VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

R. H. LEASBURG
VICE PRESIDENT
NUCLEAR OPERATIONS

October 25, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. Robert A. Clark, Chief
Operating Reactor Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 612
NO/JMM/jmj/SP4
Docket No. 50-338
License No. NPF-4

Gentlemen:

REMOVAL OF NORTH ANNA UNIT NO. 1
REACTOR COOLANT SYSTEM FLOW SPLITTER PLATES

In August and September 1982, the three flow splitter plates in the North Anna Unit No. 1 reactor coolant piping cold leg loops were removed. The attachment welds between the splitter plates and the inside diameter projections integrally cast with the coolant pipe wall had developed linear indications which were shown by ultrasonic inspection to be increasing in length with continued operation of the unit. It was, therefore, deemed desirable by Vepco in June 1982, to remove at least the "A" loop splitter plate as soon as possible. Shortly after removal of the "A" loop splitter plate, the "C" loop plate and the "B" loop plate were removed in that order.

The splitter plate removal process for all loops consisted of underwater plasma arc cutting with only the "A" loop splitter plate stubs milled an additional 1/2" to 3/4" below the plasma cut. The final surface condition of the "A" loop stub ends is a milled surface with the stubs projecting approximately 1¼" to 1½" beyond the coolant pipe inside diameter wall. The final surface condition of the "B" and "C" loop stub ends is a fairly smooth plasma cut surface with the stubs projecting approximately 1½" beyond the coolant pipe inside diameter wall.

All work related specifically to removal of the flow splitter plates has now been completed.

In support of continued operation of North Anna Unit No. 1 with the splitter plates removed are the following attachments:

Attachment 1:

Westinghouse letters VPU-393 and VPU-396 dated July 29, 1982, and August 2, 1982, respectively, which justify continued operation of Unit 1 based on pressure, thermal-hydraulic, and piping support considerations.

A001
1/40 Encls Rec'd

Attachment 2:

Westinghouse letter VRA-82-561 dated 10/19/82 which forwards Westinghouse Report, "Stability of U.T. Indications Remaining in the Flow Splitter Bosses of Loops A, B, and C North Anna Unit No. 1". This report evaluates the effects of hydraulic forces upon defects remaining in the non-pressure boundary splitter plate stub ends. It is concluded that there will be no significant extension of length of the remaining defects either along the remaining stubs or into the pressure boundary. This evaluation considers the individual defects remaining in all three loops. Also evaluated by this report is the effect erosion may have on the remaining stub ends. It is concluded that erosion will have no adverse effect on the integrity of the reactor coolant pipe.

Attachment 3:

Vepco Materials Engineering Services Memoranda:

a. Evaluation of Remaining Flow Splitter Plate Stubs - North Anna Unit 1 - Loop A, 9/23/82.
b. Evaluation of Remaining Flow Splitter Plate Stubs - North Anna Unit 1 - Loop B, 9/29/82.
c. Evaluation of Remaining Flow Splitter Plate Stubs - North Anna Unit 1 - Loop C, 9/15/82.

These memoranda conclude that the visual and ultrasonic indications remaining in the splitter plate stub ends are acceptable (no safety concerns). Visual examination of the stub ends was conducted by Vepco Materials Engineering Services personnel, Bechtel materials engineers, and third party certified visual inspectors. The above memoranda are summaries of the positions of all parties involved in the analysis. All visual inspections were performed by clear video camera scanning at magnifications of approximately 2x to 8x.

All stub ends were visually inspected except the "C" loop "reactor side" stub which was not visually inspected because no ultrasonic indications were detected in this region.

Attachment 4:

Vepco Materials Engineering Services Memorandum "Corrosion/Erosion of North Anna Unit 1 Flow Splitter Plate Stubs", 10/15/82. This memorandum addresses primarily the possible mechanisms of corrosion which could act upon the remaining stub ends and concludes that there will be essentially no corrosion of the stub ends and therefore no concern.

Based upon the extensive analysis of the effects upon North Anna Unit No. 1 performance and safety as a result of flow splitter plate removal, Vepco concludes that the plant is safe to operate with the splitter plates removed and the stub ends in their current configuration. However, as confirmation of this conclusion, Vepco will perform ultrasonic inspection (UT) of the reactor coolant pipe in the region of the flow splitter stub ends at the first, second, and fourth refueling following this work. This inspection will be performed by qualified personnel employing the same procedure used in obtaining base-line UT data after removal of the flow splitter plates. All

stub ends will be inspected at the specified intervals except the "C" loop "reactor side" stub which has no UT indications and will not be inspected further. Any significant change in defect size from that obtained by baseline inspection will be reported to the Nuclear Regulatory Commission.

Should you have any questions concerning this evaluation, please contact us.

Very truly yours,

R. H. Leasburg

Attachments

cc: Mr. Richard C. DeYoung, Director
Office of Inspection and Enforcement
Washington, D.C. 20555

Mr. James P. O'Reilly, Regional Administrator
Region II
Atlanta, Georgia 30303

ATTACHMENT 1

VPU(RRK)-393

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Commercial Operations Division
Box 355
Pittsburgh Pennsylvania 15230

July 29, 1982

Mr. A. L. Parrish, III, Manager
Multiple Power Projects
VIRGINIA ELECTRIC AND POWER COMPANY
P. O. Box 564
Richmond, VA 23204

Attention: Mr. W. McCoy

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
Removal of Flow Splitter from Reactor Coolant System
31" x 90° Main Coolant Pump Suction Elbows

Dear Mr. Parrish:

The purpose of the letter is to identify the requirements and the justification of the subject program.

A brief description of the 31" x 90° elbow is:

1) The primary pressure boundary, along with two 1-1/2 inch high ledges at 180° apart on the ID of the elbow are a one-piece casting. These ledges run the full arc length of the elbow to within 2-3/4 inches of the field butt weld ends on both ends of the elbow.

2) A 3-piece 1-1/6 inch thick splitter plate is then welded to the two ledges of the elbow and to themselves to form the splitter contour.

The pressure boundary of this elbow was originally calculated without consideration of the integrally cast 1-1/2 inch high ledge, therefore any cutting into, or complete removal of this ledge, would not violate the original pressure boundary analysis.

There is no impact on the external piping supports upon removal of the flow splitter since the piping and support analyses took no credit for the splitter. The supports are shimmed to the outside diameter and contour of the elbow with gaps to allow radial growth due to temperature of the system.

Cutting should be between the elbow ID surface and the ledge weld interface or approximately 3/4 to 1-1/4 inch away from the ID. Although metal removal right up to the elbow ID surface may be hydraulically desirable, it is not considered mandatory. Cutting through the weld or splitter should be avoided since parts of the splitter crack may remain in the form of undetectable slivers which may detach during operation.

Inspection of the cut surface should be visual to insure all remains of the original cracks are removed. In this case visual may be interpreted as good clear video camera scanning.

Since the final cut through the elbow ledge is by milling, the surface finish should be well below 500 RMS and lend itself to ultrasonic inspection through the pressure boundary into the remaining ledge area.

Ultrasonic inspection through the entire ledge area can be performed shortly after the splitter is removed for future base-line ultrasonic inspections. These subsequent inspections should be considered at each of the next two plant shutdowns. If no change occurs, then one more inspection should be considered at the fourth shutdown. Again, if no change occurs, ultrasonic inspection can be discontinued.

If you have any questions, please call me at 412-373-4507.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

Richard R. Kent

Richard R. Kent, Project Engineer
VEPCO Projects

RRK:jt

cc: W. L. Stewart (VEPCO) 1L
W. R. Cartwright (VEPCO-North Anna) 1L
F. M. Alligood. Jr. (VEPCO) 1L
W. McCoy (VEPCO) 1L

VPU(RRK)-396

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Commercial Operations Division
Box 355
Pittsburgh Pennsylvania 15230

August 2, 1982

Mr. A. L. Parrish, Manager
Multiple Power Projects
VIRGINIA ELECTRIC AND POWER COMPANY
P. O. Box 564
Richmond, VA 23204

Ref: FSD/RCS-496 dated 7/23/82

Attention: Mr. W. McCoy

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION
Unit #1 - Flow Splitter Removal

Dear Mr. Parrish:

Removing the splitter plate from the suction elbow would have a negligible effect on the pump performance. An analysis performed in early 1979 for the pumps at VGB (North Anna #2) indicated that the removal of the elbow splitter would have the effect of increasing the radial load at the pump bearing by a maximum of 260 pounds (a 6% increase), and a pump head loss of about 0.3 feet. Both of these effects are considered to be insignificant.

The splitter elbow design used at North Anna was based on a design guide developed by EMD in 1961. This guide was the result of published data of flow through pipe bends, partly of theoretical analysis, and on EMD test practice. The purpose of this design guide is to limit the axial velocity distortion at the impeller eye. The pump inlet piping designed to this EMD design guide produces a pump inlet configuration that is overly conservative; because the guide does not consider the further reduction in flow distortion that occurs within the pump. A recent analysis shows that the pump impeller has a powerful influence on reducing the flow distortion. For instance, a plus to minus 10% flow distortion entering the impeller eye is reduced to plus to minus 1% distortion through the impeller. This, to a great extent, nullifies the negative effect that inlet velocity distortion can have on the pump head and efficiency, and the hydraulic radial load at the pump bearing.

As indicated in the above referenced letter, removal of the splitter will decrease the RCS loop piping resistance by 1.2×10^{-10} ft./gpm^2. This more than offsets the increase in pump loss (1.25 ft. reduced loop loss vs. 0.3 ft. distortion loss at the pump). Therefore, the net result will be slightly increased pump flow with the inlet elbow splitter removed. Removing the splitters from all three elbows would increase the pump flow by 95 gpm (.093%) and also increase the plant flow by .093%.

Removing the splitter from only one elbow would produce increased pump flow in that particular loop. The remaining two loops, with splitters in place, would experience a slight decrease in flow. However, the resulting flow changes would be very small - less than 0.1%.

The calculated flow changes shown in the accompanying table assume that the loop pressure drop and the reactor drop are equal.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

Richard R. Kent, Project Engineer
VEPCO Projects

RRK:jt

Attachment

cc: F. M. Alligood, Jr. (VEPCO) 1L, 1A
W. L. Stewart (VEPCO) 1L, 1A
W. McCoy (VEPCO) 1L, 1A
W. R. Cartwright (VEPCO-North Anna) 1L, 1A

ATTACHMENT

PUMP AND PLANT FLOW CHANGE
RESULTING FROM REMOVAL OF SUCTION SPLITTER

ALL SPLITTERS REMOVED

	SPLITTER	ΔGPM	% CHANGE
PUMP 1	Removed	+95	+.093
PUMP 2	Removed	+95	+.093
PUMP 3	Removed	+95	+.093
PLANT		+285	+.093

TWO SPLITTERS REMOVED

	SPLITTER	ΔGPM	% CHANGE
PUMP 1	Removed	+77	+.076
PUMP 2	Removed	+77	+.076
PUMP 3	In Place	-18	-.018%
PLANT		+136	+.045

ONE SPLITTER REMOVED

	SPLITTER	ΔGPM	% CHANGE
PUMP 1	Removed	+86	+.084
PUMP 2	In Place	-9	-.009
PUMP 3	In Place	-9	-.009
PLANT		+68	+.022%

ATTACHMENT 2

Westinghouse Electric Corporation - Water Reactor Divisions

Nuclear Service Division
Box 2728
Pittsburgh Pennsylvania 15230

October 19, 1982

VRA-82-561

Mr. F. M. Alligood, Jr., Manager
Nuclear Technical Services
Virginia Electric and Power Company
P.O. Box 26666
Richmond, VA 23261

Attn: Mr. M. L. Smith

VIRGINIA ELECTRIC AND POWER COMPANY
North Anna Power Station
Stability of U.T. Indications in the
Flow Splitter Bosses of Loops A, B, and C
North Anna Unit 1 - Revision 1

Dear Mr. Alligood:

Attached is Revision 1 to the subject report which incorporates VEPCO comments from telephone conversation between Mr. M. L. Smith, VEPCO, and Messrs. R. R. Kent and J. N. Chirigos, Westinghouse.

Very truly yours,

For Richard R Kent
Joseph D. Cohen, Manager
Operating Plant Projects
East Region

Attachment

RRK/caf

cc: W. L. Stewart - 1L, 1A (VEPCO-Richmond)
M. L. Smith - 1L, 1A (VEPCO-Richmond)
W. R. Cartwright - 1L, 1A (VEPCO-Richmond)
W. S. M'Coy - 1L, 1A (VEPCO-Richmond)

STABILITY OF U.T. INDICATIONS REMAINING IN THE FLOW SPLITTER BOSSES OF LOOPS A, B AND C NORTH ANNA UNIT 1

1. INTRODUCTION

Splitter plates of North Anna Unit 1 were removed by a plasma cutting process. Ultrasonic test (U.T.) indications remained in the bosses. A previous evaluation [Ref. 1] was concerned with the stability of the U.T. indications in loops B and C under the assumption that the U.T. indications were identical with those measured in June 1982. In this report results are summarized for the evaluation of the stability of the U.T. indications (postulated to be through thickness cracks for the sake of evaluation) remaining in the bosses of loops A, B and C. This postulation is judged to be quite conservative since VEPCO has reported in other documentation that similar visual indications on the cut faces appear to be casting shrinkage or weld repairs and that no visual observations occur on the original boss surfaces.

The criteria established for the stability of the U.T. indications are as follows:

1) the natural frequencies of boss should exceed the vortex shedding frequency ($\sim$150 Hz) by at least a factor of 2;
2) the frequency range of a significant loading mechanism is considered to be 1000 Hz since the amplitudes of possible loading mechanisms (see Reference 1) are negligible if the frequency is greater than 1000 Hz;
3) if the natural frequency is greater than 1000 Hz, then U.T. indications are stable;
4) if the frequencies of the bosses are less than 1000 Hz, the indications could be accepted on the basis of the stress and fatigue crack growth analyses provided criterion 1) is satisfied.

The methods employed in the investigation of the stability of the U.T. indications in loops A, B and C include:

1) finite element modal analyses of the bosses containing potential U.T. indications after the splitter plate of loop A was removed;
2) the natural frequency calculations due to individual U.T. indications remaining in the bosses of loops A, B and C;
3) the stress analysis and fatigue crack growth calculations for portions of the bosses which have a frequency less than 1000 Hz;

4) the frequency calculation of the structure having milled circular holes in the machined face of the wall side boss, loop A. The holes were 1 inch in diameter and did not exceed 1/6 inch in depth.

2. ANALYSES

2.1 Evaluation by the Beam Analogy

The responses of individual portions of the bosses as defined by the U.T. indications are required by the evaluations described in Section 1. Because of the various cases which were necessary to evaluate, an accurate but simplified method was desirable. It appeared that the portions of the bosses so identified could be considered as beams. An evaluation was made by comparing natural frequencies obtained from finite element modal analyses with those obtained using the appropriate beam formula. Both cantilever and fixed-ended beams were considered.

Modal analyses of the remaining bosses of loop A embedded with the U.T. indications measured June, 1982 were performed. Two models were considered in the analysis. The first model contained continuous flaws and distributed flaws as shown in Figure 1 along with the calculated natural frequencies. The lengths of the continuous flaw are 24 inches from the trailing edge and 18 inches from the leading edge, respectively. The second model contained distributed flaws which are identical with those of the U.T. indications. Those flaws are shown in Figure 2 along with the natural frequencies.

The first natural frequencies in Figures 1 and 2 were calculated assuming a cantilever beam having a length of 24 inches (see Figure 1) and a fixed-ended beam having a length of 16 inches (see Figure 2).

The following formulae were used (Reference 2):

Cantilever Beam: $f_n = \frac{\lambda^2}{2\pi\ell^2}\sqrt{EI/\rho A}$, $\lambda = 1.88$ (1st mode)

Fixed Ended Beam: $f_n = \frac{\lambda^2}{2\pi\ell^2}\sqrt{EI/\rho A}$, $\lambda = 4.73$ (1st Mode)

where ℓ: length of the beam

E: Young's modulus

I: Moment of Inertia of the area

($I = \frac{1}{12} bh^3$, b - width, h - thickness)

A: Cross sectional area

ρ: mass density including the fluid

λ: eigenvalue value for the beam vibration

f_n: first natural frequency

This evaluation shows that the lowest natural frequencies obtained by using the finite element methods are very close to those obtained by using the simplified calculations. This confirms that the simplified calculation may be used to estimate the natural frequency obtained by using the finite element method.

2.2 The Natural Frequency Calculations of the Bosses Due to Individual U.T. Indications of Loops A, B and C

The U.T. indications of loops A, B and C after the splitter plates had been removed were measured and those results are shown in Table 1. The natural frequencies calculated by the simplified method (frequency calculation of the beam) only are given. The indications are plotted in Figures 3, 4 and 5 along with pipe wall thicknesses and locations of the machined faces.

Since no U.T. indications were observed to penetrate the surfaces of the bosses, an analysis was made for a postulated buried flaw 25 inches long. This was done to illustrate the conservatism of the simplified procedure. For the postulated 25 inch long flaw, the distance from the cut edge was taken as 1/2 inch and the depth of the flaw was taken as 1/2 inch. The natural frequency of the buried flaw was estimated by using the formula of the plate with four fixed edges. The natural frequency from this analysis is also given in Table 1. It should be noted that a 10 inch long buried flaw of the type evaluated would have still a greater natural frequency. The longest indication in any boss was 10 inches.

2.3 The Stress Analysis and Fatigue Crack Growth Calculations

The stress analysis and fatigue crack growth calculations were performed for the one flaw which had the natural frequency less than 1000 Hz but greater than twice the vortex shedding frequency. The ultrasonic test indications in the wall side loop C showed the flaw to have a length of 10 inches at a distance from 0.4 inch to 1 inch from the cut edge. The natural frequency of this portion of the boss based on an average depth of the indications is approximately 693 Hz which is less than 1000 Hz. The natural frequency based on the minimum depth is 396 Hz. Therefore, it was necessary to perform stress analysis and fatigue crack growth calculations.

The stress analysis was performed by using the result of the dynamic response of the cantilevered plate (Reference 3) subjected to the pump motion and the pressure fluctuation. The stiffness of the cantilevered plate was found by using the lowest natural frequency, 46.3 Hz, and the mass of the plate. The stiffness of the remaining structure taking the average natural frequency, 693 Hz, was found by using a method similar to that used in obtaining the stiffness for the cantilevered plate. The stiffnesses of the cantilevered plate and the remaining structure were compared and the result showed that the structure with the natural frequency of 693 Hz is fourteen times stiffer than the cantilevered plate. The stress response due to the pump motion and the pressure fluctuation of the remaining structure was reduced from the stress response of the cantilevered plate. The amount of the reduced stress for the structure of the natural frequencies, 693 Hz, corresponds to the ratio of the cantilevered stiffness to that of the structure, i.e. 1/14. The reduced stress response (approximately 5 psi) was used for the calculation of the fatigue crack growth. The results shows that the fatigue crack growth would be negligible after 40 years of service (less than 2 mils for each of the frequencies).

2.4 The Frequency Calculation of the Structure After Milling Circular Holes in the Machined Face of the Wall Side Boss, Loop A

For metallurgical investigations of hairline visual observations on the face of the Loop A wall side boss, documented elsewhere, one-inch diameter holes, not exceeding 1/6 in. in depth, were milled into the face.

The natural frequency of the local structure after milling circular holes (1 inch diameter, 1/6 inch deep) in loop A was estimated conservatively and it was found to be 10,000 Hz.

2.5 The Potential for Through Wall Fatigue Crack Growth

The U.T. indications are not oriented in the radial direction. However, an evaluation was made for such a situation.

The fatigue crack growth based on a crack size one third of the wall thickness was evaluated in the safe end region of another PWR plant subjected to various transients. The stresses in the safe end were observed to be the maximum stress in the primary piping system. The result showed that fatigue crack growth was not significant even with a large initial crack size. Furthermore, stresses in the region of the boss welded to the splitter plate will be lower than that in the other locations of the elbow section because of the reinforcement. Therefore, even though a flaw is assumed to be oriented in the direction of the wall thickness, the fatigue crack growth is judged not to be significant.

2.6 Erosion of the Bosses

An assessment of possible erosion effects indicates that erosion is not expected to be a problem. This conclusion is based upon the observation that there has not been any evidence of erosion of cast stainless steel components in primary water in regions of pumps where the flow velocity has exceeded 100 fps. The maximum velocity in the elbow is less than 60 fps. Furthermore, removal of the splitter plate results in a somewhat reduced velocity. If erosion effects were to occur they would be expected in the vicinity of the leading edge of the splitter boss. However, this region has been shaped and would minimize the possibility of erosion. Also none of the remaining U.T. indications lie closer than 10 inches from the leading edge and thus would be unaffected by any local effects peculiar to the leading edge.

An erosion allowance of 1/16 inch has been conservatively used in some instances for primary components for 40 years service. Allowing for such erosion identifies three areas having a frequency less than 1000 Hz instead of one as noted in Table 1. The frequencies still exceed 300 Hz and the crack extensions by fatigue remain negligible.

For the above reasons, erosion is not considered to be a factor affecting the integrity of the remnants of the splitter plates.

3. SUMMARY AND CONCLUSION

1. The natural frequencies of the bosses due to individual U.T. indications which remained in the structure after the plate had been removed were calculated. The results showed that the natural frequencies exceed 1000 Hz except for one location in the wall side, loop C.

2. Stress analysis and fatigue crack growth calculations were performed for the portion of the boss defined by the U.T. indications in loop C and having a frequency less than 1000 Hz. The result shows that the fatigue crack growth for 40 years service is negligible.

3. The calculations based on assumed through thickness cracks are very conservative for indications internal to the boss.

4. The milled holes in the wall side boss of Loop A are of no consequence.

5. The indications are not radially oriented but even if they were, only negligible crack growth would result.

6. Erosion is judged not to be a factor affecting the integrity of the bosses.

Through these analyses it can be judged that the U.T. indications remaining in the bosses after the plates had been removed should be stable and should not propagate.

4. REFERENCES

1. North Anna Flow Splitter Evaluation, MT-SME 2523, July 12, 1982.

2. W.T. Thomson, Theory of Vibration with Applications, Prentice-Hall Inc., Englewood Cliffs, N.J. p. 273 (1972)

3. North Anna Flow Splitter Plate Evaluation, MT-SME 2637, Sept. 3, 1982

TABLE 1 NATURAL FREQUENCIES IN THE BOSSES DUE TO THE INDIVIDUAL ULTRASONIC TEST INDICATIONS

Loop No.	Indication No. / Location from Trailing Edge (in.)	Length (in.)	Depth Range from Boss Face	Natural Frequency (Hz)	Remark
Loop A	1 / 9 in.	1	0.4 to 0.6	Avg. 49479 Max. 59374 Min. 39583	Wall Side
	2 / 13 - 16 in.	4	0.2 to 0.7	Avg. 2783 Max. 4329 Min. 1237	
	3 / 19 - 22 in.	4	0.6 to 0.9	Avg. 4637 Max. 5566 Min. 3711	
	4 / 26 in.	1	0.6	59374	
	5 / 28 - 29 in.	2	0.7 to 0.8	Avg. 18555 Max. 19791 Min. 17318	
	1 / 15 - 22 in.	8	0.7 to 1.0	Avg. 1314 Max. 1546 Min. 1082	Reactor Side
	2 / 47 - 48 in.	2	0.8 to 0.9	Avg. 21028 Max. 22265 Min. 19791	
Loop B	1 / 9 - 10 in.	2	1.0	24739	Wall Side
	2 / 24 in.	1	0.6	59374	
	1 / 31 - 36 in.	6	1.2 to 1.5	Avg. 3711 Max. 4123 Min. 3299	Reactor Side
	2 / 70 in.	1	0.3	29687	
Loop C	1 / 5 - 6 in.	2	1.1	27213	Wall Side
	2 / 9 - 13 in.	5	0.5 to 1.0	Avg. 2969 Max. 3958 Min. 1979	
	3 / 19 - 23 in.	5	0.5 to 0.7	Avg. 2375 Max. 2771 Min. 1979	
	4 / 57 - 66 in.	10	0.4 to 1.0	Avg. 693 Max. 990 Min. 396	

The postulated buried flaw: length :25 inch
Distance from cut edge :1/2 inch
Width of the Flaw: 1/2 inch
Natural Frequency: 146706 Hz

NOTE: No U.T. indication of this size was found. This result illustrates the conservatism in the above calculations.

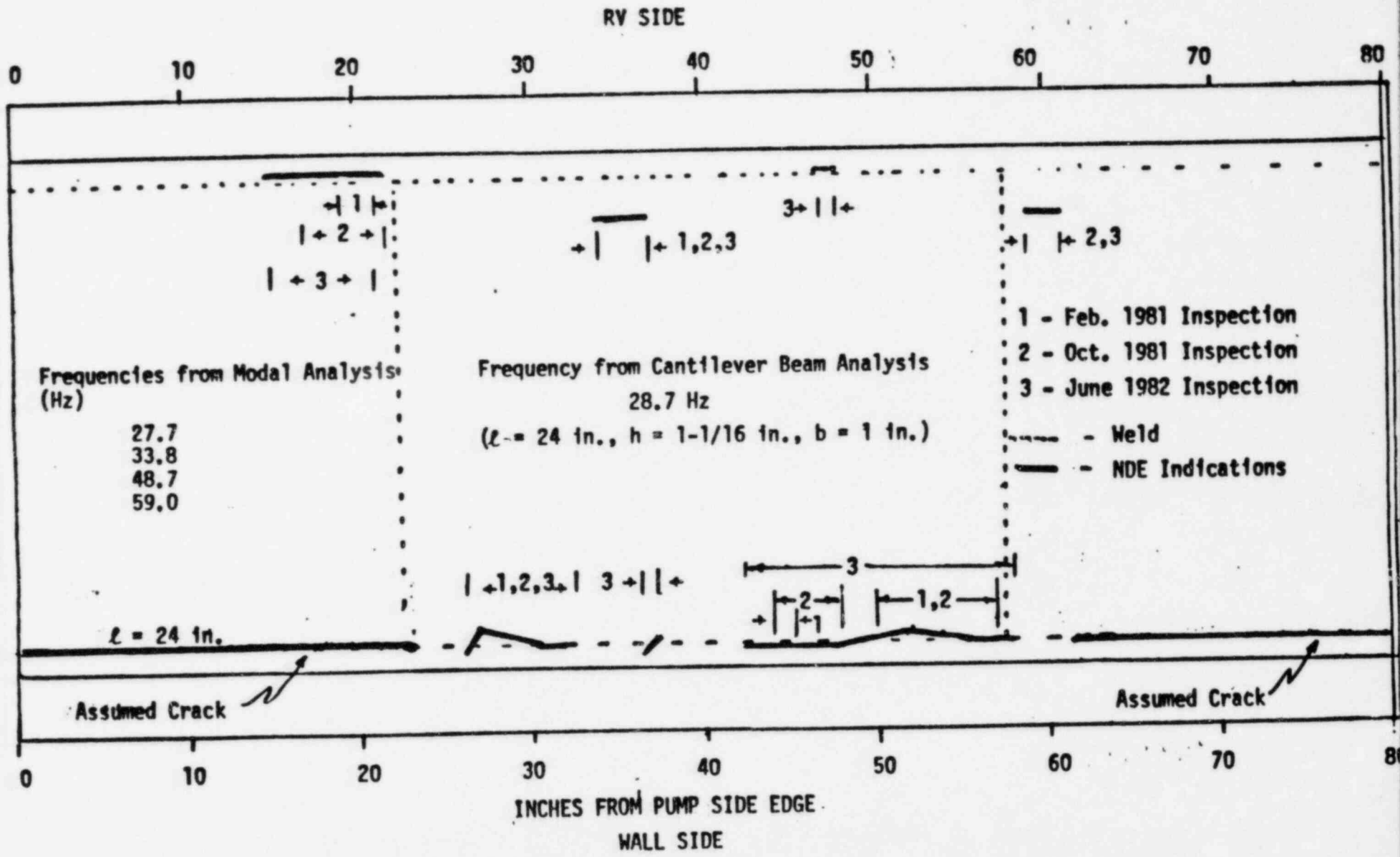

Figure 1 Results of Modal Analysis for the Wall Side, Loop A, Assuming Cracks extend to the edges compared with cantilever beam analysis.

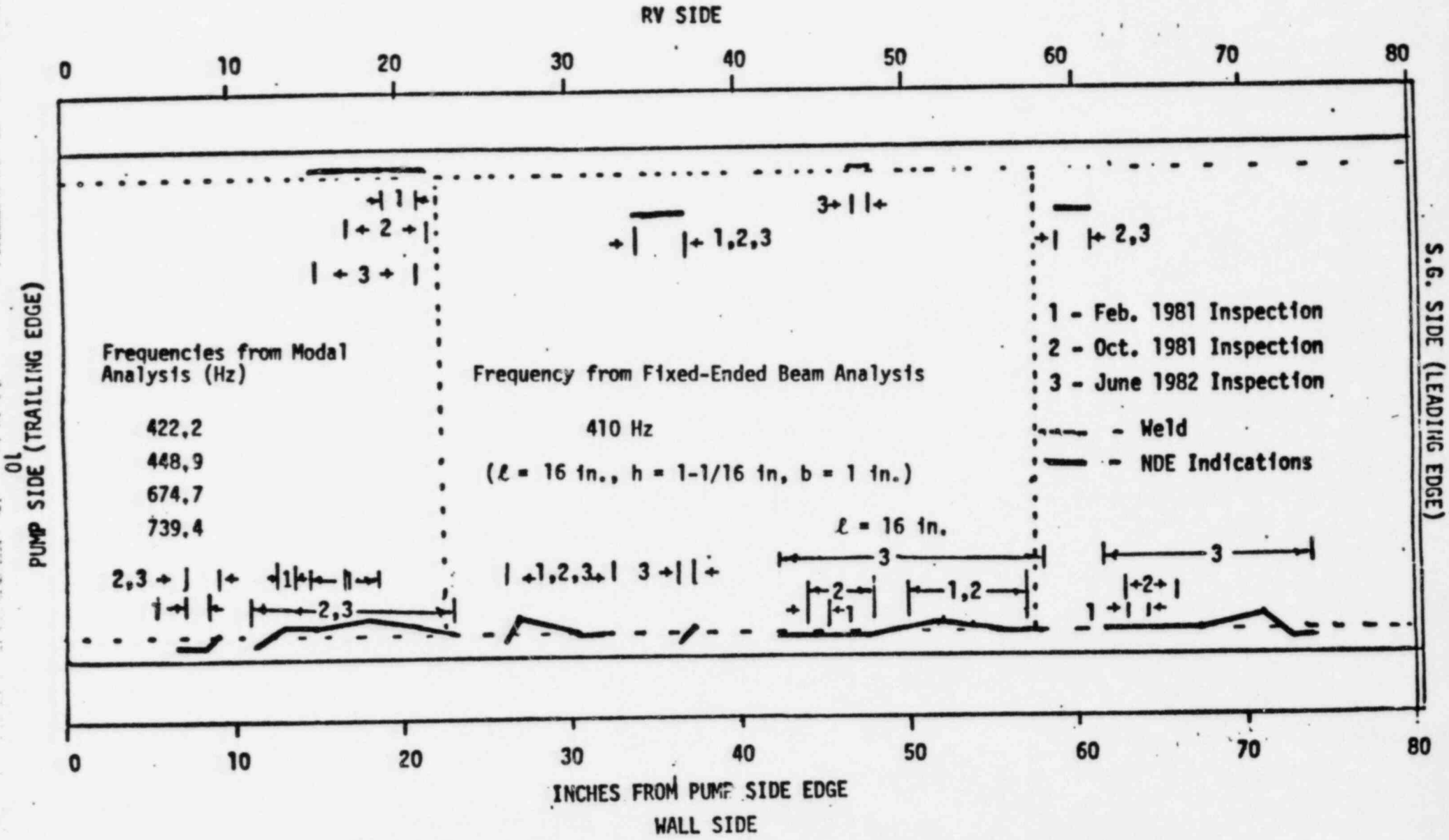

Figure 2 Results of Modal Analysis for the wall side, loop A compared with Fixed-Ended Beam analysis (based on June 1982 U.T. results)

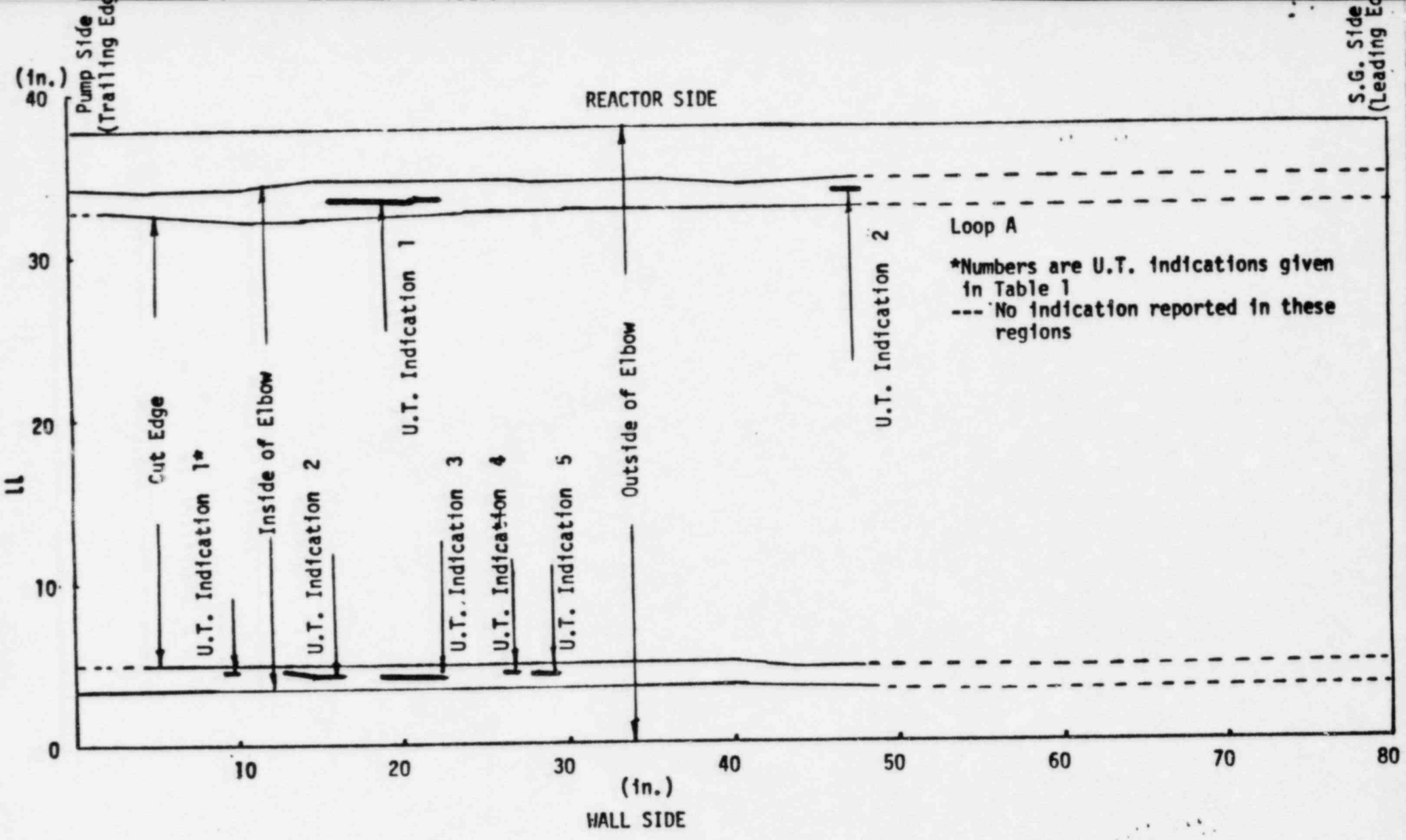

Fig. 3 U.T. Indications Remaining in Loop A Bosses

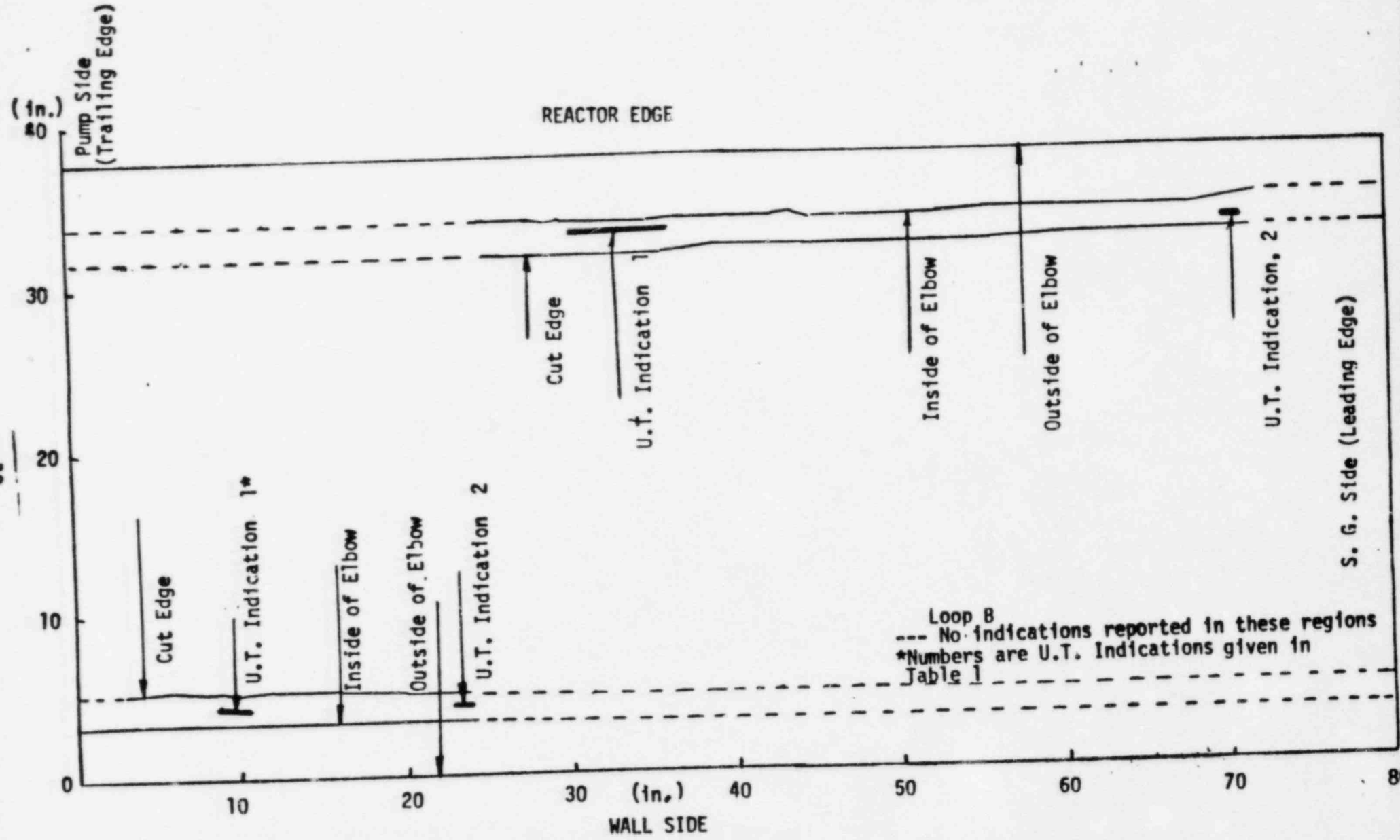

Figure 4 U.T. Indications Remaining Loop B Bosses

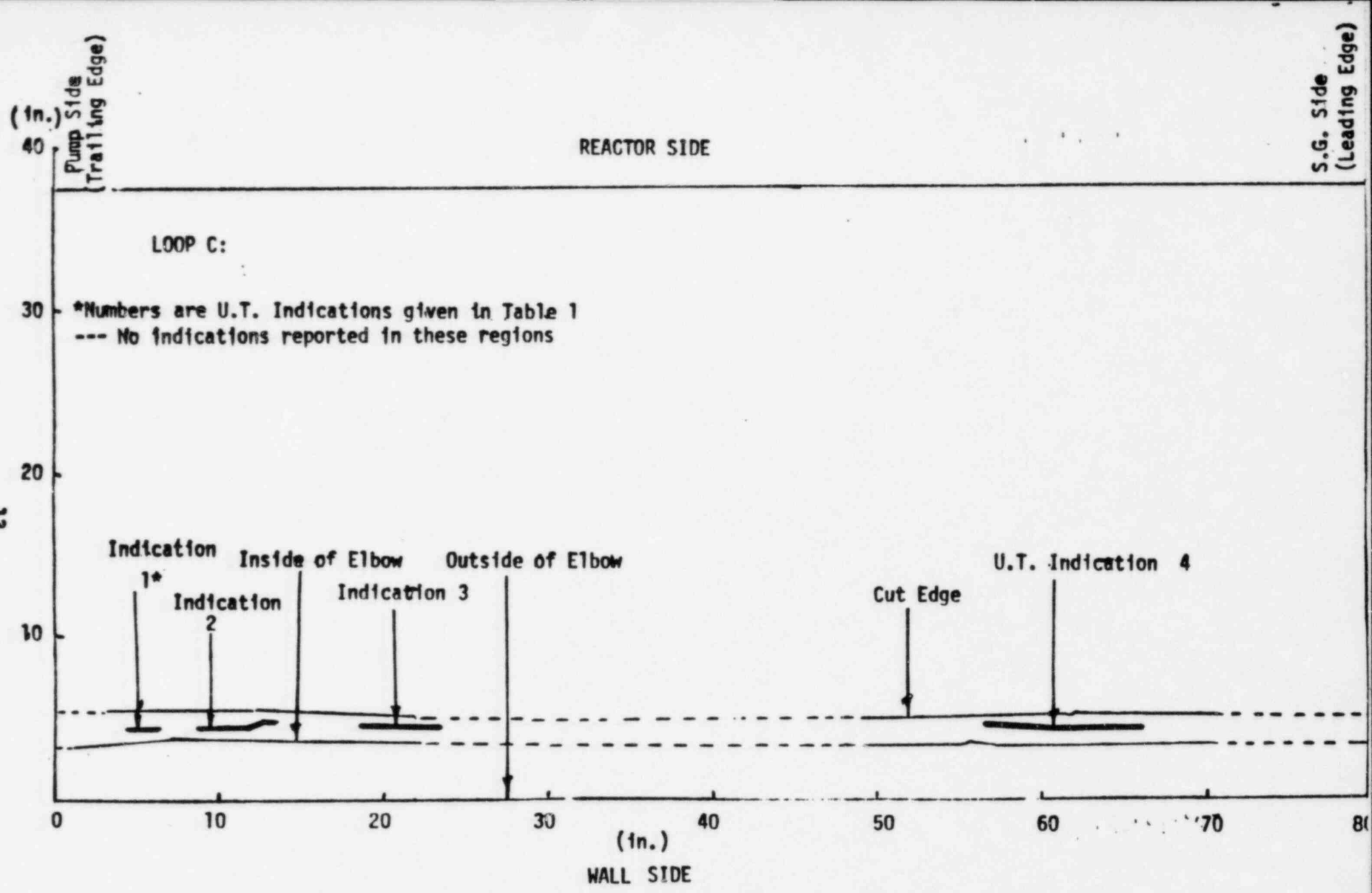

Fig. 5 U.T. Indications Remaining in Loop C Bosses

ATTACHMENT 3

No. 97024020

MEMORANDUM

TO J. M. McAvoy — North Anna - SEO

FROM W. S. M'Coy — September 27, 1982

Subject: Acceptability of Remaining Stubs in A Loop

As seen in the attached memo from Mr. A. T. Vig - PSE&C Materials Engineering Services, the wall and reactor side stubs remaining in A loop following plasma cutting and machining are acceptable.

If you have any questions, please contact me.

W. S. M'Coy

WSM/jad

cc: Mr. M. L. Bowling
Mr. J. C. Harris, Jr.
Mr. R. K. Bayer
Mr. G. C. Ludden
PSE&C Records Management NP-130

Attachments - MtES Memo of 9/23/82
Westinghouse Letter MT-SME 2647
UT Results

No. 970&4020

MEMORANDUM

TO W. S. M'Coy — Richmond, Virginia

FROM A. T. Vig — September 23, 1982

EVALUATION OF REMAINING FLOW SPLITTER PLATE STUBS - NORTH ANNA UNIT 1 - LOOP A

Materials Engineering Services (MtES) has reviewed the Visual Examination Reports and UT Reports of the remaining stubs on North Anna Unit 1 - Loop A.

Visual Inspection - Wall Side

The Visual Inspection Report indicates a number of discontinuities on the face of the boss, with most of these linear. Three areas were selected for exploratory machining to define the type and size of these discontinuities. Machining was done with a 1" diameter end mill boring in directly on the face of the boss.

Each area was examined at several steps during the machining process. The indications all appeared rounded, probably the result of casting shrinkage, porosity or weld repair of the casting, with no sharp ends. The discontinuities were not connected to other discontinuities below the surface, and were completely removed by machining 0.161", 0.150", and 0.092" respectively, below the surface.

MtES recommends acceptance of the boss as is, based on the discontinuities being casting or weld repair defects, that are round ended and not connected to other subsurface defects.

Visual Inspection - Reactor Vessel Side

The Visual Inspection Report indicates a number of discontinuities on the face and edge of the boss. Some were linear and some rounded. The linear and rounded indications are probably welding defects, such as lack of fusion near the center line of the weld and slag inclusions. The machining curl on the edge of the boss was removed by machining. The indications not removed appear to be sound and will not propagate.

MtES recommends acceptance of the boss as is, based on the discontinuities being weld repair defects that will not propagate and therefore will not affect the integrity of the stubs.

Ultrasonic Inspection - Both Sides

The Ultrasonic Testing Report indicates that subsurface indications are present in the remaining stubs of Loop A. Westinghouse has concluded that

none of the loading frequencies match with the natural frequency of the remaining boss and therefore:

1) The indications will remain as is without propagating further.

2) The indications are not expected to propagate into the wall thickness. Should, however, such occur, the fatigue crack growth would be very small and not impair the pressure boundary. Materials Engineering concurs with the Westinghouse conclusions.

Based on the above information MtES concludes:

1) Visual indications on the wall side and reactor side and ultrasonic indications will not propagate.

2) Because no indications will propagate, no loose parts will be generated.

3) Pressure boundary integrity will be maintained.

A. T. Vig

GCL /wes

cc: J. M. McAvoy
R. K. Bayer
J. C. Harris
W. C. Daley
M. B. Shelton
A. T. Vig
Records Management NP-130
G. C. Ludden

Telecopy to (703) 894-5471, Ext. 255

MT-SME 2647

TO: W. S. McCoy
VEPCO SEO

SUBJECT: EVALUATION OF UT INDICATIONS IN LOOP A BOSSES

Per your telecopy of 9/23/82, Subject: A Loop UT Results, the information below confirms our telephone conversation of 9/23/82 AM:

Indication No.	Location (in. from trailing edge)	Length (in)	Depth Range from Boss Face (in)
		WALL SIDE	
1	9	1	0.4 to 0.6
2	13-16	4	0.2 to 0.7
3	19-22	4	0.6 to 0.9
4	26	1	0.6
5	28-29	2	0.7 to 0.8
		REACTOR SIDE	
1	15-22	8	0.7 to 1.0
2	47-48	2	0.8 to 0.9

Our evaluations show that it is acceptable to leave the above indications in the boss based upon the current understanding of the loading mechanisms. A letter report will follow through official channels.

J.N. Chirigos, Manager
Structural Materials Engineering

cc: R. R. Kent
/pw

recd TELECOPIED VMB
Date 9-23-82 Time 4:15

No. 885.77
Rev. 0

ULTRASONIC EXAMINATION REPORT
NDE – UT – FORM 1
VIRGINIA ELECTRIC AND POWER COMPANY

STATION: North Anna | UNIT: 1 | DATE: 9/22/82 | PROCEDURE: NDE-UT-5 | SYSTEM: R.C. Loop A

ITEM COMPONENT INSPECTED: Remaining flow splitter material

MAINTENANCE REPORT NO: M-1-82-08516-04

BASE METAL: Cast stainless steel

WELD METAL: N/A

CALIBRATION BLOCK: V66-1

INSTRUMENT: Sonic Mark

REP RATE: 1K

REJECT: OFF

DAMPING: Min

FILTER: OFF

CALIBRATION CHECKS: Initial 12:45; Checked 3:30; Final 6:10

BEAM SURF:	STRAIGHT BEAM SCAN DIRECTION 0		AXIAL SCANS DIRECTION 2 & 5				CIRCUMFERENTIAL SCANS DIRECTION 7 & 8			
					Distance From Sound Entry Point To				Distance From Sound Entry Point To	
CALIBRATION REFLECTOR LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION
T.D. NO.	3/4 6 C-C									
T.D. SIZE	1.0"									
T.D. FREQ.	1.0 mhz									
BEAM ANGLE	0°									
V.T.	N/A	1.5								
I.T.	N/A	3.0								
MIN. DIA.	8 3/4									

Continuation sheets attached

Transfer record attached

TEST PERFORMED BY: Donald Parker

LEVEL OF CERTIFICATION: II

AUTHORIZED EXAMINER: Harley K. Grain | LEVEL: III

AREA TESTED	XFER CHECK	BASE METAL SCAN	SCAN DIRECTION 2	5	7 & 8	0	INSPECTION LIMITATIONS	SURFACE CONDITION Base Metal	Weld	RESULTS Accept	Reject	REMARKS
1/2 wall depth only	N/A	Par	N/A	N/A	N/A	Par	Irregular surface	rough	N/A	reporting all	only	reference to determine I.D. of pipe.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop "A" Wall Side Date 9-22-82

Ind. No.	1°	Depth-OD To ID-Elbow	Depth-OD. To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.3"				
	2"	3.3"				
	3"	3.4"				
	4"	3.4"	4.9"			
	5"	3.4"	5.0"			
	6"	3.5"	5.0"			
	7"	3.4"	5.0"			
	8"	3.3"	5.0"			
1	9"	3.4"	5.0"	4.4" to 4.6"	100%	
	10"	3.4"	5.0"			
	11"	3.4"	4.9"			
	12"	3.4"	4.8"			
2	13"	3.4"	4.8"	4.6"		
2	14"	3.3"	4.9"	4.3"		
2	15"	3.3"	4.9"	4.2"	110%	
2	16"	3.4"	4.9"	4.3"		
	17"	3.5"	4.8"			
	18"	3.6"	4.9"			
3	19"	3.5"	4.9"	4.3"		
3	20"	3.5"	5.0"	4.3"		
3	21"	3.6"	5.1"	4.2"	70%	
3	22"	3.6"	5.1"	4.2"		
	23"	3.6"	5.0"			
	24"	3.6"	5.1"			

Operator [signature] Level: II

• • Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop "A" Wall Side Date 9-22-82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.6"	5.0"			
4	26"	3.6"	5.0"	4.4	50%	
	27"	3.6"	5.0"			
5	28"	3.6"	5.0"	4.3		
5	29"	3.7"	5.0"	4.2	120%	
	30"	3.6"	5.0"			
	31"	3.6"	5.0"			
	32"	3.5"	5.0"			
	33"	3.5"	5.0"			
	34"	3.6"	5.0"			
	35"	3.6"	5.0"			
	36"	3.6"	5.0"			
	37"	3.5"	5.0"			
	38"	3.5"	5.0"			
	39"	3.5"	5.0"			
	40"	3.5"	5.0"			
	41"	3.6"	4.9"			
	42"	3.5"	4.8"			
	43"	3.5"	4.7"			
	44"	3.4"	4.6"			
	45"	3.4"	4.7"			
	46"	3.5"	4.7"			
	47"	3.4"	4.6"			
	48"	3.4"	4.7"			

Operator: Earl L Fortner Level: II

* Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop A wall side Date 9/22/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	44"	3.4"	4.6" to 4.9"			
	50"	3.5"	4.7"			
	51"	3.4"	4.7"			
	52"	3.5	4.7"			
	53"	3.4"	4.7"			
	54"	3.4	4.7"			
	55"	3.4"	4.8"			
	56"	3.4"	4.8"			
	57"	3.4"	4.8"			
	58"	3.5"	4.9"			
	59"	3.4"	4.8"			
	60"	3.4"	4.8"			
	61"	3.3"	4.8"			
	62"	3.3"	4.8"			
	63"	3.2"	4.8"			
	64"	3.2"	4.9"			
	65"	3.2"	4.8"			
	66"	3.2"	4.9"			
	67"	3.2"	4.8			
	68"	3.2"	4.8"			
	69	3.2"	4.9"			
	70"	3.2"	4.8"			
	71"	3.2"	4.8"			
	72"	3.2"	4.8"			

Operator: Ronald Fahs Level: II

* Distance from edge of pump weld to Transducer

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop A wall side Date 9/22/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	7.3"	3.0"	4.7"			
	7.4"	3.0"	4.7"			
	7.5"	2.9"				

Operator: David J. Fabian Level: II

* Distance from edge of pump weld to Transducer.

ULTRASONIC EXAMINATION REPORT
NDE – UT – FORM 1
VIRGINIA ELECTRIC AND POWER COMPANY

STATION: North Anna | UNIT: 1 | DATE: 8/30/82 | PROCEDURE: NDE-UT-5 | SYSTEM: RC Pipe Loop 1

ITEM COMPONENT INSPECTED: Flow splitter connecting to pipe

MAINTENANCE REPORT NO:

BASE METAL: Stainless Cast Austenitic

WELD METAL: N/A

CALIBRATION BLOCK: V.G.B.-2

INSTRUMENT: Sonic SIA 043656

CALIBRATION CHECKS: Initial 11:00 Final 13:55

REP RATE: 1K

REJECT: OFF

DAMPING: 1000

FILTER: OFF

CAM SURF:	STRAIGHT BEAM SCAN DIRECTION 0		AXIAL SCANS DIRECTION 2 & 6				CIRCUMFERENTIAL SCANS DIRECTION 7 & 8			
					Distance From Sound Entry Point To				Distance From Sound Entry Point To	
CALIBRATION REFLECTOR LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION
U.T.	N/A	15								
L.T.	N/A	30								
MIN REF. DB	96									

Continuation sheets attached: Yes

Transfer record attached: No

TEST PERFORMED BY: David L. Jaffin

LEVEL OF CERTIFICATION: II

AUTHORIZED EXAMINER: | LEVEL:

AREA TESTED	XFER CHECK	BASE METAL SCAN	SCAN DIRECTION 2	6	7 & 8	0	INSPECTION LIMITATIONS	SURFACE CONDITION Base Metal	Weld	RESULTS Accept	Reject	REMARKS
pe length of the flow splitter from the OD on the reactor side only	N/A	Far	N/A	N/A	N/A	N/A	irregular O.D. surf.	rough	N/A	reporting of data only		reference dB determined from pipe

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id.: loop A Reactor side Date 8/30/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.4"				
	2"	3.5"	4.8"			
	3"	3.6"	5.0"			
	4"	3.6"	5.1"			
	5"	3.8"	5.0"			
	6"	3.7"	5.0"			
	7"	3.6"	5.3"			
	8"	3.6"	5.4"			
	9"	3.7"	5.3"			
	10"	3.6"	5.4"			
	11"	3.5"	5.4"			
	12"	3.3"	5.4"			
	13"	3.2"	5.3"			
	14"	3.1"	5.2"			
1	15"	3.1"	5.2"	4.2"		
1	16"	3.0"	5.2"	4.3"		
1	17"	3.1"	5.2"	4.3"		
1	18"	3.1"	5.1"	4.4"		
1	19"	3.1"	5.2"	4.4"		
1	20"	3.2"	5.3"	4.4"	120%	
1	21"	3.0"	5.0"	4.2"		
1	22"	3.1"	5.0"	4.2"		
	23"	3.1"	5.0"			
	24"	3.1"	4.9"			

Operator: David L. Fahn Level: II

* Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop A reactor side Date 8/30/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.2"	5.0"			
	26"	3.2"	4.9"			
	27"	3.2"	5.0"			
	28"	3.3"	4.9"			
	29"	3.3"	4.9"			
	30"	3.3"	4.8"			
	31"	3.2"	4.9"			
	32"	3.1"	4.8"			
	33"	3.3"	4.8"			
	34"	3.2"	4.8"			
	35"	3.2"	4.8"			
	36"	3.2"	4.9"			
	37"	3.3"	4.8"			
	38"	3.3"	4.9"			
	39"	3.3"	5.0"			
	40"	3.3"	4.9"			
	41"	3.4"	4.9"			
	42"	3.3"	5.0"			
	43"	3.2"	4.9"			
	44"	3.2"	4.9"			
	45"	3.1"	4.8"			
	46"	3.1"	4.8"			
2	47"	3.0"	4.8"	3.9"	110%	
2	48"	3.0"	4.8"	4.0"	110%	

Operator Ronald L. Fahrer Level: II

* Distance from edge of dump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop A reactor side Date 8/30/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	49"	3.0"	4.7"			
	50"	3.1"	4.6"			
	51"	3.0"	4.8"			
	52"	2.9"	4.8"			
	53"	2.9"	4.6"			
	54"	3.0"	4.7"			
	55"	3.0"	4.8"			
	56"	3.1"	4.8"			
	57"	3.1"	4.8"			
	58"	3.1"	4.8"			
	59"	3.1"	4.9"			
	60"	3.1"	4.9"			
	61"	3.2"	4.8"			
	62"	3.2"	4.8"			
	63"	3.3"	4.9"			
	64"	3.3"	4.8"			
	65"	3.3"	4.7"			
	66"	3.3"	4.8"			
	67"	3.3"	4.9"			
	68"	3.3"	5.0"			
	69"	3.3"	4.9"			
	70"	3.2"	4.8"			
	71"	33"	4.6"			
	72"	3.2"	4.9"			

Operator: David L. Faken Level: II

* Distance from edge of pump weld to Transducer.

[illegible] TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop A reactor side Date 8/30/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	73"	3.2"	4.9"			
	74"	3.2"	4.9"			
	75"	3.2"	5.0"			
	76"	3.3"	4.8"			
	77"	3.2"	4.7"			
	78"	3.1"				

Operator: David L. Tokar Level: II

* 1 Distance from edge of pump weld to Transducer.

No. 97024020

MEMORANDUM

TO J. M. McAvoy — North Anna - SEO

FROM W. S. M'Coy — September 30, 1982

Subject: Acceptability of Remaining Stubs in B Loop
DCP 82-S15 Flow Splitter Removal - North Anna 1

As seen in the attached memo from Mr. M. B. Shelton - PSE&C Materials Engineering Services, the wall and reactor side stubs remaining in B Loop following the plasma cuts are acceptable.

If you have any questions, please contact me.

W. S. M'Coy Rust

W. S. M'Coy

WSM/jad

cc: Mr. M. L. Bowling
Mr. J. C. Harris
Mr. R. K. Bayer - w/attachments
Mr. G. C. Ludden - w/attachments
Mr. M. B. Shelton
PSE&C Records Management NP-130 - w/attachments

Attachments - MtES Memo 9/29/82
Westinghouse Letter VRA-82-544, 9/10/82
Westinghouse Telecopy MT-SME 2551, 9/24/82
UT Reports

No. 97024020

MEMORANDUM

TO W. S. M'Coy

FROM M. B. Shelton

Richmond, Virginia

September 29, 1982

EVALUATION OF REMAINING FLOW SPLITTER PLATE STUBS

NORTH ANNA UNIT 1 - LOOP B

Materials Engineering Services (MtES) has reviewed the Visual Examination Reports and U.T. Reports of the remaining stubs on North Anna Unit 1 - Loop B.

Visual Inspection

The Visual Examination Reports indicate a number of dark areas on the cut edges of both stubs (wall side and reactor side). Visual examinations by MtES have determined that these dark areas are non-linear anomalies probably introduced during the cutting operation. These indications appear to be sound with no linear properties and will not affect the integrity of the stubs.

One linear indication is evident near the top of the wall side stub face. This indication appears to be a welding defect such as lack of fusion near the centerline of the weld or slag inclusions. No driving force exists to cause propagation of the indication and therefore it will not affect the integrity of the stub.

Ultrasonic Inspection

The Ultrasonic Testing Report indicates that some subsurface indications are present in both the wall side and reactor side stubs remaining in Loop B. Westinghouse has concluded that none of the loading frequencies match with the natural frequency of the remaining boss and therefore:

1. the indications will remain as is without propagating further.

2. the indications are not expected to propagate into the wall thickness. Should, however, such occur, the fatigue crack growth would be very small and not impair the pressure boundary.

Materials Engineering concurs with the above Westinghouse conclusions.

Based on the above information, MtES concludes the following:

1. The only linear indications in the Loop B stubs are those indicated by U.T. and one visually observed on the wall stub face.

2. These indications will not propagate and therefore no loose parts will be generated.

3. Pressure boundary integrity will be maintained.

M. B. Shelton

MBS/jad

cc: Mr. J. M. McAvoy
Mr. R. K. Bayer
Mr. J. C. Harris
Mr. W. C. Daley
Mr. G. C. Ludden
Mr. A. T. Vig
Records Management NP-130

3630 '82/09/24 03:46

Telecopy to (703) 894-5471, Ext. 255

September 24, 1982

MT-SME 2551

TO: W. S. McCoy
VEPCO SEO

SUBJECT: EVALUATION OF UT INDICATIONS IN LOOP B AND LOOP C BOSSES

Per your telecopies of 9/24/82, Subjects: B Loop UT Results and C Loop UT Results, the information below was obtained:

Indication No.	Location (in. from trailing edge)	Length (in)	Depth Range from Boss Face (in)
	LOOP B, WALL SIDE		
1	9-10	2	1.0
2	24	1	0.6
	LOOP B, REACTOR SIDE		
1	31-36	6	1.2-1.5
2	70	1	0.3
	LOOP C, WALL SIDE		
1	5-6	2	1.1
2	9-13	5	0.5 to 1.0
3	19-23	5	0.5 to 0.7
4	57-66	10	0.4 to 1.0

Our evaluations show that it is acceptable to leave the above indications in the bosses based upon the current understanding of the loading mechanisms. A letter report will follow through official channels.

J. N. Chirigos, Manager
Structural Materials Engineering

cc: R. R. Kent
/pw

No. 885.77
Rev. 0

ULTRASONIC EXAMINATION REPORT
NDE – UT – FORM 1
VIRGINIA ELECTRIC AND POWER COMPANY

STATION:	UNIT:	DATE:	PROCEDURE:	SYSTEM:
North Anna	1	9/22/82	NDE-UT-5	N.C. Loop B

ITEM COMPONENT INSPECTED: Reactor flow splice walls, d.e

MAINTENANCE REPORT NO: M1-82-08131604

BASE METAL: Cast stainless steel

WELD METAL: N/A

CALIBRATION BLOCK: V6B-1

INSTRUMENT: 05304E

CALIBRATION CHECKS: Initial 7:35

REP RATE: 1K

REJECT: OFF

Final 11:40

DAMPING: Min

FILTER: OFF

EXAM SURF:	STRAIGHT BEAM SCAN DIRECTION 0	AXIAL SCANS DIRECTION 2 & 5	CIRCUMFERENTIAL SCANS DIRECTION 7 & 8
S.U. NO.	JQ6860		
S.U. SIZE	10		
S.U. FREQ.	10 mc		
BEAM ANGLE	0°		

CALIBRATION REFLECTOR LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	SIGNAL AMPLITUDE	SWEEP POSITION	Distance From Sound Entry Point To: Scribe Line	Distance From Sound Entry Point To: 50% DAC LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	Distance From Sound Entry Point To: Scribe Line	Distance From Sound Entry Point To: 50% DAC LOCATION
½T	N/A	1.5								
1T	N/A	3.0								
GAIN REF. DB	73									

Continuation sheets attached Yes

Transfer record attached No

TEST PERFORMED BY: David L Foltz

LEVEL OF CERTIFICATION: II

AUTHORIZED EXAMINER: | LEVEL:

AREA TESTED	XFER CHECK	BASE METAL SCAN	SCAN DIRECTION 2	5	7 & 8	0	INSPECTION LIMITATIONS	SURFACE CONDITION Base Metal	Weld	RESULTS Accept	Reject	REMARKS
Loop B wall side only	N/A	Par	N/A	N/A	N/A	Par	Surface roughness	irregular	N/A	reporting of data only		reference UR obtained from pipe.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id.: Loop 6 wallside Date 9/22/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.2"				
	2"	3.3"				
	3"	3.4"	5.2"			
	4"	3.4"	5.2"			
	5"	3.4"	5.4"			
	6"	3.4"	5.4"			
	7"	3.3"	5.2"			
	8"	3.2"	5.2"			
1	9"	3.3"	5.3"	4.3"	70%	
1	10"	3.3"	5.1"	4.1"		
	11"	3.3"	5.3"			
	12"	3.3"	5.4"			
	13"	3.3"	5.3"			
	14"	3.3"	5.3"			
	15"	3.2"	5.3"			
	16"	3.2"	5.2"			
	17"	3.3"	5.1"			
	18"	3.3"	5.0"			
	19"	3.4	5.1"			
	20"	3.3"	5.1"			
	21"	3.4"	5.0"			
	22"	3.3"	5.0"			
	23"	3.3"	5.0"			
2	24"	3.3"	5.0"	44	80%	

Operator: David Patten Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop B wall side Date 9/22/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.4"	5.1"			
	26"	3.4"	5.2"			
	27"	3.3"	5.1"			
	28"	3.3"	5.1"			
	29"	3.2"	5.2"			
	30"	3.1"	5.1"			
	31"	3.0"	5.0"			
	32"	3.1"	5.0"			
	33"	3.0"	5.0"			
	34"	3.1"	5.0"			
	35"	3.0"	5.0"			
	36"	3.0"	5.0"			
	37"	3.2"	5.0"			
	38"	3.1"	5.0"			
	39"	3.0"	5.0"			
	40"	3.0"	5.0"			
	41"	3.0"	5.0"			
	42"	3.1"	5.0"			
	43"	3.1"	5.0"			
	44"	3.1"	5.0"			
	45"	3.2"	5.0"			
	46"	3.2"	5.0"			
	47"	3.1"	5.0"			
	48"	3.2"	5.0"			

Operator: Edward L. Fitten Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop "B" Wall Side Date 9-22-93

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	49"	3.1"	5.0"			
	50"	3.1"	5.1"			
	51"	3.2"	4.9"			
	52"	3.3"	5.0"			
	53"	3.4"	5.1"			
	54"	3.3"	4.9"			
	55"	3.3"	4.9"			
	56"	3.3"	5.0"			
	57"	3.3"	5.0"			
	58"	3.2"	5.0"			
	59"	3.2"	5.0"			
	60"	3.1"	5.1"			
	61"	3.2"	5.0"			
	62"	3.3"	5.0"			
	63"	3.3"	5.1"			
	64"	3.4"	5.0"			
	65"	3.3"	5.0"			
	66"	3.4"	5.1"			
	67"	3.4"	5.1"			
	68"	3.4"	5.2"			
	69"	3.3"	5.2"			
	70"	3.3"	5.2"			
	71"	3.3"	5.2"			
	72"	3.3"	5.2"			

Operator: David Tatum Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop "B" Wall Side Date 9-22-82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	73"	3.3"	5.2"			
	74"	3.4"	5.3"			
	75"	3.4"	5.2"			
	76"	3.4"	4.9"			
	77"	3.3"	4.8"			
	78"	3.3"	4.7"			
	79"	3.1"				

Operator: Carol L Fiskum Level: II

* 1. Distance from edge of pump weld to Transducer.

No. 885.11
Rev. 8

ULTRASONIC EXAMINATION REPORT
NDE – UT – FORM 1
VIRGINIA ELECTRIC AND POWER COMPANY

STATION:	UNIT:	DATE:	PROCEDURE:	SYSTEM:
North Anna	1	9/23/82	NDE-UT-5	R.C. Loop B

ITEM COMPONENT INSPECTED: Remaining flow splitter, reactor side

MAINTENANCE REPORT NO: M-82-09231302

BASE METAL: Cast stainless steel

WELD METAL: N/A

CALIBRATION BLOCK: VGB-1

INSTRUMENT: Sonic

CALIBRATION CHECKS: Initial 07:40 / Final 10:55

EXAM SURF:	STRAIGHT BEAM SCAN DIRECTION 0	AXIAL SCANS DIRECTION 2 & 5	CIRCUMFERENTIAL SCANS DIRECTION 7 & 8
S.U. NO.	J06860		
S.U. SIZE	1.0"		
S.U. FREQ.	1.0 Mhz		
BEAM ANGLE	0°		

REP RATE	REJECT	DAMPING	FILTER
1K	OFF	MIN	Hi

CALIBRATION REFLECTOR LOCATION	STRAIGHT BEAM SCAN SIGNAL AMPLITUDE	STRAIGHT BEAM SCAN SWEEP POSITION	AXIAL SCANS SIGNAL AMPLITUDE	AXIAL SCANS SWEEP POSITION	AXIAL SCANS Distance From Sound Entry Point To Scribe Line	AXIAL SCANS Distance From Sound Entry Point To 50% DAC LOCATION	CIRCUMFERENTIAL SCANS SIGNAL AMPLITUDE	CIRCUMFERENTIAL SCANS SWEEP POSITION	CIRCUMFERENTIAL SCANS Distance From Sound Entry Point To Scribe Line	CIRCUMFERENTIAL SCANS Distance From Sound Entry Point To 50% DAC LOCATION
½t	N/A	1.5								
1T	N/A	3.0								
GAIN										
REF. DB.	77									

Continuation sheets attached Yes

Transfer record attached No

TEST PERFORMED BY: David L. Tobin

LEVEL OF CERTIFICATION: II

AUTHORIZED EXAMINER: Edward D. Hollowell — LEVEL: II

AREA TESTED	XFER CHECK	BASE METAL SCAN	SCAN DIRECTION 2	5	7 & 8	0	INSPECTION LIMITATIONS	SURFACE CONDITION Base Metal	Weld	RESULTS Accept	Reject	REMARKS
Remaining flow splitter material	N/A	Par	N/A	N/A	N/A	Par	irregular surface	rough	N/A	repairing of defects		reference dB determined from pipe.
Loop B reactor side only												

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop "B" Reactor Side Date 9-23-82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.0"				
	2"	3.4"				
	3"	3.6"				
	4"	3.7"	5.4"			
	5"	3.8"	5.4"			
	6"	3.8"	5.4"			
	7"	3.7"	5.4"			
	8"	3.6"	5.6"			
	9"	3.7"	5.5"			
	10"	3.8"	5.5"			
	11"	3.9"	5.6"			
	12"	4.0"	5.6"			
	13"	4.0"	5.5"			
	14"	4.0"	5.4"			
	15"	3.9"	5.5"			
	16"	3.8"	5.6"			
	17"	3.8"	5.7"			
	18"	3.8"	5.9"			
	19"	3.9"	5.8"			
	20"	3.9"	5.7"			
	21"	4.0"	5.8"			
	22"	4.0"	*			Unable to obtain back reflection due to surface *
	23"	3.9"	5.8"			
	24"	3.8"	5.7"			

Operator: David L. Fahrni Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop "B" Reactor Side Date 9-23-82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.9"	5.9"			
	26"	3.9"	5.9"			
	27"	3.8"	6.0"			
	28"	3.9"	5.9"			
	29"	4.1"	6.0"			
	30"	3.9"	5.9"			
1	31"	4.0"	6.0"	4.6"		
1	32"	4.0"	5.9"	4.6"		
1	33"	4.0"	5.8"	4.6"	90%	
1	34"	4.2"	5.8"	4.4"		
1	35"	4.0"	5.9"	unable to obtain reflection from indication at 35"		
1	36"	3.8"	5.9"	4.4"		
	37"	3.7"	5.7"			
	38"	3.7"	*			
	39"	3.8"	*			
	40"	3.8"	*			
	41"	3.8"	*			
	42"	3.8"	*			* unable to obtain back reflection due to I.D. Tag
	43"	3.7"	5.5"			
	44"	3.6"	5.6"			
	45"	3.8"	5.6"			
	46"	4.0"	5.7"			
	47"	3.9"	5.6"			
	48"	3.9"	5.6"			

Operator: Harold Fahrer Level: II

* 1. Distance from edge of pump-weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. Loop B Reactor side Date 9/23/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	49"	3.8"	5.7"			
	50"	3.8"	5.6"			
	51"	3.8"	5.7"			
	52"	3.9"	5.5"			
	53"	3.7"	5.5"			
	54"	3.5"	5.5"			
	55"	3.6"	5.4"			
	56"	3.6"	5.3"			
	57"	3.6"	5.4"			
	58"	3.7"	5.5"			
	59"	3.6"	5.4"			
	60"	3.6"	5.4"			
	61"	3.7"	5.2"			
	62"	3.5"	5.2"			
	63"	3.6"	5.2"			
	64"	3.4"	5.2"			
	65"	3.6"	5.2"			
	66"	3.8"	5.2"			
	67"	3.7"	5.2"			
	68"	3.8	5.2"			
	69"	3.4"	5.1"			
2	70"	3.4"	5.1"	4.8"	250%	
	71"	3.2"	5.1"			
	72"	3.1"	5.0"			

Operator: David L. Fobian Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id.: Loop B Reactor side Date 9/23/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	73"	3.1"	5.0"			
	74"	3.1"	5.1"			
	75"	3.2"				

Operator: David L. Fobian Level: II

* 1. Distance from edge of pump weld to Transducer.

No. 97024020

MEMORANDUM

TO J. M. McAvoy

North Anna - SEO

FROM W. S. M'Coy

September 24, 1982

Subject: Acceptability of Remaining Stubs in C Loop

As seen in the attached memo from Mr. G. C. Ludden - PSE&C Materials Engineering Services, the wall and reactor side stubs remaining in C Loop following the plasma cuts are acceptable.

If you have any questions, please contact me.

W. S. M'Coy

WSM/jad

cc: Mr. M. L. Bowling
Mr. J. C. Harris, Jr.
Mr. R. K. Bayer
Mr. G. C. Ludden
PSE&C Records Management NP-130

Attachment

NO. 6702A020

MEMORANDUM

TO W. B. M'Coy

FROM G. C. Ludden

Richmond, Virginia

September 15, 1982

EVALUATION OF REMAINING FLOW SPLITTER PLATE STUBS - NORTH ANNA UNIT 1 - LOOP C

Materials Engineering Services (MtES) has reviewed the attached Visual Examination Reports and U.T. Report of the remaining stub on the wall side of North Anna Unit 1 - Loop C.

The Visual Examination Report documented dark areas on the cut edge of the stub. Visual examinations by MtES have determined that these indications are non-linear anomalies probably introduced during the cutting operation. These indications appear to be sound, with no linear properties, and will not propagate, and therefore will not affect the integrity of the stubs.

The Ultrasonic Testing Report indicates that subsurface indications are present in the remaining stub of Loop C - wall side. The attached Westinghouse report concludes that none of the loading frequencies match with the natural frequency of the remaining boss and therefore:

1) The indications will remain as is without propagating further.

2) The indications are not expected to propagate into the wall thickness. Should however such occur, the fatigue crack growth would be very small and not impair the pressure boundary.

Materials Engineering concurs with the above Westinghouse conclusions. U.T. of the Loop C-RV side of the flow splitter plate has determined that no indications exist on that side.

Based on the above information MtES concludes the following:

1) The only linear indications in the Loop C stubs are those indicated by U.T.

2) These indications will not propagate.

3) Because no indications will propagate, no loose parts will be generated.

4) Pressure boundary integrity will be maintained.

G. C. Ludden

GCL/wes

cc: J. M. McAvoy
R. K. Bayer
J. C. Harris
W. C. Daley
M. B. Shelton
Records Management NP-130

(W)

3630 '82/09/24 03:46

Telecopy to (703) 894-5471, Ext. 255

September 24, 1982

MT-SME 2551

TO: W. S. McCoy
VEPCO SEO

SUBJECT: EVALUATION OF UT INDICATIONS IN LOOP B AND LOOP C BOSSES

Per your telecopies of 9/24/82, Subjects: B Loop UT Results and C Loop UT Results, the information below was obtained:

Indication No.	Location (in. from trailing edge)	Length (in)	Depth Range from Boss Face (in)
	LOOP B, WALL SIDE		
1	9-10	2	1.0
2	24	1	0.6
	LOOP B, REACTOR SIDE		
1	31-36	6	1.2-1.5
2	70	1	0.3
	LOOP C, WALL SIDE		
1	5-6	2	1.1
2	9-13	5	0.5 to 1.0
3	19-23	5	0.5 to 0.7
4	57-66	10	0.4 to 1.0

Our evaluations show that it is acceptable to leave the above indications in the bosses based upon the current understanding of the loading mechanisms. A letter report will follow through official channels.

J. N. Chirigos, Manager
Structural Materials Engineering

cc: R. R. Kent
/pw

No. 883.77
Rev. B

ULTRASONIC EXAMINATION REPORT
NDE – UT – FORM 1
VIRGINIA ELECTRIC AND POWER COMPANY

STATION:	UNIT:	DATE:	PROCEDURE:	SYSTEM:
North Anna	1	9/1/82	NDE – UT-5	R.C. Pipe loop C

ITEM COMPONENT INSPECTED: Flow splitter coming in pipe

MAINTENANCE REPORT NO:

BASE METAL: Cast stainless steel (~~carbon steel~~)

WELD METAL: N/A

CALIBRATION BLOCK: V6R-01

INSTRUMENT: Sonic Mk1 04365E

REP RATE: 1K

REJECT: OFF

DAMPING: Min

FILTER: OFF

CALIBRATION CHECKS: 8/31/82 Initial 11:05; Final 14:00; 9/1/82 Initial 8:10; Final 9:55

Continuation sheets attached: Yes

Transfer record attached: No

TEST PERFORMED BY: David L Faber

LEVEL OF CERTIFICATION: II

AUTHORIZED EXAMINER: | LEVEL:

EXAM SURF:	STRAIGHT BEAM SCAN DIRECTION 0		AXIAL SCANS DIRECTION 2 & 8				CIRCUMFERENTIAL SCANS DIRECTION 7 & 8			
					Distance From Sound Entry Point To				Distance From Sound Entry Point To	
CALIBRATION REFLECTOR LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION	SIGNAL AMPLITUDE	SWEEP POSITION	Scribe Line	50% DAC LOCATION
S.U. NO.	I068G0									
S.U. SIZE	1.0"									
S.U. FREQ.	10 Mhz									
BEAM ANGLE	0°									
½T	N/A	1.5								
1T	N/A	3.0								
GAIN										
REF. DB.	95									

AREA TESTED	XFER CHECK	BASE METAL SCAN	SCAN DIRECTION 2	8	7 & 8	0	INSPECTION LIMITATIONS	SURFACE CONDITION Base Metal	Weld	RESULTS Accept	Reject	REMARKS
The length of the flow splitter from the OD	N/A	Par	N/A	N/A	N/A	N/A	irregular OD surface	rough	N/A	reporting of data only		reference dB determined from pipe.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C reactor side Date 8/31/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.3"				
	2"	3.6"				
	3"	3.6"	4.9"			
	4"	3.7"	5.2"			
	5"	3.7"	5.3"			
	6"	3.6"	5.3"			
	7"	3.6"	5.3"			
	8"	3.6	5.3"			
	9"	3.7"	5.3"			
	10"	3.6"	5.3"			
	11"	3.7"	5.3"			
	12"	3.7"	5.3"			
	13"	3.7"	5.2"			
	14"	3.7"	5.3"			
	15"	3.7"	5.3"			
	16"	3.8"	5.3"			
	17"	3.6"	5.4"			
	18"	3.7"	5.4"			
	19"	3.7"	5.3"			
	20"	3.7"	5.2"			
	21"	3.7"	5.2"			
	22"	3.6"	5.3"			
	23"	3.7"	5.3"			
	24"	3.7"	5.1"			

Operator: David L Tokin Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C wall side Date 9/1/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.4"	5.1"			
	26"	3.4"	5.2"			
	27"	3.4"	5.1"			
	28"	3.4"	5.0"			
	29"	3.5"	5.0"			
	30"	3.4"	5.0"			
	31"	3.3"	5.0"			
	32"	3.4"	4.9"			
	33"	3.3"	4.9"			
	34"	3.2"	5.0"			
	35"	3.2"	5.0"			
	36"	3.2"	unable to obtain			Limitation due to
	37"	3.2"	back reflection			I.D. tag
	38"	3.2"	|			|
	39"	3.3"	|			|
	40"	3.3"	|			|
	41"	3.2"	5.0"			
	42"	3.2"	4.9"			
	43"	3.2"	5.0"			
	44"	3.3"	5.0"			
	45"	3.4"	5.0"			
	46"	3.4"	5.0"			
	47"	3.3"	5.0"			
	48"	3.4"	5.0"			

Operator: David L. Fokes Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C wall side Date 9/1/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	1"	3.3"				
	2"	3.4"				
	3"	3.4"	5.4"			
	4"	3.4"	5.4"			
1	5"	3.5"	5.4"	4.3"		
1	6"	3.6"	5.5"	4.4"	25%	
	7"	3.8"	5.4"			
	8"	3.5"	5.4"			
2	9"	3.7"	5.3"	4.4"		
2	10"	3.5"	5.4"	4.6"		
2	11"	3.5"	5.4"	4.4"		
2	12"	3.5"	5.5"	4.8"		
2	13"	3.5"	5.3"	4.8"	20%	
	14"	3.5"	5.3"			
	15"	3.4"	5.4"			
	16"	3.4"	5.4"			
	17"	3.5"	5.3"			
	18"	3.5"	5.3"			
3	19"	3.6"	5.1"	4.6"	85%	
3	20"	3.5"	5.2"	4.5"		
3	21"	3.6"	5.2"	4.5"		
3	22"	3.5"	5.0"	4.4"		
3	23"	3.4"	5.1"	4.4"		
	24"	3.4"	5.0"			

Operator: David L. Tatum Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C reactor side Date 8/31/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	49"	3.9"	5.2"			
	50"	3.8"	5.1"			
	51"	3.7"	5.2"			
	52"	3.7"	5.1"			
	53"	3.6"	5.0"			
	54"	3.5"	5.0"			
	55"	3.6"	4.9"			
	56"	3.6"	5.1"			
	57"	3.6"	5.0"			
	58"	3.7"	5.1"			
	59"	3.6"	5.1"			
	60"	3.6"	5.1"			
	61"	3.6"	5.3"			
	62"	3.6"	5.5"			
	63"	3.6"	5.4"			
	64"	3.5"	5.4"			
	65"	3.5"	5.5"			
	66"	3.5"	5.5"			
	67"	3.6"	5.3"			
	68"	3.4"	5.2"			
	69"	3.4"	5.2"			
	70"	3.5"	5.0"			
	71"	3.5"				

Operator: David L. Fokin Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C reactor side Date 8/31/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	25"	3.7"	5.2"			
	26"	3.8"	5.3"			
	27"	3.8"	5.4"			
	28"	3.7"	5.3"			
	29"	3.7"	5.4"			
	30"	3.7"	5.3"			
	31"	3.7"	5.0"			
	32"	3.7"	5.1"			
	33"	3.7"	5.2"			
	34"	3.8"	5.2"			
	35"	3.8"	5.0"			
	36"	3.7"	5.0"			
	37"	3.6"	5.2"			
	38"	3.7"	5.2"			
	39"	3.5"	5.1"			
	40"	3.5"	5.0"			
	41"	3.6"	5.1"			
	42"	3.6"	5.1"			
	43"	3.6"	5.0"			
	44"	3.7"	5.1"			
	45"	3.7"	5.1"			
	46"	3.8"	5.1"			
	47"	38"	5.0"			
	48"	3.8"	5.2"			

Operator: David L. Fokens Level: II

* 1. Distance from edge of pump weld to Transducer.

ELBOW SPLITTER TRANSDUCER LOCATION DATA SHEET

Elbow Id. loop C wall side Date 9/1/82

Ind. No.	1*	Depth-OD To ID-Elbow	Depth-OD To Cut Edge	Dist.-OD To Disc.	Max. Amplitude	Remarks
	49"	3.3"	5.0"			
	50"	3.2"	5.0"			
	51"	3.3"	5.0"			
	52"	3.2"	5.0"			
	53"	3.2"	5.0"			
	54"	3.4"	5.0"			
	55"	3.4"	4.9"			
	56"	3.5"	5.0"			
4	57"	3.3"	5.0"	4.6"		
4	58"	3.3"	5.1"	4.5"		
4	59"	3.2"	5.0"	4.4"		
4	60"	3.3"	5.0"	4.3"		
4	61"	3.4"	5.2"	4.3"	224%	
4	62"	3.4"	5.2"	4.5"		
4	63"	3.4"	5.3"	4.3"		
4	64	3.4"	5.2"	4.4"		
4	65"	3.5"	5.2"	4.5"		
4	66"	3.4"	5.1"	4.4"		
	67"	3.4"	5.1"			
	68"	3.4"	5.1"			
	69"	3.6"	5.2"			
	70"	3.5	5.1"			
	71"	3.4	5.0"			
	72"	3.2"				

Operator: David L. Fokens Level: II

* 1. Distance from edge of pump weld to Transducer.

ATTACHMENT 4

No. 97024020

MEMORANDUM

TO Mr. J. M. McAvoy — Richmond, Virginia

FROM W. S. M'Coy — October 19, 1982

REMOVAL OF RCP FLOW SPLITTERS
NORTH ANNA UNIT 1

Attached is the corrosion/erosion study on the remaining flow splitter stubs as you requested. This should complete our analysis on the effects of removing the splitter plates.

If you have any questions or require additional information, please contact me.

W. S. M'Coy

WSMC/nh

Attachment

cc: Mr. J. C. Harris, Jr.
Mr. T. W. Bernett
Mr. W. T. Davidson
Mr. G. C. Ludden
Mr. M. B. Shelton
Mr. R. K. Bayer, w/attachment)
PSE&C Records Management NP-130, (w/attachment)

No. 97024020

MEMORANDUM

TO Mr. W. S. M'Coy — Richmond, Virginia

FROM M. B. Shelton — October 15, 1982

CORROSION/EROSION OF NORTH ANNA UNIT 1 FLOW SPLITTER PLATE STUBS

In association with the flow splitter plate removal effort a review of corrosion/erosion of the remaining flow splitter stubs in Loops "A", "B", and "C" of North Anna Unit 1 was performed. The possibility of stub erosion was addressed in Westinghouse letter VRA-82-555, dated October 12, 1982 (Attached).

Materials Engineering Services has performed a review of corrosion resistance of the remaining flow splitter stubs. This review considered the possibility of general corrosion, corrosion fatigue, and stress corrosion cracking due to environment, material susceptibility, and configuration of indications present in the stubs.

The remaining stub portion, or boss, of the flow splitter is integrally cast with the reactor coolant pipe elbow and meets the requirements of ASTM A351 GrCF8M. This alloy is commonly used for reactor coolant piping because of its resistance to all forms of corrosion in primary loop water. Based on this alloy's history in the primary loop environment, general corrosion of the boss is not expected. Also, all visual indications present on the stubs are open and rounded, thus removing the possibility of crevice corrosion.

For corrosion fatigue to occur a corrosive environment and vibratory stresses must be present simultaneously. It was previously stated that corrosion of the boss will not occur, therefore corrosion fatigue cannot occur. However, if it is assumed that some crevice corrosion is present (also unlikely as discussed above) it is necessary to determine if vibratory stresses will be present. Westinghouse has determined that none of the loading frequencies present (e.g. vortex shedding frequency, pump blading frequency, etc.) match with the natural frequency of the remaining boss (see Attachment). As a result the boss will not be excited by the loadings and corrosion fatigue will not occur.

Stainless steel castings with duplex structures, such as CF8M, have demonstrated excellent resistance to intergranular stress corrosion. Ferrite distribution throughout the matrix of the essentially austenite structure is in the form of discontinuous pools. These pools are preferred carbide

precipitation sites and thus reduce the susceptibility of this alloy to intergranular attack. This resistance to intergranular attack combined with low stress and an essentially non-corrosive environment, assures that stress corrosion cracking will not occur in the flow splitter boss.

M. B. Shelton

Attachment

MBS/wes

cc: Mr. W. C. Daley
Mr. J. C. Harris
Mr. G. C. Ludden
Mr. A. T. Vig
Records Management NP-130

ATTACHMENT 4

No. 97024020

MEMORANDUM

TO Mr. J. M. McAvoy — Richmond, Virginia

FROM W. S. M'Coy — October 19, 1982

REMOVAL OF RCP FLOW SPLITTERS
NORTH ANNA UNIT 1

Attached is the corrosion/erosion study on the remaining flow splitter stubs as you requested. This should complete our analysis on the effects of removing the splitter plates.

If you have any questions or require additional information, please contact me.

W. S. M'Coy

WSMC/nh

Attachment

cc: Mr. J. C. Harris, Jr.
Mr. T. W. Bernett
Mr. W. T. Davidson
Mr. G. C. Ludden
Mr. M. B. Shelton
Mr. R. K. Bayer, w/attachment)
PSE&C Records Management NP-130, (w/attachment)

No. 97024020

MEMORANDUM

TO Mr. W. S. M'Coy Richmond, Virginia

FROM M. B. Shelton October 15, 1982

CORROSION/EROSION OF NORTH ANNA UNIT 1 FLOW SPLITTER PLATE STUBS

In association with the flow splitter plate removal effort a review of corrosion/erosion of the remaining flow splitter stubs in Loops "A", "B", and "C" of North Anna Unit 1 was performed. The possibility of stub erosion was addressed in Westinghouse letter VRA-82-555, dated October 12, 1982 (Attached).

Materials Engineering Services has performed a review of corrosion resistance of the remaining flow splitter stubs. This review considered the possibility of general corrosion, corrosion fatigue, and stress corrosion cracking due to environment, material susceptibility, and configuration of indications present in the stubs.

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precipitation sites and thus reduce the susceptibility of this alloy to intergranular attack. This resistance to intergranular attack combined with low stress and an essentially non-corrosive environment, assures that stress corrosion cracking will not occur in the flow splitter boss.

M. B. Shelton

Attachment

MBS/wes

cc: Mr. W. C. Daley
Mr. J. C. Harris
Mr. G. C. Ludden
Mr. A. T. Vig
Records Management NP-130