Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

FPL

June 11, 2012

L-2012-166
10 CFR 50.4
10 CFR 50.55a

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Unit 2
Docket No. 50-389
Inservice Inspection Plan
Third Ten-Year Interval Unit 2 Relief Request No. 13, Revision 01

Pursuant to 10 CFR 50.55a(a)(3)(ii), Florida Power & Light (FPL) requests relief from the 10CFR50.55a(g)(6)(ii)(F)(4) exception to ASME Code Case N-770-1 that essentially 100% coverage be achieved for the baseline required volumetric examinations. The details and justification for this request are provided in the attachment to this letter.

FPL requests approval of this relief request to support the upcoming Unit 2 SL2-20 Spring / Summer 2012 refueling outage.

Please contact Ken Frehafer at (772) 467-7748 if there are any questions about this submittal.

Sincerely,

Eric S. Katzman
Licensing Manager
St. Lucie Plant

Attachment
ESK/KWF

A047
NRR

Relief Request
In Accordance with 10 CFR50.55a(a)(3)(ii)

--Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety--

1. ASME Code Component(s) Affected

Class 1 pressure retaining dissimilar metal piping welds containing Alloy 82/182. American Society of Mechanical Engineers (ASME) Code Case N-770-1, Table 1, Examination Categories, Inspection Item B – Unmitigated butt weld at cold leg operating temperature.

2. Applicable Code Edition and Addenda

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Rules for Inservice Inspection of Nuclear Power Plant Components, Section XI, 1998 Edition with Addenda through 2000 [1] as amended by 10CFR50.55a,[2] is the code of record for the St. Lucie Unit 2, 3rd 10-year interval.

10CFR50.55a(g)(6)(ii)(F)(1), effective date August 22, 2011, requires "licensees of existing, operating pressurized water reactors as of July 21, 2011, shall implement the requirements of ASME Code Case N-770-1, subject to the conditions specified in paragraphs (g)(6)(ii)(F)(2) through (g)(6)(ii)(F)(10) of this section, by the first refueling outage after August 22, 2011."

Additionally, 10CFR50.55a(g)(6)(ii)(F)(3) states that the baseline examinations for welds in Code Case N-770-1, Table 1, Inspection Item B, *"shall be completed by the end of the next refueling outage after January 20, 2012. Previous examinations of these welds can be credited for baseline examinations if they were performed within the re-inspection period for the weld item in Table 1 using Section XI, Appendix VIII requirements and met the Code required examination volume of essentially 100 percent. Other previous examinations that do not meet these requirements can be used to meet the baseline examination requirement, provided NRC approval of alternative inspection requirements in accordance with paragraphs (a)(3)(i) or (a)(3)(ii) of this section is granted prior to the end of the next refueling outage after January 20, 2012."*

3. Applicable Code Requirement

ASME Code Case N-770-1 as Amended by 10CFR50.55a(g)(6)(ii)(F)(4)		
CLASS 1 PWR Pressure Retaining Dissimilar Metal Piping and Vessel Nozzle Butt Welds Containing Alloy 82/182		
Parts Examined	Insp Item	Extent and Frequency of Examination
Unmitigated butt weld at Cold Leg operating temperature (-2410) ≥ 525°F (274°C) and < 580°F (304°C)	B	Bare metal visual examination once per interval Essentially 100% volumetric examination for axial and circumferential flaws in accordance with the applicable requirements of ASME Section XI, Appendix VIII, every second inspection period not to exceed 7 years. Baseline examinations shall be completed by the end of the next refueling outage after January 20, 2012.

As defined by ASME Code Case N-460,[3] essentially 100% means greater than 90% of the examination volume of each weld where reduction in coverage is due to interference by another component or part geometry.

ASME Section XI, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds" is applicable to dissimilar metal welds without cast materials. ASME Section XI, Appendix VIII, states that the supplement for the examination of cast stainless steel is "in the course of preparation".

4. Reason for Request

Florida Power and Light is requesting permission to utilize the Ultrasonic examinations performed in accordance with MRP-139 [4] during the 2011 (SL2-19) outage to satisfy the baseline examination requirements of 10CFR50.55a(g)(6)(ii)(F)(3). However, the welds listed within this request did not satisfy the required ASME Code Case N-770-1, as amended by 10CFR50.55a(g)(6)(ii)(F)(3), volume coverage due to their configuration. The scanning limitations prohibited essentially 100% ultrasonic examination coverage of the required examination volume.

10CFR50.55a(g)(6)(ii)(F)(4) provides the following exception to ASME Code Case N-770-1, "the axial examination coverage requirements of -2500(c) may not be considered to be satisfied unless essentially 100 percent coverage is achieved."

Relief is requested from the 10CFR50.55a(g)(6)(ii)(F)(4) exception to ASME Code Case N-770-1 that essentially 100% coverage be achieved for the baseline volumetric examinations.

5. Proposed Alternative and Basis for Use

Proposed Alternative

1) Periodic system pressure tests in accordance with ASME Section XI Category B-P, Table IWB-2500-1.

2) Ultrasonic examinations conducted to the maximum extent possible.

3) During refueling outages, system engineers walkdown Class 1 systems inside containment. This walkdown was performed to look for system anomalies that could affect plant performance. These examinations identified no evidence of leakage for these components.

4) Bare metal visual examinations of the Inspection Item B welds in accordance with ASME Code Case N-722-1. Those examinations identified no evidence of leakage for these components. The combination of these examinations provides confidence that an acceptable level of quality and safety has been maintained.

Basis

FPL's, St. Lucie unit 2 contains a thirty (30) inch I.D. inlet and a thirty (30) inch I.D. outlet weld connected to each of the four (4) reactor coolant pumps (RCPs). Each weld joins mill-clad SA-516, Grade 70 carbon steel pipe with SA-240-304L stainless steel cladding to a SA-351, Grade CF8M cast stainless steel safe end.

All of the welds covered by this relief request are found in cold leg temperature (T_{cold}) regions of the system. This means there is a lower probability of crack initiation, and a slower crack growth rate. These welds are also very highly flaw tolerant, as demonstrated in the MRP-109 report.[5] No service-induced flaws have been found in these large diameter pipes, even though most of the plants of interest have been in service for over 25 years. [6,7]

During the 2011 (SL2-19) outage, examinations were performed of the eight (8) reactor coolant pump inlet/outlet dissimilar metal welds utilizing a manual non-encoded phased array Ultrasonic (UT) technique. In all cases, examination was performed from the carbon steel side of the weld. The equipment, procedure, and personnel utilized for the performance of the examinations were qualified in accordance with the requirements of ASME Section XI, Appendix VIII, Supplement 10, as implemented through the Performance Demonstration Initiative (PDI) program.

Prior to the issuance of the revised final rule 10CFR50.55a (effective date August 22, 2011) that includes the requirement to implement the requirements of ASME Code Case N-770-1 as amended, the Materials Reliability Program issued "Primary System Piping Butt Weld Inspection and Evaluation Guidelines (MRP-139)" that included mandatory elements per the implementation protocol of the Nuclear Energy Institute (NEI) 03-08 initiative. The guideline provided a strategy to manage degradation of butt welds with

alloy 82/182 in primary system piping that are 1" NPS or greater and exposed to temperatures greater than or equal to cold leg temperature. The guideline was structured to categorize weld inspections to acknowledge mitigation, temperature, safety significance of flaw orientation, and inspection capabilities. The guideline defined examination locations on the piping, examination requirements for various weld categories, and extent of examination for each location. Finally, the guideline provided evaluation procedures to determine acceptance of flaws, justification for mitigation actions, and changing examination categories.

MRP-139 delineated acceptable coverage of the required examination volume to be calculated separately for axial and circumferential flaw orientations using the actual weld configuration and the procedure's essential variables, if needed. Coverage calculations could be made by manual plotting or by using computer-aided design (CAD) or other software that models the procedure's beam angles and scan plans.

- The inspection was considered complete when, using the qualified procedure and personnel, the coverage for both axial and circumferential flaws was greater than 90% of the required examination volume.

- If >90% coverage for circumferential or axial flaws was not attained then the following independent actions were required:

  – If greater than 90% coverage for circumferential flaws could not be met (using qualified personnel and procedures), then specific actions described within the document were required.

  – If greater than 90% coverage for axial flaws could not be met, but greater than 90% coverage was obtained for circumferential flaws (using qualified personnel and procedures), then the examination for axial flaws would be completed to achieve the maximum coverage possible with limitations noted in the examination report.

The UT techniques proposed for each weld were reviewed to determine the amount of examination coverage that could be achieved. Extensive surface conditioning was performed to obtain the maximum amount of coverage. As a result, essentially 100% of the susceptible material in all 8 welds was examined for circumferential flaws. However, due to the weld taper and no access for examination from the cast CF8M safe-end side of the welds, limited examination volume coverage was noted for axial flaws. Therefore, FPL satisfied the examination volume coverage requirements identified in MRP-139.

The amount of coverage that could be credited was determined in accordance with the qualified examination procedure utilizing field obtained contours. Qualification for the UT examination of the cast material is "in the course of preparation." No coverage is claimed in the cast material for the MRP-139 or ASME Code Case N-770-1 exam volume in Table 1, since access for scanning was not available from the cast side of the weld, and the qualified procedure specifically excludes cast materials in the coverage calculation. However, as shown in the figures, the theoretical beam path extends into the cast

material for the examinations performed from the carbon steel side of the weld. While the coverage is not included in the Table, UT examinations conducted using Appendix VIII qualified procedures also provide reasonable assurance for the detection of flaws on the cast side of dissimilar metal welds, even though there is presently no standardized process to qualify them.

For the MRP-139 axial and circumferential flaw examination volume coverage achieved, the calculation includes the carbon steel base material and susceptible material. For the ASME Code Case N-770-1 axial and circumferential flaw examination volume coverage achieved, the calculation includes the volume identified in Figure 1 of the code case which, in the case of St. Lucie unit 2, includes cast stainless steel.

Table 1 provides the percent of coverage credited for MRP-139, Code Case N-770-1 (as described above), and references specific figures that illustrate the extent of coverage for each weld. The angles, ultrasonic wave modes (Shear-S or Longitudinal-L) that were employed for the manual non-encoded phased array examinations, and limitations encountered are listed for each weld. Arrows and lines on the figures illustrate the phased array search unit beam direction and extent of the area examined.

The examination volume coverage for MRP-139 included the carbon steel base material and susceptible material. As shown in Table 1, essentially 100% of the examination volume coverage for the safety significant circumferential flaw in the carbon steel base material and susceptible material was achieved during the MRP-139 examinations. However, the MRP-139 axial flaw examination volume coverage did not satisfy the essentially 100% requirement. As identified in MRP-109 [5], the axial flaw(s) that could result from a primary water stress corrosion cracking (PWSCC) mechanism in the susceptible alloy 82/182 butt weld are not safety significant. The axial critical flaw length for an RCP inlet and outlet alloy 82/182 butt weld is 38.2" (MRP-109 Table 5-2) which exceeds the width of the St. Lucie Unit 2 RCP inlet and outlet alloy 82/182 butt weld material width of 1.75"-2.5". Therefore a critical axial flaw in an RCP inlet or outlet alloy 82/182 butt resulting from a PWSCC mechanism is not credible and improving the exam axial flaw examination volume coverage would not result in an increase in safety. During the St. Lucie Unit 2 2011 refueling outage, examination volume coverage for the RCP inlet and outlet welds was extensively improved by grinding and contouring to meet the ASME Section XI, Appendix VIII, Supplement 10 qualified procedure scanning requirements for the search units. Further contouring is limited by design minimum wall calculations for the piping. To obtain acceptable surface contour conditions for axial flaw examinations, weld build up of the DM weld, additional contouring, and a Construction Code RT examination would be required. This additional effort to improve axial flaw coverage would be a hardship that would not result in an increase of health and safety to the public.

As stated above, the initiation or growth of a safety significant flaw in a cold leg alloy 82/182 DM butt weld is extremely unlikely. However, as an added measure of safety, the industry imposed an NEI-03-08 "needed" requirement, to improve their RCS leak detection capability in part due to the concern with PWSCC. St. Lucie Unit 2 has adopted the standardized approach to measuring RCS leak rate in WCAP-16423 [8] and

has proceduralized the action levels in WCAP-16456.[9] The enhanced leak rate monitoring and detection procedure monitors specific values of unidentified leakage, seven day rolling average, and baseline means. Action levels are initiated as low as when the unidentified leak rate exceeds 0.1 gpm. The enhanced leak detection capability provides an increased level of safety that if a flaw were to grow through wall, although unlikely, that is would be detected prior to it growing to a safety significant size.

Therefore, examination coverage meeting the MRP-139 volume, which includes essentially 100% of the susceptible material for the safety significant circumferential flaw and a significant percentage of the susceptible material for the non safety significant axial flaw (Attachment 1) combined with the periodic system pressure tests and outage system walk downs, provides an acceptable level of qualify and safety for identifying degradation from PWSCC prior to a safety significant flaw developing.

6. Duration of Proposed Alternative

This relief request is applicable to the St. Lucie unit 2 Third Inservice Inspection Interval which began August 8, 2003 and ends August 7, 2013.

7. References

1. ASME Section XI, "Rules For Inservice Inspection of Nuclear Power Plant Components," 1998 Edition with Addenda through 2000.

2. Nuclear Regulatory Commission Federal Register part II, Vol. 76, No. 119, effective date August 22, 2011, 10 CFR part 50 Industry Codes and Standards; Amended Requirements; Final Rule.

3. ASME Section XI, Division 1, Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1."

4. Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139, Revision 1), EPRI, Palo Alto, CA: 2008. 1015009.

5. Material Reliability Program, Alloy 82/182 Pipe Butt Weld Safety Assessment for US PWR Plant Designs (MRP-109): Westinghouse and CE Design Plants, EPRI, Palo Alto, CA: 2005. 1009804.

6. "Changing Frequency of Inspections for PWSCC Susceptible Welds at Cold Leg Temperatures", in Proceedings of 2011 ASME Pressure Vessels and Piping Conference, July 17-21, 2011, Baltimore, Maryland, USA.

7. "Technical Basis for a Flaw tolerance Option for Code Case N-770-1 for Large Diameter Cold Leg Piping to Main Coolant Pump Welds, with Obstructions", in Proceedings of 2010 ASME Pressure Vessels and Piping Division Conference, July 2010, Bellevue, WA, USA.

8. WCAP-16423-NP, Rev. 0, "Pressurized Water Reactor Owners Group Standard Process and Methods for Calculating RCS Leak Rate for Pressurized Water Reactors," Westinghouse Electric Co., September 2006.

9. WCAP-16456-NP, Rev. 0, "Pressurized Water Reactor Owners Group Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors," Westinghouse Electric Co., September 2006.

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
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Table 1

Component ID	Location	Nozz Size	Insp. Item Cat.	MRP-139[(1)] Volume Coverage		N-770-1[(2)] Volume Coverage		Angle/ Wave Mode	Fig.	Comments/Limitation
				Axial Flaw	Circ Flaw	Axial Flaw	Circ Flaw			
RC-112-1501-771-C	RCP 2A1 Inlet Elbow(CS) to Safe-end (Cast SS)	30	B	69%	100%	50%	73%	25-70L 35-65S	1	Cast SS, Weld Taper
RC-112-1066-771	RCP 2A1 Outlet Safe-end (Cast SS) to Pipe(CS)	30	B	66%	100%	49%	74%	25-70L 35-65S	2	Cast SS, Weld Taper
RC-115-1501-771-A	RCP 2A2 Inlet Elbow(CS) to Safe-end (Cast SS)	30	B	64%	100%	52%	82%	25-70L 35-65S	3	Cast SS, Weld Taper
RC-115-701-771	RCP 2A2 Outlet Safe-end (Cast SS) to Pipe (CS)	30	B	68%	97%	49%	71%	25-70L 35-65S	4	Cast SS, Weld Taper
RC-121-1501-771-B	RCP 2B1 Inlet Elbow (CS) to Safe-end (Cast SS)	30	B	66%	99%	52%	78%	25-70L 35-65S	5	Cast SS, Weld Taper
RC-121-901-771	RCP 2B1 Outlet Safe-end (Cast SS) to Pipe (CS)	30	B	64%	99.4%	51%	77.9%	25-70L 35-65S	6,7	Cast SS, Weld Taper, Spray Nozzle
RC-124-1501-771-D	RCP 2B2 Inlet Elbow (CS) to Safe-end (Cast SS)	30	B	67%	100%	49%	72%	25-70L 35-65S	8	Cast SS, Weld Taper
RC-124-1301-771	RCP 2B2 Outlet Safe-end (Cast SS) to Pipe (CS)	30	B	66%	99.1%	50%	77%	25-70L 35-65S	9, 10	Cast SS, Weld Taper, Spray Nozzle

Note 1-For the MRP-139 axial and circumferential flaw examination volume coverage achieved, the calculation includes the carbon steel base material and susceptible material.
Note 2-For the ASME Code Case N-770-1 axial and circumferential flaw examination volume coverage achieved, the calculation includes the volume identified in Figure 1 of the code case.

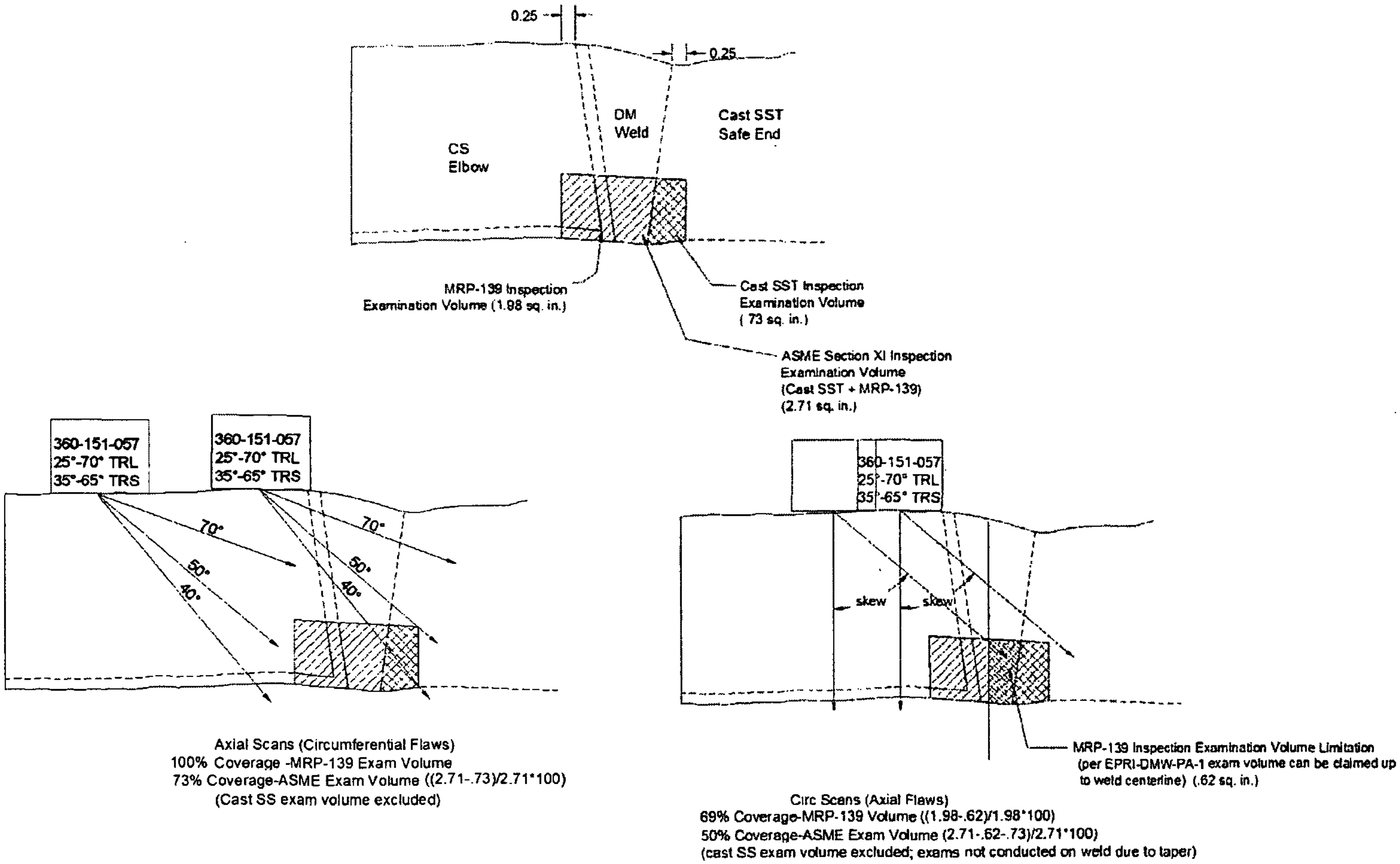

Figure 1
2A1 RCP Inlet (RC-112-1501-771-C)

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
RELIEF REQUEST NUMBER 13, REVISION 1

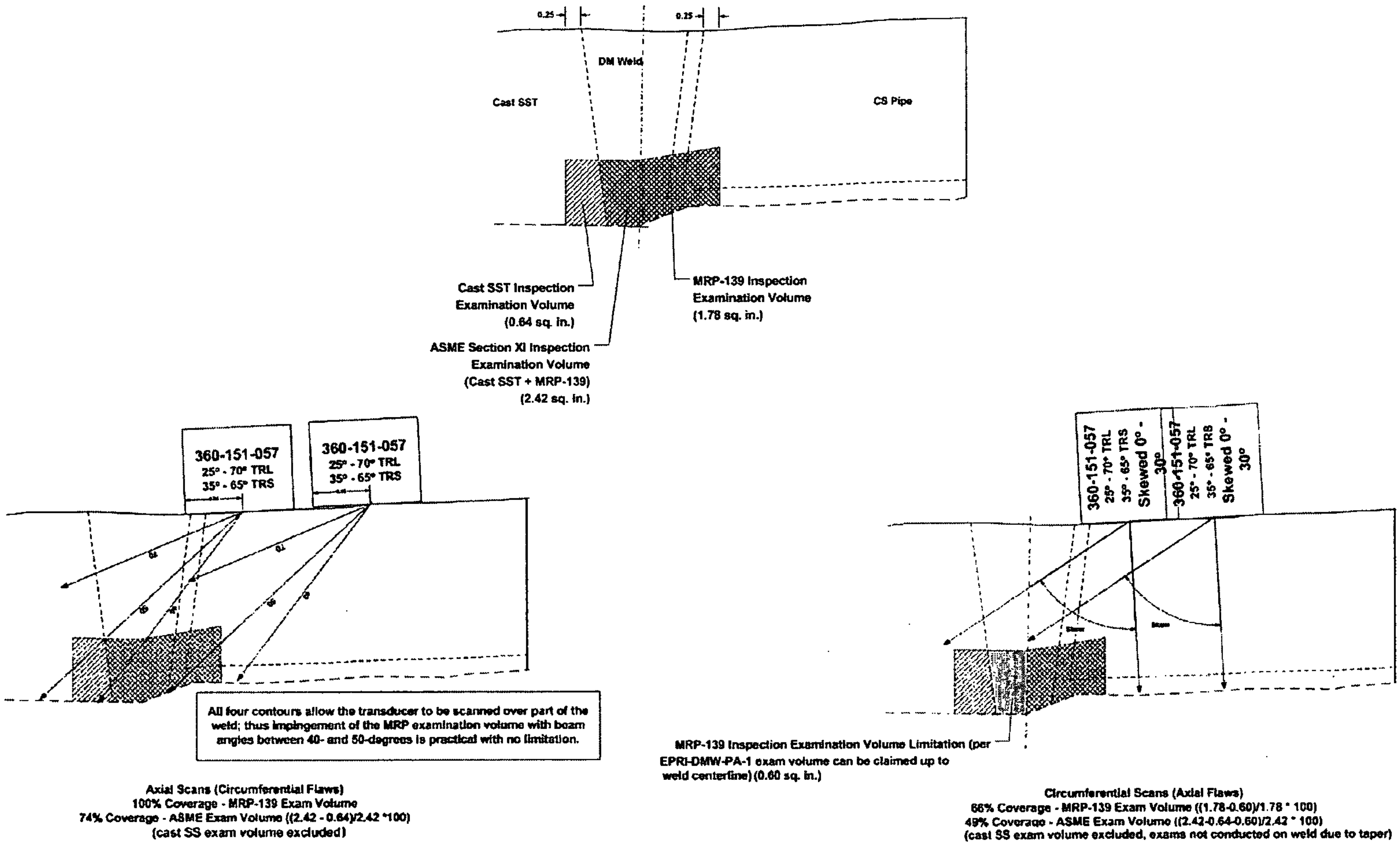

Figure 2
2A1 Outlet (RC-112-1066-771)

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
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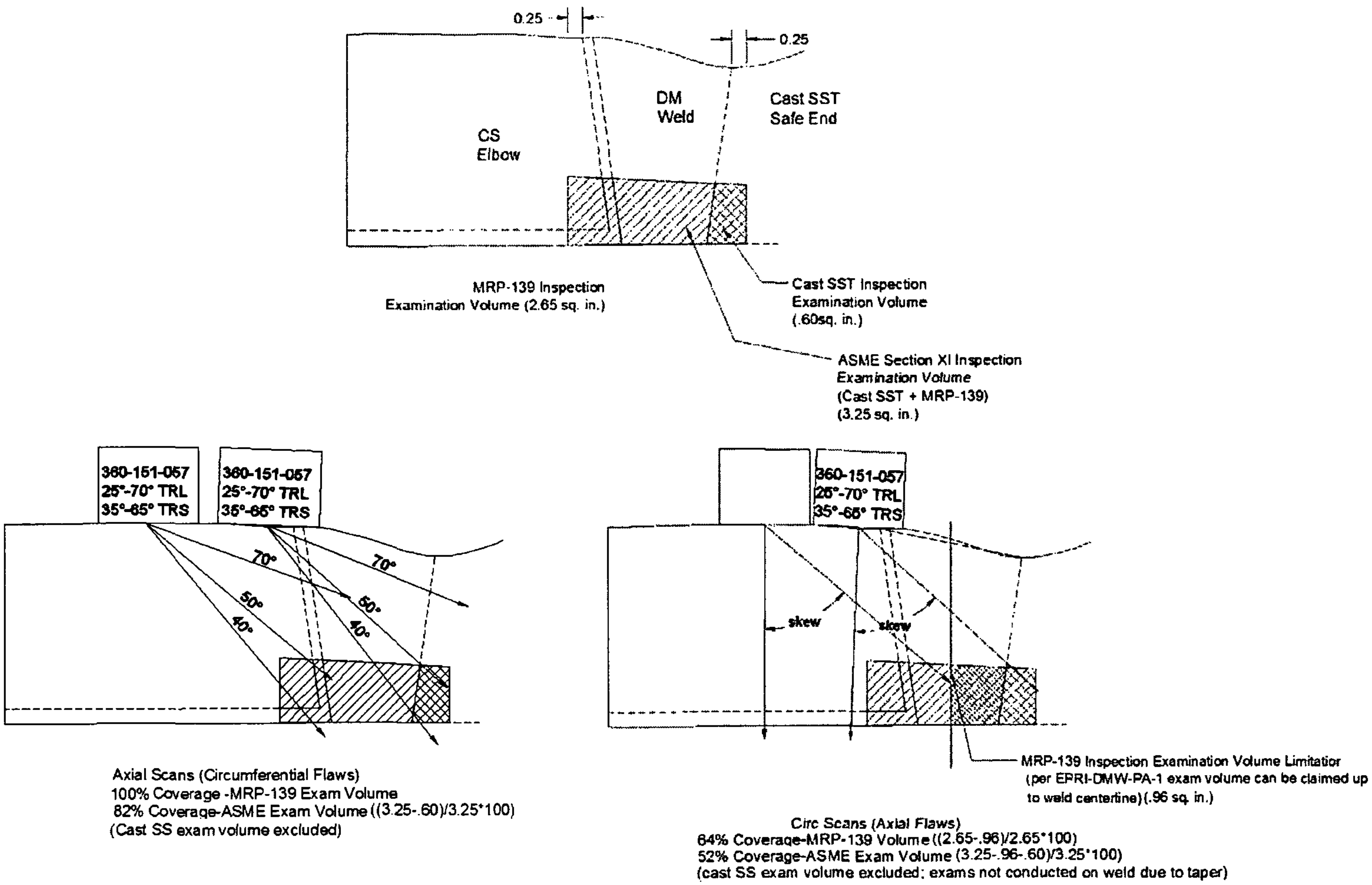
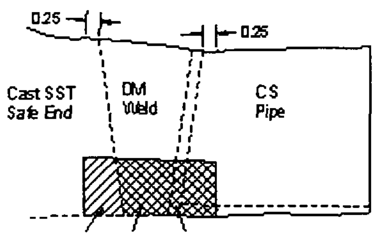


Figure 3



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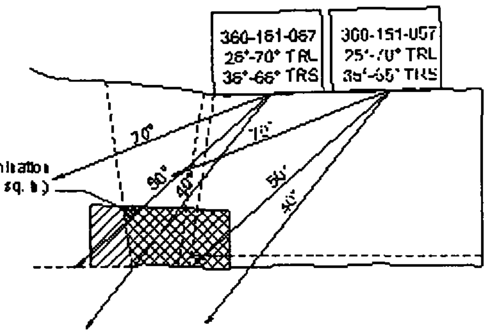
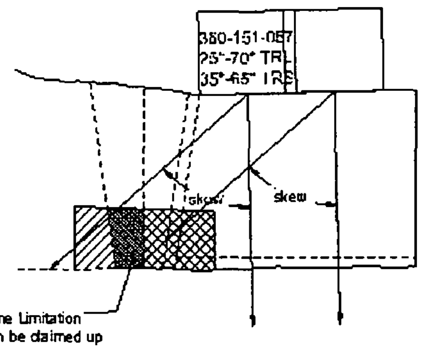


Axial Scans (Circumferential Flaws)
97 % Coverage -MRP-139 Exam Volume ((1.63-.048)/1.63*100)
71 % Coverage-ASME Exam Volume ((2.29-.048-.61)/2.29*100)
(Cast SS exam volume excluded)



Circ Scans (Axial Flaws)
68% Coverage-MRP-139 Volume ((1.63-.53)/1.63*100)
49% Coverage-ASME Exam Volume (2.24-.53-.61)/2.24*100)
(cast SS exam volume excluded; exams not conducted on weld due to taper)

Figure 4
2A2 Outlet (RC-115-701-771)

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
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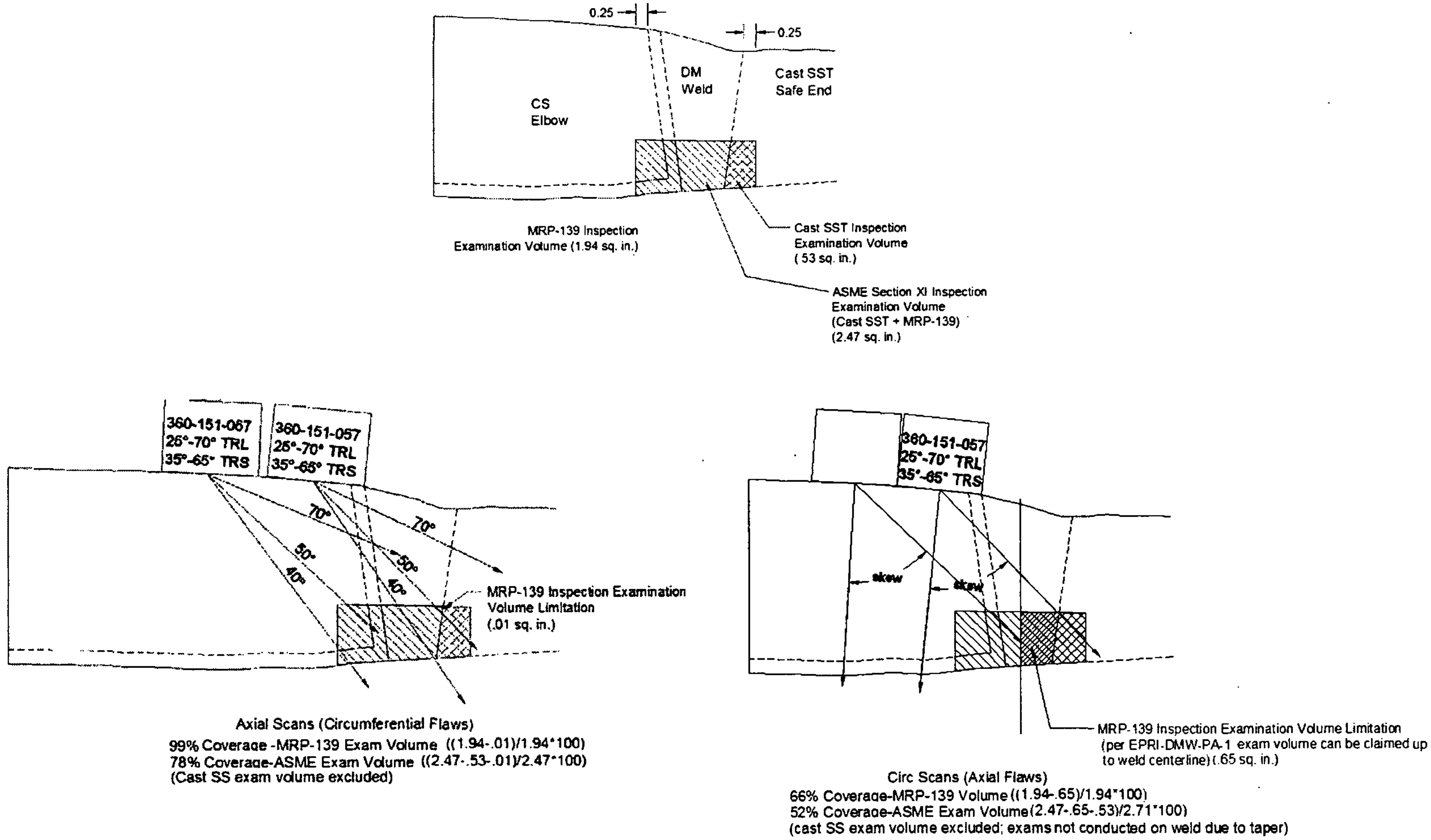

Figure 5
2B1 Inlet (RC-121-1501-771-B)

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
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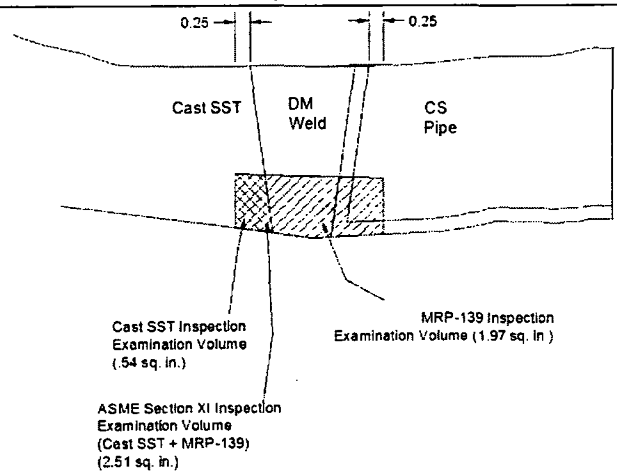
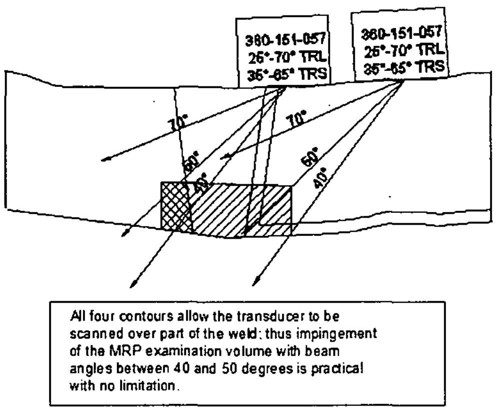
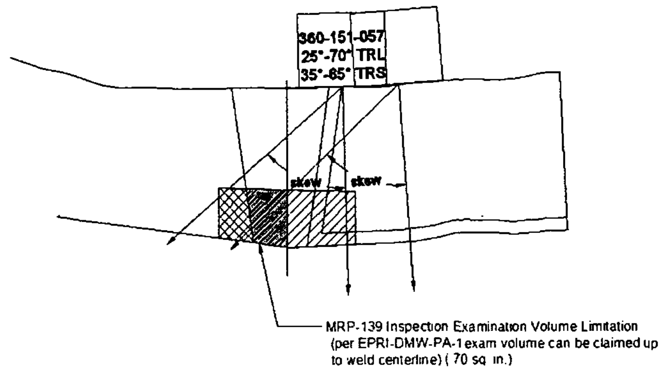




Axial Scans (Circumferential Flaws)
99.4% Coverage-MRP-139 Exam Volume (see detailed evaluation)
77.9% Coverage-ASME Exam Volume ((2.51-.54/2 51*100-(100-99 4))
(cast SS exam volume excluded)



Circ Scans (Axial Flaws)
64% Coverage-MRP-139 Volume((1.97-.70)/1.97*100)
51% Coverage-ASME Exam Volume(2.51-.54-.70)/2.51*100)
(cast SS exam volume excluded; exams not conducted on weld due to taper)

MRP-139 examination volume coverage over total OD circumference with no obsturctions=91 5""1.97 sq. in.=180.3 cu. in.
% of total MRP-139 examination volume outside of obstructed areas= 180 3/191.5*100=94 2%
% MRP-139 examiantion volume coverage around Spray Nozzle = 4.95*2=9.9 cu in: 9.9/191 5*100=5.2%
% MRP-139 examination volume coverage in obsturcted area =5.2%
Total % Examination Coverage of MRP-139 Examination Volume=94% 5 2%=99.4%

Figure 6
2B1 Outlet (RC-121-901-771)

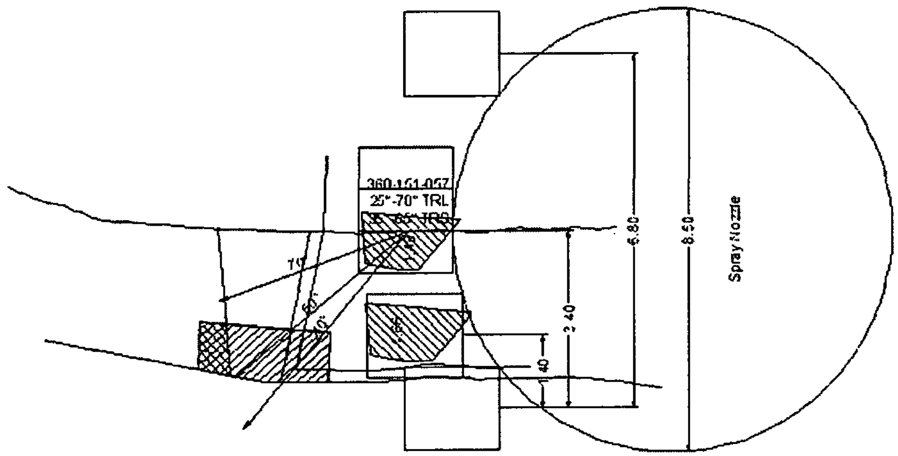


Figure 7
2B1 Outlet (RC-121-901-771)

St. Lucie Unit 2
THIRD INSPECTION INTERVAL
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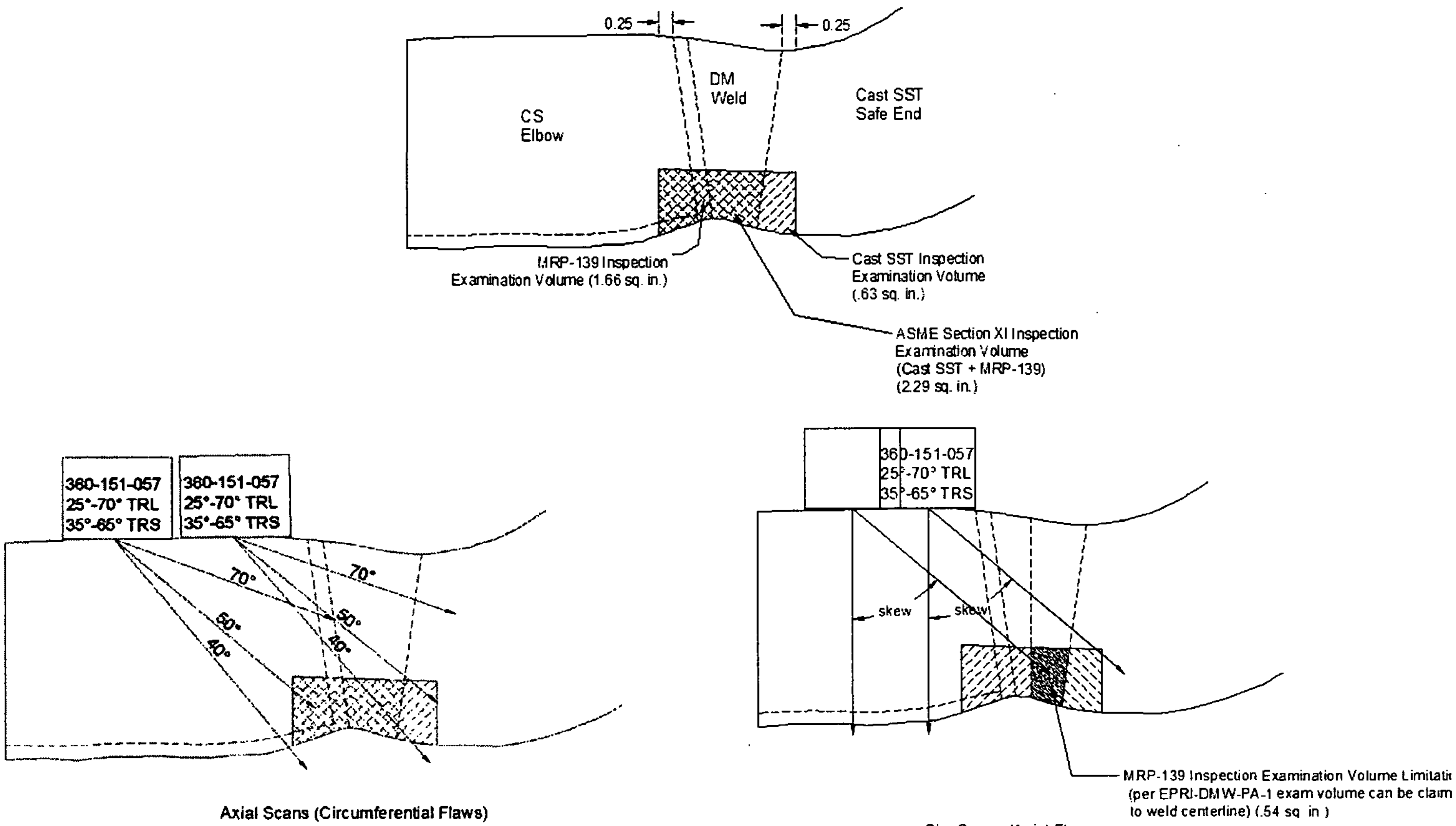

Axial Scans (Circumferential Flaws)
100% Coverage -MRP-139 Exam Volume
72% Coverage-ASME Exam Volume((2.29-.63)/2.29*100)
(Cast SS exam volume excluded)

Circ Scans (Axial Flaws
67% Coverage-MRP-139 Volume ((1.66-.54)/1.66*100)
49% Coverage-ASME Exam Volume (2.29-.54-.63)/2.29*100)
(cast SS exam volume excluded; exams not conducted on weld due to taper)

Figure 8
2B2 Inlet (RC-124-1501-771-D)

St. Lucie Unit 2
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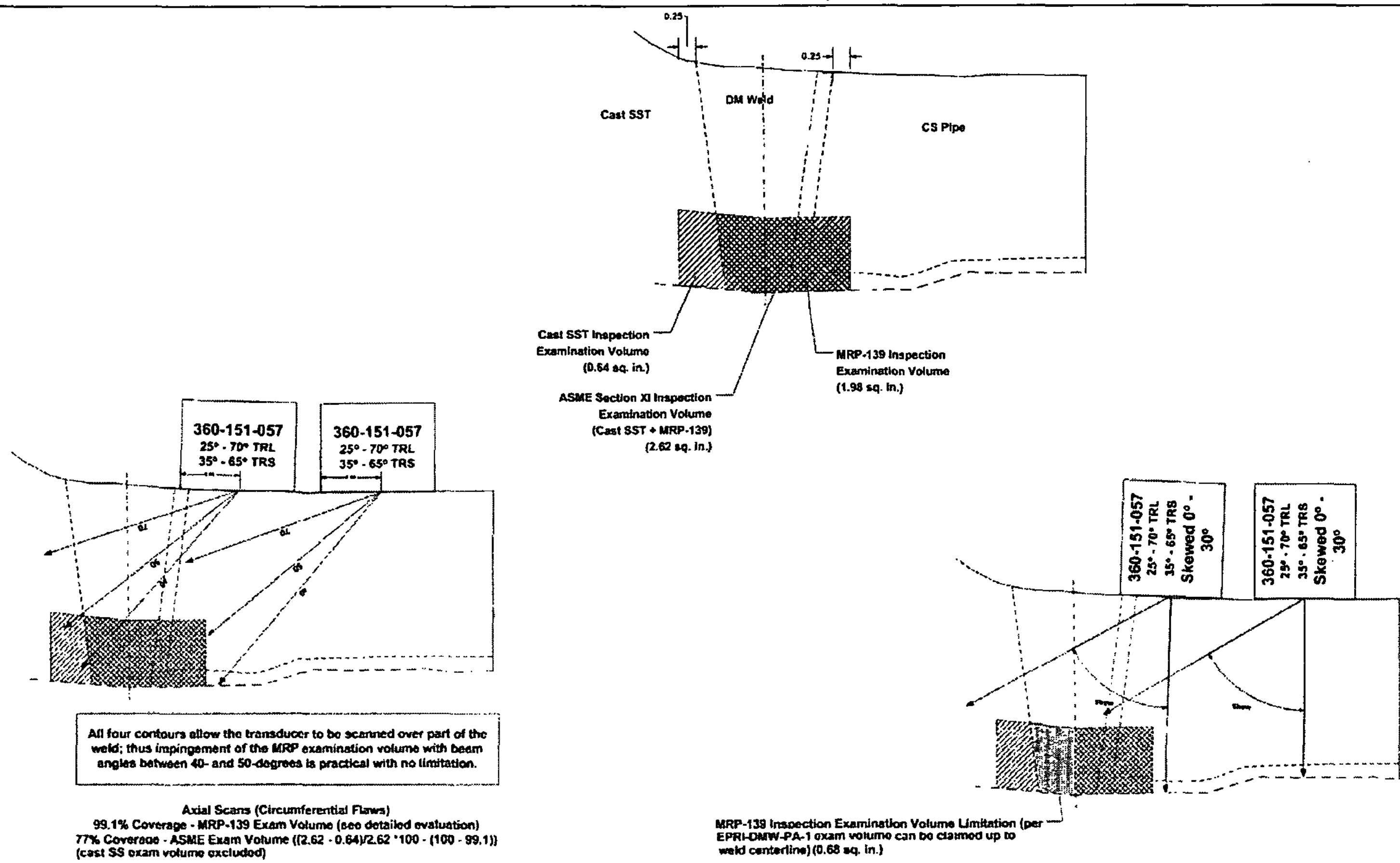

Axial Scans (Circumferential Flaws)
99.1% Coverage - MRP-139 Exam Volume (see detailed evaluation)
77% Coverage - ASME Exam Volume ((2.62 - 0.64)/2.62 *100 - (100 - 99.1))
(cast SS exam volume excluded)

Circumferential Scans (Axial Flaws)
66% Coverage - MRP-139 Exam Volume ((1.98-0.68)/1.98 * 100)
50% Coverage - ASME Exam Volume ((2.62-0.64-0.68)/2.62 * 100)
(cast SS exam volume excluded, assumes only partial scans on weld)

*MRP-139 examination volume coverage over total OD circumference with no obstructions = 90.4" * 1.98 sq. in. = 179 c*
% of total MRP-139 examination volume outside of obstructed areas = 179/189.3 * 100 = 94.6%
% MRP-139 examination volume coverage around Spray Nozzle = 4.25 * 2 = 8.5 cu in ; 8.5/189.3 * 100 = 4.5%
% MRP-139 examination volume coverage in obstructed areas = 4.5%
Total % Examination Coverage of MRP-139 Examination Volume = 94.6% + 4.5% = 99.1%

Figure 9
2B2 Outlet (RC-124-1301-771)

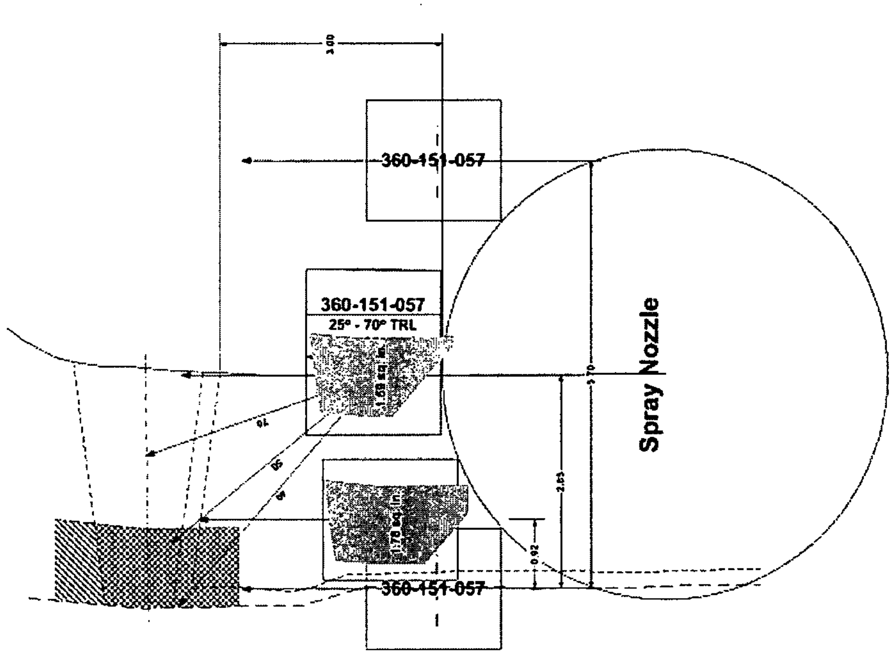

Figure 10
2B2 Outlet (RC-124-1301-771)