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NL-17-142

November 1, 2017

U.S. Nuclear Regulatory Commission
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SUBJECT: Response to Request for Additional Information Regarding Request IP2-ISI-RR-20 for Relief from Examinations of Code Class 1 Component Welds with Less Than Essentially 100% Coverage for Fourth Ten-Year Inservice Inspection Interval Closeout
Indian Point Nuclear Generating Unit No. 2
Docket No. 50-247
License No. DPR-26

REFERENCE:
1) Entergy Letter dated May 30, 2017, "Request IP2-ISI-RR-20 for Relief from Examinations of Code Class 1 Component Welds with Less Than Essentially 100% Coverage for Fourth Ten-Year Inservice Inspection Interval Closeout (NL-17-057) (ML17159A524)

2) NRC Electronic Mail dated October 3, 2017, "Indian Point Unit 2 - Request for Additional Information - Relief Request IP2-ISI-RR-20 Regarding Weld Examination Coverage (CAC MF9843)

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(g)(5)(iii), Entergy Nuclear Operations, Inc. (Entergy) submitted IP2 Relief Request IP2-ISI-RR-20 for NRC review and approval. The relief request proposes alternatives where the requirement of "essentially 100%" volumetric examination was not feasible due to construction limitations, obstructions, accessibility and examination techniques (Reference 1).

By Reference 2, the U.S. Nuclear Regulatory Commission (NRC) identified a need for additional information for the piping welds listed in Tables 1 and 2 of the relief request in order to complete its review. Attachments 1 and 2 of this letter provide Entergy's responses to the NRC staff's information needs.

There are no new commitments being made in this submittal.

A047
NRR

If you have any questions, or require additional information, please contact Mr. Robert Walpole at (914) 254-6710.

Sincerely,

AJV/rl

Attachments:

1. Reply to NRC Request for Additional Information Regarding Relief Request IP2-ISI-RR-20

2. Figures

cc: Mr. Richard V. Guzman, Senior Project Manager, NRC NRR DORL
Mr. Daniel H. Dorman, Regional Administrator, NRC Region I
Ms. Bridget Frymire, New York State Department of Public Service
Ms. Alicia Barton, President and CEO NYSERDA
NRC Resident Inspector's Office

ATTACHMENT 1

to NL-17-142

REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION

REGARDING RELIEF REQUEST IP2-ISI-RR-20

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

REQUEST FOR ADDITIONAL INFORMATION
RELIEF REQUEST IP2-ISI-RR-20 REGARDING WELD EXAMINATION COVERAGE
ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR POWER PLANT, UNIT 2
DOCKET NUMBER 50-247

By letter dated May 30, 2017 (Accession No. ML17159A524), Entergy Nuclear Operations, Inc. (the licensee) requested relief from the requirement of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-460 "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1." Relief request IP2-ISI-RR-20 pertains to examination coverage of ASME Code Class 1 piping welds and vessel/shell welds at Indian Point Unit No. 2 (IP2).

To complete its review, the NRC staff requests the following additional information for the piping welds listed in Tables 1 and 2 of the relief request.

1. In the submittal, the licensee described Weld No. 351 2 as an elbow to sweep-o-let to pipe weld in one sentence and as a branch connection sweep-o-let to pipe weld in another. The NRC staff has difficulty determining type/location of this weld from the descriptions provided.

   (e.g., Does Weld No. 351 2 joint a sweep-o-let to a pipe to create a branch connection on a pipe? Does Weld No. 351 2 joint a sweep-o-let to an elbow to create a branch connection on an elbow? Does Weld No. 351 2 joint an elbow to a sweep-to-let?).

   Provide clear descriptions, type, and/or location of this weld, and if possible, supplement with sketches and/or photographs.

   Response:

   Weld 351 2 is a Class 1 weld, which attaches a 10" boss/nozzle to a 10" elbow. See Figure 1 in Attachment 2 for additional details.

2. The licensee stated that the mode of degradation for Weld Nos. 351 4, 353 4, 351 2, and 353 1 is thermal fatigue or thermal stratification, cycling, and striping (TASCS). The NRC staff assumes that the above welds are potentially susceptible to low cycle thermal fatigue. If the above welds are susceptible to high cycle thermal fatigue, please describe.

   Response:

   The evaluation performed during the development of the ISI program for the fourth ten year interval concluded that welds 351 2 and 353 1 screened out for TASCS (i.e. these two welds were not susceptible to thermal fatigue). These welds screened in for intergranular stress corrosion cracking (IGSCC) only. This same evaluation concluded that welds 351 4 and 353 4 screened in for both TASCS and IGSCC.

The evaluation used three degradation mechanisms to evaluate welds relative to TASCS. The first was low flow/valve leakage, the second was convection heating and the third was steam/water mixture in the pipe. The evaluation concluded that welds 351 4 and 353 4 could be susceptible to convection heating due to its location relative to the RCS. Welds 351 4 and 353 4 were determined not to be susceptible to either low flow/valve leakage or steam/water mixture.

Since convection heating can result in thermal stratification in a stagnant pipe but does not introduce rapid temperature cycling, it can be concluded that none of these four welds are susceptible to high cycle thermal fatigue.

3. Confirm that the piping welds under consideration are not part of any augmented inspection program (e.g., MRP-146, and/or the Electric Power Research Institute (EPRI) interim guidance MRP 2015-025 "EPRI-MRP Interim Guidance for Management of Thermal Fatigue" (Accession Number ML15189A100)). If these piping welds are part of any augmented program, please describe.

Response:

The piping welds under consideration are not part of any augmented inspection program (e.g., MRP-146, and/or the Electric Power Research Institute (EPRI) interim guidance MRP 2015-025 "EPRI-MRP Interim Guidance for Management of Thermal Fatigue" (Accession Number ML15189A100)). They were selected for inspection under the Risk Informed ISI (RISI) program.

4. For assurance of structural integrity of unexamined volume of the subject piping welds, provide cumulative fatigue usage (CFU) factor for those welds with limited coverage of less than or equal to 50 percent.

Response:

Since the IPEC piping was designed in accordance with the requirements of the 1955 Edition of the USAS B31.1 Code for Pressure Piping Code, a fatigue analysis was not required and therefore was not performed during original plant design and construction. However, fatigue analyses were performed for a limited number of piping locations as part of the development of the License Renewal Application (LRA).

Table A below provides the cumulative usage factors (CUFs) available for those welds where the inspection coverage was less than or equal to fifty percent.

Table A

Weld Number	% Coverage	CUF	Comments
351 4	50	N/A	No CUF available for this location
353 4	50	N/A	No CUF available for this location
353 1	50	0.0021(1)	CUF from the inside crotch of the nozzle.

RCC21-14	42.89	0.050[2]	Note that this CUF is the most limiting value for the entire vessel cold leg nozzle and it is not necessarily at the exact weld location.
RCC22-14	42.89	0.050[2]	Note that this CUF is the most limiting value for the entire vessel cold leg nozzle and it is not necessarily at the exact weld location.
RCC23-14	42.89	0.050[2]	Note that this CUF is the most limiting value for the entire vessel cold leg nozzle and it is not necessarily at the exact weld location.
RCC24-14	42.89	0.050[2]	Note that this CUF is the most limiting value for the entire vessel cold leg nozzle and it is not necessarily at the exact weld location.

(1) From WCAP-17199 Rev 0. "Environmental Fatigue Evaluation for Indian Point Unit 2" June 2010.
(2) From UFSAR Table 4.3-2

5. Provide materials of construction for the piping welds and their associated components (e.g., pipe, valve, elbow, branch connection, sweep-o-let, safe end, clad, nozzle, and weld metal) listed in Tables 1 and 2.

Response:

Weld Number 351 4:
Weld 351 4 is a Stainless Steel (SS) weld which joins a 10" SS A-376 TP-316 pipe to a SS A-351 GR CF-8 valve (Valve 897A).

Weld Number 353 4:
Weld 353 4 is a Stainless Steel (SS) weld which joins a 10" SS A-376 TP-316 pipe to a SS A-351 GR CF-8 valve (Valve 897C).

Weld Number 351 2:
Weld 351 2 is a Stainless Steel (SS) weld which joins a 10" SS A-403 WP-316 elbow to a SS A-182 F-316 Boss/Nozzle.

Weld Number 353 1:
Weld 353 1 is a Stainless Steel (SS) weld which joins a 10" SS A-182 F-316 Boss/Nozzle to a 32 ¼" SS A-376 TP-316 pipe.

Weld Numbers RCC21-14, RCC22-14, RCC23-14, RCC24-14:
Weld RCC21-14 (same as RCC22-14, RCC23-14, RCC24-14 welds) is a Stainless Steel (SS) weld which joins a SS A-351-65 GR CF8M elbow to a TP-316 SA-182 safe-end with a 304 SS ID overlay layer covering the safe-end onto the pipe butt weld.

6. At bottom of page 8 of 10 in Attachment 1 to the relief request, the licensee stated, in part,

   "this means no coverage is credited until the sound path travels from the transducer, through the clad, directly into the weld, and then into the base metal of the safe-end."

   a. Discuss in detail which components (weld, elbow, safe end, and/or nozzle) of Weld Nos. RCC21-14, RCC22-14, RCC23-14, and RCC24-14 were cladded. If possible, supplement with a sketch showing that sound waves travel through clad into components (weld, elbow, safe end, and/or nozzle).

      Response:

      Each of these four (4) welds are of similar construction and have a stainless steel overlay covering the inside diameter surface of the safe-end and pipe groove weld. This overlay is the "clad" being referred to at the bottom of page 8 of 10 in attachment 1 to the relief request IP2-ISI-RR-20 (Reference 1). Refer to Attachment 2, Figure 2.

      Figure 3 of Attachment 2 shows the 70 degree longitudinal sound wave orientation for the upstream and downstream axial UT scans, and clock wise and counter clock wise circumferential UT scans. This sketch also identifies the areas of limited coverage for both axial and circumferential scans when disallowing examination into or from the cast material. The cast stainless steel elbow material is the condition causing the inspection limitation, not the overlay (clad). Figure 3 of Attachment 2 is essentially the same as IP2-ISI-RR-20 Attachment I (Reference 1), modified to clarify the UT scans performed and coverage obtained.

      As described on page 8 of the relief request IP2-ISI-RR-20 (Reference 1), the (ASME) code required volume was scanned by these exams obtaining greater than 98% coverage. However, when discounting the portions of these exams where the sound passes through the cast stainless steel elbow material the resulting inspection coverage is reduced to 42.89%. The vendor UT procedure used for these exams is not qualified for examinations performed from the cast stainless steel side of a component.

   b. Confirm that each reactor vessel cold leg nozzle contains two welds (a nickel based alloy weld connecting nozzle to safe end and a stainless steel weld connecting safe end to elbow).

      Response:

      Yes, the reactor vessel cold leg nozzle contains two welds. A nickel based alloy weld connecting the nozzle to the safe end and a stainless steel weld connecting the safe end to the cast elbow.

   c. Confirm that the stainless steel welds connecting safe ends to elbows (Weld Nos. RCC21-14, RCC22-14, RCC23-14, and RCC24-14) are the subject of this relief request.

Response:

Yes, the stainless steel welds connecting safe ends to elbows are the subject of this relief request.

7. Provide normal operating pressure and temperature for each piping weld listed in Tables 1 and 2.

Response:

See Table B below.

Table B

Cat	Item	Component ID	System	Dia (in)	Thk (in)	Normal Operating Pressure (psig)	Normal Operating Temperature (F)
R-A	R1.11-3	351 4	SIS	10	1.0	2235	555
R-A	R1.11-3	353 4	SIS	10	1.0	2235	555
R-A	R1.16-1	351 2	SIS	10	1.0	2235	555
R-A	R1.16-1	353 1	SIS	10	2.325	2235	555
R-A	R1.20-1	RCC21-14	RCS	27.5 ID	2.5	2235	555
R-A	R1.20-1	RCC22-14	RCS	27.5 ID	2.5	2235	555
R-A	R1.20-1	RCC23-14	RCS	27.5 ID	2.5	2235	555
R-A	R1.20-1	RCC24-14	RCS	27.5 ID	2.5	2235	555

8. In the submittal (Table 2), the licensee categorized the piping welds as Item Nos. R1.11-3, R1.16-1, and R1.20-1. The NRC staff notes that ASME Code Case N-578-1 "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B, Section XI, Division 1" categorization is R1.11, R1.16, and R1.20. Revise, or justify the submittal's categorization.

Response:

The Risk-Informed categories shown by CC N-578-1 have been further sub-categorized by the IP2 ISI Program based on degradation mechanism with an additional dashed number. For the purpose of relief request IP2-ISI-RR-20 (Reference 1) and CC N-578-1; R1.11-3 is equivalent to R1.11, R1.16-1 is equivalent to R1.16, and R1.20-1 is equivalent to R1.20.

9. In the third 10-year (previous) ISI interval,

   a. Were the piping welds in Tables 1 and 2 inspected? If yes, discuss the results of inspections.

Response:

Weld Nos. 351 4 and 353 4, were not inspected in the third 10-year (previous) ISI interval.

Weld 351 2 was inspected on 5/22/97 during the third 10-year ISI interval first period second outage, prior to implementation of ASME Section XI Appendix VIII requirements. This inspection used 45 and 60 degree shear wave transducers and recorded similar limited coverage due to elbow to boss/nozzle connection weld geometry, on the boss/nozzle side of the weld. IP2 Relief Request Number 51 was submitted and relief granted for the third 10-year interval for that limited inspection coverage. The UT inspection results were acceptable and a PT inspection was also performed at that time with acceptable results.

Weld 353 1 was inspected on 5/5/00 during the third 10-year ISI interval second period second outage, prior to implementation of ASME Section XI Appendix VIII requirements. This inspection used 45 degree shear and 60 degree longitudinal wave transducers from the boss/nozzle side of the weld. This single sided access inspection did not record any coverage limitations. The UT inspection results were acceptable and a PT inspection was also performed at that time with acceptable results.

Welds RCC21-14, RCC22-14, RCC23-14 and RCC24-14 were inspected 5/4/06 during the third 10-year ISI interval. These inspections used 70 degree longitudinal wave transducers from the pipe ID surface. The inspections recorded essentially 100% inspection coverage for the code required inspection volume and did not identify any limitations due to the cast stainless steel elbow base metal as detailed in the current relief request. Note that the inspection results discussed in the current relief request also reflect essentially 100% inspection coverage was obtained for the code required inspection volume. An additional calculation was performed to discount the sound passing through the cast stainless steel base metal which is the subject of the current limitation relief request. The UT inspection results were acceptable.

b. Were similar piping welds with similar configurations and subject to similar degradation(s) inspected? If yes, discuss the results of inspections.

Response:

During the third 10- year ISI interval IP2 did not perform any inspections of 10" circumferential weld valve-to-pipe, pipe-to-boss/nozzle or elbow-to-boss/nozzle configuration subject to similar degradation.

Welds RCC21-14, RCC22-14, RCC23-14 and RCC24-14 inspections were performed during the third 10- year ISI interval; refer to question 9a for inspection results.

10. The NRC staff notes that the refracted longitudinal waves have shown to have better penetration capability in the cast austenitic stainless steel (CASS) and austenitic stainless steel materials, and they could be used as an extra effort to scan the far-side

of examination volume ("best effort" examination). The NRC staff also notes that the "best effort" examination is not a requirement.

Given the reduced inspection coverage of the weld under consideration, discuss whether the licensee performed the "best effort" examination as an extra effort to interrogate the required examination volume of other side of the weld (far-side), particularly the root of the weld and the heat affected zone (HAZ) of the base materials typically susceptible to high stresses and potential degradation, If not, explain.

Response:

Even though credit was not taken, the CASS material portion of welds 351 4 and 353 4 was interrogated on a best effort basis using refracted longitudinal waves and no recordable indications were identified. The exam volume coverages included the weld root area and the heat affected zone as illustrated by the relief request IP2-ISI-RR-20 (Reference 1) Attachment G coverage sketches submitted for each weld. Note that material limitations prevented achieving 100% coverage of the inspection volume.

Even though credit was not taken, the CASS material portion of welds RCC21-14, RCC22-14, RCC23-14 and RCC24-14 was interrogated on a best effort basis using refracted longitudinal waves and no recordable indications were identified. Essentially 100% coverage was obtained of the CASS material including the root area and the heat affected zone of the material.

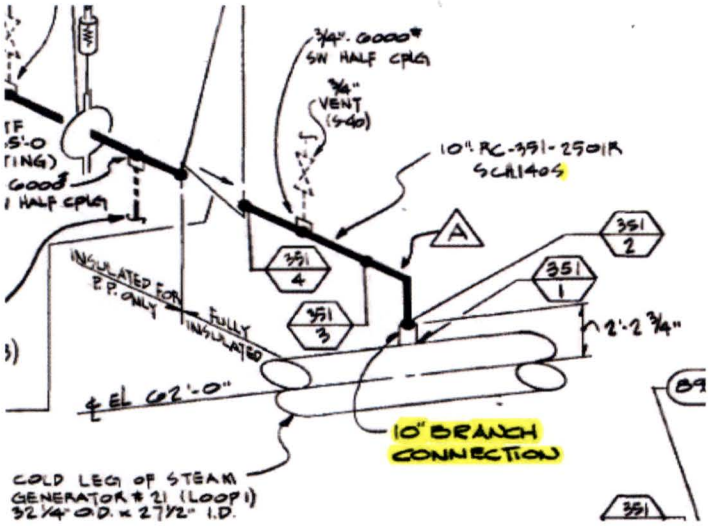
ATTACHMENT 2

to NL-17-142

FIGURES

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

Figure 1
Weld 351 2 – Elbow to Boss/Nozzle



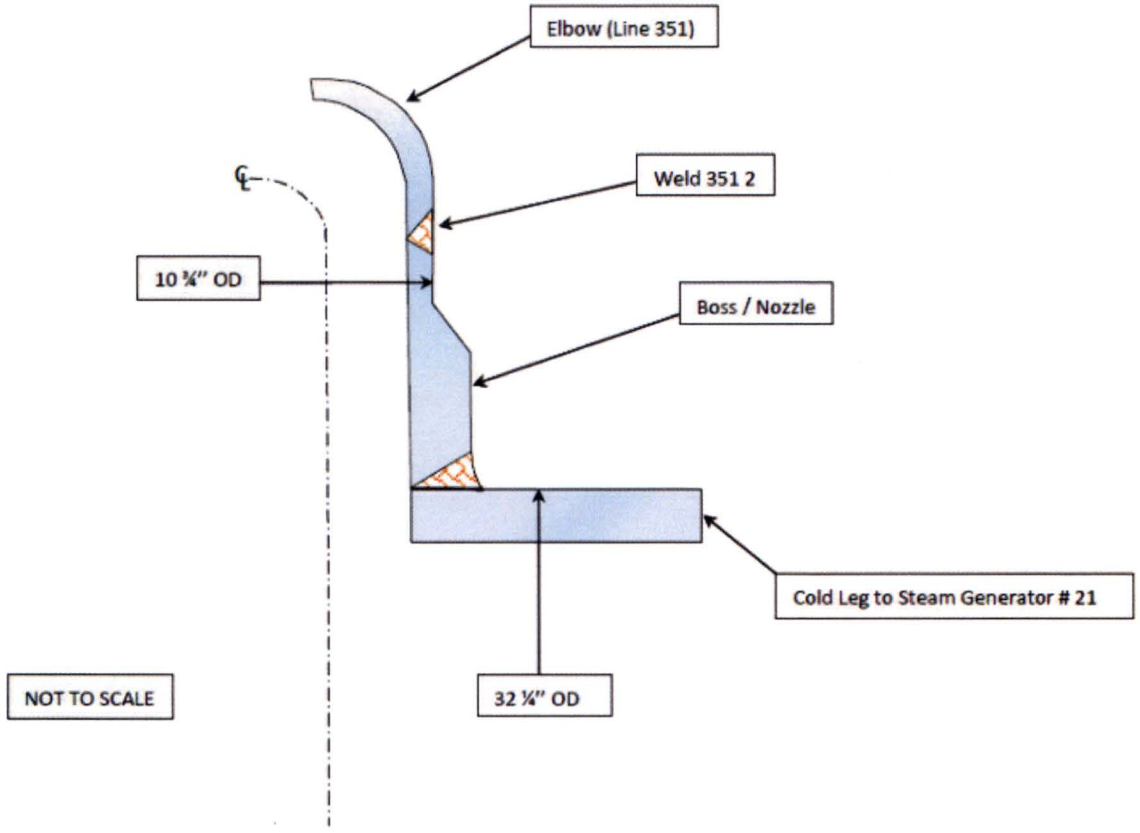


Figure 2
Drawing D207909-0 / Weld RCC21-14
(Typical for Welds RCC21-14, RCC22-14, RCC23-14 & RCC-24-14)

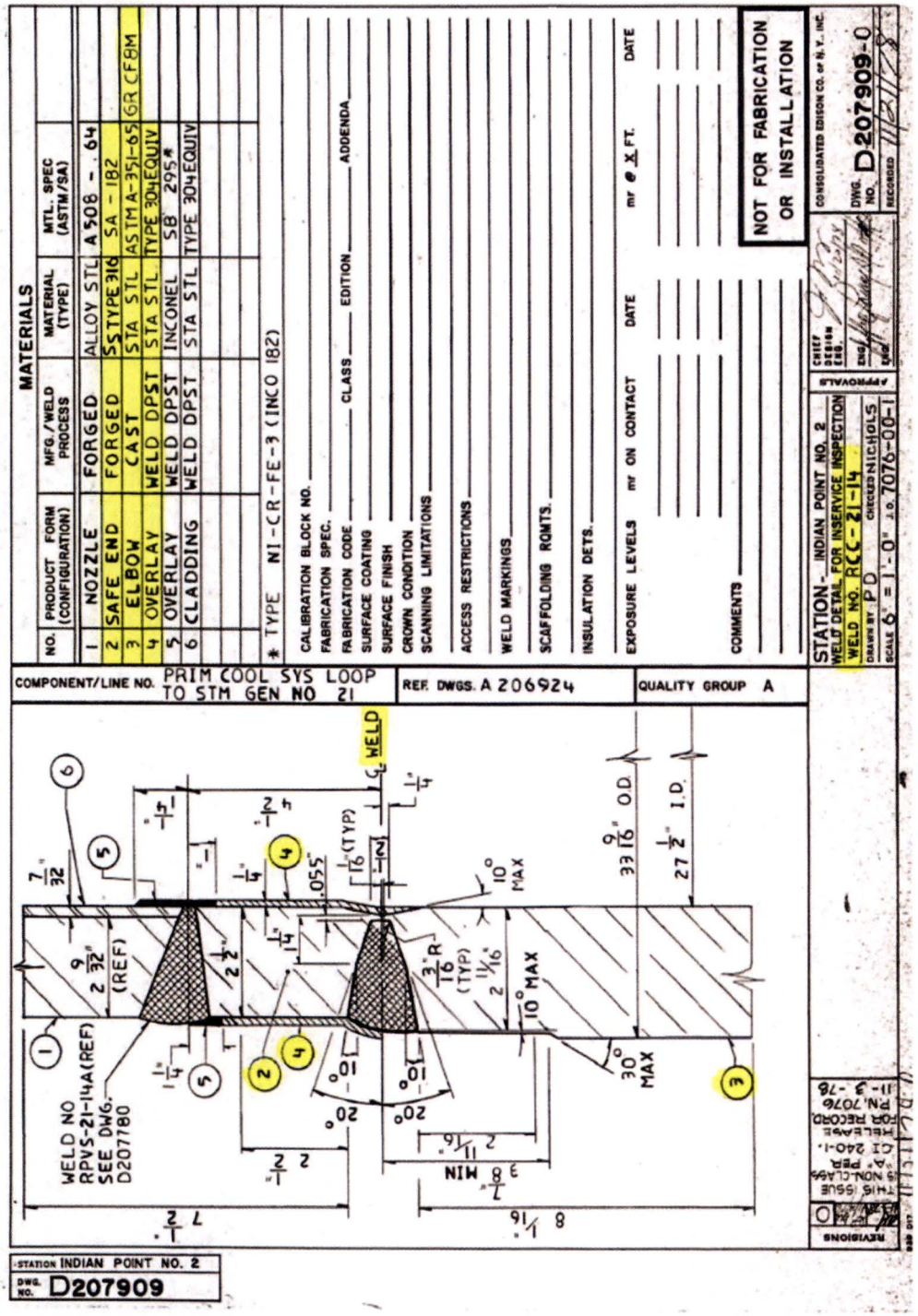
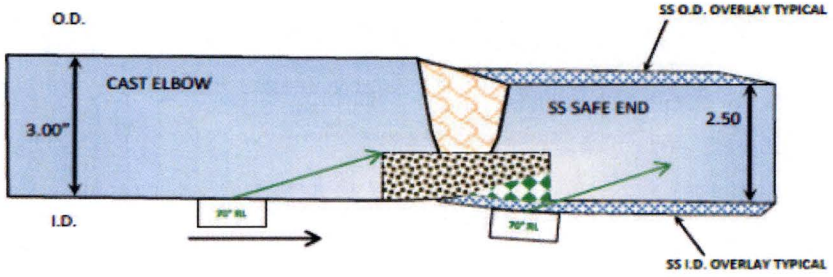


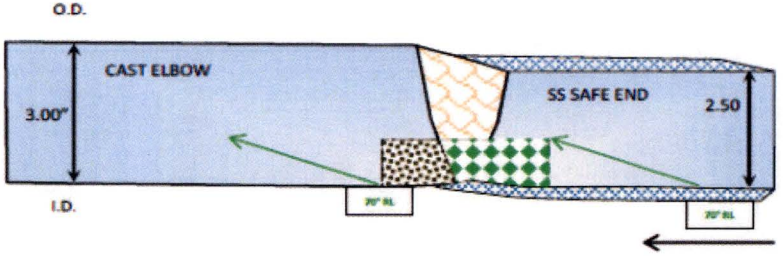
Figure 3
Similar to IP2-ISI-RR-20, Attachment I
(Typical for Welds RCC21-14, RCC22-14, RCC23-14 & RCC-24-14)

AXIAL SCAN FROM CAST SIDE



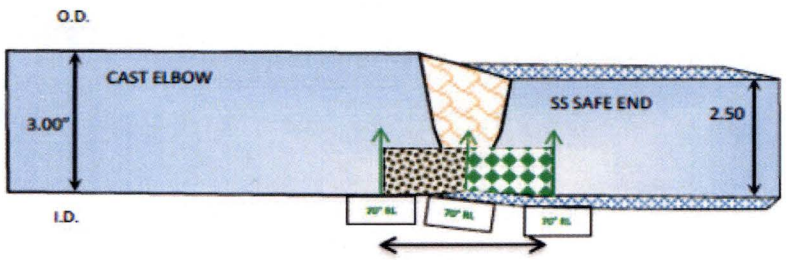
11.46% AREA OF COVERAGE ACHIEVED

AXIAL SCAN FROM SAFE END SIDE

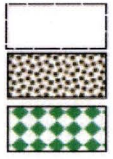


61.66% AREA OF COVERAGE ACHIEVED

CIRCUMFERENTIAL SCAN CW & CCW



49.22% AREA OF COVERAGE ACHIEVED



ASME SCEC. XI CODE REQUIRED EXAM VOLUME

AREA OF LIMITED COVERAGE

AREA OF COVERAGE ACHIEVED

COVERAGE CALCULATIONS

Circumferential CW Scan	49.22%
Circumferential CCW Scan	49.22%
Axial Scan From Elbow	11.46%
Axial Scan From Safe End	+61.66%
Total Estimated Coverage	171.56 / 4 = **42.89%**