Stephen A. Byrne
Senior Vice President, Nuclear Operations
803.345.4622

SCE&G®
A SCANA COMPANY

May 13, 2002
RC-02-0094

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

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
SUBMITTAL OF INFORMATION REQUESTED BY NRC FOR INTEGRITY EVALUATION FOR FUTURE OPERATION
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS):
REACTOR VESSEL NOZZLE TO PIPE WELD REGIONS

Reference: Steve Byrne (SCE&G) to Document Control Desk (NRC) letter (RC-02-0088), May 4, 2002

Attachment: NDE Results from V. C. Summer Outlet Nozzle to Pipe Welds taken after application of the Mechanical Stress Improvement Process (MSIP).

On May 4, 2002, South Carolina Electric & Gas Company (SCE&G) transmitted a letter to the NRC, which included the results of NDE performed on the "B" and "C" Reactor Coolant System hot leg nozzles. Those examinations were conducted prior to MSIP application. The purpose of this letter is to transmit the results of examination conducted following MSIP application.

Post MSIP NDE was performed using the same techniques that were described in the May 4, 2002 letter. A field report of the results is included as an attachment to this letter. SCE&G's review of the information concludes that there are no new indications. The amplitudes and lengths of eddy current detection were consistent with pre-MSIP values. Indication No. 1 in the 145-degree nozzle is identical to the pre-MSIP data.

Indication No. 1 in the 245-degree nozzle was not detected after MSIP by UT; however, the ECT indication was detected. MSIP maintains the inside region of the weld area in compression even during its application and so there is no physical mechanism for any crack growth. The eddy current examination has confirmed there is no growth in crack length. Further, the EPRI Final Report on Research Project T305-1 concludes, "Neither shallow nor deep pre-existing defects were extended as a result of the MSIP application". A copy of this EPRI report was included in our May 4, 2002 letter. Therefore, we are confident that the crack has been arrested by MSIP.

A047

As a verification of the effectiveness of MSIP, VCSNS will perform ASME Section XI Inservice Inspection of the nozzles again in refuel 14. Based on the attached inspection data, and the repair process undertaken, future safe operation of the unit is assured.

SCE&G has met the commitments made from refuel 12 for VCSNS through the inspections just completed in our current refuel 13 and through application of MSIP. At the January 17, 2002, meeting at NRR headquarters, SCE&G Senior Management reiterated our intention to meet the schedule for these commitments. This letter and the attached inspection summary fully meets that commitment. As was discussed on January 17, 2002, and re-iterated in the NRC meeting summary docketed in TAC NO. MB3839, an expedited review would be provided by the NRC to facilitate VCSNS start-up schedule. In order to not impact the start up schedule, a revised safety evaluation is needed by May 18, 2002.

Should you have any questions, please call Mr. Mel Browne at (803) 345-4141 at your convenience.

Very truly yours,

for SAB

Stephen A. Byrne

RS/SAB
Attachment

NOTE: Without Attachment unless noted below.
Attachment is on file in the NL&OE office.

c: N. O. Lorick
N. S. Carns
T. G. Eppink
B. K. Duncan
R. J. White
L. A. Reyes
G. E. Edison (with attachment)
K. R. Cotton (with attachment)
K. M. Sutton
R. B. Clary
NRC Resident Inspector
NSRC
RTS (0-C-00-1392)
File (810.58)
DMS (RC-02-0094)
Dr. S. Doctor (with attachment)

NDE Results from V. C. Summer Outlet Nozzle to Pipe Welds

taken after application of the

Mechanical Stress Improvement Process (MSIP).

13 Pages

V.C. SUMMER

REACTOR VESSEL B AND C LOOP OUTLET NOZZLE TO PIPE WELDS

RESULTS FROM PRE AND POST MSIP ULTRASONIC AND EDDY CURRENT EXAMINATIONS

May, 2002

Summary

Automated Ultrasonic and Eddy Current examinations were performed prior to and after MSIP (Mechanical Stress Improvement Process) on the B and C loop reactor vessel nozzle to pipe welds from April 29, 2002 through May 13, 2002. Ultrasonic exams were governed by the basic requirements of Section XI, 1989 Edition. Techniques provided defect detection and sizing capabilities through the full volume of the weld and surrounding base metal. Eddy current techniques were used as a complimentary NDE method to detect surface breaking flaws in the area of the weld and surrounding base metal. Calibration and acquisition techniques were similar to the 2000 examinations with some equipment and process enhancements designed to improve detection capabilities.

Pre MSIP eddy current examinations in the B and C hot leg nozzles resulted in a good correlation with 2000 examination data. All previous eddy current indications were re-confirmed and no new indications were detected. Pre MSIP ultrasonic examinations resulted in a confirmation of two eddy current indications. No ultrasonic indications had been reported in the 2000 examinations and the two new recordings are believed to be the result of improved transducer contact.

Post MSIP eddy current and ultrasonic examinations revealed no new indications. The amplitudes and lengths of eddy current detections were consistent with the pre-MSIP values. Ultrasonically, Indication No.1 in the 245° nozzle was not detected after MSIP. Indication 1 in the 145° nozzle identical to the pre MSIP data.

Equipment and Procedures

Ultrasonic examinations were defined by operating procedure CGE-ISI-214 Revision 2 and the Examination Program Plan. The basic ultrasonic technique with respect to beam angles and calibration methodology was identical to the 2000 examinations. Longitudinal wave dual element probes at 70° were applied four directionally normal to and along the weld/exam volume. Probe sizes were reduced from 30x30mm to 22x22mm for better surface contact.

Probe frequency was reduced from 2.0 MHz to 1.5 MHz to improve the flaw signal to noise ratio. The 70° probe was responsible for flaw detection from the ID surface to a practical depth of about .75".

The 45°longitudinal wave dual element probe at 2.0 MHz was used for diffraction tip sizing measurements of indications detected with the 70 degree probe having planar characteristics. The size of the 45 degree probe was optimized for surface contact at 22 x 22 mm. For detection and measurement of flaws residing in a volume from about .75" deep from the ID surface to the OD surface, a 37° longitudinal wave probe at 1.0 MHz was applied in four directions normal to and along the weld. Again probe size was optimized for surface contact at 40 x 40 mm.

Eddy current acquisition techniques were defined by procedure CGE-ISI-207-ET Revision 1 and were identical to the 2000 examinations including the use of 2 plus-point probes in the driver-pickup mode. The probes are oriented at 45 and 90 degrees for off-axis detection. The examination frequencies were 100, 250 and 500 KHz. Acquisition was conducted two directionally with spacing of 0.125" between scan lines. Eddy current characterization criteria was developed experimentally through investigations conducted on the Loop A nozzle to pipe weld removed from service. From these investigations a minimum requirement of 3 successive "hits" or detections was decided upon as the identifying criteria for significant indications (at least 0.25" long).

Ultrasonic and eddy current probes were delivered to the exam surface by independently compliant end-effectors at speeds between 2 and 3 inches per second. The WesDyne Paragon system was used for ultrasonic acquisition and display and eddy current display. An R/D Tech TC 4700 was used for eddy current data acquisition.

Results

Comparing 2002 Pre MSIP Data to the 2000 exam results

In the year 2000 examinations, one eddy current indication was reported in outlet nozzle Loop B at 145 degrees, and four eddy current indications were reported in outlet nozzle Loop C At 265 degrees. A review of the pre-MSIP data shows a good correlation between the 2000 eddy current exam data and the 2002 pre-MSIP eddy current examinations. In all cases, the locations and amplitudes of the indications match up reasonably well (Table 1). The only significant differences occur in the 265 degree nozzle, indication no. 1, where the 2002 eddy current data shows a length increase from .25" to .5". This indication is axially oriented and well supported by excellent UT detection and sizing data. There were no new eddy current indications found in the 2002 data.

In the 2000 examinations, no ultrasonic indications were reported in the 145 degree nozzle or the 265 degree nozzle. In the 2002 examinations one indication was reported in the 145 degree nozzle and one in the 265 degree nozzle. The ultrasonic indication in the 145 degree nozzle (indication 1) is a weak correlation with a circumferentially oriented eddy current indication. The correlation is not strong because the 70 degree data does not have any surface connecting characteristics. The indication was bounded and assessed in terms of the Code, Section XI, IWB 3514-2 and found to be within the allowable limits specified.

In the 265 degree nozzle, one ultrasonic indication was reported (indication 1). The indication is axial in orientation and correlates very well with an eddy current indication at the same location. The indication was bounded conservatively by taking the length measurement from the 70 degree data and the through-wall extension with the 45 degree data using tip diffraction sizing. The resulting size of .625" length by .317" through-wall was assessed as being marginally outside of the allowable limits of IWB-3514-2. This indication is located in the Inconel buttering/weld area within the surface depression formed by the counter-bore. Ultrasonic detection of this flaw was probably made possible by optimizing the probe size. The other two eddy current indications (indications 2 and 3) were not seen in the ultrasonic test data. A fourth eddy current indication, identified in the 2000 data as non-quantifiable was determined by remote visual examinations to be a surface blemish and is not considered in these results.

Comparing 2002 Pre MSIP Data and Post MSIP Data

Pre and post MSIP data (ultrasonic and eddy current) was compared by noting the locations, amplitudes, characteristics and sizes of indications and looking for any new indications. Analysis of eddy current data revealed no significant changes in eddy current amplitude or length for documented indications (Indication 1, 145° nozzle and indications 1,2,and 3 in the 265° nozzle). No new eddy current indications were detected.

In the ultrasonic examinations, axially oriented Indication 1 in the 265° nozzle was detected well in the pre MSIP examinations and not detected in the post MSIP examinations. It is likely that after MSIP all but the surface component of indication No. 1 was compressed making the remainder of the indication ultrasonically transparent.

Circumferentially oriented indication 1 in the 145° nozzle was seen with exactly the same size and amplitude within 1dB. No new ultrasonic indications were detected.

Conclusions

Loop B and C reactor vessel nozzles were inspected before and after MSIP with eddy current and ultrasonic techniques. The pre MSIP examination data was compared to the 2000 exam data. Four previously detected eddy current indications were re-identified. All four indications had similar locations and amplitudes compared with the 2000 data. One indication, identified as indication 1 in the 265° nozzle, had an eddy current length measurement greater than the 2000 data (.5" vs .25"). This indication was well characterized in the UT data at 0.625" in length. One other eddy current indication had a weak UT correlation (indication 1,145° nozzle). There were no new eddy current indications detected in either nozzle in the pre MSIP exams.

The post MSIP examination data was compared to the pre MSIP data. Eddy current results were consistent between examinations with no new detections. The best ultrasonic detection, axially oriented Indication 1 in the 265° nozzle, was not seen in the post MSIP data. Indication 1 in the 145° nozzle was measured identically to the pre MSIP exam data. No new ultrasonic indications were detected.

Table 1 - Examination Results

			Eddy Current			Ultrasonic			
NOZZLE	IND	ORIENTATION	LOCATION	AMP	LENGTH	LOCATION	DEPTH	LENGTH	EXAM
145°	1	CIRC	309°	32(3)	.5"				2000
	1	CIRC	300°	24	.5"	299.4°	.11"	.375"	PRE-MSIP
	1	CIRC	310°	16	.5"	299°	.11"	.375"	POST-MSIP
265° (1)	1	AXIAL	200.8°	39(3)	.25"				2000
	1	AXIAL	200°	48/33	.5"	202°	.317"	.625"	PRE-MSIP
	1	AXIAL	200.4°	41/38	.5"	Not Seen	Not Seen	Not Seen	POST-MSIP
	2	CIRC	35°	29(3)	.6"				2000
	2	CIRC	50°	25/41	.36/.5"				PRE-MSIP
	2	CIRC	50°	43/32	.5"				POST-MSIP
	3	CIRC	348°	12(3)	.25"				2000
	3	CIRC (2)	340°	19	.25"				PRE-MSIP
	3	CIRC (2)	340°	17	.25"				POST-MSIP

(1) 1" LONG NQI (NON QUANTIFIABLE INDICATION) AT 240 DEGREES REPORTED IN 2000 EXAM SUMMARY WAS DETERMINDTO BE THE RESULT OF A SURFACE SCRATCH. FURTHER INVESTIGATION OF THIS PARTICULAR INDICATION IS NOT WARRANTED.
(2) MAY BE THE RESULT OF GEOMETRY AND/OR MATERIAL PROPERTY VARIATIONS
(3) AMPLITUDES FROM 2000 EXAMINATION CONVERTED TO 2002 MEASUREMENT SYSTEM

D.Kurek, W. Junker, S. Sabo, C. Wyffels May 12, 2002

ATTACHMENTS TO THE SUMMARY

FIGURE 1 – INDICATION 1, 265° NOZZLE , ECT/UT PRE AND POST MSIP OBSERVATIONS

FIGURE 2 – INDICATION 1, 265° NOZZLE, SECTION XI INDICATION ASSESSMENT - PRE AND POST MSIP EXAMS

FIGURE 3 – PARAGON HARD COPY OF SIZING POINTS – INDICATION 1 265° NOZZLE, PRE AND POST MSIP

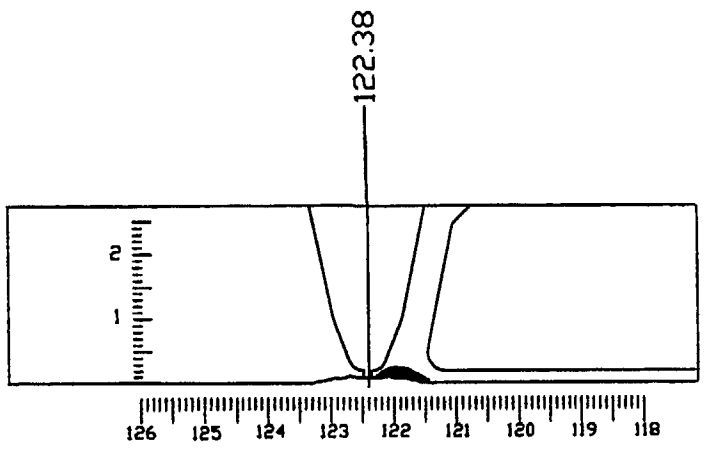
FIGURE 4 – INDICATION 2, 265° NOZZLE, ECT OBSERVATIONS PRE AND POST MSIP

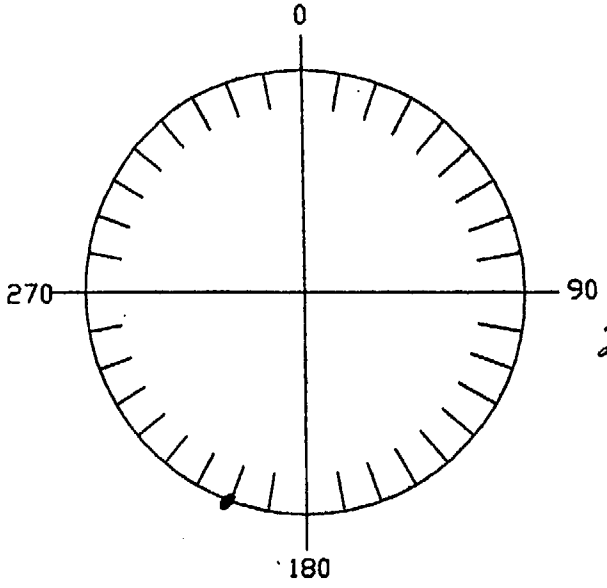
FIGURE 5 – INDICATION 3, 265° NOZZLE, ECT OBSERVATIONS PRE AND POST MSIP

FIGURE 6 – INDICATION 1, 145° NOZZLE, ECT/UT OBSERVATIONS PRE AND POST MSIP

FIGURE 7 – INDICATION 1, 145° NOZZLE, SECTION XI INDICATION ASSESSMENT – PRE AND POST MSIP EXAMS

FIGURE 8 – PARAGON HARD COPY OF SIZING POINTS – INDICATION 1 145° NOZZLE, PRE AND POST MSIP





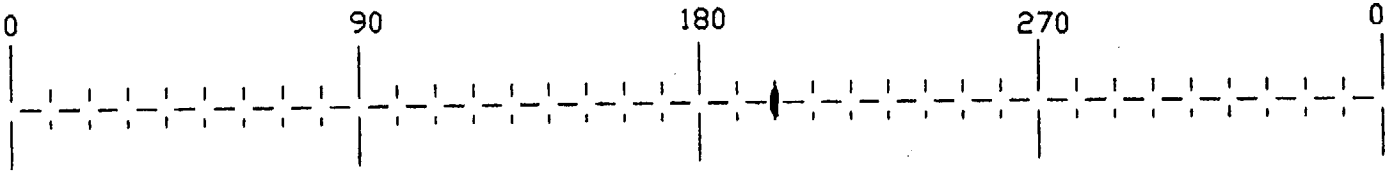
265° Nozzle

INDICATION NO. 1 (ECT) (UT) (AXIAL) CIRC — INDICATION ORIENTATION

LENGTH BY UT: .625" LENGTH BY ECT: .5"

RADIAL LOCATION BY UT 122" @ 202° AVG. TWE BY UT .317 by 45°L

RADIAL LOCATION BY ECT: 122", 200° AVG



COMMENTS: POST MSIP - UT - NO DETECTION - ECT -

PREPARED BY: D Kemp UTILITY:

Westinghouse Proprietary Class 2C

FIGURE 1

WESDYNE INTERNATIONAL

INDICATION ASSESSMENT

PLANT: V.C. Summer — UNIT: 1

PROCEDURE: CGE-ISI-254 — REV.: 2

ANALYST: [signature] — LEVEL: III — DATE: 4/30/2002

FILE / BUFFER	DISK	WELD NO.	INDICATION NO.	BEAM ANGLE	BEAM DIRECTION	CLASSIFICATION VOLUMETRIC / PLANAR	APPLICABLE "t"	FLAW DEPTH MIN / MAX	LENGTH (L)	SURF. / SUB.	S. DIM.	Y VALUE (S / a)	2a DIM. / a DIM.	a / L VALUE (0.50 MAX)	a / t%	ALLOWABLE a / t%	P MAX AMP (% DAC)	E X (SWP#)	A YB	K ZB	NOTES
IN265-SE	1	SE265	1	45	CCW	P	2.74	0.317	0.625	Surf	0	0	0.317	0.5	11.57	11.26	N/A	(44)	202	.317"	(1)
AR-SIZ1																		122"			

NOTES (1) Non-Allowable per ASME 1989 Edition, IWB-3514-2

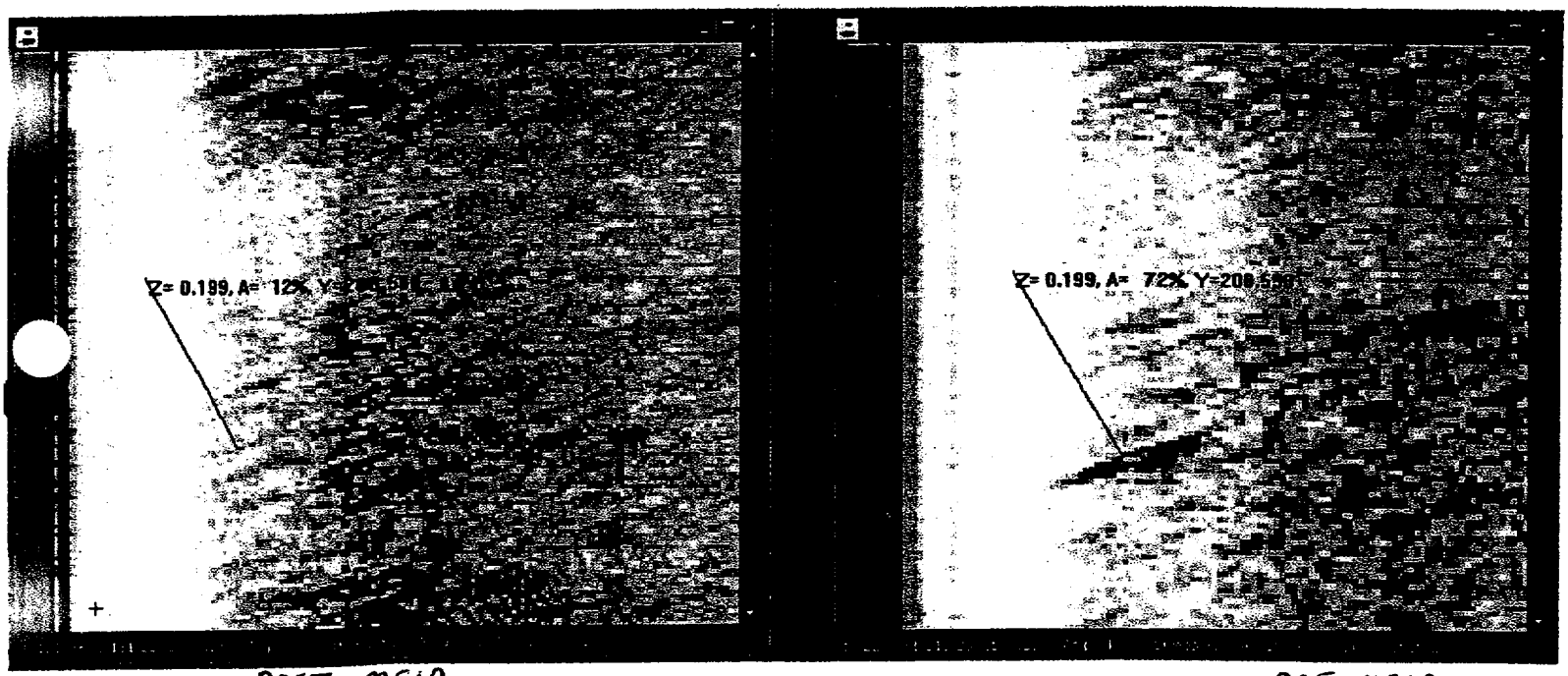
(2) INDICATION NOT DETECTED IN POST MSIP EXAMINATIONS.

Calibration Data Sheet No. N/A

Acquisition Log Sheet No. D-145-1

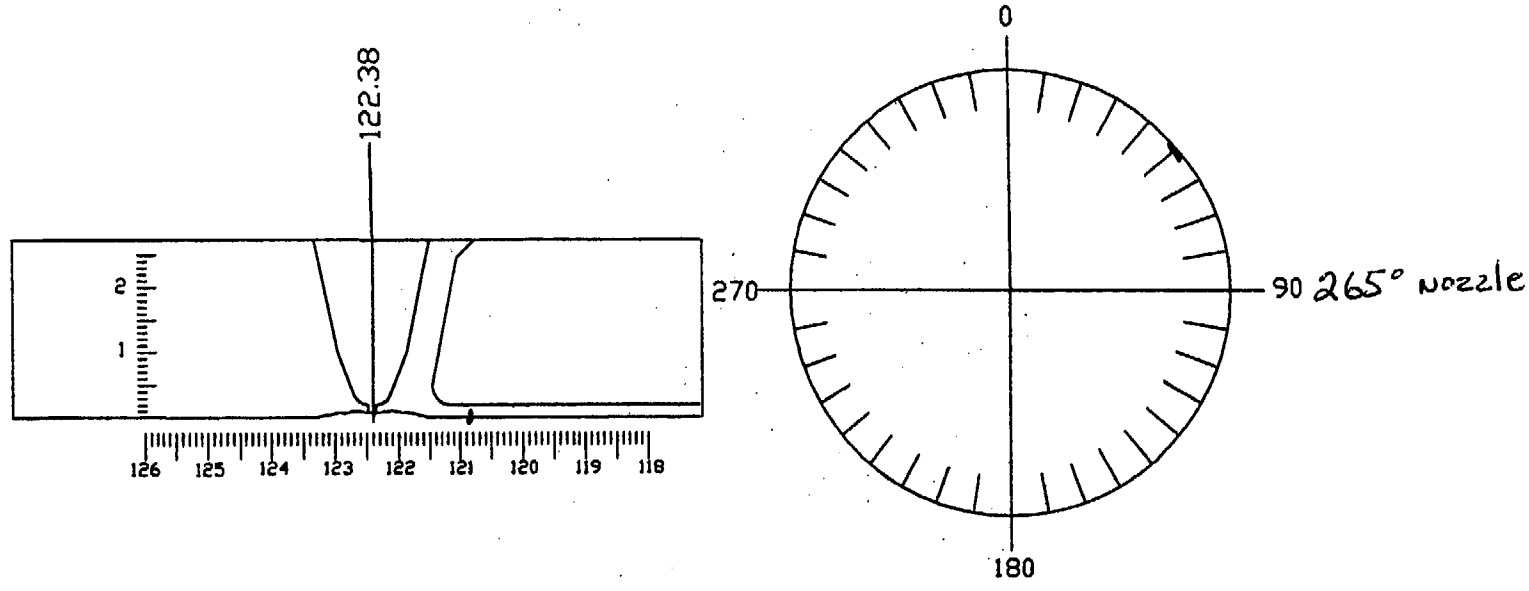
Analysis Log Sheet No. D-145-1

FIGURE 2



PARAGON HARD COPY OF SIZING POINTS – INDICATION 1
265° NOZZLE, PRE AND POST MSIP

FIGURE 3

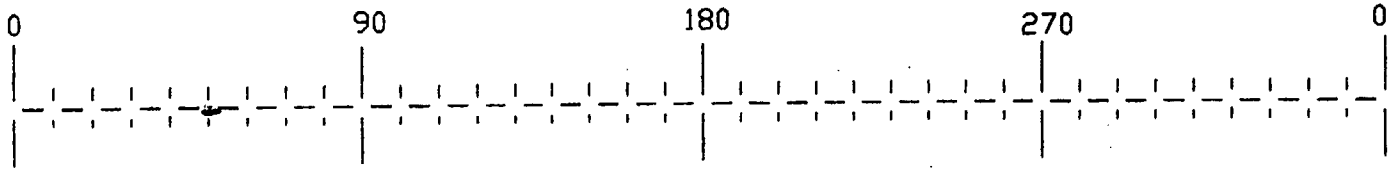


INDICATION NO. 2 (ECT) UT AXIAL (CIRC)

LENGTH BY UT: N/A LENGTH BY ECT: .32circ, 0.5circ.

RADIAL LOCATION BY UT N/A TWE BY UT N/A

RADIAL LOCATION BY ECT: 120.7" @ 50°

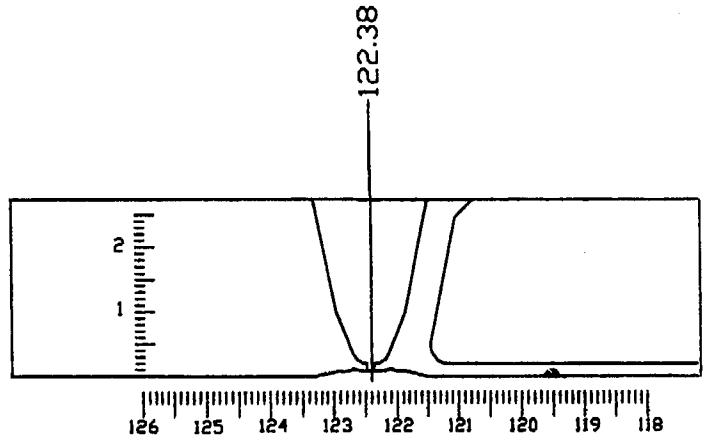


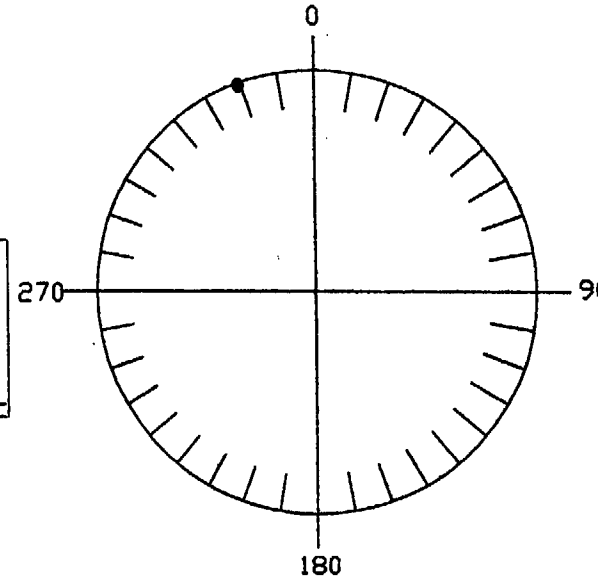
COMMENTS: POST MSIP ~

PREPARED BY: WYFFELS, JUNKER. UTILITY:

Westinghouse Proprietary Class 2C

FIGURE 4





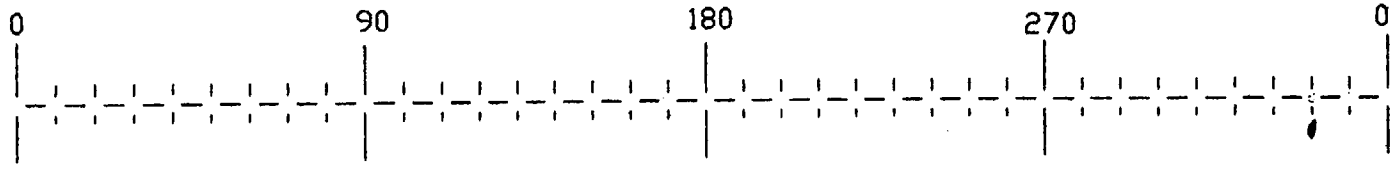
265° nozzle.

INDICATION NO. 3 (ECT) UT (AXIAL) CIRC

LENGTH BY UT: N/A LENGTH BY ECT: 0.25"

RADIAL LOCATION BY UT N/A TWE BY UT N/A

RADIAL LOCATION BY ECT: 119.6 @ 340°

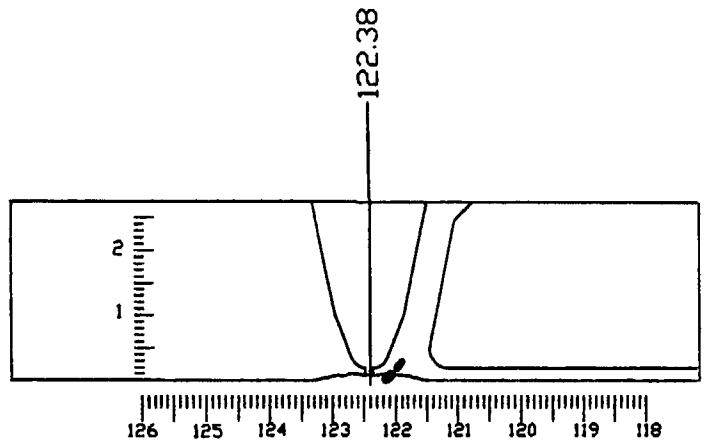


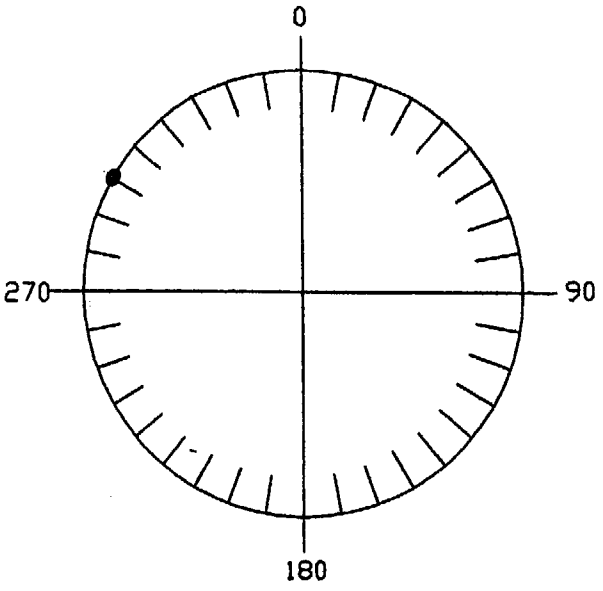
COMMENTS: POST MSIP ~ REVIEW INDICATES GEOMETRY COMBINED WITH ECT MATERIAL PROPERTY VARIATIONS. INDICATION IS POSSIBLY NOT VALID.

PREPARED BY: JUNKER, WYFFELS UTILITY:

Westinghouse Proprietary Class 2C

FIGURE 5





145° nozzle.

INDICATION NO. 1 (ECT) (UT) AXIAL (CIRC) INDICATION ORIENTATION.

LENGTH BY UT: .375" LENGTH BY ECT: .5

RADIAL LOCATION BY UT 122" 299.4° TWE BY UT 0.11

RADIAL LOCATION BY ECT: 122.75 300°

COMMENTS: POST MSIP ~ UT EXACTLY SAME SIZE.

PREPARED BY: UTILITY:

Westinghouse Proprietary Class 2C

FIGURE 6

WESDYNE INTERNATIONAL

INDICATION ASSESSMENT

PLANT: V.C. Summer — UNIT: 1

PROCEDURE: CGE-ISI-254 — REV.: 2

ANALYST: [signature] — LEVEL: III — DATE: 4/30/2002

FILE / BUFFER	DISK	WELD NO.	INDICATION NO.	BEAM ANGLE	BEAM DIRECTION	CLASSIFICATION VOLUMETRIC / PLANAR	APPLICABLE "t"	FLAW DEPTH MIN / MAX	LENGTH (L)	SURF. / SUB.	S. DIM.	Y VALUE (S / a)	2a DIM. / a DIM.	a / L VALUE (0.50 MAX)	a / t%	ALLOWABLE a / t%	P MAX AMP (% DAC)	E X (SWP#)	A YB	K ZB	NOTES
N145-SE	1	SE145	1	70	IN	P	2.74	0.28	0.38	Sub	0.28	1	0.11	0.147	2.01	10.49	(120%)	(586)	121.75"	0.322	(1)
RP-DET								0.4					0.055				96%	292.5			
00_02																					

NOTES (1) Allowable per ASME 1989 Edition, IWB-3514-2

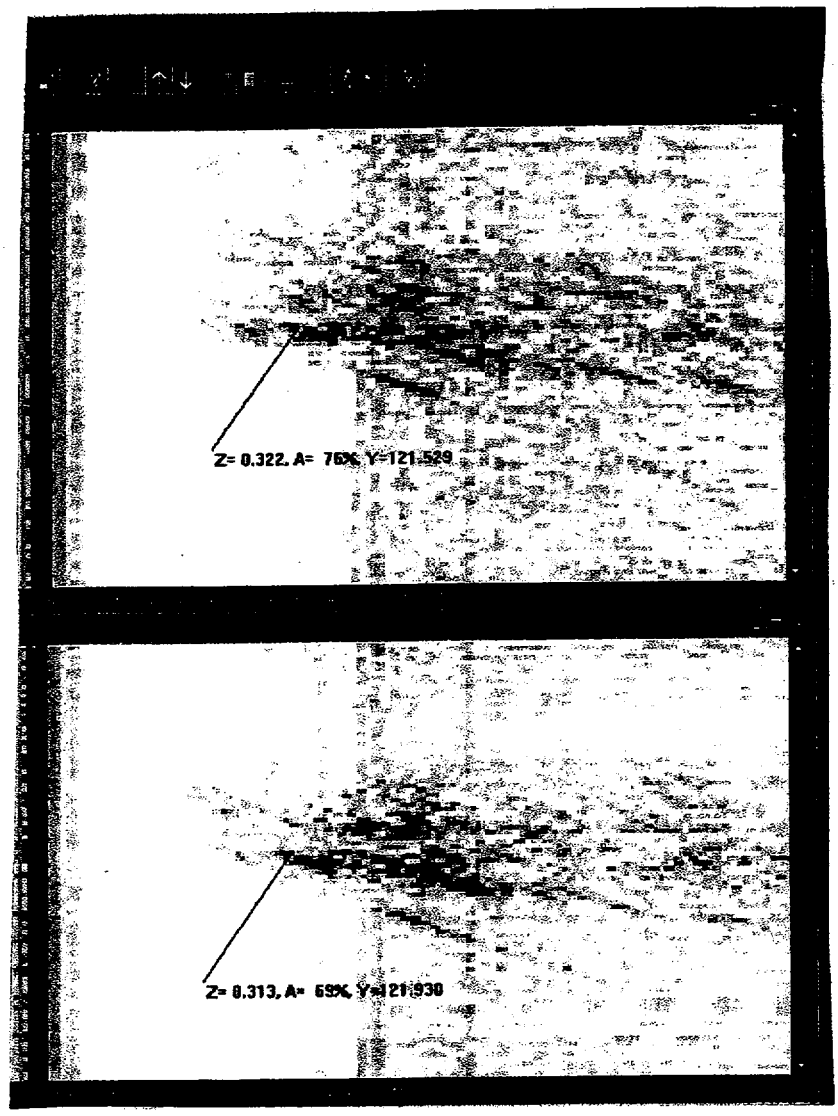
(2) POST MSIP EXAMINATIONS - VALUES ABOVE APPLY.

Calibration Data Sheet No. N/A

Acquisition Log Sheet No. D-145-1

Analysis Log Sheet No. D-145-1

FIGURE 7



PRE MSIP

POST MSIP

PARAGON HARD COPY OF SIZING POINTS – INDICATION 1
145° NOZZLE, PRE AND POST MSIP

FIGURE 8