UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 30, 2021

Mr. Daniel G. Stoddard
Senior Vice President and
Chief Nuclear Officer
Dominion Nuclear
Innsbrook Technical Center
5000 Dominion Blvd.
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 - RELIEF REQUEST FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2020-LLR-0081 THROUGH EPID L-2020-LLR-0088)

Dear Mr. Stoddard:

By letter dated June 17, 2020, as supplemented by letter dated September 10, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML20169A512 and ML20258A251, respectively), Dominion Nuclear Connecticut, Inc. (the licensee) submitted Relief Requests (RRs) IR-3-40, IR-3-41, IR-3-42, IR-3-43, IR-3-44, IR-3-45, IR-3-46 and IR-3-47 for Millstone Power Station, Unit No 3 (Millstone 3). The licensee requested relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME) Code, Section XI, for the third period of the third 10-year inservice inspection (ISI) interval, in which the licensee adopted the 2004 Edition with no Addenda. The third 10-year ISI interval began on April 23, 2009, and ended June 22, 2019. Each RR contained in the June 17, 2020, submittal is addressed separately.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the licensee's subject RRs for Millstone 3. For RRs IR-3-40, IR-3-41, IR-3-42, IR-3-43, IR-3-44, IR-3-45, IR-3-46, and IR-3-47, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i), the NRC staff has determined that it is impractical for the licensee to comply with the ASME Code, Section XI, requirement that the proposed examinations performed to the extent practical provide reasonable assurance of structural integrity and leaktightness of the subject welds, and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security and is, otherwise, in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i) and, therefore, grants relief for the subject examinations of the components contained in the submitted RRs for the third 10-year ISI interval at Millstone 3.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Millstone project manager, Richard Guzman, at 301-415-1030 or by e-mail to Richard.Guzman@nrc.gov.

Sincerely,

James G. Danna

Digitally signed by James G. Danna
Date: 2021.06.30 12:14:16 -04'00'

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure:
Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST FOR LIMITED COVERAGE EXAMINATION

PERFORMED IN THE THIRD 10-YEAR INSPECTION INTERVAL

DOMINION ENERGY NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated June 17, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20169A512), as supplemented by letter dated September 10, 2020 (ADAMS Accession No. ML20258A251), Dominion Energy Nuclear Connecticut, Inc. (the licensee), submitted Relief Requests(RRs) IR-3-40, IR-3-41, IR-3-42, IR-3-43, IR-3-44, IR-3-45, IR-3-46 and IR-3-47, from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), 2004 Edition, under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), for limited coverage examinations performed in the third inspection period of the third 10-year inservice inspection (ISI) interval for Millstone Power Station, Unit No. 3 (Millstone 3). The third 10-year ISI interval began on April 23, 2009, and ended on June 22, 2019. Each RR contained in the June 17, 2020, submittal is addressed separately.

Pursuant to 50.55a(g)(5)(iii), the licensee requested relief on the basis that the required examination coverage was impractical due to physical obstructions and limitations imposed by design, geometry, and materials of construction, of the subject components.

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety; or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction, of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals complies with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(a), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b). The code of record for the third 10-year interval ISI program is the 2004 Edition of Section XI of the ASME Code.

The regulation at 10 CFR 50.55a(b)(2)(xv)(A) requires that, when applying Supplement 2 (Qualification Requirements for Wrought Austenitic Piping Welds) to the ASME Code, Section XI, Appendix VIII (Performance Demonstration for Ultrasonic [UT] Examination Systems), the following examination coverage criteria be met:

(1) Piping must be examined in two axial directions, and when examination in the circumferential direction is required, the circumferential examination must be performed in two directions, provided access is available. Dissimilar metal welds must be examined axially and circumferentially.

(2) Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld. Dissimilar metal weld qualifications must be demonstrated from the austenitic side of the weld, and the qualification may be expanded for austenitic welds with no austenitic sides using a separate add-on performance demonstration. Dissimilar metal welds may be examined from either side of the weld.

The regulation at 10 CFR 50.55a(b)(2)(xvi)(B) requires, in part, that examinations performed from one side of a ferritic or stainless steel pipe weld must be conducted with equipment, procedures, and personnel that have demonstrated proficiency with single-sided examinations. To demonstrate equivalency to two-sided examinations, the demonstration must be performed to the requirements of Appendix VIII, as conditioned by this paragraph and 10 CFR 50.55a(b)(2)(xv)(A).

The regulation at 10 CFR 50.55a(g)(5)(iii) states, in part, that licensees may determine that conformance with certain ASME Code requirements is impractical and that the licensee shall notify the U.S. Nuclear Regulatory Commission (NRC) and submit information in support of the determination. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial 120-month inspection interval or subsequent 120-month inspection interval for which relief is sought.

The regulation at 10 CFR 50.55a(g)(6)(i) states that the NRC will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The NRC may grant

such relief and may impose such alternative requirements as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the NRC to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 RR IR-3-40

ASME Code Components Affected

ASME Code Class: Code Class 1
Exam Category: B-B, Pressure Retaining Welds in Vessels other than Reactor Vessels
Item Nos.: B2.11, Pressurizer Circumferential Weld, Shell-to-Head Weld
Weld Identification: 03-007-SW-J, Pressurizer Upper Head-to-Shell Weld

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category B-B, Item No. B2.11, requires 100 percent volumetric examination coverage of the pressure retaining welds as defined in Table IWB-2500-1 and Figure IWB-2500-1.

ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (ADAMS Accession No. ML13339A689), states that a reduction in examination coverage due to part geometry or interference for any ASME Class 1 or 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Although not discussed in the licensee's RR, the NRC staff also finds the ASME Code, Section XI, 2004 Edition, Mandatory Appendix I, Article I-2120, applicable to the weld examination. This ASME Code requires that UT examination of vessels other than reactor vessels greater than 2 inches in thickness shall be conducted in accordance with Section V, Article 4.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical. The examination coverages and results as documented in the licensee request are described in this section. Also described in this section are the access restrictions which prevented full coverage during the ASME Code required examinations.

Examination results for the pressurizer circumferential weld under Examination Category BB are shown in Table 1, as obtained from Attachment 1 to the licensee's submittal. For the pressurizer circumferential shell-to-head weld listed in Table-1, the licensee stated that scan

limitations were due to four vertical support members from a safety valve restraint and seven permanently welded insulation support mounting pads.

Table 1: Examination Category B-B Welds with Limited Volumetric Coverage

Weld ID	Weld Material	Category / Item No.	Coverage	Examination Limitations and Results
03-007-SW-J	Ferritic steel	B-B / Item B2.11 Reactor Coolant System, Pressurizer Upper Head to Shell Weld	69.7%	Support structures for pressurizer safety valves and welded insulation support pads obstruct portions of the weld. No recordable indications detected

The licensee performed the required exam to the maximum extent practical. The licensee stated that this component is monitored for through-wall leakage as part of the ASME Code, Section XI, periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category B-P. The licensee also stated that no recordable indications were detected as a result of the limited coverage exams. The licensee concluded that these activities provided an acceptable level of quality and safety by establishing reasonable assurance of structural integrity. Also, the licensee concluded that meeting the ASME Code examination coverage requirements would be impractical due to cost, increased radiation exposure, and impact to plant equipment and personnel.

NRC Staff Evaluation

For the pressurizer circumferential weld (Weld 03-007-SW-J), the NRC staff examined the coverage diagrams provided in Attachment 1 to the licensee's submittal. The staff finds that it would be impractical to achieve greater than 90 percent volumetric coverage without extensive weld or component design modifications. NRC staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code is acceptable since Article I-2120 of the ASME Code requires UT examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V.

In addition to the volumetric examinations required by the ASME Code for Category B-B welds, the system leakage tests required by the ASME Code Section XI Category B-P for all ASME Code Class 1 pressure retaining components is an additional line of defense in the detection of service-induced degradation. Table IWB-2500-1 requires a system leakage test for all pressure retaining components each refueling outage. The VT-2 visual examination specified in Table IWB-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- Accessible external exposed surfaces be examined for evidence of leakage
- The surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Table IWB-2500-1 and IWB-3522 for these leakage tests requires, in part, that corrective action be taken for identified leakage, unless within defined permissible limits.

Based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed each refueling outage, the staff concludes that, if significant

service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the extent to which the examinations were performed, the NRC staff has determined with reasonable assurance that the structural integrity of these welds was maintained throughout the third 10-year ISI interval.

3.2 RR IR-3-41

ASME Code Components Affected

ASME Code Class: Code Class 1
Exam Category: B-D, Full Penetration Welded Nozzles in Vessels – Inspection Program B
Item Nos.: B3.110, Pressurizer, Nozzle-to-Vessel Welds
Weld Identification: 03-007-SW-S, Pressurizer Surge Nozzle-to-Lower Head Weld

Item Nos.: B3.130, Steam Generator (Primary Side), Nozzle-to-Vessel Welds
Weld Identification: 03-005-SW-U, Steam Generator Outlet Nozzle-to-Head Weld
03-005-SW-V, Steam Generator Inlet Nozzle-to-Head Weld

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category B-D, Item Nos. B3.110 and B3.130, require 100 percent volumetric examination coverage of the pressure retaining welds as defined in Table IWB-2500-1 and Figure IWB-2500-7.

ASME Code Case N-460, as approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any ASME Class 1 or 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Although not discussed in the licensee's RR, the NRC staff also finds the ASME Code, Section XI, 2004 Edition, Mandatory Appendix I, Article I-2120, applicable to the weld examination. This ASME Code requires that UT examination of vessels other than reactor vessels greater than 2 inches in thickness shall be conducted in accordance with Section V, Article 4.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical. The examination coverages and results as documented in the licensee request are described in this section. Also described in this section are the access restrictions which prevented full coverage during the ASME Code required examinations.

Examination results for the pressurizer and steam generator nozzle-to-vessel welds under Examination Category B-D are shown in Table 2, as obtained from Attachment 2 to the licensee's submittal. For the pressurizer and steam generator nozzle-to-vessel welds listed in Table 2, the licensee stated that scan limitations were due to lift-off of the probe occurring at the weld interface on the nozzle outside radius.

Table 2: Examination Category B-D Welds with Limited Volumetric Coverage

Weld ID	Weld Material	Category / Item No.	Coverage	Examination Limitations and Results
03-005-SW-U	Ferritic steel	B-D / Item B3.130 Reactor Coolant System, Steam Generator Outlet Nozzle-to-Head Weld	82.8%	Nozzle configuration restricts scan from the nozzle side. No recordable indications detected.
03-005-SW-V	Ferritic steel	B-D / Item B3.130 Reactor Coolant System, Steam Generator Inlet Nozzle-to-Head Weld	82.8%	Nozzle configuration restricts scan from the nozzle side. No recordable indications detected.
03-007-SW-S	Ferritic steel	B-D / Item B3.110 Reactor Coolant System, Pressurizer Surge Nozzle-to-Lower Head Weld	64.6%	Nozzle configuration and heater sleeves restrict scan from the nozzle side. No recordable indications detected.

The licensee performed the required exam to the maximum extent practical. The licensee stated that these components are monitored for through-wall leakage as part of the ASME Code, Section XI, periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category B-P. The licensee also stated that no recordable indications were detected as a result of the limited coverage exams. The licensee concluded that these activities provided assurance of an acceptable level of quality and safety by establishing reasonable assurance of structural integrity. Also, the licensee concluded that meeting the ASME Code examination coverage requirements would be impractical due to cost, increased radiation exposure, and impact to plant equipment and personnel.

NRC Staff Evaluation

For the pressurizer and steam generator nozzle-to-vessel welds (Welds 03-005-SW-U, 03-005-SW-V, and 03-007-SW-S), the NRC staff examined the coverage diagrams provided in Attachment 2 to the licensee's submittal. The staff finds that it would be impractical to achieve greater than 90 percent volumetric coverage without extensive weld or component design modifications. NRC staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code is acceptable since Article I-2120 of the ASME Code requires UT examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V.

In addition to the volumetric examinations required by the ASME Code for Category B-D welds, the system leakage tests required by the ASME Code Section XI Category B-P for all ASME Class 1 pressure retaining components is an additional line of defense in the detection of service-induced degradation. Table IWB-2500-1 requires a system leakage test for all pressure

retaining components each refueling outage. The VT-2 visual examination specified in Table IWB-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- Accessible external exposed surfaces be examined for evidence of leakage
- The surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Table IWB-2500-1 and IWB-3522 for these leakage tests requires, in part, that corrective action be taken for identified leakage, unless within defined permissible limits.

Based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed each inspection period, it is reasonable to conclude that, if significant service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the extent to which the examinations were performed, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the third 10-year interval ISI program.

3.3 RR IR-3-42

ASME Code Components Affected

ASME Code Class: Code Class 2
Exam Category: C-A, Pressure Retaining Welds in Pressure Vessels
Item Nos.: C1.20, Head Circumferential Welds
Weld Identification: 03-073-008, Residual Heat Removal (RHR) Shell to Lower Head

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category C-A, Item No. C1.20, requires 100 percent volumetric examination coverage of the pressure retaining welds as defined in Table IWC-2500-1 and Figure IWC-2500-1.

ASME Code Case N-460, as approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any ASME Class 1 or 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Although not discussed in the licensee's RR, the NRC staff also finds the ASME Code, Section XI, 2004 Edition, Mandatory Appendix I, Article I-2210, applicable to the weld examination. This ASME Code requires that UT examination of vessels not greater than 2 inches in thickness shall be conducted in accordance with Appendix III, as supplemented by Table I-2000-1.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical. The examination coverages and results as documented in the licensee request are described in this section. Also described in this section are the access restrictions which prevented full coverage during the ASME Code required examinations.

Examination results for the Residual Heat Removal Heat Exchanger shell-to-lower head weld under Examination Category C-A are shown in Table 3, as obtained from Attachment 3 to the licensee's submittal. For the heat exchanger shell-to-lower head welds listed in Table 3, the licensee stated that scan limitations were due to the inlet and outlet reinforcement plates obstructing the examination.

Table 3: Examination Category C-A Weld with Limited Volumetric Coverage

Weld ID	Weld Material	Category / Item No.	Coverage	Examination Limitations and Results
03-073-008	Stainless steel	C-A / Item B1.20 Residual Heat Removal, Shell to Lower Head	81.9%	Obstructions due to the inlet and outlet reinforcement plates. No recordable indications detected.

The licensee performed the required exam to the maximum extent practical. The licensee stated that these components are monitored for through-wall leakage as part of the ASME Code, Section XI, periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category C-H. The licensee also stated that no recordable indications were detected as a result of the limited coverage exams. The licensee concluded that these activities provided assurance of an acceptable level of quality and safety by establishing reasonable assurance of structural integrity. Also, the licensee concluded that meeting the ASME Code examination coverage requirements would be impractical due to cost, increased radiation exposure, and impact to plant equipment and personnel.

NRC Staff Evaluation

For the Residual Heat Removal Heat Exchanger shell-to-lower head weld (Weld 03-073-008), the NRC staff examined the coverage diagrams provided in Attachment 3 to the licensee's submittal. The staff finds that it would be impractical to achieve greater than 90 percent volumetric coverage without extensive weld or component design modifications. NRC staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code is acceptable since Article I-2120 of the ASME Code requires UT examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V.

In addition to the volumetric examinations required by the ASME Code for Category C-A welds, the system leakage tests required by the ASME Code Section XI Category C-H for all ASME Class 2 pressure retaining components is an additional line of defense in the detection of service-induced degradation. Table IWC-2500-1 requires a system leakage test for all pressure retaining components each refueling outage. The VT-2 visual examination specified in Table IWC-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- Accessible external exposed surfaces be examined for evidence of leakage
- The surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Table IWC-2500-1 and IWC-3516 (which refers to IWB-3522) for these leakage tests requires, in part, that corrective action be taken for identified leakage, unless within defined permissible limits.

Based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed each refueling outage, the staff concluded that, if significant service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the extent to which the examinations were performed, the NRC staff has determined with reasonable assurance that the structural integrity of these welds was maintained throughout the third 10-year interval ISI program.

3.4 RR IR-3-43

ASME Code Components Affected

ASME Code Class:	Code Class 2
Exam Category:	C-B, Pressure Retaining Nozzle Welds in Vessels
Item Nos.:	C2.22, Nozzle Inside Radius Section
Weld Identification:	03-053-SW-T-IR, Steam Generator Main Steam Outlet Nozzle Inner
	03-054-SW-T-IR, Steam Generator Main Steam Outlet Nozzle Inner
	03-055-SW-T-IR, Steam Generator Main Steam Outlet Nozzle Inner
	03-056-SW-T-IR, Steam Generator Main Steam Outlet Nozzle Inner

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category C-B, Item No. C2.22, requires 100 percent volumetric examination coverage of the pressure retaining welds as defined in Table IWC-2500-1 and Figure IWC-2500-4.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical. The examination coverages and results as documented in the licensee request are described in this section. Also described in this section are the access restrictions which prevented full coverage during the ASME Code required examinations.

Examination results for the steam generator outlet nozzle inner radius under Examination Category C-B are shown in Table 4, as obtained from Attachment 4 to the licensee's submittal. For the steam generator outlet nozzle inner radius locations listed in Table 4, the licensee stated that scan limitations were due to incompatible nozzle geometry. The licensee also mentioned that visual examination of the steam generator outlet nozzle inner radius from the inside surface was obstructed by the moisture separators. Therefore, the licensee did not attempt a limited coverage examination in this case.

Table 4: Examination Category C-B, Limited Volumetric Coverage

Weld ID	Weld Material	Category / Item No.	Coverage	Examination Limitations and Results
03-053-SW-T-IR	Ferritic steel	C-B / Item C2.22 Nozzle Inside Radius Section	0%	Nozzle design and obstruction by the moisture separators
03-054-SW-T-IR	Ferritic steel	C-B / Item C2.22 Nozzle Inside Radius Section	0%	Nozzle design and obstruction by the moisture separators
03-055-SW-T-IR	Ferritic steel	C-B / Item C2.22 Nozzle Inside Radius Section	0%	Nozzle design and obstruction by the moisture separators
03-056-SW-T-IR	Ferritic steel	C-B / Item C2.22 Nozzle Inside Radius Section	0%	Nozzle design and obstruction by the moisture separators

The licensee stated that the accessible portions of the steam generator outlet nozzle welds are monitored for through-wall leakage as part of the ASME Section XI periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category C-H. The licensee concluded that this activity provides an acceptable level of quality and safety by establishing reasonable assurance of structural integrity. Also, the licensee concluded that meeting the ASME Code examination coverage requirements would be impractical due to cost, increased radiation exposure, and impact to plant equipment and personnel.

NRC Staff Evaluation

For the steam generator outlet nozzle inner radius exams (locations 03-053-SW-T-IR, 03-054-SW-T-IR, 03-055-SW-T-IR, 03-056-SW-T-IR), the NRC staff confirmed by inspection of Figure 1 of Attachment 4 to the licensee's submittal that the unique nozzle geometry precluded examination of the inner radius location. The NRC staff finds that it would be impractical to achieve greater than 90 percent volumetric coverage without extensive weld or component design modifications.

The NRC staff referred to the safety evaluation dated July 24, 2000 (ADAMS Accession No. ML003730922), for the second 10-year ISI interval regarding the inner radius examinations at Millstone 3. At that time, the licensee discussed the stress state in the steam generator main steam nozzles. The bored holes parallel to the nozzle centerline create ligaments that distribute the loads, avoiding a stress concentration. The staff at that time reviewed a proprietary report describing the stress analysis. In addition to the low stresses expected in this unique nozzle geometry, the system leakage tests required by the ASME Code Section XI Category C-H for all ASME Class 2 pressure retaining components is an additional line of defense in the detection of service-induced degradation. Table IWC-2500-1 requires a system leakage test for all pressure retaining components each refueling outage. The VT-2 visual examination specified in Table IWC-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- Accessible external exposed surfaces be examined for evidence of leakage
- The surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Table IWC-2500-1 and IWC-3516 (which refers to IWB-3522) for these leakage tests requires, in part, that corrective action be taken for identified leakage, unless within defined permissible limits.

Based on the system leakage tests performed each refueling outage, it is reasonable to conclude that, if significant service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the low stresses expected in this unique nozzle geometry, the staff has determined with reasonable assurance that the structural integrity of these welds was maintained throughout the third 10-year ISI interval program.

3.5 RR IR-3-44

ASME Code Components Affected

ASME Code Class:	Code Class 2
Exam Category:	C-F-1, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping
Item Nos.:	C5.11, Circumferential Welds: Piping Welds greater than 3/8 inch nominal wall thickness for piping greater than nominal pipe size (NPS) 4 inches
Weld Identification:	CHS-30-11-SW-E, Chemical and Volume Control, 6" Pipe-to-Flange CHS-30-12-SW-B, Chemical and Volume Control, 6" Pipe-to-Flange CHS-30-12-SW-C, Chemical and Volume Control, 6" Flange-to-Pipe CHS-30-13-SW-B, Chemical and Volume Control, 6" Flange-to-Elbow QSS-6-3-SW-D, Quench Spray, 14" Pipe to Flange QSS-6-4-SW-D, Quench Spray, 14" Pipe to Flange RHS-501-FW-6, Residual Heat Removal, 12" Valve-to-Pipe RHS-502-FW-7, Residual Heat Removal, 12" Valve-to-Pipe RSS-1-3-SW-B, Recirculation Spray, 12" Flange-to-Pipe RSS-8-2-SW-R, Recirculation Spray, 12" Flange-to-Elbow RSS-16-2-SW-B, Recirculation Spray, 12" Valve-to-Pipe RSS-19-4-SW-G, Recirculation Spray, 16" Reducer-to-Nozzle RSS-21-4-SW-G, Recirculation Spray, 16" Reducer-to-Flange SIH-12-3-SW-C, Intermediate Head Safety Injection, 6" Pipe-to-Flange SIH-12-FW-3, Intermediate Head Safety Injection, 6" Valve-to-Pipe SIL-25-FW-1-5M, Low Pressure Safety Injection, 8" Pipe-to-Tee SIL-25-FW-1-8M, Low Pressure Safety Injection, 8" Tee-to-Pipe SIL-25-FW-2, Low Pressure Safety Injection, 8" Pipe-to-Valve SIL-25-FW-3, Low Pressure Safety Injection, 8" Pipe-to-Valve SIL-152A-FW-1, Low Pressure Safety Injection, 24" Pipe-to-Flange

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category C-F-1, requires 100 percent volumetric examination coverage for circumferential piping welds as defined in Table IWC-2500-1.

The licensee adopted ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," which defines "essentially 100 percent" as greater than 90 percent coverage of the examination volume or surface area, as applicable. The

90 percent minimum coverage was applied to all surface and volumetric examinations required by ASME Code, Section XI.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the essentially 100 percent volumetric examination requirement is impractical.

The examination coverages and results for IR-3-44, as documented in the licensee's request, are summarized in Table 5 below. The components covered by IR-3-44 are the 20 ASME Code, Section XI, Class 2, Examination Category C-F-1, Item No. C5.11, "Circumferential welds: Piping Welds ≥ 3/8 in. Nominal Wall Thickness for Piping > NPS 4 in." Each weld was only accessible from one side due to geometry of the welds and components.

Table 5: Examination Category C-F-1 Welds with Limited Volumetric Coverage

Component Identification and System	Item No.	System	Pipe Size (inch)	Materials	Coverage Obtained
CHS-30-11-SW-E	C5.11	Chemical Volume and Control	6	SA312 TP304	50%
CHS-30-12-SW-B	C5.11	Chemical Volume and Control	6	SA312 TP304	50%
CHS-30-12-SW-C	C5.11	Chemical Volume and Control	6	SA312 TP304	50%
CHS-30-13-SW-B	C5.11	Chemical Volume and Control	6	SA403 WP304	50%
QSS-6-3-SW-D	C5.11	Quench Spray System	14	SA312 TP304/ Flange SA182 F304	50%
QSS-6-4-SW-D	C5.11	Quench Spray System	14	SA312 TP304/ Flange SA182 F304	50%
RHS-501-FW-6	C5.11	Residual Heat Removal	12	SA182 F304/ SA376 T316	50%
RHS-502-FW-7	C5.11	Residual Heat Removal	12	SA182 F304/ SA376 T316	50%
RSS-1-3-SW-B	C5.11	Recirculation Spray System	12	SA312 TP304	50%
RSS-8-2-SW-R	C5.11	Recirculation Spray System	12	SA182 F304/ Elbow SA312 TP304	50%
RSS-16-2-SW-B	C5.11	Recirculation Spray System	12	SA312 TP304	50%

Component Identification and System	Item No.	System	Pipe Size (inch)	Materials	Coverage Obtained
RSS-19-4-SW-G	C5.11	Recirculation Spray System	16	SA402 WP304/ SA182 F304	48.5%
RSS-21-4-SW-G	C5.11	Recirculation Spray System	16	SA403 WP304/ Flange SA182 F304	50%
SIH-12-3-SW-C	C5.11	Intermediate Head Safety Inspection	6	SA312 TP304	50%
SIH-12-FW-3	C5.11	Intermediate Head Safety Inspection	6	Valve SA351 CF8/ SA312 TP304 Sch 40	50%
SIL-25-FW-1-5M	C5.11	Low Pressure Safety Injection	8	SA376 T316/ SA403 WP316	75%
SIL-25-FW-1-8M	C5.11	Low Pressure Safety Injection	8	SA376 T316/ SA403 WP316	75%
SIL-25-FW-2	C5.11	Low Pressure Safety Injection	8	SA376 TP316	70.8%
SIL-25-FW-3	C5.11	Low Pressure Safety Injection	8	SA376 TP316	75%
SIL-152A-FW-1	C5.11	Low Pressure Safety Injection	24	SA182 F304/ SA312 TP304	50%

In lieu of satisfying the examination coverage in accordance with the ASME Code, Section XI, requirement, the licensee proposed the alternate examination coverage for the subject welds shown in the table above. The basis of the proposed alternative is that the licensee has performed the ASME Code, Section XI-required examinations to the maximum extent practical utilizing qualified personnel, techniques, and equipment. The licensee explained that due to the physical interferences causing these limitations, there are no alternative examination techniques currently available to increase coverage. Furthermore, in combination with additional monitoring methods that the welds are subject to, the examinations performed provide reasonable assurance that service-induced degradation or leakage will be detected.

NRC Staff Evaluation

The NRC staff has evaluated RR IR-3-44 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the Code required examinations would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff finds

that if these three criteria are met that the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief will not "endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility") will also be met.

The licensee claimed to obtain 48.5 percent – 75 percent examination coverage of the Category C-F-1, Item Number C5.11, circumferential welds listed in the table above. As stated in the submittal, the reduction in coverage was attributed to the design configuration of the components which limited scans to a single side of the welds. Particularly, the proximity of the welds to the flanges, valves, nozzles, and tees does not provide sufficient distance for the scanner to perform any examinations from the tapered side of each weld. Included in the submittal are the scan plots detailing the required volumetric coverage, the UT beams used in the examination, the actual coverage obtained and the limitations preventing further examination. The NRC staff reviewed the diagrams and confirmed the examination coverages obtained, the licensee's calculations, and that no further coverage could be obtained. Additionally, the licensee performed best-effort examinations of the unobtainable regions though it cannot be credited to the code required examination coverage. The NRC staff finds that the examinations were performed to the maximum extent practical, the percentage of examination coverage is reasonably calculated, and further coverage is not feasible. No recordable indications were observed during any of the exams.

As described in the submittal, the examinations performed were limited due to the configuration of the components which restricted full examinations of the welds. The configurations also prevent alternative examination techniques from achieving greater credited coverage. The components were designed and fabricated prior to the examination requirements of ASME Code, Section XI, being published; therefore, the plant was not designed specifically to meet the requirements. The NRC staff finds these limitations to be an acceptable basis for impracticality of conforming to the essentially 100 percent volumetric coverage requirements. Furthermore, obtaining greater coverage would require extensive component design modifications or replacement to create room for the transducer to scan from both sides of the weld. This would also require increased radiation exposure to personnel. Therefore, the NRC staff also finds that the modifications necessary to achieve the required dual sided coverage constitutes a burden upon the licensee.

The required examination volumes include the volume surrounding the weld, weld heat affected zone, and base metal, where applicable, in the crevice region. The intent of the examinations is to detect cracks initiating and propagating from the inner surface. The licensee performed the required volumetric examination of the welds using UT to the extent practical and achieved the coverages stated above. These examinations were performed manually using UT techniques and utilizing personnel, equipment and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII, as implemented by the Performance Demonstration Initiative (PDI). The NRC staff reviewed the scan diagrams and coverage sheet which showed that the examined volumes included weld and base materials in the inner region where degradation is expected to occur (if it occurs). The NRC staff determined that the limited coverages for these welds are acceptable.

In addition to the ASME Code-required volumetric examinations, the welds are subject to further defense-in-depth measures. These components are monitored for through-wall leakage as part of the ASME Code, Section XI, System Pressure Test Program, and receive a visual (VT-2) examination each inspection period during the system leakage tests as required by Section XI, Table IWC-2500-1, Category C-H for Class 2 components. The NRC staff finds that the

coverage obtained with the UT examinations combined with visual examinations and ongoing leakage testing provides reasonable assurance that any significant service induced degradation would be observed and mitigated in a timely manner to maintain structural integrity.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code-required examination volume for the subject welds is impractical because of the stated limitations and that the modifications necessary to obtain the required coverage would impose an undue burden upon the licensee. The NRC staff determined that the licensee performed volumetric examinations to the maximum extent practical and the licensee has implemented compensatory measures that effectively monitor the weld volumes that could not be examined. Therefore, it is reasonable to conclude that any significant service-induced degradation that is present in these welds would have be detected. Lastly, the NRC staff concluded that there is reasonable assurance that the structural integrity of the welds will be maintained considering the following: the majority of the most susceptible portions of the welds were examined; no indications were found suggesting that cracks are developing or growing from previous intervals; these welds will likely leak before breaking; and the licensee has defense-in-depth measures to monitor these welds for leakage. Based on operational experience and the extent to which the licensee performed examinations, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the third 10-year ISI inspection interval.

3.6 RR IR-3-45

ASME Code Components Affected

ASME Code Class:	Code Class 2
Exam Category:	C-F-2, Pressure Retaining Welds in Carbon or Low Alloy Steel Piping
Item Nos.:	C5.51, Circumferential Welds: Piping Welds greater than or equal to 3/8 inch nominal wall thickness for piping greater than NPS 4 inches
Weld Identification:	DTM-31-FW-1, Main Steam, 6" Weldolet-to-Pipe FWS-11-FW-70, Feedwater, 16" Valve-to-Pipe FWS-11-FW-74, Feedwater, 18" Pipe-to-Valve FWS-12-FW-27, Feedwater, 6" Pipe-to-Valve FWS-17-FW-104, Feedwater, 16" Valve-to-Pipe FWS-17-FW-70, Feedwater, 18" Pipe-to-Valve FWS-18-FW-35, Feedwater, 6" Valve-to-Pipe MSS-29-FW-3, Main Steam, 8" Valve-to-Pipe

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category C-F-2 requires 100 percent volumetric examination coverage for circumferential piping welds as defined in Table IWC-2500-1.

The licensee adopted ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," which defines "essentially 100 percent" as greater than 90 percent coverage of the examination volume or surface area, as applicable. The 90 percent minimum coverage was applied to all surface and volumetric examinations required by ASME Code, Section XI.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the essentially 100 percent volumetric examination requirement is impractical.

The examination coverages and results for IR-3-45, as documented in the licensee's request, are summarized in Table 6 below. The components covered by IR-3-45 are the eight ASME Code, Section XI, Class 2, Examination Category C-F-2, Item No. C5.51, "Circumferential welds: Piping Welds ≥ 3/8 in. Nominal Wall Thickness for Piping > NPS 4 in." Each weld was only accessible from one side due to geometry of the welds and components.

Table 6: Examination Category C-F-2 Welds with Limited Volumetric Coverage

Component Identification and System	Item No.	System	Pipe Size (inch)	Materials	Coverage Obtained
DTM-31-FW-1	C5.51	Main Steam	6	CS Weldolet SA105 / CS pipe SA106 GR.B	73.45%
FWS-11-FW-70	C5.51	Feedwater	16	CS Valve SA216 WC-B / CS pipe SA106 GR.C with internal Stainless Steel cladding	62.5%
FWS-11-FW-74	C5.51	Feedwater	18	CS pipe SA106 GR.C with internal Stainless Steel cladding / CS Valve SA216 WC-B	72.9%
FWS-12-FW-27	C5.51	Feedwater	6	CS Valve SA216 WC-B / CS pipe SA106 GR.C	83%
FWS-17-FW-104	C5.51	Feedwater	16	CS Valve SA216 WC-B / CS pipe SA106 GR.C with internal Stainless Steel cladding	47.15%
FWS-17-FW-70	C5.51	Feedwater	18	CS pipe SA106 GR.C with internal Stainless Steel cladding / CS Valve SA216 WC-B	53.75%

Component Identification and System	Item No.	System	Pipe Size (inch)	Materials	Coverage Obtained
FWS-18-FW-35	C5.51	Feedwater	6	CS Valve SA216 WC-B / CS pipe SA106 GR.C	69.1%
MSS-29-FW-3	C5.51	Main Steam	8	CS Valve SA216 WC-B / CS pipe SA106 GR.B	87.5%

In lieu of satisfying the examination coverage in accordance with the ASME Code, Section XI, requirement, the licensee proposed the alternate examination coverage for the subject welds shown in the table above. The basis of the proposed alternative is that the licensee has performed the ASME Code, Section XI-required examinations to the maximum extent practical utilizing qualified personnel, techniques, and equipment. The licensee explained that due to the physical interferences causing these limitations, there are no alternative examination techniques currently available to increase coverage. Additionally, surface examinations were performed with 100 percent coverage obtained. Furthermore, in combination with additional monitoring methods that the welds are subject to, the examinations performed provide reasonable assurance that service-induced degradation or leakage will be detected.

NRC Staff Evaluation

The NRC staff has evaluated RR IR-3-45 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the ASME Code-required examinations would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff finds that if these three criteria are met that the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief will not "endanger life or property or the common defense and security, and is, otherwise, in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility") will also be met.

The subject welds are examined using manual UT techniques in accordance with ASME Code, Section XI, Appendix VIII. The licensee claimed to obtain 47.15 percent - 87.5 percent examination coverage of the Category C-F-2, Item Number C5.51, circumferential welds listed in the table above. As stated in the submittal, the reduction in coverage was attributed to the design configuration of the components which limited scans to a single side of the welds. Particularly, each of the welds have either pipe-to-valve or pipe-to-weldolet configurations. The proximity of the welds to the tapered surface of the valve or weldolet does not provide sufficient distance for the scanner to perform any examinations from the tapered side of each weld.

Included in the submittal are the scan plots detailing the required volumetric coverage, the UT beams used in the examination, the actual coverage obtained and the limitations preventing further examination. The NRC staff reviewed the diagrams and finds that the examinations were performed to the maximum extent practical, the percentage of examination coverage is reasonably calculated, and further coverage is not feasible. During the UT examinations, indications were observed in five of the eight welds. Each of these indications, however, were determined to be inner diameter weld root geometry and therefore acceptable. In addition to the

UT examinations, magnetic particle and liquid penetrant surface examinations were also performed on the subject welds and 100 percent coverage was achieved. One recordable indication was found during liquid penetrant testing of welds FWS-17-FW-104 and FWS-17-FW-70. Both indications were evaluated against the acceptance standards of ASME Code, Section XI, IWB-3514, and were determined to be acceptable. No indications suggesting that cracks are developing or growing from previous intervals were found during the volumetric or surface exams.

As described in the submittal, the examinations performed were limited due to the configuration of the components which restricted full examinations of the welds. The configurations also prevent alternative examination techniques from achieving greater credited coverage. The components were designed and fabricated prior to the examination requirements of ASME Code, Section XI, being published, therefore, the plant was not designed specifically to meet the requirements. The NRC staff finds these limitations to be an acceptable basis for impracticality of conforming to the essentially 100 percent volumetric coverage requirements. Furthermore, obtaining greater coverage would require extensive component design modifications or replacement to create room for the transducer to scan from both sides of the weld. This would also require increased radiation exposure to personnel. Therefore, the NRC staff also finds that the modifications necessary to achieve the required dual sided coverage constitutes a burden upon the licensee.

The required examination volumes include the volume surrounding the weld, weld heat affected zone, and base metal, where applicable, in the crevice region. The intent of the examinations is to detect cracks initiating and propagating from the inner surface. The licensee performed the required volumetric examination of the welds using UT to the extent practical and achieved the coverages stated above. These examinations were performed manually using UT techniques and utilizing personnel, equipment and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII as implemented by the PDI. The NRC staff reviewed the scan diagrams and coverage sheets, which showed that the examined volumes included weld and base materials in the inner region where degradation is expected to occur (if it occurs). The staff determined that the limited coverages for these welds are acceptable.

In addition to the volumetric surface examinations conducted, the welds are subject to further defense-in-depth measures. These components are monitored for through-wall leakage as part of the ASME Code, Section XI, System Pressure Test Program, and receive a visual (VT-2) examination each inspection period during the system leakage tests as required by Section XI, Table IWC-2500-1, Category C-H for Class 2 components. The NRC staff finds that the coverage obtained with the UT examinations combined with the surface examinations, visual examinations and ongoing leakage testing provides reasonable assurance that any significant service induced degradation would be observed and mitigated in a timely manner to maintain structural integrity.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code-required examination volume for the subject welds is impractical because of the stated limitations and that the modifications necessary to obtain the required coverage would impose an undue burden upon the licensee. The NRC staff determined that the licensee performed volumetric examinations to the maximum extent practical and the licensee has implemented compensatory measures that effectively monitor the weld volumes that could not be examined. Therefore, it is reasonable to conclude that any significant service-induced degradation that is present in these welds would have be detected. Lastly, the NRC staff concluded that there is reasonable assurance that the structural integrity of the welds will be maintained considering the

following: the majority of the most susceptible portions of the welds were examined; none of the indications found suggest that cracks are developing or growing from previous intervals; these welds will likely leak before breaking; and the licensee has defense-in-depth measures to monitor these welds for leakage. Based on operational experience and the extent to which the licensee performed examinations, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the third 10-year ISI inspection interval.

3.7 RR IR-3-46

ASME Code Components Affected

ASME Code Class: Code Class 1
Exam Category: F-A, Supports
Item Nos: F1.40, Supports Other than Piping Supports
Weld Identification: 3-RVS-1, 3-RVS-2, 3-RVS-3, 3-RVS-4

Applicable Code Requirements

ASME Code, Section XI, Examination Category F-A, Item F1.40, requires 100 percent visual VT-3 examination, as defined by ASME Code, Section XI, Figure IWF-1300-1, of selected ASME Code, Class 1, 2, 3, and MC, supports other than piping supports.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the essentially 100 percent volumetric examination requirement is impractical. Specifically, the licensee stated that removal of the reactor pressure vessel (RPV) insulation panels would be required to increase the direct visual examination coverage of the subject supports. The licensee considers performance of this activity to meet the 100 percent ASME Code examination requirement to be impractical, due to the access restrictions, high radiation levels and support design. In addition, the licensee stated:

> The subject supports received a VT-3 visual examination on the accessible portions to the maximum extent practical with the insulation in place. In addition, the insulation was examined for any evidence of disturbance or degradation which may be attributed to abnormal support disturbance.

NRC Staff Evaluation

The ASME Code requires 100 percent VT-3 examination of ASME Code, Class 1 RPV nozzle supports. Visual examinations of these supports at Millstone 3 are limited due to partial inaccessibility caused by their design and the surrounding environment.

The nozzle support assemblies consist of a nozzle pad and steel plates positioned between a steel support structure and the RPV hot and cold leg nozzles. They are encased by eight permanent RPV insulation panels. The insulation panels range from approximately 230 to 1200 pounds, which requires special rigging to be setup in a very congested area. Removal of the panels is further complicated by their location in the restricted area under the permanently welded cavity seal ring. These panels have not been removed since original construction. Due to the size and weight of these panels and their location in the confined area under the cavity

seal ring, specialized rigging equipment would need to be set up through the existing seal ring manways in an attempt to remove the panels without modification or removal of the cavity seal ring. The licensee calculated that 26.08 man-rem would be necessary to remove the insulation panels for the VT-3 examinations. In order for the licensee to obtain 100 percent of the ASME Code-required examination coverage, RPV insulation panels need to be removed which would cause excessive radiation exposure to personnel. Normally, the removal of insulation and the associated dose would be considered a hardship and would require a proposed alternative under 10 CFR 50.55a(z)(2). The NRC staff has evaluated this inspection and determined that in this individual case the nature of the installed insulation and the cavity seal ring make this inspection impractical.

Visual VT-3 examinations on RPV nozzle supports 3-RVS [reactor vessel system]-1 through -4 have been performed to the extent practical, with the licensee obtaining approximately 10 percent of the ASME Code-required visual coverage. The licensee also examined the surrounding insulation for any evidence of deformation or degradation attributable to significant support disturbance. These nozzle supports are exposed to high thermal loads during normal operations, and physical displacement of the insulation should be evident if the supports experience significant degradation.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code-required examination volume for the subject welds is impractical because of the stated limitations and that the modifications necessary to obtain the required coverage would impose an undue burden upon the licensee. The NRC staff determined that the licensee performed VT-3 visual examinations on the accessible portions of the subject supports to the maximum extent practical with the insulation panels in place, including examination of the insulation for any evidence of disturbance or degradation which may be attributed to abnormal support disturbance. Based on the visual coverage obtained on the accessible supports and surrounding insulation, it is reasonable to conclude that, if significant service-induced degradation had occurred, evidence of it would be have been detected by the examinations that were performed. Based on operational experience and the extent to which the licensee performed examinations, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the third 10-year ISI inspection interval.

3.8 RR IR-3-47

ASME Code Components Affected

ASME Code Class: Code Class 1
Exam Category: R-A, Risk-Informed Piping Examinations
Item Nos.: R 1.11, Elements Subject to Thermal Fatigue
Weld Identification: RCS-504A-FW-4, Reactor Coolant, 8" Pipe-to-Valve
RCS-504B-FW-4, Reactor Coolant, 8" Pipe-to-Valve
RCS-504D-FW-1, Reactor Coolant, 8" Pipe-to-Valve
RHS-501-FW-3, Residual Heat Removal, 12" Valve-to-Pipe
SIL-13-FW-5, Reactor Coolant, 6" Pipe-to-Valve Body
SIL-4-FW-10, Reactor Coolant, 10" Valve-to-Pipe
SIL-5-FW-10, Reactor Coolant, 10" Pipe-to-Valve
SIL-6-FW-10, Reactor Coolant, 10" Valve-to-Pipe
SIL-7-FW-10, Reactor Coolant, 10" Pipe-to-Valve

Item Nos.: R 1.20, Elements not Subject to a Degradation Mechanism
Weld Identification: 3-CHS-150-P1A-2, Chemical and Volume Control, 1.5" Flange-to-Pipe
3-CHS-150-P1C-2, Chemical and Volume Control, 1.5" Flange-to-Pipe
3-CHS-150-P1D-2, Chemical and Volume Control, 1.5" Flange-to-Pipe
RCS-5-FW-8, Reactor Coolant, 2" Pipe-to-Valve
RCS-LP2-FW-4, Reactor Coolant, 29" Elbow-to-Nozzle
RCS-LP2-FW-5, Reactor Coolant, 31" Elbow-to-Nozzle
RCS-LP2-HL1-SW-C, Reactor Coolant, 14" Pipe-to-Nozzle
RCS-LP4-FW-HL1-CMR, Reactor Coolant, 12" Pipe-to-Nozzle

Applicable Code Requirements

The examination requirements for ASME Code, Section XI, Class 1, piping welds covered in RR IR-3-47 are governed by the risk-informed ISI program that was approved by the NRC in a letter dated March 24, 2011 (ADAMS Accession No. ML110680080). Examination Category R-A requires that essentially 100 percent of the weld volume be examined.

Additionally, pursuant to 10 CFR 50.55a(b)(2)(xv)(A)(1) and 10 CFR 50.55a(b)(2)(xv)(A)(2), full coverage credit from a single side of an austenitic weld may be claimed only after completing a successful single-sided ASME Code, Section XI, Appendix VIII, demonstration using flaws on the opposite side of the weld. To date no examination procedure has been successfully passed ASME Code, Section XI, Appendix VIII, Supplement 2, demonstration testing from a single side of an austenitic weld.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the essentially 100 percent volumetric examination requirement is impractical. The examination coverages and results for IR-3-47, as documented in the licensee's request, are summarized in Table 6 below. The components covered by RR IR-3-47 are 17 ASME Code, Section XI, Class 1, Examination Category RA, Item Nos. R1.11, "Elements Subject to Thermal Fatigue," and R1.20, "Elements Not Subject to a Damage Mechanism" items. Each weld was only accessible from one side due to geometry of the welds and components.

Table 6: Examination Category R-A Welds with Limited Volumetric Coverage

Component Identification and System	Item No.	Limitation	Pipe Size (inch)	Materials	Coverage Obtained
3-CHS-150-P1A-2 Chemical and Volume Control	R1.20	Flange-to-Pipe	1.5	Type 316 Stainless Steel, Schedule 160	75%
3-CHS-150-PIC-2 Chemical and Volume Control	R1.20	Flange-to-Pipe	1.5	Type 316 Stainless Steel, Schedule 160	50%
3-CHS-150-PID-2 Chemical and Volume Control	R1.20	Flange-to-Pipe	1.5	Type 316 Stainless Steel, Schedule 160	50%

Component Identification and System	Item No.	Limitation	Pipe Size (inch)	Materials	Coverage Obtained
RCS-5-FW-8 Reactor Coolant	R1.20	Pipe-to-Valve	2	Pipe SA 351 F316N Valve SA-351, CF8M	32.2%
RCS-LP2-FW-4 Reactor Coolant	R1.20	Elbow-to-Nozzle	29	Elbow SA-351 CF8A SG Nozzle SA-508 CL2A	53.22%
RCS-LP2-FW-5 Reactor Coolant	R1.20	Elbow-to-Nozzle	31	Elbow SA-351 CF8A SG Nozzle SA-508 CL2A	53.22%
RCS-LP2-HL1-SW-C Reactor Coolant	R1.20	Pipe-To-Nozzle	14	Pipe SA-351, CF8A, Sch 140. Nozzle SA-182, F316N	29.7%
RCS-LP4-FW-HL1-CMR Reactor Coolant	R1.20	Pipe-To-Nozzle	12	Pipe SA-351, CF8A, Sch 140. Nozzle SA-182, F316N	52.05%
RHS-504A-FW-4 Reactor Coolant	R1.11	Pipe-To-Valve	8	Pipe SA-376, TP-304. Sch 160 Valve SA-351, CF8M	50%
RCS-504B-FW-4 Reactor Coolant	R1.11	Pipe-To-Valve	8	SA-376, TP-304. Sch 160	50%
RCS-504D-FW-1 Reactor Coolant	R1.11	Pipe-To-Valve	8	Pipe SA-376, TP-304. Sch 160 Valve SA-351, CF8M	50%
RHS-501-FW-3 Residual Heat Removal	R1.11	Valve-to-Pipe	12	Valve SA-182, F316. Pipe Sch 160. SA 376, T316	50%
SIL-13-FW-5 Reactor Coolant	R1.11	Pipe-To-Valve Body	6	Pipe SA-376, T316. Valve SA-182, F316	50%
SIL-4-FW-10 Reactor Coolant	R1.11	Valve-To-Pipe	10	SA-376, TP-316 Sch 140	50%
SIL-5-FW-10 Reactor Coolant	R1.11	Pipe-To-Valve	10	SA-376, TP-316 Sch 140	50%
SIL-6-FW-10 Reactor Coolant	R1.11	Valve-To-Pipe	10	Valve SA-351 CF8M SA376, T316 Sch 140	50%
SIL-7-FW-10 Reactor Coolant	R1.11	Pipe-To-Valve	10	SA-376, T316 Sch 140 Valve SA-182, F316	50%

Specifically, conformance to the requirement would require extensive modifications to, or replacement of, the subject components with a design that would allow full examination from both sides of the weld. Implementing these adjustments would be impractical based on cost, increased radiation exposure, and impact to plant equipment.

The licensee determined that the ASME Code-required volumes of the subject welds were examined to the maximum extent possible using PDI-qualified UT techniques. Additionally, the licensee stated that no alternative methods or advanced technologies, including the use of phased array, were considered capable of obtaining complete coverage of the examination volume.

The subject welds consist of a pipe-to-valve, pipe-to-nozzle, elbow-to-nozzle or pipe-to-flange configuration in which the tapered surface of the valve, nozzle, or flange within close proximity of the weld limits the ability to scan from that side of the weld. Based on the weld configurations being limited to single-sided access, relief is requested from complying with the essentially 100 percent required examination coverage.

There are currently no PDI-qualified single-sided examination procedures that demonstrate equivalency to two-sided examination procedures on austenitic piping welds. None of the current technology is capable of reliably detecting or sizing flaws on the opposite side of an austenitic weld. Therefore, the licensee requested relief from complying with the ASME Code-required volumetric examinations of the subject components.

In lieu of satisfying the examination coverage in accordance with the ASME Code, Section XI, requirement, the licensee proposed the alternate examination coverage for the subject welds shown in Table 1 of the RR for IR-3-47, “Examination Category R-A Welds with Limited Volumetric Coverage.” The basis of the proposed alternative is that the licensee has performed the ASME Code, Section XI-required examinations to the maximum extent practical utilizing PDI-qualified personnel, techniques, and equipment.

Additionally, the licensee stated the subject components are monitored for through-wall leakage as part of the ASME Section XI, System Pressure Test Program, and receive a visual (VT-2) examination at the end of each refueling outage during system leakage tests. In combination with additional monitoring methods that the welds are subject to, the examinations performed provide reasonable assurance that service-induced degradation or leakage will be detected.

NRC Staff Evaluation

The NRC staff has evaluated RR IR-3-47 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff’s evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the ASME Code required examinations would result in a burden to the licensee; and (3) that the licensee’s proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff finds that if these three criteria are met that the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief will not “endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility”) will also be met.

As described in the submittal, the predominant limitations that prevented the licensee’s UT to achieve essentially 100 percent coverage of the ASME Code-required volume were the

configurations that limited the examinations to one side of the weld. The licensee performed the UT from one side of the welds because scanning from the other side of the welds was not possible (single-sided scan). The NRC staff confirms that each weld's particular design configuration prevented the licensee from scanning the welds from both sides. Therefore, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

The licensee proposed that obtaining essentially 100 percent coverage would require extensive modification or replacement of components with a design that would allow full examination from both sides of the weld. The NRC staff finds that replacing or reconfiguring the components of the subject welds is the only reasonable means to achieve dual-sided coverage of these welds and that replacement or reconfiguration of the pipe, valve, reducer, and flange, constitutes a burden on the licensee.

The NRC staff also verified that: (1) the pipe welds were examined using the appropriate equipment, UT modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage; (2) the coverage was calculated in a reasonable manner; (3) the personnel and UT procedures utilized for the volumetric examination were qualified as required by the regulation; (4) the coverage was limited by physical limitations or access (i.e., the configuration of one side of the weld did not permit access for scanning); and (5) no unacceptable indications were identified.

The NRC staff notes that the licensee was able to obtain 29.7 percent to 75 percent coverage meeting the ASME Code, Section XI, Appendix VIII, requirements for each of the subject welds. For each weld, the wetted surface of the weld and heat-affected zone volume of the far side of the welds received best effort examinations. While the best effort examination coverage does not meet the ASME Code, Section XI, requirements to be able to detect small cracks, the examinations would have been able to detect significant cracking if such cracking had been present.

The NRC staff determined that based on the coverage achieved by the qualified UT, the supplemental best effort examinations, and the examination of the weld root and its heat-affected zone to the extent possible, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee performed.

The NRC staff also determined that, in addition to the required volumetric examinations, these welds have received the required system leakage test according to the ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P), during each refueling outage. Despite reduced coverage of the required examination volume, the NRC staff finds that these examinations will provide additional assurance that any pattern of degradation, if it were to occur, would be detected, and the licensee will take appropriate correction actions.

Therefore, the NRC staff finds that the volumetric examinations performed to the extent possible provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements for these welds would be a burden on the licensee.

4.0 CONCLUSION

The NRC staff has reviewed the licensee's submittal and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in RRs IR-3-40, IR-3-41, IR-3-42, IR-3-43, IR-3-44, IR-3-45, IR-3-46, and IR-3-47. Specifically, pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff has determined that it is impractical for the licensee to comply with the ASME Code, Section XI requirement; that the proposed examinations performed to the extent practical provide reasonable assurance of structural integrity and leaktightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed, it is reasonable to conclude that, if significant service-induced degradation was present, evidence of it would have been detected by the examinations that were performed.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC grants relief for the subject examinations of the components contained in RRs IR-3-40, IR-3-41, IR-3-42, IR-3-43, IR-3-44, IR-3-45, IR-3-46, and IR-3-47, at Millstone 3 for the third 10-year ISI interval.

All other ASME Code, Section XI requirements for which relief has not been specifically requested and approved in this RR remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

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Date: June 30, 2021

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 - RELIEF REQUEST FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2020-LLR-0081 THROUGH EPID L-2020-LLR-0088) DATED JUNE 30, 2021

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