1997 AUTOMATED INSERVICE EXAMINATION OF THE REACTOR PRESSURE VESSEL AND ADJACENT PIPING WELDS AT THE SHEARON HARRIS NUCLEAR PLANT, UNIT 1

VOLUME I
FINAL REPORT
WITH APPENDICES
SwRI Project 8504

Prepared for

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ABSTRACT

An automated inservice examination (ISI) of the reactor pressure vessel (RPV) and adjacent piping welds at Carolina Power & Light Company's (CP&L) Shearon Harris Nuclear Plant, Unit 1 (Harris Plant), was performed by Southwest Research Institute (SwRI) personnel during the 1997 refueling outage. The examinations were performed during April and May 1997. These examinations constitute the second ISI of the third period performed at the Harris Plant during the first 10-year interval of operations.

The RPV ISI was performed utilizing automated ultrasonic (AUT) nondestructive examination techniques. The AUT examinations were performed in accordance with the American Society of Mechanical Engineers Section XI, 1983 Edition with Addenda through Summer 1983. At CP&L's request, the RPV shell welds were examined using procedures which were qualified in accordance with Appendix VIII of Section XI as implemented by the utility Performance Demonstration Initiative.

During the examination activities, an AUT examination technique was applied from the inside surface of the outlet nozzle-to-pipe welds (both sides) and the elbow-to-inlet nozzle (nozzle side only) in lieu of the Code-required outside surface examinations. The techniques used for these examinations had been previously qualified at SwRI.

The AUT examinations revealed six Code-allowable reflectors. CP&L personnel were notified of the Code-allowable reflectors.

Limitations to the examination coverage were experienced during the ISI and documented on the appropriate examination data records. A Coverage Report for the AUT examination is presented in Appendix C (Tab C).

No indications of a reportable nature were observed during this ISI.

APPENDIX C

EXAMINATION COVERAGE REPORT FOR THE SHEARON HARRIS NUCLEAR PLANT, UNIT 1, REACTOR PRESSURE VESSEL AND PIPING WELDS

APPENDIX C

EXAMINATION COVERAGE REPORT FOR THE SHEARON HARRIS NUCLEAR PLANT, UNIT 1, REACTOR PRESSURE VESSEL AND PIPING WELDS

This appendix describes the automated ultrasonic (AUT) examination coverage obtained and examination limitations encountered during the 1997 inservice examination of the Shearon Harris Nuclear Plant, Unit 1, reactor pressure vessel (RPV) and selected piping welds. The examinations were performed by Southwest Research Institute (SwRI) using automated scanning equipment and AUT data recording and analysis systems in accordance with a Scan Plan and procedures approved by Carolina Power & Light Company (CP&L). These procedures comply with requirements of the 1983 Edition with Addenda through Summer 1983 of the American Society of Mechanical Engineers (ASME) Section XI and United States Nuclear Regulatory Commission Regulatory Guide 1.150, Rev. 1, Appendix A. In addition, the RPV shell welds were examined in accordance with Appendix VIII of Section XI as implemented by the utility Performance Demonstration Initiative (PDI) and Section XI, IWA-2240.

The scope of the RPV AUT examinations included all circumferential, longitudinal, lower head, nozzle inner radius, and nozzle weld areas for 100 percent of the accessible weld length. The scope of the piping AUT examinations included the inner 1/3t volume of the inlet and outlet nozzle-to-safe end weld areas. Where possible, the outside surface of these piping welds were also examined with ultrasonic (UT) techniques in lieu of the Code-required surface techniques.

As stated above, the RPV AUT examinations were conducted using either conventional ASME Code techniques or techniques qualified by SwRI under the utility sponsored PDI. The following is a description of the coverage requirements as it relates to the different techniques.

1. RPV Examination Coverage Requirements Using PDI Techniques

In accordance with ASME Section XI, IWA-2240, Alternative Examinations, SwRI implemented qualified PDI techniques for selected circumferential, longitudinal, and meridional welds as requested by CP&L. The SwRI techniques and procedures are qualified for both single- and double-sided detection capabilities. The single-sided examination technique, which requires three examination angles, was utilized by SwRI to provide additional coverage when weld access was restricted. The double-sided technique requires two examination angles and was used when access was not restricted. The examination coverage requirements for this technique are as follows:

1.1 Single-Sided Examination

1.1.1 Reflectors Oriented Parallel to the Weld

The examination for **reflectors oriented parallel to the weld** is performed with the beam directed perpendicular to the weld axis.

a. The first 1 inch of the **inner 3.25" including the weld metal and adjacent base metal for 1/2t either side of the weld fusion line** must be completely scanned with SLIC 40 search units. The remainder of the inner 3.25" (Volume A in the figures) must be completely scanned with SLIC 40 or 45- and 55-degree search units. Scanning must be performed in at least one direction.

b. The **weld metal and adjacent base material in the outer volume beyond 3.25"** (volume B in the figures) must be completely scanned with 45- and 55-degree search units. Scanning must be performed in at least one direction.

1.1.2 Reflectors Oriented Transverse To The Weld

The examination for **reflectors oriented transverse to the weld** is performed with the beam directed parallel with the weld axis.

a. The first 1 inch of the **inner 3.25" including the weld metal and adjacent base metal for 1/2t either side of the weld fusion line** must be completely scanned with SLIC 40 search units. The remainder of the inner 3.25" (Volume A in the figures) must be completely scanned with SLIC 40 or 45- and 55-degree search units. Scanning must be performed in at least one direction.

b. The **weld metal and adjacent base material in the outer volume beyond 3.25"** (volume B in the figures) must be completely scanned with 45- and 55-degree search units. Scanning must be performed in at least one direction.

1.2 Double-Sided Examination

1.2.1 Reflectors Oriented Parallel to the Weld

The examination for **reflectors oriented parallel to the weld** is performed with the beam directed perpendicular to the weld axis.

a. The first 1 inch of **inner 3.25" including the weld metal and adjacent base metal for 1/2t either side of the weld fusion line** must be completely scanned with SLIC 40 search units. The remainder of the inner 3.25" (volume A in the figures) must be completely scanned with SLIC 40 or 55-degree search units. Scanning must be performed in two directions 180 degrees to each other.

b. The **outer volume beyond 3.25" including weld metal and adjacent base material for 1/2t either side of the weld fusion line** (volume B in the figures) must be completely scanned with 55-degree search units. Scanning must be performed in two directions 180 degrees to each other.

1.2.2 Reflectors Oriented Transverse to the Weld

The examination for reflectors oriented transverse to the weld is performed with the beam directed parallel with the weld axis.

a. The first 1 inch of the **inner 3.25" including the weld metal and adjacent base metal for 1/2t either side of the weld fusion line** must be completely scanned with two SLIC 40 search units. The remainder of the inner 3.25" (Volume A in the figures) must be completely scanned with SLIC 40 or 55-degree search units. Scanning must be performed in two directions 180 degrees to each other.

b. The **weld metal and adjacent base material in the outer volume beyond 3.25"** (volume B in the figures) must be completely scanned with 55-degree search units. Scanning must be performed in two directions 180 degrees to each other.

2. RPV Examination Coverage Requirements Using Conventional Code Techniques

Conventional ASME Code techniques were utilized during the parallel examination of the nozzle-to-shell, nozzle inner radius, and flange-to-upper shell weld areas. The examination coverage for these welds was determined in accordance with the requirements of Section V, T-441. These requirements include the following:

a. For those examinations performed from the nozzle bores and flange seal surface, the UT beams must be directed essentially perpendicular to the plane of the weld to detect reflectors parallel to the welds. The beam angles used must be sufficient to provide complete coverage of the required volumes from one direction.

b. The examination coverage for nozzle inner radius areas was determined in accordance with the requirements of Figure IWB-2500-7. The required area must be scanned with 50/70 or SLIC 40 search units in two directions (clockwise and counterclockwise) to detect radial-axial flaws.

3. Piping Examination Coverage

The examination coverage for the outlet nozzle-to-pipe and elbow-to-inlet nozzle welds is determined in accordance with the requirements of Section XI, Appendix III, Paragraphs III-4420 and III-4430. These requirements are as follows:

3.1 Reflectors Parallel to the Weld

The **inner 1/3t of the weld metal and adjacent base metal for 1/4 inch either side of the weld fusion line** (volume A in the figures) must be examined from two sides of the weld using the SLIC 40 or SLIC 20 search unit, with the beam directed perpendicular to the weld axis. The UT beam must pass through the volume in two opposing directions.

3.2 Reflectors Transverse to the Weld

The **inner 1/3t of the weld metal and adjacent base metal for 1/4 inch either side of the weld fusion line** (volume A in the figures) must be examined using the SLIC 40 or SLIC 20 search unit, with the beam directed parallel to the weld axis. The UT beam must pass through the volume in two opposing directions.

3.3 Reflectors on the Outside Surface

The **outer surface of the weld and 1/2 inch either side of the weld fusion line** (surface B in the figures) must be examined using the SLIC 20 search units with the beam directed parallel and perpendicular to the weld axis.

4. Summary of Limitations and Coverage Obtained

The outlet nozzle integral extensions, the lower core support pads, the lower head specimen tubes, and the vessel flange limited scanning accessibility to the full length and/or width of some areas from the inside surface. The examination coverage obtained is compared to the weld and base metal volumes identified as the examination areas in Figures 1 through 8 contained in this report. AUT examination coverage tables in this appendix quantify the volume of material examined with each UT technique for each examination area.

EXPLANATION OF THE EXAMINATION COVERAGE TABLES

The following contains an explanation of each item listed in the Examination Coverage Table:

Summary Number - The examination Summary Sheet Number that is assigned to each particular weld.

Weld Number - The specific weld identification number as supplied by CP&L.

Exam Area Identification - Description of the weld type or component identification.

Exam Volume and Figure - The specific volume as identified in ASME Section XI, Regulatory Guide 1.150, Figures 1 through 8.

Beam Angle(s)) - The refracted longitudinal- or shear-wave angles used for the examination.

Exam Type - As defined in Article 4 of ASME Section V, the type of flaw that each examination is intended to detect, e.g., flaws transverse or parallel to the weld, straight beam for planar or laminar flaws etc.

Beam Direction(s) - For each volume, the number of directions that the beam was directed to detect the type of flaw (parallel or transverse to the weld).

Code Coverage - The percent of coverage of each volume, as a function of beam angle(s), examination type, and beam direction(s).

Remarks - This section is used to explain the source or cause of any limitations encountered.

NOTES:

1. The average shown as a percent is a simple average of the coverage for all required examinations performed.

2. The examination coverage report and coverage tables are restricted to examinations performed by SwRI, and do not reflect limitations from examinations performed by others during previous inservice inspections, or examinations that have been deferred.

Shearon Harris Nuclear Plant, Unit 1
1997 Reactor Vessel Inservice Inspection
Examination Coverage Tables

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
000100	CSW-RV-02	Upper Shell	A	1	SLIC 40	Parallel	2 directions	100%	
		-to-	A,B		55°	Parallel	2 directions	100%	
		Intermediate Shell	A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
000200	CSW-RV-03	Intermediate Shell	A	2	SLIC 40	Parallel	2 directions	100%	
		-to-	A,B		55°	Parallel	2 directions	100%	
		Lower Shell	A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
000500	LSW-RV-05	Upper Shell	A	2	SLIC 40	Parallel	2 directions	90%	Transverse and parallel
		Longitudinal	A,B		55°	Parallel	2 directions	100%	examinations limited due to
		@ 25°	A		SLIC 40	Transverse	1 direction	91%	nozzle AON-06 and flange
			A,B		45°, 55°	Transverse	1 direction	83%	taper.
							Average	91%	
000600	LSW-RV-06	Upper Shell	A	2	SLIC 40	Parallel	2 directions	100%	Transverse and parallel
		Longitudinal	A,B		55°	Parallel	2 directions	100%	examinations limited due to
		@ 215°	A		SLIC 40	Transverse	1 direction	89%	nozzle BIN-03 and flange
			A,B		45°, 55°	Transverse	1 direction	96%	taper.
							Average	96%	

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Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
000700	LSW-RV-07	Intermediate Shell Longitudinal @ 45°	A	2	SLIC 40	Parallel	2 directions	100%	
			A,B		55°	Parallel	2 directions	100%	
			A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
000800	LSW-RV-08	Intermediate Shell Longitudinal @ 225°	A	2	SLIC 40	Parallel	2 directions	100%	
			A,B		55°	Parallel	2 directions	100%	
			A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
000900	LSW-RV-09	Lower Shell Longitudinal @ 135°	A	2	SLIC 40	Parallel	2 directions	100%	
			A,B		55°	Parallel	2 directions	100%	
			A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
001000	LSW-RV-10	Lower Shell Longitudinal @ 315°	A	2	SLIC 40	Parallel	2 directions	100%	
			A,B		55°	Parallel	2 directions	100%	
			A		SLIC 40	Transverse	2 directions	100%	
			A,B		55°	Transverse	2 directions	100%	
							Average	100%	
001100	CHW-RV-17	Bottom Head Dome	A	2	SLIC 40	Parallel	1 direction	93%	Parallel and transverse examinations limited due to instrumentation tubes.
			A,B		45°, 55°	Parallel	1 direction	68%	
			A		SLIC 40	Transverse	2 directions	49%	
			A,B		55°	Transverse	2 directions	56%	
							Average	67%	

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Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
001110	STHW-RV-04	Lower Shell -to- Bottom Head	A	1	SLIC 40	Parallel	1 direction	84%	Parallel and transverse examinations limited due to radial support lugs and weld transition.
			A,B		45°, 55°	Parallel	1 direction	85%	
			A		SLIC 40	Transverse	1 direction	76%	
			A,B		45°, 55°	Transverse	1 direction	76%	
							Average	80%	
001200	MHW-RV-11	Meridional @ 345°	A	2	SLIC 40	Parallel	2 directions	99%	Parallel and transverse examinations limited due to instrumentation tubes and a radial support lug.
			A,B		55°	Parallel	2 directions	95%	
			A		SLIC 40	Transverse	1 direction	90%	
			A,B		45°, 55°	Transverse	1 direction	91%	
							Average	94%	
001300	MHW-RV-12	Meridional @ 285°	A	2	SLIC 40	Parallel	2 directions	99%	Parallel and transverse examinations limited due to instrumentation tubes and a radial support lug.
			A,B		55°	Parallel	2 directions	96%	
			A		SLIC 40	Transverse	1 direction	90%	
			A,B		45°, 55°	Transverse	1 direction	91%	
							Average	94%	
001400	MHW-RV-13	Meridional @ 225°	A	2	SLIC 40	Parallel	2 directions	94%	Parallel and transverse examinations limited due to instrumentation tubes.
			A,B		55°	Parallel	2 directions	98%	
			A		SLIC 40	Transverse	1 direction	98%	
			A,B		45°, 55°	Transverse	1 direction	88%	
							Average	95%	
001500	MHW-RV-14	Meridional @ 165°	A	2	SLIC 40	Parallel	2 directions	85%	Parallel examination limited due to a radial support lug.
			A,B		55°	Parallel	2 directions	96%	
			A		SLIC 40	Transverse	1 direction	100%	
			A,B		45°, 55°	Transverse	1 direction	100%	
							Average	95%	

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Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
001600	MHW-RV-15	Meridional @ 105°	A	2	SLIC 40	Parallel	2 directions	91%	Parallel and transverse examinations limited due to instrumentation tubes and a radial support lug.
			A,B		55°	Parallel	2 directions	93%	
			A		SLIC 40	Transverse	1 direction	92%	
			A,B		45°, 55°	Transverse	1 direction	89%	
							Average	91%	
001700	MHW-RV-16	Meridional @ 45°	A	2	SLIC 40	Parallel	2 directions	93%	Parallel and transverse examinations limited due to instrumentation tubes.
			A,B		55°	Parallel	2 directions	91%	
			A		SLIC 40	Transverse	1 direction	87%	
			A,B		45°, 55°	Transverse	1 direction	87%	
							Average	90%	
001710	FTSW-RV-01	Flange -to- Upper Shell	A,B	3	2°, 4°, 11°	Parallel	N/A	100%	Limited transverse examination due to the inside surface taper.
			A,B		55° & SLIC 40°	Transverse	2 directions	33%	
							Average	67%	
002100	RVNOZAI-N-01	Inlet Nozzle @ 335°	A,B	4	6°, 20°	Parallel	TWD	100%	Transverse examination limited due to nozzle inner radius.
			A,B		55° & SLIC 40°	Transverse	2 directions	87%	
							Average	93%	
002200	RVNOZBO-N-02	Outlet Nozzle @ 265°	A,B	5	6°, 20°	Parallel	TWD	100%	Transverse examination limited due to integral extension.
			A;B		55° & SLIC 40°	Transverse	2 directions	60%	
							Average	80%	
002300	RVNOZBI-N-03	Inlet Nozzle @ 215°	A,B	4	6°, 20°	Parallel	TWD	100%	Transverse examination limited due to nozzle inner radius.
			A,B		55° & SLIC 40°	Transverse	2 directions	87%	
							Average	93%	

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Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
002400	RVNOZCO-N-04	Outlet Nozzle @ 145°	A,B A,B	5	6°, 20° 55° & SLIC 40°	Parallel Transverse	TWD 2 directions Average	100% 60% 80%	Transverse examination limited due to integral extension.
002500	RVNOZCI-N-05	Inlet Nozzle @ 95°	A,B A,B	4	6°, 20° 55° & SLIC 40°	Parallel Transverse	TWD 2 directions Average	100% 87% 93%	Transverse examination limited due to nozzle inner radius.
002600	RVNOZAO-N-06	Outlet Nozzle @ 25°	A,B A,B	5	6°, 20° 55° & SLIC 40°	Parallel Transverse	TWD 2 directions Average	100% 60% 80%	Transverse examination limited due to integral extension.
002700	RVNOZAI-N-01-IRS	Inlet Nozzle @ 335°	A	6	50/70	Transverse	2 directions	100%	
002800	RVNOZBO-N-02-IRS	Outlet Nozzle @ 265°	A	7	SLIC 40	Transverse	2 directions	100%	Examination limited due to the integral extension geometry.
002900	RVNOZBI-N-03-IRS	Inlet Nozzle @ 215°	A	6	50/70	Transverse	2 directions	100%	
003000	RVNOZCO-N-04-IRS	Outlet Nozzle @ 145°	A	7	SLIC 40	Transverse	2 directions	100%	Examination limited due to the integral extension geometry.
003100	RVNOZCI-N-05-IRS	Inlet Nozzle @ 95°	A	6	50/70	Transverse	2 directions	100%	

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Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
003200	RVNOZAO-N-06-IRS	Outlet Nozzle @ 25°	A	7	SLIC 40	Transverse	2 directions	100%	Examination limited due to the integral extension geometry.
003300	RVNOZAI-N-01-SE	Safe End -to- Inlet Nozzle @ 335°	A	8	SLIC 20 & 40	Transverse	2 directions	89%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	59%	
							Inner 1/3 Average	74%	
			B		SLIC 20	Transverse	2 directions	20%	
			B		SLIC 20	Parallel	2 directions	83%	
							Outside Surface Average	52%	
003400	RVNOZBO-N-02-SE	Outlet Nozzle -to- Safe End @ 265°	A	8	SLIC 20 & 40	Transverse	2 directions	76%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	75%	
							Inner 1/3 Average	76%	
			B		SLIC 20	Transverse	2 directions	98%	
			B		SLIC 20	Parallel	2 directions	88%	
							Outside Surface Average	93%	
003500	RVNOZBI-N-03-SE	Safe End -to- Inlet Nozzle @ 215°	A	8	SLIC 20 & 40	Transverse	2 directions	99%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	91%	
							Inner 1/3 Average	95%	
			B		SLIC 20	Transverse	2 directions	82%	
			B		SLIC 20	Parallel	2 directions	66%	
							Outside Surface Average	74%	

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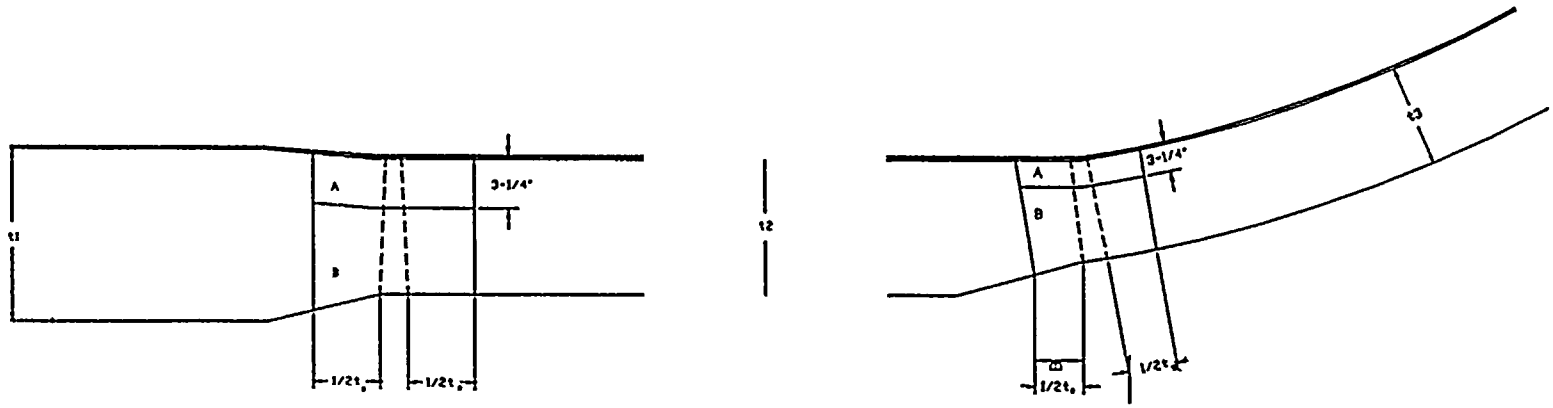
Examination Coverage Tables (Cont'd)

Summary Number	Weld Number	Exam Area Identification	Exam Volume or Surface	Exam Figure	Beam Angle(s)	Exam Type	Beam Direction(s)	Code Coverage	Remarks
003600	RVNOZCO-N-04-SE	Outlet Nozzle -to- Safe End @ 145°	A	8	SLIC 20 & 40	Transverse	2 directions	99%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	89%	
							Inner 1/3 Average	94%	
			B		SLIC 20	Transverse	2 directions	99%	
			B		SLIC 20	Parallel	2 directions	74%	
							Outside Surface Average	87%	
003700	RVNOZCI-N-05-SE	Safe End -to- Inlet Nozzle @ 95°	A	8	SLIC 20 & 40	Transverse	2 directions	99%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	84%	
							Inner 1/3 Average	92%	
			B		SLIC-20	Transverse	2 directions	78%	
			B		SLIC 20	Parallel	2 directions	83%	
							Outside Surface Average	81%	
003800	RVNOZAO-N-06-SE	Outlet Nozzle -to- Safe End @ 25°	A	8	SLIC 20 & 40	Transverse	2 directions	99%	Limitations due to the inside surface counterbore geometry.
			A		SLIC 20 & 40	Parallel	2 directions	99%	
							Inner 1/3 Average	99%	
			B		SLIC 20	Transverse	2 directions	99%	
			B		SLIC 20	Parallel	2 directions	99%	
							Outside Surface Average	99%	

Prepared by: [signature]

SNT Level: III

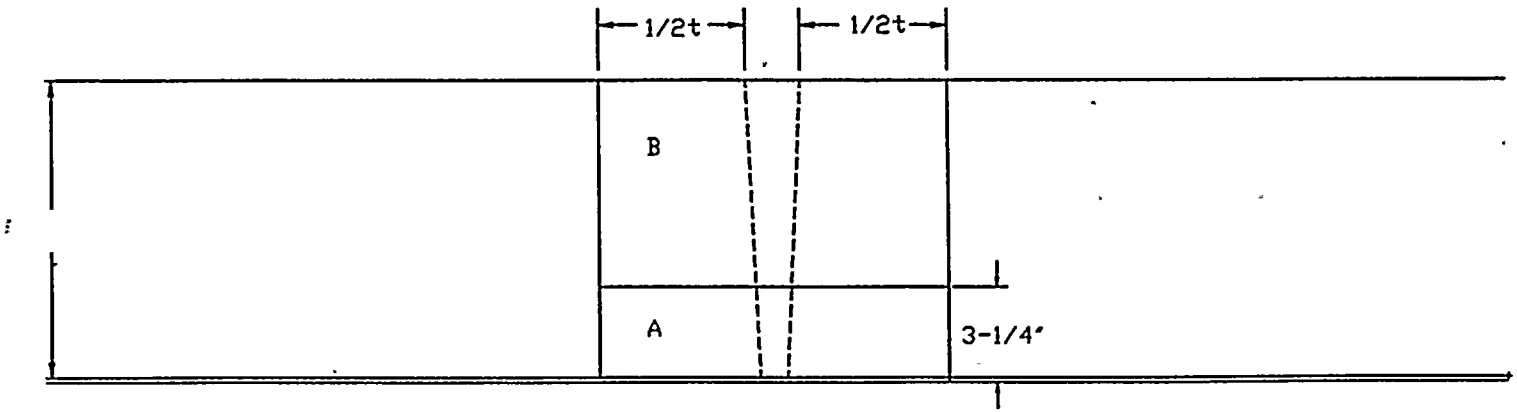
Date: 2 July 97



Vessel Welds with Tapers

Figure 1

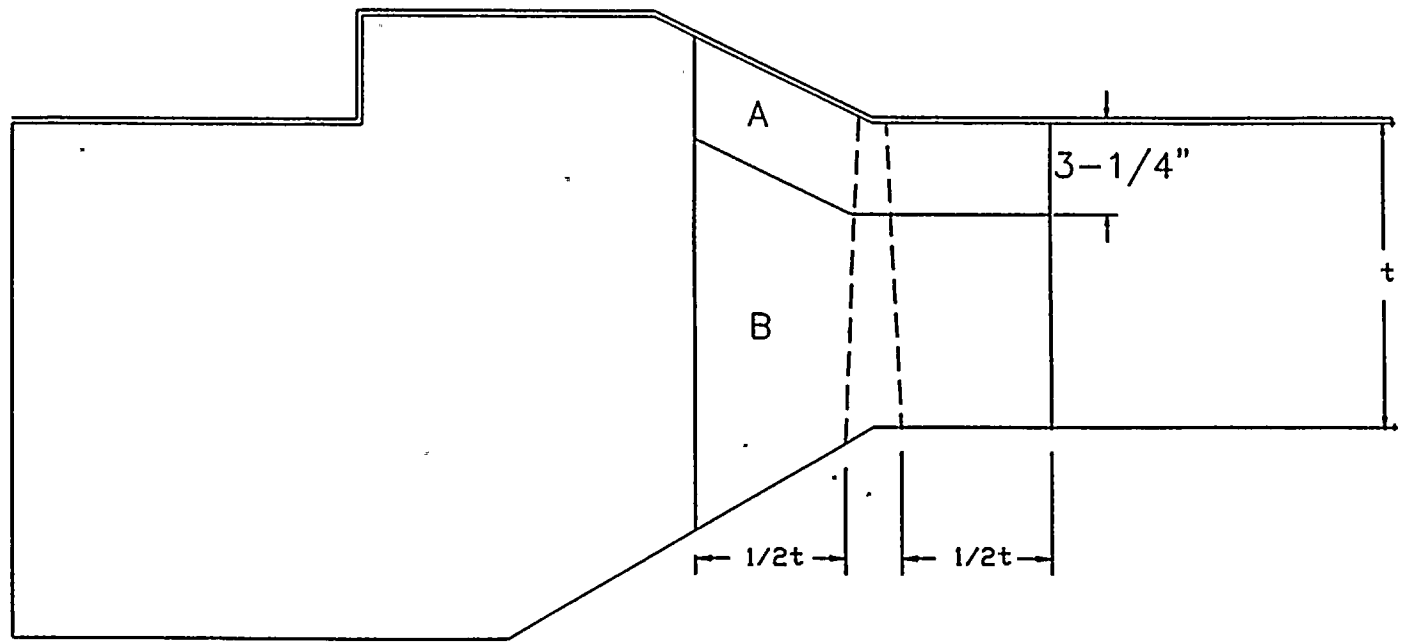
SHH 1
April 97



Vessel Shell Circumferential Welds
Other Than
Vessel–to–Flange

Figure 2

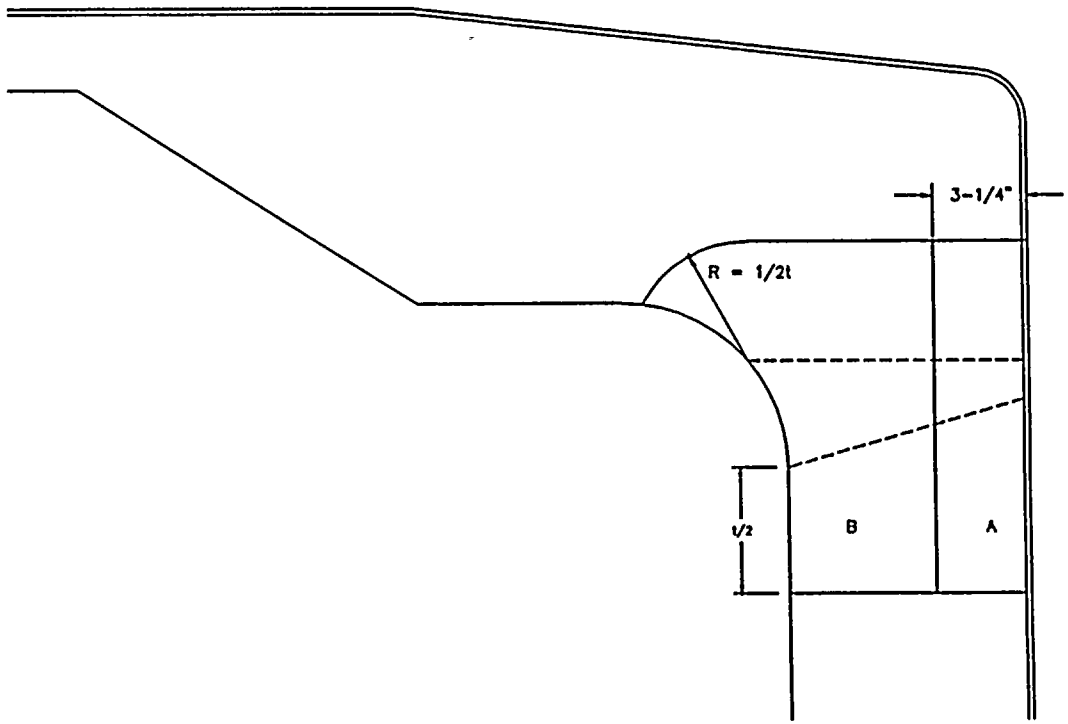
SHH 1
April 97



Vessel–to–Flange

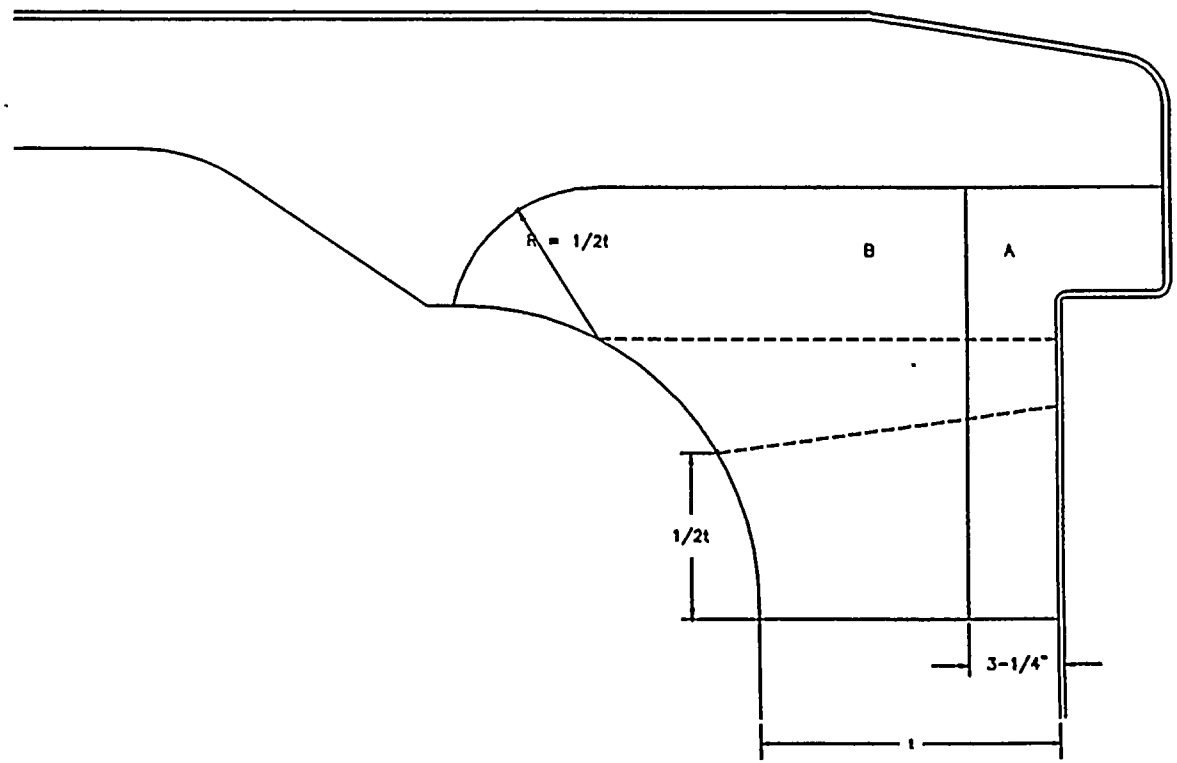
Figure 3

SHH 1
April 97



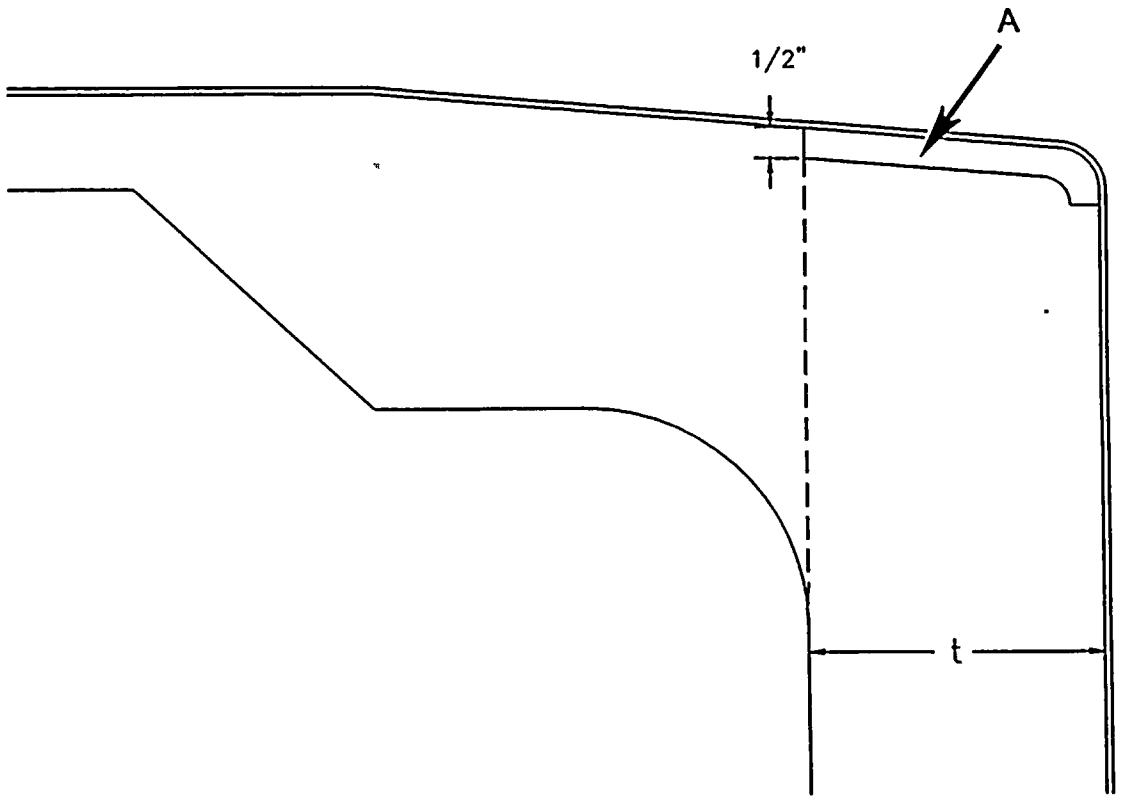
Inlet Nozzle–to–Shell Welds

Figure 4



Outlet Nozzle
–to–
Shell Weld

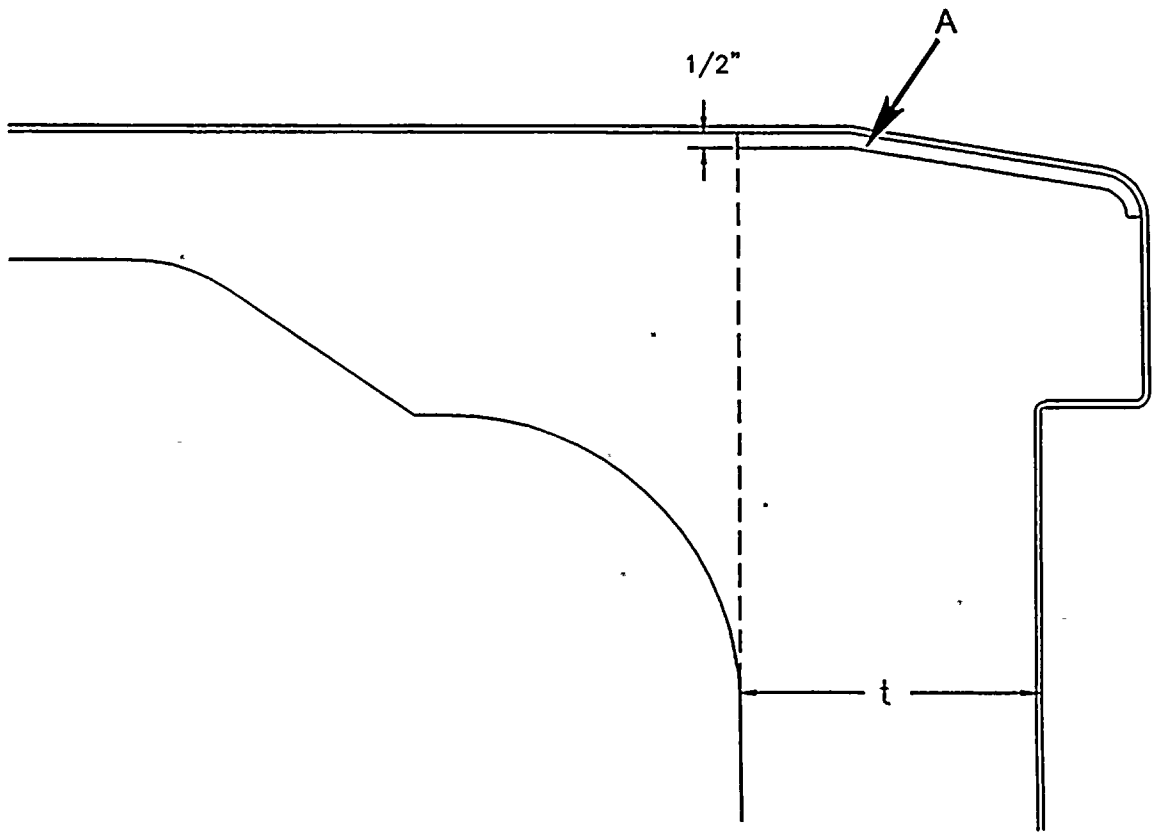
Figure 5



Inlet Nozzle
Inside Radius Section

Figure 6

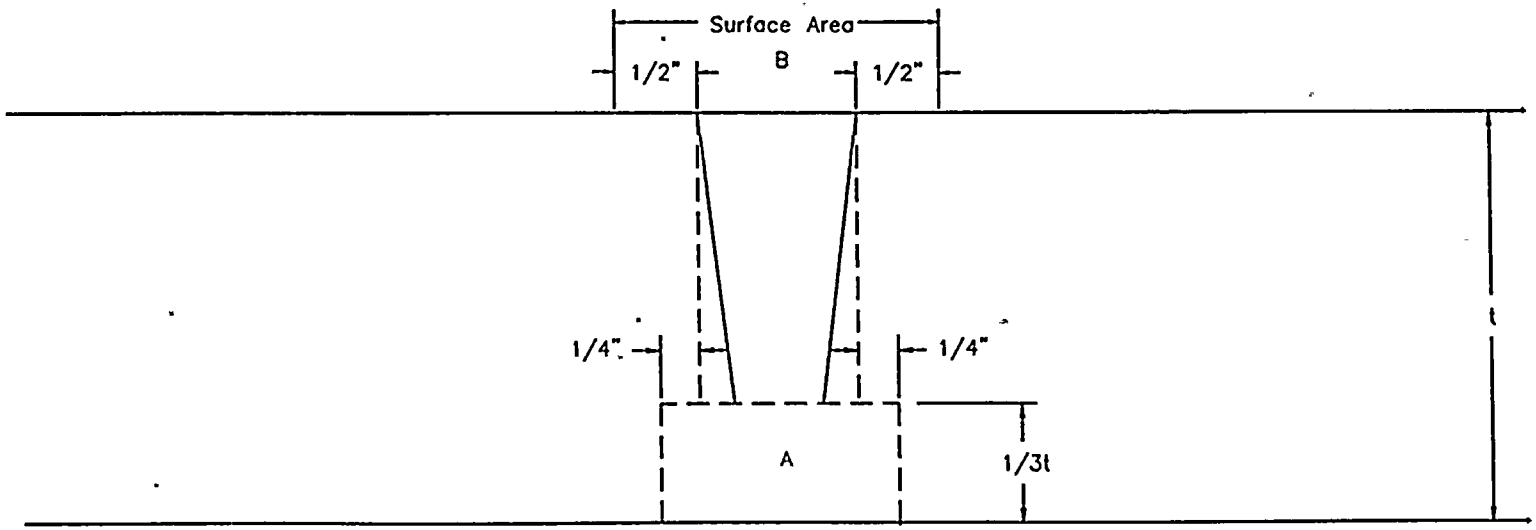
SHH 1
April 97



Outlet Nozzle
Inside Radius Section

Figure 7

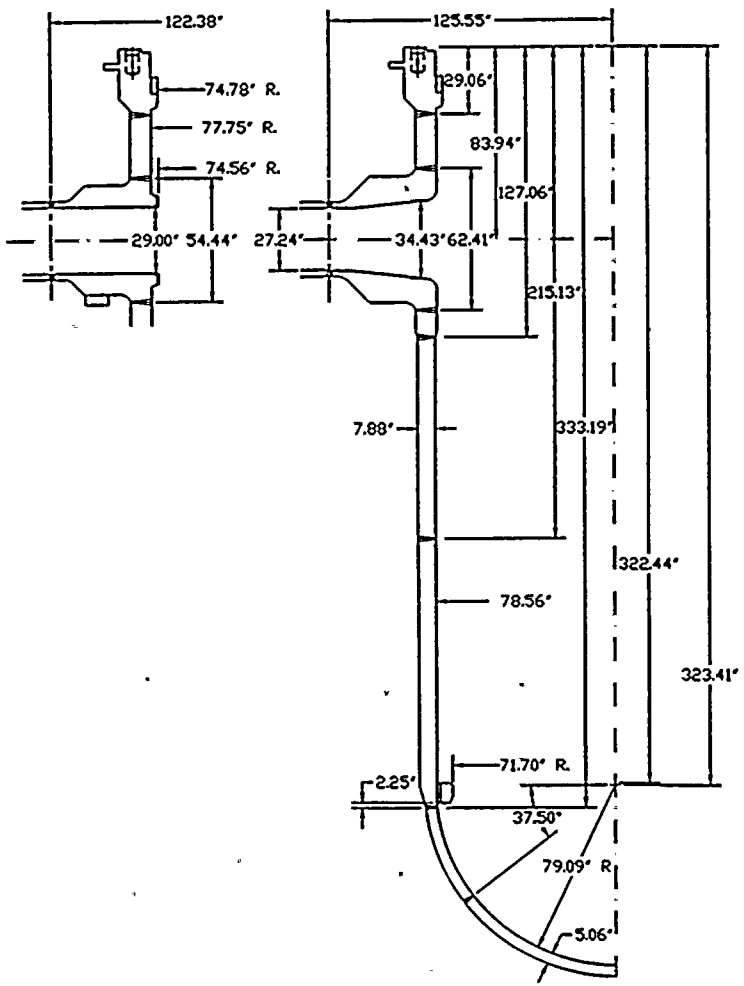
SHH 1
April 97

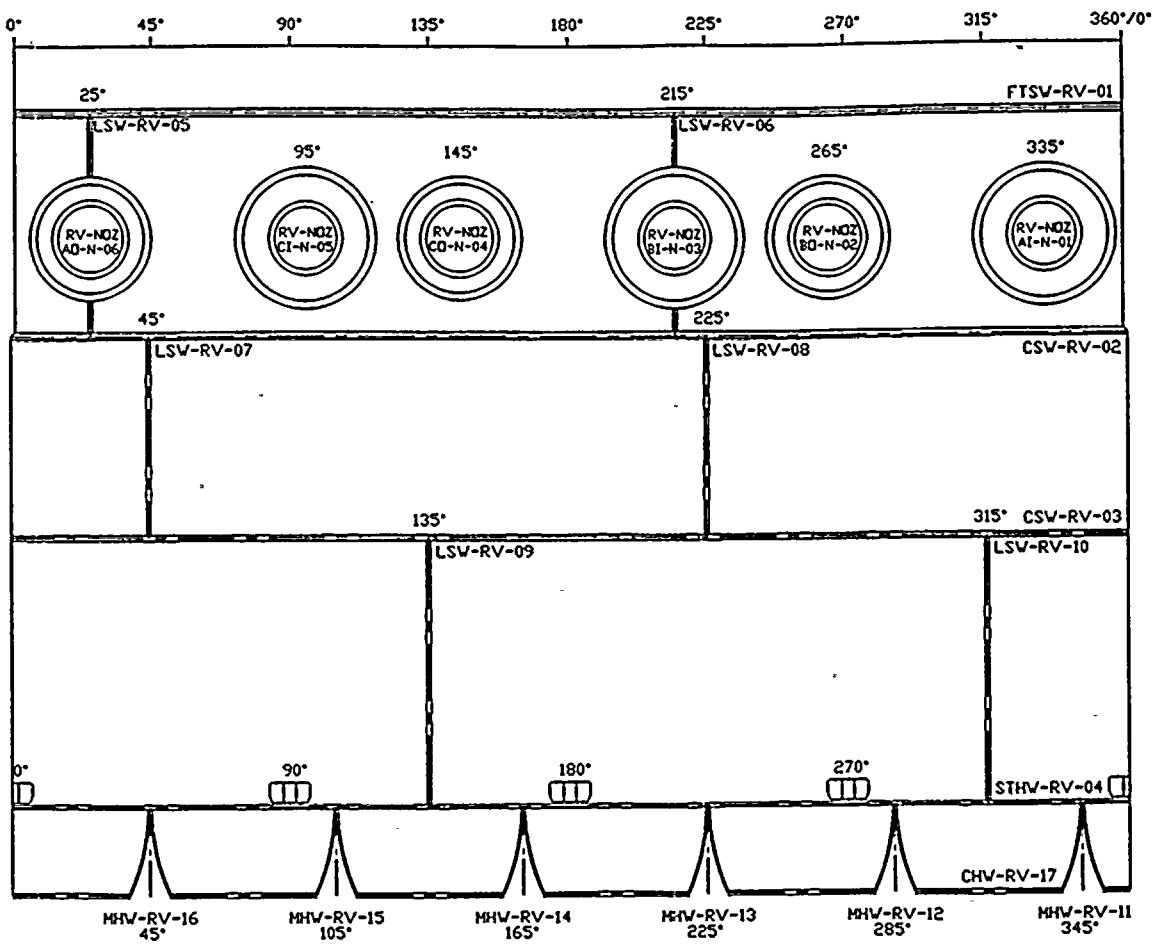


Piping Welds

Figure 8

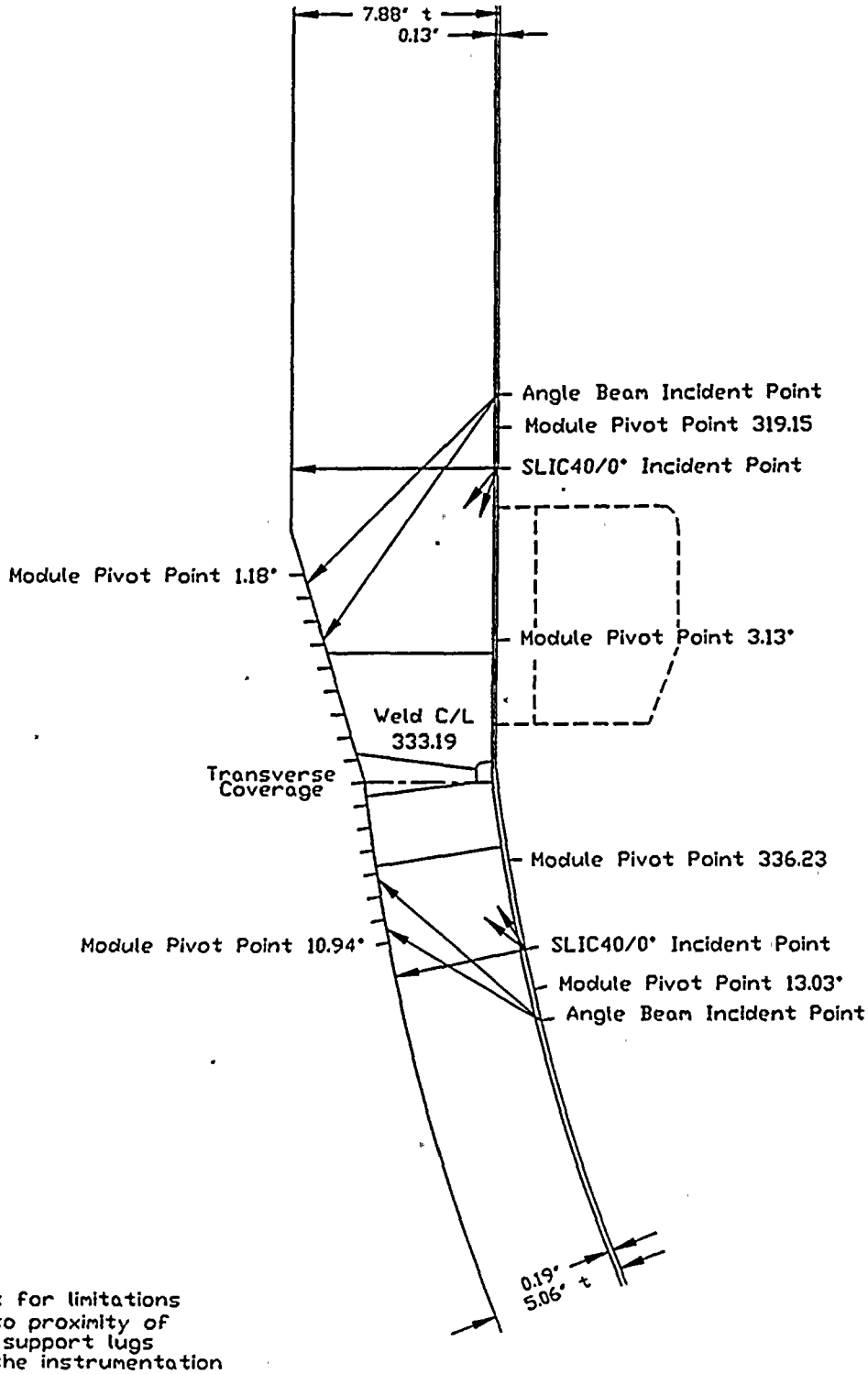
SHH 1
April 97





Shearon Harris
Vessel Rollout
3 December 1996
RPV

Shearon Harris
Lower Shell-to-Lower Head
04 December 96
SP04



NOTE: Check for limitations due to proximity of core support lugs and the instrumentation tubes.
Scan w/Hoist looking down between the lugs.
Scan w/Pivot looking up below the lugs.