .298". A .283" diameter transducer was used to provide the best access, but due to the tapered configuration and the restrictions caused by the flange bolting and lack of direct access to the opposite side of the valve, this examination is considered to be best effort. The lowest readings were identified at the flange to valve weld, and became continuely thicker as the flange was examined up the taper.

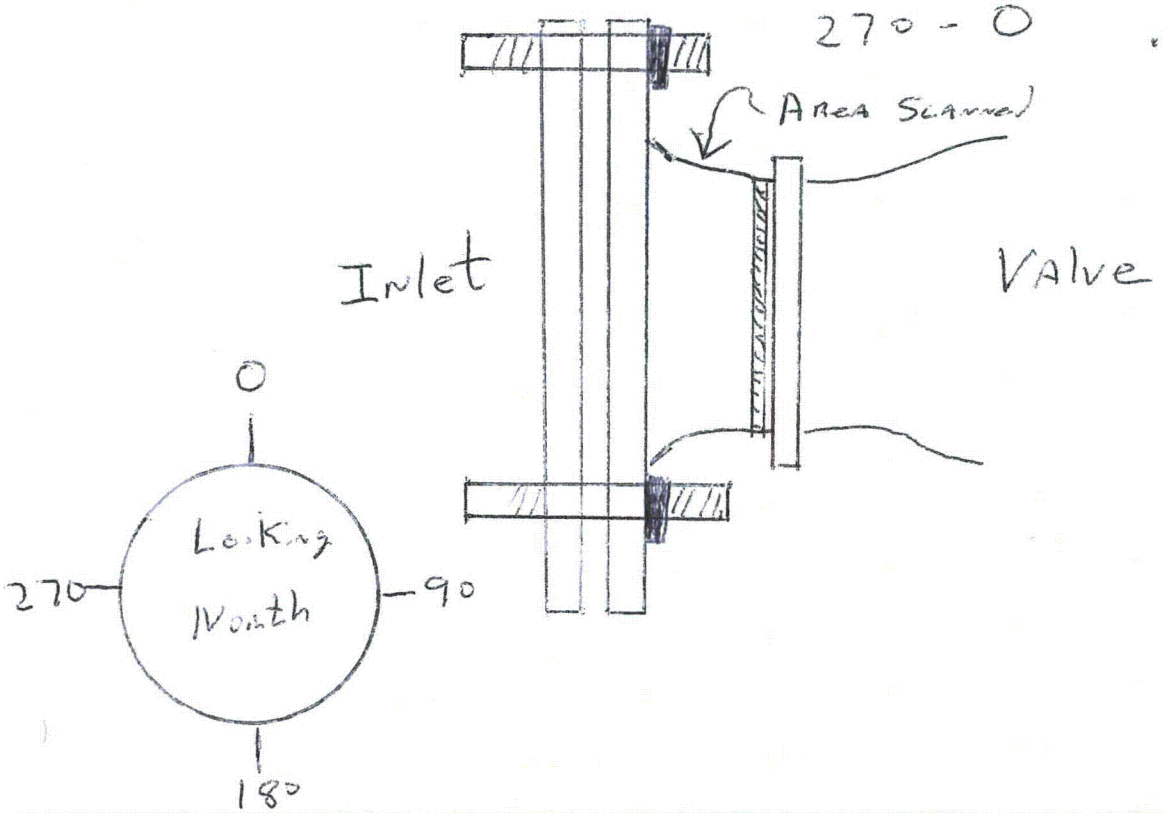
Lowest Readings

0 - 90 - .298"

90 - 180 - .305"

180 - 270 - .313"

270 - 0 .303"



ATTACHMENT 9.1 PROCESS APPLICABILITY DETERMINATION FORM

PAD Log #: 12-0347
PAD Rev. #: 0

I. OVERVIEW

Facility: Palisades

Proposed Activity / Document: Compensatory Measures to be taken per CR-PLP-2012-06365 Operability Evaluation, "Thin area and through wall leak on valve body of MV-SW136 (E-54B SW Outlet CV-0826 bypass)." **Change/Rev. #:** 0

Description of Proposed Activity:

The leak and thinned area found on the valve body of MV-SW136 has been deemed acceptable per the operability evaluation performed under CR-PLP-2012-06365, with an evaluation performed by Structural Integrity. This operability evaluation has classified the Service Water System as Operable-Comp measure. To ensure the evaluation performed remains acceptable, inspections of the piping and leakage are necessary. The inspections will be performed in accordance with approved processes.

II. DOCUMENT REVIEW

Provide the requested information for each item below.

1. **For documents available electronically:**

   a. **List search engine or documents searched, and keywords used:**

   Searched: FSAR (Palisades Network L-Drive), TechSpecs (Palisades Network L-Drive), ORM (In Merlin)
   Keywords: Service Water, E-54, CV-0826, MV-SW136, Ultrasonic, Visual

   b. **List relevant sections of controlled electronic documents reviewed:**

   FSAR Sections: 1.9.1.14, 6.3, 9.1, 9.3
   FSAR Tables: 9-2, 5.2-3, 6-12

   Tech Specs LCO 3.6.6, 3.7.7, 3.7.8

2. **Documents reviewed manually (hardcopy):** None.

3. **For those documents that are not reviewed either electronically or manually, use the specific questions provided in Sections III and IV of Attachment 9.2 of EN-LI-100 as needed. Document below the extent to which the Attachment 9.2 questions were used.**

   The questions provided in Attachment 9.2 were used in addition to the electronic reviews of the documents described above.

ATTACHMENT 9.1 PROCESS APPLICABILITY DETERMINATION FORM

III. PROCESS REVIEW

Does the proposed activity affect, invalidate, or render incorrect, OR have the potential to affect, invalidate, or render incorrect, information contained in any of the following processes? Associated regulations and procedures are identified with each process below.

PROCESS (Regulations / Procedures)	YES	NO	REVIEW RESULTS
Chemistry / Effluents	☐	☒	
Radwaste / Process Control Program (PCP) (EN-RW-105 or contact the Radiation Protection Dept.)	☐	☒	
Radiation Protection / ALARA (10 CFR 20 / EN-RP-110 or contact the Radiation Protection Dept.)	☐	☒	
Inservice Inspection Program (10 CFR 50.55a / EN-DC-120, -351)	☐	☒	
Inservice Testing Program (10 CFR 50.55a / EN-DC-332)	☐	☒	
Maintenance Rule Program (10 CFR 50.65 / EN-DC-203, -204, -205, -206, -207)	☐	☒	
Containment Leakage Rate Testing (Appendix J) Program (10 CFR 50 Appendix J / EN-DC-334)	☐	☒	

IF any box is checked "Yes," THEN contact the appropriate department to ensure that the proposed change is acceptable and document the results in the REVIEW RESULTS column.

IV. LICENSING BASIS DOCUMENT REVIEW

Does the proposed activity affect, invalidate, or render incorrect, OR have the potential to affect, invalidate, or render incorrect, information contained in any of the following Licensing Basis Document(s)? Associated regulations and procedures are identified with each Licensing Basis Document below.

LICENSING BASIS DOCUMENTS (Regulations / Procedures)	YES	NO	REVIEW RESULTS OR SECTIONS AFFECTED OR LBDCR #
Quality Assurance Program Manual (QAPM) (10 CFR 50.54(a) / EN-QV-104)	☐	☒	
Fire Protection Program (FPP) [includes the Fire Hazards Analysis (FHA)] (OL Condition, 10 CFR 50.48 / EN-DC-128)	☐	☒	
Emergency Plan (10 CFR 50.54(q) / EN-EP-305)	☐	☒	
Environmental Protection Plan (Appendix B of the OL, Environmental Evaluation / EN-EV-115, EN-EV-117, EN-LI-103)	☐	☒	
Security Plan and Cyber Security Plan [10 CFR 50.54(p) / EN-NS-210 or contact the site Security / IT Dept.]	☐	☒	
Operating License (OL) / Technical Specifications (TS) (10 CFR 50.90 / EN-LI-103)	☐*	☒	
TS Bases (10 CFR 50.59 / EN-LI-100 / EN-LI-101)	☐	☒	
Technical Requirements Manual (TRM) (including TRM Bases) (10 CFR 50.59 / EN-LI-100 / EN-LI-101)	☐	☒	
Core Operating Limits Report (COLR), and Pressure and Temperature Limits Report (PTLR) (TS Administrative Controls, EN-LI-113, EN-LI-100, EN-LI-101)	☐	☒	
Offsite Dose Calculation Manual (ODCM) (TS Administrative Controls or 10 CFR 50.59 / EN-LI-113 or EN-LI-100 / EN-LI-101)	☐	☒	
Updated Final Safety Analysis Report (UFSAR) (10 CFR 50.71(e) / EN-LI-113, EN-LI-100, EN-LI-101)	☐	☒	
Storage Cask Certificate of Compliance (10 CFR 72.244 / EN-LI-113)	☐*	☒	
Cask FSAR (CFSAR) (including the CTS Bases) (10 CFR 72.70 or 72.248 / EN-LI-113, EN-LI-100,EN-LI-112)	☐	☒	
10 CFR 72.212 Evaluation Report (212 Report) (10 CFR 72.48 / EN-LI-100, EN-LI-112)	☐	☒	
NRC Orders (10 CFR 50.90 / EN-LI-103 or as directed by the Order)	☐*	☒	
NRC Commitments and Obligations (EN-LI-110)	☐	☒	
Site Specific CFR Exemption (10 CFR 50.12, 10 CFR 55.11, 10 CFR 55.13, 10 CFR 72.7)	☐*	☒	

*Contact the site Licensing Department.

IF any box is checked "Yes," THEN ensure that any required regulatory reviews are performed in accordance with the referenced procedures. Prepare an LBDCR per procedure EN-LI-113 if a LBD is to be changed, and document any affected sections or the LBDCR #. Briefly discuss how the LBD is affected in Section VII.A.

V. 10 CFR 50.59 / 10 CFR 72.48 APPLICABILITY

Can the proposed activity be dispositioned by one of the following criteria? Check the appropriate box (if any).

☐	An approved, valid 50.59/72.48 Evaluation covering associated aspects of the proposed activity already exists. Reference 50.59/72.48 Evaluation # _____ (if applicable) or attach documentation. Verify the previous 50.59/72.48 Evaluation remains valid.
☐	The NRC has approved the proposed activity or portions thereof or a license amendment being reviewed by the NRC addresses the proposed activity. Reference the approval document: _____
☐	The proposed activity is controlled by one or more specific regulations. Examples of specific regulations are: • Maintenance Rule (50.65), • Quality Assurance Program (10 CFR 50 Appendix B) • Security Plan (50.54(p)) • Emergency Plan (50.54(q)) • Fire Protection (operating license condition) See NEI 96-07 Section 4.1 for additional guidance on specific regulations. Reference the controlling specific regulation(s):

IF the entire proposed activity can be dispositioned by the criteria in Section V, THEN proceed to Section VII and provide basis for conclusion in Section VII.A.

Otherwise, continue to Section VI to perform a 50.59 and/or 72.48 Screening, or perform a 50.59 and/or 72.48 Evaluation in accordance with EN-LI-101 and/or EN-LI-112.

Changes to the IPEC Unit 1 Decommissioning Plan are to be evaluated in accordance with the 50.59 process, as allowed by the NRC in a letter to IPEC dated January 31, 1996. [IPEC-1 Letter RA960014]

ATTACHMENT 9.1 PROCESS APPLICABILITY DETERMINATION FORM

VI. 50.59 / 72.48 SCREENING REVIEW

VI.A 50.59/72.48 SCREENING (Check the appropriate boxes.)

☒	10 CFR 50.59 Screening criteria are met. [10 CFR 50.59(c)(1)] The proposed activity meets all of the following criteria regarding design function: • Does not adversely affect the design function of an SSC as described in the UFSAR; AND • Does not adversely affect a method of performing or controlling a design function of an SSC as described in the UFSAR; AND • Does not adversely affect a method of evaluation that demonstrates intended design function(s) of an SSC will be accomplished as described in the UFSAR; AND • Does not involve a test or experiment not described in the UFSAR.
☐	The proposed activity does not involve structures, systems, or components controlled by 10 CFR 50.59.
☐	10 CFR 72.48 Screening criteria are met. [10 CFR 72.48(c)(1)] (Applicable to sites with an ISFSI) The proposed activity meets all of the following criteria regarding design function: • Does not adversely affect the design function of an SSC as described in the CFSAR; AND • Does not adversely affect a method of performing or controlling a design function of an SSC as described in the CFSAR; AND • Does not adversely affect a method of evaluation that demonstrates intended design function(s) of an SSC will be accomplished as described in the CFSAR; AND • Does not involve a test or experiment not described in the CFSAR.
☒	The proposed activity does not involve structures, systems, or components controlled by 10 CFR 72.48.

IF either of the 50.59 or 72.48 Screening criteria are met, THEN complete VI.B below as appropriate and proceed to Section VII.

IF the proposed activity does not meet the applicable criteria, THEN perform a 50.59 or 72.48 Evaluation in accordance with EN-LI-101 or EN-LI-112, as appropriate, attach a copy of the Evaluation to this form, and proceed to Section VII.

IF the activity does not involve systems, structures, or components controlled by 10 CFR 50.59 or by 10 CFR 72.48, THEN a 50.59 or 72.48 Screening is not required, as appropriate, and proceed to Section VII.

VI.B BASIS

Provide a clear, concise basis for determining the proposed activity may be screened out such that a third-party reviewer can reach the same conclusions. Refer to NEI 96-07 Section 4.2 for guidance. Provide supporting documentation or references as appropriate.

Per fleet procedure EN-OP-104, "Operability Determination Process," Section 5.5 [7], the Process Applicability Determination (PAD), which contains the Entergy 50.59 screening process, is required to be performed on the effect of the compensatory measure(s) on other aspects of the facility, and not on the effectiveness of the compensatory measure with regard to the degraded or nonconforming condition. This guidance in EN-OP-104 is consistent with the NRC-endorsed NEI 96-07, Revision 1, "Guidelines for 10 CFR 50.59 Implementation," Section 4.4. Per NRC Regulatory Issue Summary 2005-20, the effectiveness of the compensatory measure in mitigating the degraded or nonconforming condition is to be addressed within the corrective action system (i.e., the operability evaluation). Therefore, the scope of this 50.59 screening is to review the effect of the compensatory measures documented in CR-PLP-2012-06365 Corrective Action (CA) 1 on other aspects of the facility.

Compensatory measures have been established for Service Water Piping as part of the operability evaluation performed under CR-PLP-2012-06365 CA 1. The compensatory measures are:

1. Perform monthly UT examination bounding the three identified thinned locations to validate the flaw analysis completed in the Structural Integrity Reports. WR 284493

2. Perform daily visual walkdown to confirm analysis from NDE examinations remain valid (i.e. No New significant leakage in accordance with Section 2(f) of N-513-3). This can be completed through remote camera connection to observe "leakage" by monitoring the catch basin for increased flow. Operations to verify during rounds of the Component Cooling Water Room that the Service Water leakage is contained by the catch basin, and not leaking on other equipment. Quantitative analysis not needed, a future developed ODMI will develop necessary trigger points.

3. Submit relief request to the Nuclear Regulatory Commission in accordance with NRC Inspection Manual Part 9900: Technical Guidance "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety."

4. Perform extent of condition NDE examination at a minimum of five susceptible locations within 30 days in accordance with ASME Code Case N-513-3.

The compensatory measures were established to ensure that MV-SW136 (E-54B SW Outlet CV-0826 Bypass) remains operable. This is done by monitoring for significant changes to the leakage and monitoring the flawed area to ensure we are still within the bounds of PLP-RPT-12-00139.

These compensatory measures have no effect on plant structures, systems, or components (SSCs). The compensatory measures concern only the inspection of the Service Water piping and do not affect the ability of other components, or other aspects of the facility, to perform their design functions.

Therefore, with regard to other aspects of the facility, the compensatory measures for ensuring operability of that MV-SW136 (E-54B SW Outlet CV-0826 Bypass) do not adversely affect the design functions performed by SSCs, the method of performing or controlling a design function of an SSC, or a method of evaluation that demonstrates the intended design functions of an SSC as described in the UFSAR. A test or experiment not described in the UFSAR is not involved.

ATTACHMENT 9.1 PROCESS APPLICABILITY DETERMINATION FORM

VII. REGULATORY REVIEW SUMMARY

VII.A GENERAL REVIEW COMMENTS (Provide pertinent review details and basis for conclusions if not addressed elsewhere in form.)

None.

VII.B CONCLUSIONS

1.	Is a change to an LBD being initiated?	☐	Yes
	IF "Yes," THEN enter the appropriate change control process and include this form with the change package.	☒	No
2.	Is a 10 CFR 50.59 Evaluation required?	☐	Yes
	IF "Yes," THEN complete a 50.59 Evaluation in accordance with EN-LI-101 and attach a copy to the change activity.	☒	No
3.	Is a 10 CFR 72.48 Evaluation required?	☐	Yes
	IF "Yes," THEN complete a 72.48 Evaluation in accordance with EN-LI-112 and attach a copy to the change activity.	☒	No

VIII. SIGNATURES [1]

Preparer: Dan Geerlings / [signature] / ENTERGY / System Eng / 9-26-2012
Name (print) / Signature / Company / Department / Date

Reviewer: Steve Overway / [signature] / ENTERGY / System Eng / 9-26-2012
Name (print) / Signature / Company / Department / Date

Process Applicability Exclusion

Site Procedure Champion or Owner: N/A
Name (print) / Signature / Company / Department / Date

Upon completion, forward this PAD form to the appropriate organization for record storage. If the PAD form is part of a process that requires transmittal of documentation, including PAD forms, for record storage, then the PAD form need not be forwarded separately.

[1] Signatures may be obtained via electronic processes (e.g., PCRS, ER processes, Asset Suite signature), manual methods (e.g., ink signature), e-mail, or telecommunication. If using an e-mail , attach it to this form.