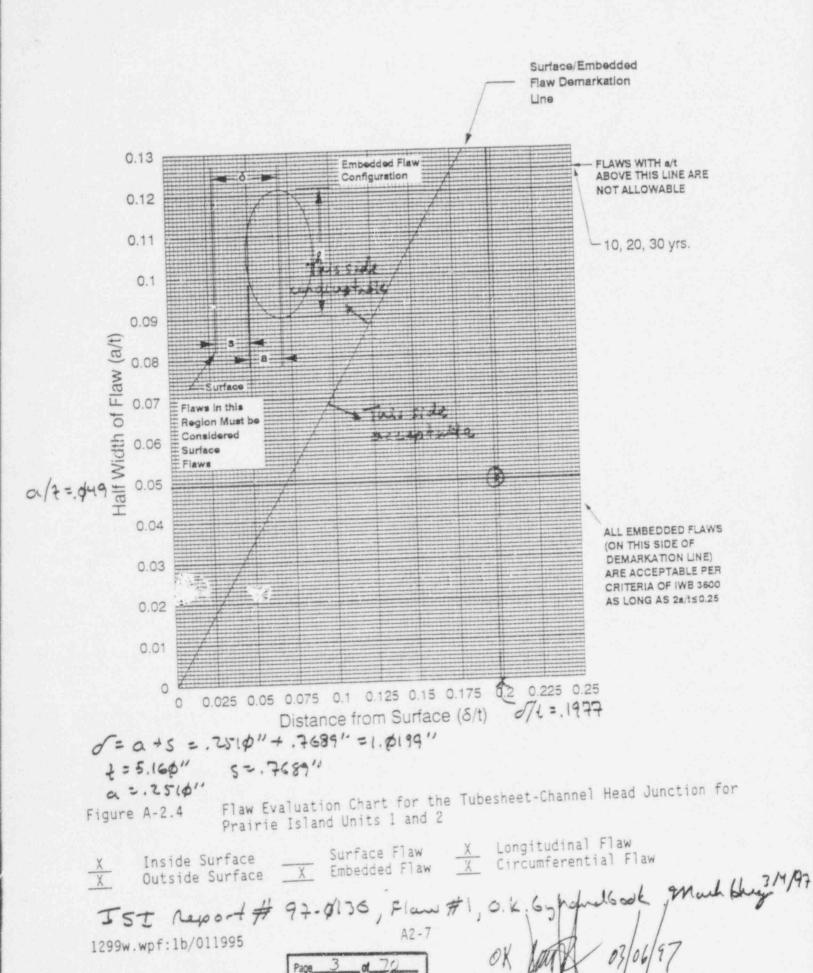
| Opera   | tions            | ates Po             | cenar | ce Su          | pt 4               | 5 UL            | TRA              | e Island<br>SONIC EX                         | MIN               | ATION          |                     | eport#                     |                    | R1                    |
|---|------------------|---------------------|-------|----------------|--------------------|-----------------|------------------|--|-------------------|----------------|---------------------|----------------------------|--------------------|-----------------------|
| Mater:<br>System                                | menaras versenes | Specia              | al Pr | ISO            | es                 | RE              | PO               | S/N 2618                                     |                   |                |                     |                            |                    | TOTAL COMMENTS OF THE |
|   |                  | rator 2             | 2     |                | I- 37B             |                 |                  | Item Item Description W-A Tube Sheet to Head |                   |                |                     |                            |                    |                       |
| Material Size/Length SA216 WCC / SA508 CL2 135" |                  |                     |       |                |                    | Th              | ick/Dia<br>5.160 | Te   | mp 7:             | Secretary and  | Surface<br>BLENDED  |                            | ion                |                       |
| Proced<br>ISI-U                                 |                  | Res                 | 7 7   | Fie            | ld Char            | nge <u>N/</u> / | A                | W R Numb<br>961222                           |                   | ISI            | Cont                | ractor                     | Exam<br>03/        | Date<br>07/97         |
| Calib:<br>Report                                |                  |                     | 002   |                | am Angl<br>45' (No |                 | )                | Temp Gar                                     |                   | S/N            |                     | Start<br>am End            |                    | hours                 |
| Evalua<br>20%                                   | ation<br>DAC     | Level               |       | ortin<br>0% DA | g Level            |                 |                  | lock<br>Std L                                | 25A<br>MT-1       |                | Ref<br>Scan         | Sensit<br>Sensit           | ivity 2            | 0/7 dB<br>0/16 dB     |
| RESUL   | rs na<br>Ge      | AD = No<br>IO = Geo | Appa  | rent<br>Y      | Discont            | inuit<br>Vis    | ies<br>ual       | ; L = Li:<br>= Non-Se                        | near              | ; S =<br>on XI | Spot<br>Visu        | ; M = M<br>al Exam         | ultiple<br>ination |                       |
| Scan<br>Nmbr                                    | Res-<br>ults     | Indicat<br>Type     | tion  |                | Metal<br>Path      | Surf<br>Dist    | 1                | irc<br>ocation                               |                   | Axial<br>Locat |                     | Indi<br>Leng               | cation<br>th       | Amp<br>%DAC           |
|   |                  |                     |       |                |                    |                 |                  |  |                   |                |                     |                            |                    |                       |
| LIMITAT   | IONS:            | Refer to RF         | T No. | 97-0136.       |                    |                 | r Barrol Lares   |  |                   |                |                     | pe nelle amus, none electr |                    |                       |
| REMARK  | Rev              | er to RPT N         | tune  | at Hem         | 17 04 0            | law Eval        | I.               | on. This reports 1 flaw 5,1                  | ung 1             | works          | d as NAI<br>sheet 1 | eskeds i                   | later da           | ta .                  |
| SKETC   | H                |                     |       |                |                    | 4/4/9           |                  | PERSON                                       |                   |                |                     |                            |                    |                       |
|   |                  |                     |       |                |                    |                 |                  | Examin                                       |                   | N/A<br>N/A     |                     |                            |                    | evel                  |
|   |                  |                     |       |                |                    |                 |                  | Contra<br>Revi                               |                   |                | N/A                 |                            |                    | /_/_<br>Date          |
|   |                  |                     |       |                |                    |                 |                  | NSP<br>Revi                                  | ew:               | To             | his                 | unn                        | g) 3               | 7/7/97<br>Date        |
|   |                  |                     |       |                |                    |                 |                  | ANII<br>Revi                                 | ew:               | 1              | Put                 | Re                         | 3                  | / <u>Z</u> 47         |
|   |                  |                     |       |                |                    |                 |                  |  | Contract Contract |                | and the control     | toxumbas scarrentesi sira  | Page               | 1 of 7                |

| ISI Report Number 97-0136 P. Flaw Number   | Disposition Worksheet   |
|--|---|
| Part A II I will 2 L II  | 3. Item Number B 2. 40 14. Total Number of Pages 1  |
| ISI Interval & OK Reviewer 18 1  | 5. Code Edition and Addenda & OK Reviewer   |
| second interval third interval preservice  | □ 80 W81 □ 86 no addenda 🐿 89 no addenda □ other  |
| Acceptance Standard  | WB-3512   |
| A Property of the Control of the Con | WC-3512   |
| Calculations OK Reviewer   |   |
|  | q worksheet: l= 0.80" a = 0.25%   |
|  | Planar toon = 5.160" S = 0.7689   |
| $\frac{a}{l} = \frac{0.2510}{0.80} = 0.3138$   | Round to 0.31   |
| Use 4 to 12 subsurface   | Flaw:   |
| $\frac{a}{t}\% = \frac{0.2510}{5.160} = 0.0$   | 486 Round to 4,9%   |
| From Table INB-3510-1  |   |
| 4 4 2 Y=   | $\frac{s}{a} = \frac{0.7689}{0.2510} = 3.1 \Rightarrow \gamma = 1$  |
| 6.30 4.4 Y } Therefore   | tion % = 0,31, 4% = 4.5%  |
| 0.35 5.14 ) Ticler bott  | The 1 = 0,31, 7 10 = 4.3 10   |
|  |   |
|  |   |
| 1  |   |
|  |   |
| 8. Results & OK Reviewer 1   | 21  |
| a/t = 0.   | . 31  |
| Approximation of the contract  |   |
| Approximation of the contract  | 976   |
| calculated 0/t %= 4  | 970   |
| calculated a/t %= 4  Code allowable a/t %= 4   |   |
| calculated 0/t %= 4 Code allowable 0/t %= 4  laminar flaw surface area: (0.75 · l · w) = N  9. Table used for analysis  OK Reviewer  1WB-3510-2  | 1   1   1   1   1   1   1   1   1   1   |
| calculated 0/t %= 4 (Code allowable 0/t %= 4 (Indicated 1)   | 1   1   1   1   1   1   1   1   1   1   |
| Code allowable 0/t %= 4  | WB-3510-3   |
| Code allowable   | IWB-3510-3  |
| calculated 0/t %= 4  Code allowable 0/t %= 4  laminar flaw surface area: (0.75 • l • w) = 1  9. Table used for analysis  OK Reviewer   | IWB-3510-3  |
| calculated 0/t %= 4  Code allowable 0/t %= 4  laminar flaw surface area: (0.75 • l • w) = N  9. Table used for analysis  OK Reviewer   | WB-3510-3   |
| calculated 0/t %= 4  Code allowable 0/t %= 4  laminar flaw surface area: (0.75 · l · w) = N  9. Table used for analysis  OK Reviewer   | WB-3510-3   |
| calculated 0/t %= 4  Code allowable 0/t %= 4  laminar flaw surface area: (0.75 • t • w) = 1  9. Table used for analysis  OK Reviewer   | Mar.   Mar. |
| Code allowable a/t %= 4  Code allowable a/t %= 4  Iaminar flaw surface area: (0.75 • l • w) = N  9. Table used for analysis  OK Reviewer   |   |
| calculated 0/t %= 4  Code allowable 0/t %= 4  laminar flaw surface area: (0.75 • l • w) = 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2  | Mar.   Mar. |
| Code allowable a/t %= 4    Code allowable a/t %= 4    Iaminar flaw surface area: (0.75 • l • w) = N    Particle used for analysis   OK Reviewer   N    IWB-3510-1  |   |

NUNISINGAISINSIFDWR0 DOC ISI Flaw Disposition Worksheet Revision 0

Report 97-01368)



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| ISI Flaw Sizi  | ing Worksheet  |
|--|--|
| 1. ISI Report Number PI 2 97-0136 2. Flaw Number   | 1. 3. Item Number 73 2. 40   |
| 4. ISI Interval  OK Reviewer 14 5. Code Edition and Addenda  | DOK Reviewer ( 6. Method WUT I RT  |
| A STATE OF THE PARTY OF THE PAR | enda 🗵 89 no addenda 🗆 other 💮 🗆 PT 🗆 MT   |
| 7. Flaw Sketch DOK Reviewer 62 239   | 7.2  |
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| 0  | ,5021 5.160"   |
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| Side View  |  |
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| BTM Head   |  |
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|  |  |
| 8. Calculations COK Reviewer C   |  |
|  |  |
| show determination of surface or subsurface  see a Hacked  |  |
|  |  |
| Show determination of type of "a" to use  See attached   | 7  |
| see attached   |  |
|  | 1 / 2600 . (1  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Styles Prepared 10. Code Flaw Dimensions QOK Reviewer  |  |
| "i" = 0.8000" "a" = 0.2510" "forming" = 5.160  | ""tmessured" = N/A "S" = 0.7689" "W" = N/A   |
|  | measured N/A O 1 1001 11 1711  |
| 11. Flaw Type CVOK Reviewer Subsurface Plana (UT/RT)   | ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure GOK Reviewer 5  | -3350-1 □ IWA-3380-1 □ IWA-3400-1  |
|  | A-3350-1 □ IWA-3380-1 □ IWA-3400-1<br>A-3360-1 □ IWA-3390-1  |
| 13. Flaw Characterization Figure Number Flaw 1   | Flaw 2   |
| 14. Was IWA-3300 Flaw Characterization followed? **D yes   | The BOK Reviewer 3   |
| 15. The correct Code Edition and Addenda was available and used. The pare 16. Prepared by and date   | 17. Review by and date / /   |
| Tom all 2/23/97  | E 1 Show 3-12-97   |
| - 10m Schl 2/23/71   | 6.0.   |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures   |
| specifications and procedures  | Constitution of the Consti |
|  | Page 4 of  |
|  | 07-013681  |

NSP O USTUGASAISIPSWR1 DOC ISI Flaw Sizing Worksheet Revision!

**REVISION 11-11-94** 

## Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface  |       |
|--|-------|
| ASME SECT XI 1989 W/ NO ADDENDA INITIAL TO VERIFY  |       |
| ISI Report # 97-0136 Evaluation Performed By: Tom Jours Date: 2/23/97 Flaw # 1 Date: 3-1V-97   | į.    |
| Length Length of the flaw "" is determined by finding the difference between L1 and L2 for perpendicular scans, W1 and W2 for parallel scans. L and W values are from page of the UT report.  t = 234 _ 6 (L2)233 _ 8 (L1) = 8 inches.   |       |
| Thickness Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page 1 of the UT report. "t" = 5 . 160 inches  |       |
| Calibration The measured angle in the calibration block was _450_ degrees  |       |
| Calculations using metal path  From page of the UT report, Scan #1  The flaw exhibited 20% DAC at _5 _ 50 and _6 _ 21 inches MP. Max amplitude is at _5 _ 75 inches MP with the transducer exit point at _2 _ 2 inches (W) from the centerline of the weld and _234.2 inches (L) from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative.)   |       |
| 1) Determine the upper depth of the flaw from the exam surface.  _550_ (metal path at 20% upper) * COS of the measured angle _07071 = _38890_ inches depth.  |       |
| Determine the lower depth of the flaw from the exam surface. 6 21 (metal path at 20% lower) * COS of the measured angle 0 7071 = 4 3911 inches depth.  |       |
| Determine the depth of the flaw from the exam surface at the maximum amplitude point.  _575_ (metal path at maximum amplitude point) * COS of the measured angle _07071 =40658_ inches depth.  |       |
| Determine the distance from the center line of the weld to the maximum amplitude point of the flaw.  5 75 (metal path at maximum amplitude point) squared = 33 . 0625 (a²)  4 0658 (depth at maximum amplitude point) squared = 16 . 5307 (b²)  7 a² - b² = 4 . 0659 inches of surface distance to the flaw from the transducer exit point.  2 2 (Wmax) - 4 0659 (surf dist) = -1 . 8659 inches to the centerline of the weld. |       |
| Determine S by picking the smaller of the following;  S = 3 _8890_ (result of 1) = distance between exam surface and the upper flaw tip  >> OR <<  S = 5 _ 160_ (part "t") - 4 _ 3911_ (result of 2) = 0 _ 7689_ distance between the side opposite exam surface and the lower flaw tip  |       |
| 6) Determine 2d in though wall thickness.  4 3911 (from step 2) - 3 8890 (from step 1) = 0 5021 inches.  |       |
| Determination of surface or subsurface $0.4d = (2d/2) * 0.4 = 0.1004$<br>Compare to S (from step 5)<br>If S is less than 0.4d, the flaw is surface. $a = 2d + S = 1$ inches.<br>If S is greater than or equal to 0.4a the flaw is sub-surface. $a = 2a/2 = 0.2510$ inches.   |       |
| l = 0.8  (for a/l > 0.5,  l = 2a) $t = 5.160  (part thickness)a = 0.2510  (surf or sub surf circle one)$ $s = 0.7689$  | DEACS |

flawtrig (for perpendicular scans) Rev 0



March 5, 1997 Date

CSC-2

Location

From Ad Hoc Evaluation Group

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTININ TO RU CLOSURE HEAD W. L PER TELLON APPROVAL TOM TOWES 1:001

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- · The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- . The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | - 4  | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

| 1  | ISI Flaw Dist  | osition Workshee                        | t                    | 1   | The section of Parks and Section 1 |
|--|--|---|----------------------|---|------------------------------------|
| ISI Report Number 97 - 0136 2. Flaw N  | vymber 9   | 3. Item Number 8 2                      | 1/2                  | 4/Total Number o  | Pages /                            |
| 1 2 97 - 01361   | A - 150  | ode Edition and Addenda                 | OK Beviewer          | M.  |                                    |
| ISI Interval OK Reviewer  Second interval third interval   |  | 80 W81 🖸 86 no adden                    | da 🗷 89 no adder     | da 🗆 other  | 3545.5                             |
| Acceptance Standard NOK Reviewer   | (-   |   |                      |   | C 0100 3510                        |
| /  | IWB-3511   | 3512 🗆 IWB-3514                         | □ IWB-3515           | □ IWB-3516  | ☐ IWB-3518                         |
|  | 1 IWC-3511   IWC-  | 3512 🗆 IWC-3513                         | ☐ IWC-3514           | ☐ IWC-3515  |                                    |
| Calculations OK Reviewer   |  |   |                      |   |                                    |
| T # 1 / \  |  |   | 0                    |   |                                    |
| From attached ISI  | Tlaw Sizin   | e worksheet                             | : 1 = 0.8            | a =   | 0.0636                             |
| Flan Type : Subsi  | urface Plan.   | ar                                      | -turn =              |   |                                    |
| a 0.0636   |  | , ,                                     |                      |   |                                    |
| $\frac{a}{\ell} = \frac{0.0636}{0.80} = 0.$  | 0795 R   | ound to                                 | 0.08                 |   |                                    |
| use 4 to 12 8  | out surface  | Flaw:                                   |                      |   |                                    |
| $\frac{4}{7}\% = \frac{0.063}{5.160}$  | 6 = 0.   | 0123 Royn                               | d to                 | , 2%  |                                    |
|  |  |   |                      |   |                                    |
| From Table INB   | - 3510 -1:   |   |                      |   |                                    |
| 4/2 af 7   | Y = S  | $=\frac{1.2233}{0.0636}$                | = 19.                | 2 => )  | 1 = 1                              |
| 0,05 2.24  | a  | 0.0636                                  |                      |   |                                    |
| 0,05 2.27  |  |   |                      |   |                                    |
| 0.10 2.5Y  |  |   |                      |   |                                    |
| 8. Results OK Reviewer   | ah = 0.0   | 2 8                                     |                      |   |                                    |
|  | Application of the second seco | AND DESCRIPTION OF PERSONS              |                      |   |                                    |
| calcula  | jed a/t %= 1, 2  | 10                                      | 7                    |   |                                    |
| Code allowa  | ble a/t %= 2.2%  | < 94 7 < 2.5                            | /0                   |   |                                    |
| laminar flaw surface area: (0.7  | 9 . ( . W) = NA  |   |                      |   |                                    |
| 9. Table used for analysis OK Reviewer   | <b>1</b>   |   |                      | 24.1.2  | WB 2512.1                          |
| ₩B-3510-1  | feet water and you are   | WB-3510-3 □ IWB-3<br>IWB-3514-2 □ IWB-3 |                      |   | WB-3512-1<br>WB-3514-6             |
| □ IWB-3512-2<br>□ IWB-3515-1   | THE RESERVE OF THE PERSON NAMED IN   | WB-3516-2 □ IWB-3                       | 518-1                | -3518-2   |                                    |
| □ IWC-3510-1   |  | WC-3510-3 🗆 WC-3                        | 51 -1 D (WC          | -3511-2   | WC-3512-2                          |
| ☐ [WC-3513-1<br>10. Was linear interpolation used? ☐ yes 🔊 no 1f   | for why? A. ALS.   | waten                                   | 1                    |   |                                    |
| 11. Was IWA-3200 Significant Digits For Limiting   | Values followed? W ves   | no MOK Reviewer                         | M If no              | vhy?  |                                    |
| 12. The correct Code Edition and Addenda was ave   | ailable and used. W yes  | Preparer M KOK                          | Reviewer M           | lum .   |                                    |
| 13. Statement of acceptability or rejectability with   | basis OK Reviewer  | - IA -                                  | - 1                  |   |                                    |
|  |  |   |                      |   |                                    |
|  | de allowable ≥ (a)   |   |                      |   |                                    |
| ☐ Reject. ☐ (a/f)Cod   | ie allowable # (a)   | Dealculated                             |                      |   |                                    |
| □ OEM flar   | w evaluation hand  | lbook (see attached                     | analysis)            |   |                                    |
| 15. Prepared by and date   | 16. Engineering rev  | iew by and date                         | 17. Approve          | by and date   | 100                                |
| 15-15-9- 01-1  | 2 North  | 03/03/97                                | 12                   | Kick  | 41km 7                             |
| 11mm / 2/25/9.   | 1 000  | results are correct and the methodol    | lum disposition were | ures that all involved with<br>tweete of the necessity that | the results and the                |
| The results are correct and the methodology used is in accordance a  | with used a in accurationer with   | applicable codes sanderds.              | methodology are      | correct and in accordance                                   | with applicable codes.             |
|  |  |   |                      |   |                                    |
| applicable codes standards specifications and procedures   | specifications and procesh   | Deno                                    | 7 1 70               |   |                                    |
| applicable codes, standards, specifications and procedures  N FUSIVGNISNSIFDWR0 DOC ISI Flaw Disposition Worksheet | 7 7  | Page_                                   | 7 01 70              | 2   | REVISION 10-                       |

|   | ISI Flaw Sizi  | ing Worksheet  |  |  |
|---|--|--|--|--|
| I. ISI Report Number  | 2. Flaw Number 7   | The section of the se | 3. Item Number   | B 2.40   |
| 4. ISI Interval OOK Reviewer Co   | 5. Code Edition and Addenda  | POK Reviewer 1   | 7  | 6. Method Ø UT 🗆 RT  |
| ☐ 2nd interval 33rd interval ☐ preservice   | ☐ 80 W81 ☐ 86 no add   | enda 🔣 89 no addenda   | other  | OPT OM   |
| 7. Flaw Sketch GOK Reviewer 1   | k- 122   | 2.6  |  |  |
| Front View  | NAME OF TAXABLE PARTY OF TAXABLE PARTY.  |  | 12222  | A  |
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| Top View  | ***  |  |  | Colorinate pro proteoproporer passivo  |
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| Side View   |  |  |  |  |
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|   | BTM Head   |  |  |  |
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|   | Additional Advantage and the order of the or |  |  |  |
|   |  |  |  |  |
| 8. Calculations DOK Reviewer 2  |  |  |  |  |
| Show determination of surface or subsurface   | e attached   | 2  |  |  |
| < 6   | e attached   |  |  |  |
|   | ee attached  |  |  |  |
| Show determination of type of "a" to use  | 11   | 0  |  |  |
| < 4   | ee attached  | X  |  |  |
|   |  | 1/   |  |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method  | "was used. Wyes Preparer   | M OK Review  | er W   |  |
| 10. Code Flaw Dimensions COK Reviewer   | 11   | ,  | 1  |  |
| "l" = 0.8000 "" = 0.063   | 6" "t nominal" = 5,160"  | "tmeasured" = W//  | 4  "S" = 1.22  | 55 "W" = N/A   |
| 11. Flaw Type ZVOK Reviewer 9.1   | April 1  |  |  |  |
| Surface Planar (UT/RT)  | ibsurface Planar (UT)RT)   | ☐ Laminar (UT/RT)  | ☐ Linea  | r (PT/MT/RT)   |
| 12. Flaw Characterization Figure ☐ OK Review ☐ IWA-3310-1 ☐ IWA-3                                 |  | -3350-1  | □ IWA-3380-1   | □ IWA-3400-1   |
| ☐ IWA-3310-1 ☐ IWA-3<br>☑ IWA-3320-1 ☐ IWA-3  |  |  | □ IWA-3390-1   |  |
| 13. Flaw Characterization Figure Number   | ₩ Flaw 1 □ 1   | MICHAEL PROPERTY AND ADDRESS OF THE PARTY OF | aw 3 🔲 Flav  | v 4 🔲 Flaw 5   |
| 14. Was IWA-3300 Flaw Characterization followe  | d? Skyes ono If no, why?   |  |  |  |
| 15. The correct Code Edition and Addenda was ava  | illable and used. ** es Preparer   | 17. Review by and da   | newer /  |  |
| 16. Prepared by and date  |  | 17. Keview by and da   | 11   | 3-12-97  |
| -TAY 1001   | 2/23/97  | ( 8.2.   | Thom   | 5-10-11  |
| 10m Jones   |  |  | 0  | andology used to in accordance with  |
| The results are correct and the methodology used is in accordan<br>specifications and procedures. | ce with applicable codes, standards,   | This review assures that the applicable codes, standards   | results are correct and the met<br>specifications and procedures | hodology used is in accordance with  |
|   |  |  | D = 70   |  |
|   |  | Page   | 0                          |  |
|   |  | Rend   | 11 47-0136R1   |  |

NSP CASAGAISMSIFSWRI DOC ISI Flaw Sizing Worksheet Revision 1

REVISION 11-11-94

# Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|           |           |    |             | (       |    |        |
|-----------|-----------|----|-------------|---------|----|--------|
| ASME SECT | XI 1989 W | NO | ADDENDA TAU | INITIAL | TO | VERIFY |

2/22/20

|                        | #_ 2  | Reviewed By:_   | 2. J. Thom  | Date: 3-  | Date: 2/23/7/                      |
|------------------------|---|---|---|---|------------------------------------|
| W1 a                   | ath th of the flaw "" is determined W2 for parallel scans. We walues are from page 123 2 (L2) - 122 4   | of the UT rep   | port.   | L1 and L2 for p   | perpendicular scans,               |
| Thick                  | kness kness of the component at value is from page _1 of _5 160_ inches   |   | ne flaw, using UT or r  | nom wall (circle  | one).                              |
| procession federal     | oration<br>measured angle in the calit  | oration block was   | s_45_0_degrees  |   |                                    |
| The with (L) fr        | ulations using metal path<br>flaw exhibited 20% DAC at<br>the transducer exit point at<br>om the 0" reference. (Use<br>ervative.)                 | 1.73 and 1<br>-1.3 inches                                 | . 91 inches MP. M<br>(W) from the centerlin                                 | ax amplitude is<br>ne of the weld a                                       | at 1.82 inches MP and 122.6 inches |
| 1)                     | Determine the upper dept 1.73 (metal path at 2 inches depth.  |   |   | ingle _07071  | = 1 . 2233                         |
| 2)                     | Determine the lower dept 1.91 (metal path at 2 inches depth.  |   |   | ngle <u>0 7071</u>  | = 1.3506                           |
| 3)                     | Determine the depth of the 1 . 82 (metal path at n 1 . 2869 inches depth  | naximum amplitu   |   |   |                                    |
| 4)                     | Determine the distance fr<br>1 82 (metal path at r<br>1 2869 (depth at ma<br>$\sqrt{a^2 - b^2} = 1$ 2870 inc<br>-1 3 (Wmax) - 1                   | maximum amplitude<br>ximum amplitude<br>ches of surface o | ude point) squared = _1<br>e point) squared = _1<br>distance to the flaw fr | 3 . 3124 (a <sup>2</sup><br>1 . 6561 (b <sup>2</sup> )<br>rom the transdu | cer exit point.                    |
| 5)                     | Determine S by picking the S = 1 . 2233 (result of >> OR << S = 5 . 160 (part "t") - exam surface and the low                                     | 1) = distance be<br>1 3506 (res                           | etween exam surface   |   |                                    |
| 6)                     | Determine 2d in though w<br>1_3506_ (from step 2)   |   | rom step 1) = _01   | 273_ inches.  |                                    |
| 0.4d<br>Com<br>If S is | rmination of surface or s<br>= (2d / 2) * 0.4 = _0025<br>pare to S (from step 5)<br>s less than 0.4d, the flaw is<br>s greater than or equal to 0 | surface a = 20  |   |   | _inches.                           |
|                        | 0 . 8 (for all > 0.5, l = 2a<br>0 . 0636 (surf or sub sur   |   | t = _5160_ (part<br>S = _12233_   | t thickness)  | Page 9 of 70                       |

flawtrig (for perpendicular scans) Rev 0

From Ad Hoc Evaluation Group



March 5, 1997 Date

CSC-2 Location

File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RV CLOSURE HEAD W. L. PER TELCON APPROVAL TOM TOWES 1:00/

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- · The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

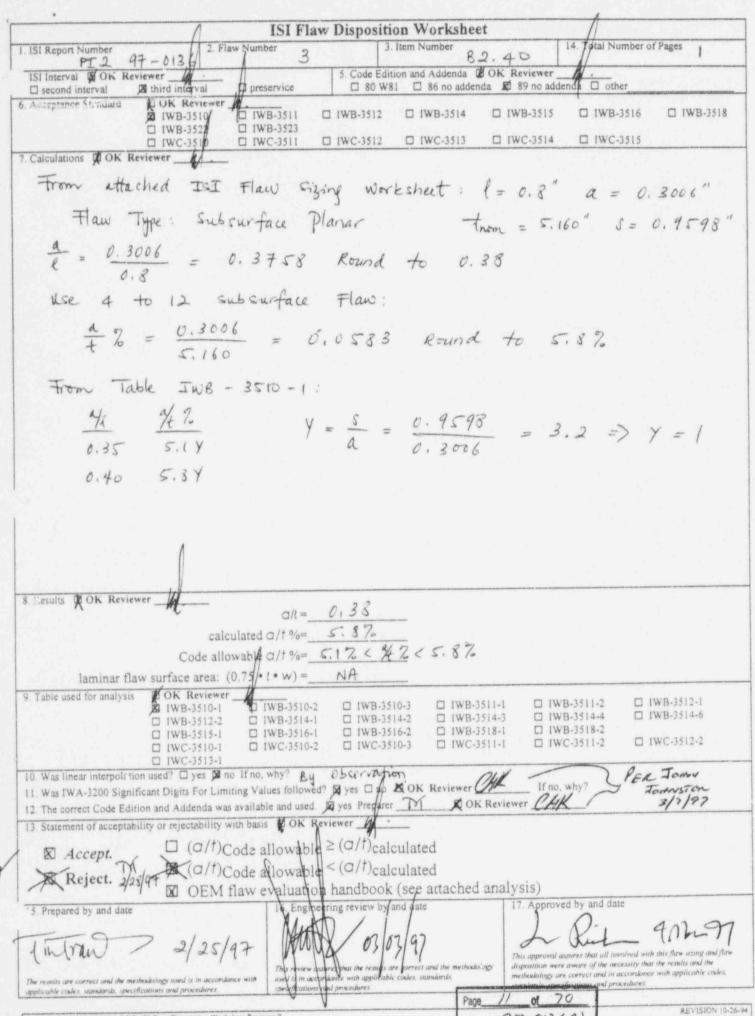
| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID -     | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets

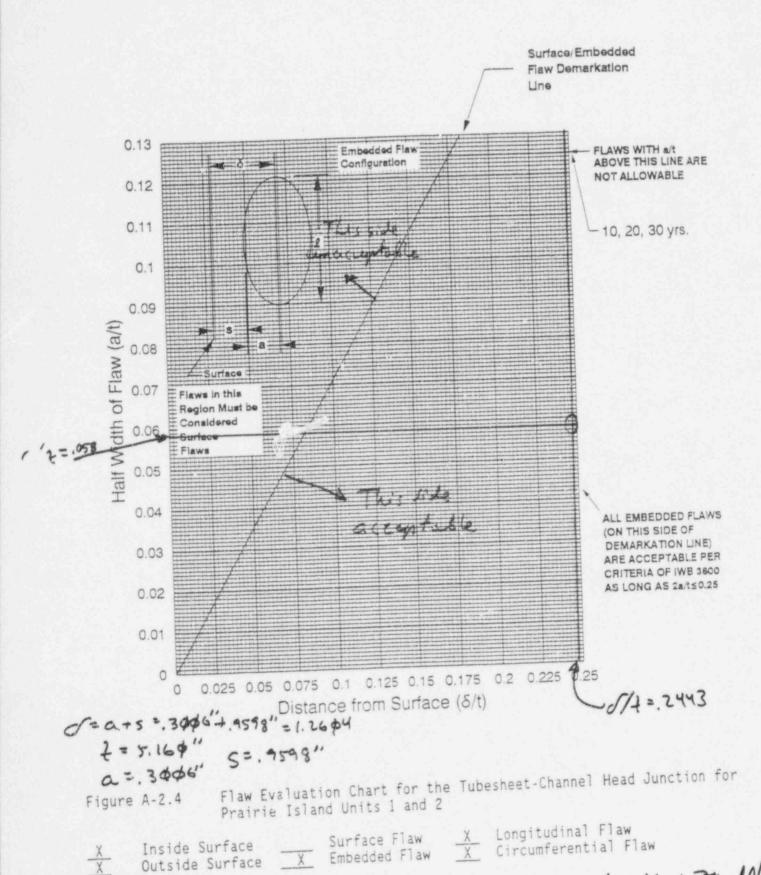
The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Jeff Ricker Supt M&SF



NIMSTUGAISTISTEDWRO DOC ISI Flaw Disposition Worksheet Revision 0



ISI Neport # 97-0136, Flow # 3, O.K. 65 hard 600k. Malthys
1299w.wpf:1b/011995

Page 12 0170
Report 97-0136R1

| ISI Flaw Sizi  | ng Worksheet   |
|--|--|
| 1. ISI Report Number 97-0136 2. Flaw Number 3  | 3. Item Number B 2.40  |
| -4, ISI Interval GOK Reviewer 5 5. Code Edition and Addenda  | GOK Reviewer 7 6. Method WUT CIRT  |
|  | nda ☑ 89 no addenda □ other □ □ PT □ MT  |
| Front View   |  |
| 0"   | 4  |
| ^  | 6011"  |
| O.   | 4  |
|  | 0.9598   |
|  | 0.4598   |
|  | <u></u>  |
|  |  |
| Top View   |  |
|  |  |
|  |  |
| - 10   |  |
| Bim Head   |  |
|  |  |
|  | 6.2679   |
|  | the same and the s |
| Side View  |  |
| Manufacture and American Administration and American Admin |  |
|  |  |
|  |  |
| 37.10  |  |
| BTM Head   |  |
|  |  |
|  | A CONTRACTOR OF THE PARTY OF TH |
|  |  |
| 8. Calculations @OK Reviewer 2 Show determination of surface or subsurface   | 0  |
| Show determination of surface or subsurface  See a Hacke   | 2  |
| 500 000  | 경우 회에 가는 이 그 생각을 하셨다는 것으로 하셨다.   |
| Show determination of type of "a" to use See a Hache   | . 0  |
| see attaché  | 200  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Tyes Preparer 7  |  |
| 10. Code Flaw Dimensions OK Reviewer 1   | A Maria Caraca C |
| 10. Code Flaw Dimensions Ook Reviewer 2/<br>"1" = 0.8" "a" = 0.3006 "tnomina" = 5.160  | "tmeasured" = N/A "S" = 0.9598 "W" == N/A  |
| 11. Flaw Type DOK Reviewer 1   | □ Larninar (UT/RT) □ Linear (PT/MT/RT)   |
| Surface Planar (UT/RT)  Subsurface Planar (UT/RT)  12. Flaw Characterization Figure GOK Reviewer   | PA STALL SIGN I  |
| □ IWA-3310-1 □ IWA-3330-1 □ IWA  |  |
| 13. Flaw Characterization Figure Number  Flaw 1  | Flaw 2   |
| 14. Was [WA-3300 Flaw Characterization followed?  yes  no If no, why?  | The SOK Reviewer WA  |
| 15. The correct Code Edition and Addenda was available and used. Lyes Preparet 16. Prepared by and date  | 17. Review by and date   |
| TOU COULS 1/23/97  | 17. Review by and date & Shorma 3-12-97  |
| 300  | - · · · ·  |
| The results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures.   | This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures   |
|  | Page /3 of 70  |
|  | Report 97-0/36R)   |
|  | TIGUUT F   |

1

REVIUTON 11-11-94

#### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|                              |  | ECT XI 1989 W/ NO ADDENDA TWO NI   |  |                 | ining Juniave       |
|------------------------------|--|--|--|-----------------|---------------------|
|                              | leport #_97-0136   | Evaluation Performed By Reviewed By S.J.   | Soull                                    | Date:           | 2/23/97             |
| Leng<br>W1 a                 | ith of the flaw "." is dete<br>and W2 for parallel sca<br>d W values are from pa | ermined by finding the difference between L  |  |                 |                     |
| This                         | kness kness of the componer value is from page _1 5 _ 160 inches                 | nt at the location of the flaw, using UT or no of the UT report.   | m wall (circle                           | e one).         |                     |
| - National Association (Co.) | bration<br>measured angle in the   | calibration block was 45.0 degrees   |  |                 |                     |
| The with (L) fi              | flaw exhibited 20% DA<br>the transducer exit poi                                 | path From page of the UT report of the U | x amplitude is<br>e of the weld          | and 14          | 3 2_inches          |
| 1)                           |  | depth of the flaw from the exam surface. at 20% upper) * COS of the measured ang   | e <u>0 7071</u>                          | = _3 .          | <b>5991_</b> inches |
| 2)                           |  | depth of the flaw from the exam surface.<br>at 20% lower) * COS of the measured angle  | e <u>0</u> 7071                          | = _4 .          | 2002_inches         |
| 3)                           |  | of the flaw from the exam surface at the maximum amplitude point) * CC S of the epth.  |  |                 |                     |
| 4)                           | 5 . 47 (metal path<br>3 . 8678 (depth at<br>$\sqrt{a^2 - b^2} = 3 . 8679$        | maximum amplitude point) squared = 2<br>maximum amplitude point) squared = 2<br>maximum amplitude point) squared = 14.<br>inches of surface distance to the flaw from<br>8.8679 (surf dist) = -6.2679 inches to  | 9 . 9209 (a²<br>9599 (b²)<br>the transdu | )<br>cer exit p | point.              |
| 5)                           | S = 3.5991 (resu<br>>> OR <<   | ing the smaller of (* Collowing;<br>It of 1) = distance between exam surface ar<br>"t") - 4 2002 (result of 2) = 0 . 9598 d<br>e lower flaw tip  |  |                 | side opposite       |
| 6)                           | Determine 2d in thou<br>4 . 2002 (from ste                                       | ugh wall thickness.<br>p 2)3 . 5991_ (from step 1) = _06011  | _inches                                  |                 |                     |
| 0.4d<br>Com                  |  | 1202_  |  | 6_inche         | S.                  |
|                              |  | = 2a)  |  |                 |                     |

flawtrig (for perpendicular scans) Rev 0

a = 0 . 3006 (surf or sub surf) circle one) S = 0 . 9598

Page 14 of 970 Report 97-0136R) From Ad Hoc Evaluation Group



March 5, 1997 Date

CSC-2 Location

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RU CLOSURE HEAD W. 4 PER TELCON APPROVAL JOHN TOWES 1:00/

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

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Consideration of the effect of the curvature of the vessel on depth determination for indications

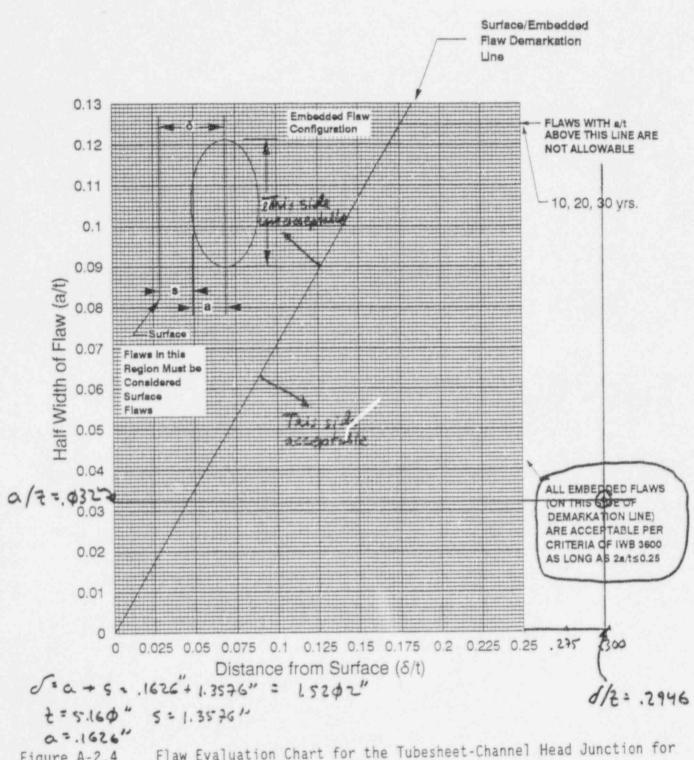
| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d     |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|----------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028   |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721   |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 - |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160   |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004   |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778   |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990   |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849   |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089   |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735   |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594   |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032   |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

|  | 1  | ISI Flav   | w Disposit   |   |  |  | Λ  |  |              |
|--|--|--|--|---|--|--|--|--|--------------|
| ISI Report Number PT 2 97-01   | 2. Flaw  | Number 5   |  | 3. Item Num   | ber 82.4   | 0  | 14. Total Num  | ber of Pages   | 1            |
| ISI Interval WOK Reviewer  |  |  | 5. Code Ed   | ition and A   | ddenda LOK   | Reviewer   | W  |  |              |
| second interval third i  | nterval [  | preservice   | □ 80 W   | /81 □ 86  | no addenda 🔊   | 89 no adde   | nda 🗆 other  |  |              |
|  | Reviewer   | WB-3511  | □ (WB-3512   | n iwi   | 3-3514 🗆 [   | WB-3515  | □ IWB-35   | 516 🗆 IW   | B-3518       |
|  |  | ☐ TWB-3523   |  |   |  |  |  |  |              |
|  |  | ☐ FWC-3511   | □ IWC-3512   | C) IWO  | C-3513 🖸 I   | WC-3514  | □ IWC-3:   | 515  |              |
| Calculations & OK Reviewer   |  |  |  |   |  |  |  |  |              |
| From attached  | ISI  | Flaw   | sizing 1   | worksl  | heet: 1  | = 1.0"   | A =  | 0.162  | 6"           |
| Flaw Type:   | Subsu  | urface P   | lanar  |   | -tron  | n = 5.   | 160"   | S = 1.3.   | 57           |
| $\frac{a}{l} = \frac{0.1626}{1.0}$   | = 0  | 1626   | Round  | to  | 0.16   |  |  |  |              |
| use 4 to   | 12 Su  | bourface   | Flan   | 1   |  |  |  |  |              |
| 47 =   | 5.160  | = 0.   | 0315   | Ro  | rund to  | 3.   | 2%   |  |              |
| From Table   |  |  | 1  |   |  |  |  |  |              |
| 40 4   | 7.   |  |  | 1 2   | 571  |  |  |  |              |
| <u>4€</u> <u>4€</u> <u>0.15</u> <u>2.</u>  | ay ,   | Υ =  | = = =  | 0.1   | 576 =  | 8, 3   | =>   | Y = 1  |              |
| 0.20 3.  | 3y (   | T  |  |   |  |  |  |  |              |
| 0,20 5.  | 2/ 3   | Interpol   | ation  | 1 :   | = 0.16   | a/   | 7 -  | 3.0%   |              |
|  |  |  |  | -   |  |  |  |  |              |
|  |  |  |  |   |  |  |  |  |              |
|  |  |  |  |   |  |  |  |  |              |
|  |  |  |  |   |  |  |  |  |              |
|  | 1  |  |  |   |  |  |  |  |              |
|  |  |  |  |   |  |  |  |  |              |
| Pouls & OV Perioway  | 1  |  |  |   |  |  |  |  |              |
| Results &OK Reviewer   | 1  | $\alpha t =$   |  | and the second second   |  |  |  | A 440 A  |              |
| Results & OK Reviewer  | <b>A</b>   | Q/t =  | 0.16   |   |  |  |  |  |              |
| Results AOK Reviewer   |  | lated 0/1 %=   | 0.16   |   |  |  |  |  |              |
| Results & OK Reviewer  |  | -  | 0.16   |   |  |  |  |  |              |
| Results AOK Reviewer   | Code allow   | lated a/t %=   | 0.16   |   |  |  |  |  |              |
| laminar flaw surfa   | Code allow<br>ace area: (0<br>K Reviewer_  | lated a/t %=   | 0.16<br>3.27<br>3.07<br>NA   |   |  |  |  | □ (WB-35)2   |              |
| laminar flaw surfa   | Code allow<br>ace area: (0   | lated a/t %=   | 0.16   | 510-3   | □ IWB-3511-1<br>□ IWB-3514-3   | O IWE  | 3-3511-2<br>3-3514-4   | □ IWB-3512<br>□ IWB-3514   |              |
| laminar flaw surfa  Table used for analysis   I W  | Code allow<br>ace area: (0<br>K Reviewer _<br>VB-3510-1  | lated a / t % =  | 0.16<br>3.27.<br>3.07.<br>NA   | 510-3<br>514-2<br>516-2   | □ IWB-3511-1<br>□ IWB-3514-3<br>□ IWB-3518-J   | O IWE  | 3-3511-2<br>3-3514-4<br>3-3518-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  Table used for analysis  IW  | Code allow<br>ace area: (0<br>K Reviewer _<br>VB-3510-1<br>VB-3512-2<br>VB-3515-1<br>VC-3510-1   | lated 0/t %=<br>vable 0/t %=<br>.75 • ( • w) =<br>1WB-3510-2<br>1WB-3514-1   | 0.16<br>3.27.<br>3.07.<br>NA   | 510-3<br>514-2<br>516-2   | □ IWB-3511-1<br>□ IWB-3514-3   | O IWE  | 3-3511-2<br>3-3514-4   |  | 6            |
| laminar flaw surfa  Table used for analysis  N  N  N  N  N  N  N  N  N  N  N  N  N   | Code allow<br>ace area: (0.<br>K Reviewer _<br>VB-3510-1<br>VB-3512-2<br>VB-3515-1<br>VC-3510-1<br>VC-3513-1   | lated a / t % =  | 0.16<br>3.27.<br>3.07.<br>NA   | 510-3<br>514-2<br>516-2   | □ IWB-3511-1<br>□ IWB-3514-3<br>□ IWB-3518-J   | O IWE  | 3-3511-2<br>3-3514-4<br>3-3518-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  Table used for analysis   I W  I W  I W  I W  I W  I W  I W  | Code allow ace area: (0. K Reviewer _ VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  | lated a/t %=  /able a/t %=  .7 • (• w) =  1WB-3510-2  1WB-3516-1  1WC-3510-2  If no, why?  | 0.16<br>3.27.<br>3.07.<br>NA<br>1W8-3  | 510-3<br>514-2<br>516-2<br>1510-3   | ☐ [WB-35]1-1<br>☐ [WB-35]4-3<br>☐ [WB-35]8-1<br>☐ [WC-35]1                           | O IWE  | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  Table used for analysis  IW  IW  IW  IW  IW  Was linear interpolation used?  | Code allow ace area: (0. K Reviewer _ VB-3510-1 VB-3512-2 VB-3513-1 VC-3513-1 ☑ yes ☐ no gits For Limitin  | lated a / t %=   // wable a / t %=   // wable a / t %=   // wable a / t * w * =   // wable a / wable a / wable a // wab   | 0.16<br>3.27.<br>3.07.<br>NA<br>1W8-3<br>1W8-3<br>1WC-3  | 510-3<br>514-2<br>516-2<br>510-3  | ☐ [WB-35]1-1<br>☐ [WB-35]4-3<br>☐ [WB-35]8-1<br>☐ [WC-35]1                           | If nd,   | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  O Table used for analysis  O IW  O IW  O IW  O IW  O Was linear interpolation used?  II Was IWA-3200 Significant Dis   | Code allow ace area: (0. K Reviewer _ VB-3510-1 VB-3512-2 VB-3513-1 VC-3513-1 ✓ Yes ☐ no gits For Limitin Addenda was a  | atted a / t % =   / wable a / t % =   / wb =     | 0, 16 3, 2% 3, 0% NA 1W8-3 1W8-3 1W6-3   | 510-3<br>514-2<br>516-2<br>510-3  | C [WB-35]1-1  IWB-35]4-3  IWB-35]8-1  IWC-35]1                                       | IWE<br>  IWE<br>  IWC<br>  If nd,  | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  O Table used for analysis  O IW  O IW  O IW  O IW  O Was linear interpolation used?  II Was IWA-3200 Significant Dis   | Code allow ace area: (0. K Reviewer _ VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1 M yes no gits For Limitin Addenda was a ejectability with  | able 0/t %=   // able 0/t %=   // 2   // 2   // 2   // 3   // 4   // 2   // 3   // 4   // 2   // 3   // 4   | 0.16 3.27. 3.07. NA   IWB-3   IWB-3   IWC-3  | 510-3<br>514-2<br>516-2<br>510-3  | IWB-3511-1<br>  IWB-3514-3<br>  IWB-3518-1<br>  IWC-3511/1<br>  eviewer              | IWE<br>  IWE<br>  IWC<br>  If nd,  | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  O Table used for analysis  O IW  O | Code allow ace area: (0.  K Reviewer _ VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with a control of the contro | able 0/t %=  | 0.16 3.27. 3.07.  NA  1 1WB-3  1 1WB-3  1 1WC-3  2 yes Prepareviewer Charteriewer C | 510-3<br>514-2<br>516-2<br>510-3<br>OK R<br>er TY   | C [WB-35]1-1  [WB-35]4-3  [WB-35]1-1  [WC-35]1-1  [WC-35]1-1  [eviewer               | IWE<br>  IWE<br>  IWC<br>  If nd,  | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  D. Table used for analysis  D. Iwilliam of Iwi | Code allow ace area: (0.  K Reviewer _ VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with a control of the contro | able 0/t %=   // able 0/t %=   // 2   // 2   // 2   // 3   // 4   // 2   // 3   // 4   // 2   // 3   // 4   | 0.16 3.27. 3.07.  NA  1 1WB-3  1 1WB-3  1 1WC-3  2 yes Prepareviewer Charteriewer C | 510-3<br>514-2<br>516-2<br>510-3<br>OK R<br>er TY   | C [WB-35]1-1  [WB-35]4-3  [WB-35]1-1  [WC-35]1-1  [WC-35]1-1  [eviewer               | IWE<br>  IWE<br>  IWC<br>  If nd,  | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| laminar flaw surfa  D. Table used for analysis  D. Iwilliam of Iwi | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with [a/t)Co  | lated a/t %=  vable a/t %=  .75 · ( • w) =  1WB-3510-2  1WB-3516-1  1WC-3510-2  If no, why?  If no, why?  If was and used the basis SOK Recorded allowable and used allowable and allowable allowable and allowable and allowable and allowable allowable allowable and allowable and allowable and allowable  | 0, 16 3, 27. 3, 07.  NA    1W8-3   1W8-3   1WC-3   1WC-3   2 (0/t)ca   | 510-3<br>514-2<br>516-2<br>510-3<br>OFOK Rer TY   | IWB-3511-1 IWB-3518-1 IWC-3511/1 Ieviewer OK Reviewer AGT out                        | IWE    | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2<br>why?   | □ IWB-3514   | 6            |
| laminar flaw surfa  O Table used for analysis  O OF  O IW  O | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with [a/t)Co  | lated a/t %=  /able a/t %=  /a | 0, 16 3, 27. 3, 07.  NA    1W8-3   1W8-3   1WC-3   1WC-3   2 (0/t)ca   | 510-3<br>514-2<br>516-2<br>510-3<br>OK R<br>er W  | IWB-3511-1 IWB-3518-1 IWC-3511/1 Ieviewer OK Reviewer AGT out                        | IWE    | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2   | □ IWB-3514   | 6            |
| O. Table used for analysis  O. Table used for analysis  O. Two I.W.  I.W | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with [a/t)Co  | lated a/t %=  /able a/t %=  /a | 0.16 3.27. 3.07.  NA    1WB-3   1WB-3   1WB-3   1WC-3    Yes Prepareviewer CA   < (0/t)ca   < (0/t)ca   handboo  | 510-3<br>514-2<br>516-2<br>510-3<br>OK R<br>er W  | IWB-3511-1 IWB-3518-1 IWC-3511/1 Ieviewer OK Reviewer AGT out                        | IWE   IWE   IWE   IWE   IWE   Wer   Wer   Wer   Yes    | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2<br>why?   | (1) 1WB-3514   | -2           |
| laminar flaw surfa  O Table used for analysis  O OF  O IW  O | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  yes □ no gits For Limitin Addenda was a ejectability with [a/t)Co  | lated a/t %=  vable a/t %=  .75 · ( • w) =  IWB-3510-2  IWB-3516-1  IWC-3510-2  If no, why?  Ing Values followed available and used the basis SOK Report of the away and the basis Sok Report and the basis Sok Report of the away and the basis Sok Report of the basis Sok R | 0.16 3.27. 3.07. NA    1WB-3   1WB-3   1WC-3   1WC-3   1WC-3   2 (0/t)ca   < (0/t)ca   < (0/t)ca   can handbookering review by   | S10-3<br>514-2<br>516-2<br>510-3<br>OK R<br>er TY<br>Iculated<br>Iculated<br>Iculated<br>Iculated<br>Iculated<br>Iculated | IWB-3511-1 IWB-3514-3 IWB-3511-1 IWC-3511-1 IWC-3511-1 Ieviewer OK Revie             | IWE   IWE   IWE   IWE   IWE   Wer    | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2<br>why?   | U IWB-3514  U IWC-3512   | of one could |
| laminar flaw surfa  O Table used for analysis  O OF  I W  I W  I W  I W  I W  I W  I W  I  | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3515-1 VC-3510-1 VC-3513-1  M yes \( \text{not} \) no gits For Limitin Addenda was a ejectability with \( \text{Ca/t} \) Co \( \text{Ca/t} \)   | lated a/t %=  vable a/t %=  .71 · ( · w) =  IWB-3510-2  IWB-3516-1  IWC-3510-2  If no, why?  Ing Values followed available and used the basis SOK Report of the basis Sok Repo | 0.16 3.27. 3.07. NA    1WB-3   1WB-3   1WC-3   1WC-3   1WC-3   2 (0/t)ca   < (0/t)ca   can handbookering review by   | S10-3 514-2 516-2 510-3  OK R er TY  Iculated k (see all y add date   | IWB-3511-1 IWB-3514-3 IWB-3518-1 IWC-3511/1 Ieviewer OK Revie  AGT ou  Ittached anal | If no.  We If no.  Wer #/28/97  YSIS)  This approved as disposition were methodology are metho | d by and date  Sures that all invoice aware of the necesorrect and in accidence of the necesor of t | (1) IWC-3512  (1) IWC-3512  The dwith this flaw size sory that the results on conclusion with applications with applications of the size o | 2 and the    |
| laminar flaw surfa  O Table used for analysis  O I W  O I  | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3513-1 VC-3510-1 VC-3513-1  Mayes no gits For Limiting Addenda was a ejectability with a company of the comp    | lated a/t %=  /able a/t %=  /able a/t %=  /b = 1 · W) =    WB-3510-2   WB-3516-1   WB-3516-1   WC-3510-2    If no, why?  If no, why?  If no why?  If a lated allowable and used basis BOK Robot allowable and used by the away are allowable away evaluation which basis because of the late and used by the late away are allowable away evaluation which basis BOK Robot allowable away and the basis BOK Robot all | 0.16 3.27. 3.07. NA    1WB-3   1WB-3   1WB-3   1WC-3   | S10-3 514-2 516-2 510-3  OK R er TY  Iculated k (see all y add date   | IWB-3511-1 IWB-3514-3 IWB-3518-1 IWC-3511/1 Ieviewer OK Revie  AGT ou  Ittached anal | If no.  We If no.  Wer #/28/97  YSIS)  This approved as disposition were methodology are metho | 3-3511-2<br>3-3514-4<br>3-3518-2<br>2-3511-2<br>why?   | (1) IWC-3512  (1) IWC-3512  The dwith this flaw size sory that the results on conclusion with applications with applications of the size o | 2 and the    |
| laminar flaw surfa  O Table used for analysis  O OF  I W  I W  I W  I W  I W  I W  I W  I  | Code allow ace area: (0.  K Reviewer VB-3510-1 VB-3512-2 VB-3513-1 VC-3510-1 VC-3513-1  Mayes no gits For Limiting Addenda was a ejectability with a company of the code of    | lated 0/t %=  /able 0/t %=  /able 0/t %=  /b 1 • W) =    WB-3510-2   WB-3516-1   WB-3516-1   WC-3510-2    If no, why?  If no, why?  If values followed evaluation   WB-Basis BOK Residual and used    If allowable and used   WB-Basis BOK Residual and used    If allowable aw evaluation   WB-Basis BOK Residual and used    If allowable   WB-Basis Bok Residual and used    If allowable | O. 16  3. 27.  3. 07.  NA  IWB-3  IWB-3  IWB-3  IWC-3  IWC-3  Yes Prepareviewer CA  (a/t)ca  (a/t)ca  n handboo  tering review by  Iwc-s with displice  Iwc-s with displice  | S10-3 514-2 516-2 510-3  OK R er TY  Iculated k (see all y add date   | IWB-3511-1 IWB-3514-3 IWB-3518-1 IWC-3511/1 Ieviewer OK Revie  AGT ou  Ittached anal | If no.  We If no.  Wer #/28/97  YSIS)  This approved as disposition were methodology are metho | d by and date  Sures that all invoice aware of the necesorrect and in accidence of the necesor of t | (1) IWC-3512  Of two dwith this flow size saily that the results as cordance with applicationers.  | 2 and the    |



Flaw Evaluation Chart for the Tubesheet-Channel Head Junction for Figure A-2.4 Prairie Island Units 1 and 2

X Longitudinal Flaw
X Circumferential Flaw Surface Flaw
X Embedded Flaw Inside Surface Outside Surface

ISI Report #97-0136, Flaw#5, O.K. by handbook 9 Mark blygg 3/4/97
1299w.wpf:1b/011995

Report 97-0136 R

| ISI Flaw Sizing  |  |
|--|--|
| 1. ISI Report Number 97-0136 2. Flaw Number 5  | 3. Item Number B 2.40  |
| 4. ISI Interval DOK Reviewer 4.1 5. Code Edition and Addenda &   | OK Reviewer 2 6. Method 2 UT □ RT a 2 89 no addenda □ other □ PT □ MT  |
| 7. Flaw Sketch DOK Reviewer And 29.  |  |
| Front View   | A CONTRACTOR OF THE PARTY OF TH |
| 0  | 1.3576   |
|  |  |
| 0.325  | 3  |
|  | *  |
|  | 1.0  |
|  |  |
|  |  |
| Top View   |  |
|  |  |
|  |  |
| 1:0  |  |
| BTM Head   |  |
|  | 1.6203   |
|  | -1.623   |
|  |  |
| Side View  |  |
| ARTOLOGICA AND AND AND AND AND AND AND AND AND AN  |  |
|  | 이 살고 있을만 하는 것이 마리를 가장하다면 하셨다.  |
|  |  |
| BTM Head   |  |
|  |  |
|  |  |
|  |  |
| 8. Calculations BOK Reviewer 5   |  |
| Show determination of surface or subsurface  |  |
| see attached   |  |
| Show determination of type of "a" to use   |  |
| Show determination of type of "a" to use  see attached   |  |
|  | 1 / //   |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Syes Preparer 74   | C J COK Reviewer 2 J   |
| 10. Code Flaw Dimensions DOK Reviewer 5  | "tmessures" = N/A "S" = 1.3576 "W" = N/A   |
| 11. Flaw Type DOK Reviewer 1   | I measured NIII o 1/33 10 11 N/III   |
| Subsurface Planar (UT/RT) Subsurface Planar (UT/RT)  | Laminar (UT/RT)  |
| 12. Flaw Characterization Figure   | 50-1   |
| ▼ IWA-3320-1 □ IWA-3340-1 □ IWA-33   | 60-1 🔲 IWA-3390-1  |
| 13. Flaw Characterization Figure Number B-Flaw 1 ☐ Flaw 1 14. Was IWA-3300 Flaw Characterization followed? Wyes ☐ no If no, why? | w2 □ Flaw 3 □ Flaw 4 □ Flaw 5  |
| 15. The correct Code Edition and Addenda was available and used. Byes Preparet   |  |
| 16. Prepared by and date   | 17. Review by and date 3-12-97   |
| Tom Janes 2/27/97  | C. J. Shows  |
| The results are correct and the methodology used is in accordance with applicable codes, standards,                              | This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures   |
| specifications and procedures  | Page 18 of 70  |
|  | Report # 97-0/36 R1  |
|  | Report 7 273821  |

REVISION 11-11-94

## Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| For                             | surface and subsurf   | ace single planar flaws  | oriented in plane  | normal to press                                | sure retaining surface               |      |
|---------------------------------|---|--|--|--|--------------------------------------|------|
|                                 | ASME S  | ECT XI 1989 W/ NO A  |  |  |                                      |      |
| ISI Rep<br>Flaw #_              | ort #_97-0136   | Evaluation Perfo   | rmed By: John  | m Date:  | Date: 2/2 3/9                        | 7    |
| W1 and<br>L and V               | of the flaw "" is dete<br>W2 for parallel sca<br>V values are from pa | ermined by finding the   | difference between   |  |                                      |      |
| This val                        | NAME OF TAXABLE PARTY.  | nt at the location of the of the UT report.  | flaw, using UT or  | nom wall (circle                               | e one).                              |      |
| Calibra<br>The me               | ACCORD TRYSLAMA   | calibration block was  | <b>45</b> . <b>0</b> degrees                                       |  |                                      |      |
| The flav                        | w exhibited 20% DA transducer exit poi                                | path From pa<br>C at 1.92 and 2.<br>nt at -0.1 inches (V<br>e of 20% DAC vs. 50%   | 38 inches MP. N<br>V) from the center!                             | lax amplitude in of the weld                   | s at 2.15 inches for and 39.2 inches | (L   |
| _                               |   | depth of the flaw from at 20% upper) * COS of  |  |  | _ = _1 . 3576_ inche                 | S    |
| _                               |   | depth of the flaw from at 20% lower) * COS of  |  | gle <u>0</u> 7071                              | _ = _1 . 6829_ inches                | 10   |
|                                 |   | of the flaw from the ex<br>at maximum amplitude<br>opth.   |  |  |                                      |      |
| 7                               | 2 . 15 (metal path<br>1 . 5203 (depth at<br>$a^2 - b^2 = 1 . 5203$    | ce from the center line at maximum amplitude paximum amplitude pinches of surface dist . 5203 (surf dist) =  | point) squared = _2<br>oint) squared = _2<br>ance to the flaw from | 4 . 6225 (a²)<br>. 3143 (b²)<br>om the transdu | cer exit point                       | N.   |
| S                               | = 1.3576 (resu<br>>> OR <<  | ng the smaller of the formula to find the formula to fin | een exam surface   |  |                                      | 47   |
|                                 | etermine 2d in thou<br>1 . 6829_ (from step                           | gh wall thickness.<br>o 2) - 1 3576 (from  | step 1) = _0 . 325   | 3_ inches.                                     |                                      |      |
| 0.4d = (<br>Compa<br>If S is le |   | 0650_  |  |  | _inches                              |      |
|                                 | . 0 (for a/l > 0.5, l   | = 2a)<br>b surf) circle one)   | t = <u>5</u> . 160 (par  | t thickness)                                   |                                      | 100. |

flawtrig (for perpendicular scans) Rev 0



March 5, 1997 Date

CSC-2

Location

Location

Ad Hoc Evaluation Group

File

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RU CLOSURE HEAD W. L. EXAM 97-0109. PEN TELLOW ARRENDUM JOST RECKER 3/7/97 PER TELCON APPROUNT TOM TOWES 1:00 P

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- · The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7 .  | 3    | circ | - 3.92 | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0,7721 |
|         | 8    | 3    | circ | C 2.29 | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0. 678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2 1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications

Jeff Ricker Supt M&S

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Report # 97-6136F

|  | 1  | TOTA   | THE IT IS TO POUR !  | ion Worksheet   |  | - A             | 2.0   |
|--|--|--|--|---|--|-----------------|---|
| ISI Report Number  | 2. Fla   | w Number   | 4  | Item Number B 2.  | 40   | 4. Total Number | of Pages 1  |
| ISI Interval MOK Revi  |  |  | 5. Coue Jdi  | ition and Addenda 💢 🤇   | K Reviewer   | W               |   |
| ☐ second interval  | third interval   | Deservice  | □ 80 W   | 81 🗆 86 no addenda  | 20 89 no adden   | da 🗆 other      |   |
| Acceptance Standard  | KOK Reviewer   | C IVP 2511   | □ IWB-3512   | □ IWB-3514  | CJ [WB-3515  | ☐ IWB-3516      | ☐ IWB-3518  |
|  | IWB-3510<br>IWB-3572   | ☐ IWB-3511<br>☐ IWB-3523   | L 140-1312   | G 1110-3314   |  |                 |   |
|  | □ IWC-35 0   | ☐ IWC-3511   | □ 1WC-3512   | □ (WC-3513  | □ IWC-3514   | □ IWC-3515      |   |
| Calculations OK Rev  | viewer   |  |  |   |  |                 |   |
| From atta  | .thed Isi  | Flaw   | sizing w   | ork sheet:  | 1 = 0.3  | " a =           | 0.0071  |
|  |  |  |  | -   |  | .160" s         | = 0.6204  |
| 1 = 0.00   | =  | 0.023  | 7 Roun   | d to v.   | 02   |                 |   |
| Use 4 to   | 0 12 50  | de son for c   | e Flaw   |   |  |                 |   |
| 4 %  | = 0.007  | _  | 0 00 14  | Round +   | 0.1  | + %             |   |
| From Ta  |  | - 3510   | - (  |   |  |                 |   |
| SALES OF THE PARTY | aft 76   |  | $V = \frac{S}{A}$  | 0.6204  | - = 83   | 7.4 =>          | 7 Y = 1   |
| 0.0  | 2.0Y   |  | -  | 0.00+1  |  |                 |   |
| 0.05   | 2.24   |  |  |   |  |                 |   |
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|  |  |  |  | ted eque  |  |                 | which i   |
| less th  | nen 2.1  |  | Indicat  |   |  |                 | which is  |
| less th  | ver 4:   | alt=   | indicat<br>0.02<br>0.147   | tion is   |  |                 | which is  |
| less th  | ver 4:   | alt=   | indicat<br>0.02<br>0.147   | tion is   |  |                 | which is  |
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| laminar flav  Results KOK Review  laminar flav  Table used for analysis  Was linear interpolation  Was IWA-3200 Signifi  | calc Code allo w surface area: (  OK Reviewer IWB-3510-1 IWB-3515-1 IWC-3510-1 IWC-3510-1 IWC-3513-1 on used? I yes In nicant Digits For Limi  | alt = ulated a/t %= wable a/t %= 0.75 • t • w) = 0.75 • w) = 0 | Indicat  0.02  0.147  2.07. < 46  NA  0.2 DIWB.3  6-1 DIWB.3  0.2 DIW.3  | 510-3   | 1-1 DIWB<br>4-3 DIWB<br>1-1 DIWB   | -3511-2         | IWB-3512-1<br>IWB-3514-6  |
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| laminar flav  Results KOK Review  laminar flav  Table used for analysis  Was linear interpolation  Was IWA-3200 Signifi  The correct Code Editi  Statement of acceptable  Accept.  Reject.   | calc Code allo w surface area: (  OK Reviewer NB-3510-1 IWB-3515-1 IWC-3513-1 IWC-3513-1 INC-3513-1 | ulated a/t %=  ulated a/t %=  wable a/t %=  0.75 • t • w) =  0.75 • t • w) | Indicate  0.02  0.147  2.07.64  NA  0.2   IWB-3  6-1   IWB-3  6-1   IWB-3  0.2   IW-3  By Observing wed? A yes Prepare  Reviewer   Western   West    | 510-3 IWB-351 514-2 IWB-351 510-3 IWC-351 100K Reviewer er MOK Reviewer | nalysis)  This approved ass disposition were methodoxy are | -3511-2         | IWB-3512-1 IWB-3514-6 IWC-3512-2  th this flaw sizing and flate the results and the new with applicable codes |

| The same and the s | ISI Flaw Sizing  | Worksheet  |  |  |
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| ISI Interval POK Reviewer U1 5 Co  | de Edition and Addenda   | OK Reviewer A  | 7  | 6. Method HUT  |
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| 8 Calculations BOK Reviewer 2  |  |  |  |  |
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| Show determination of type of "a" to use  See a  | Hacked   | J WOK Revie  | wer &J   |  |
| Show determination of type of "a" to use  See a  See a  See a  See a  See a  | Hacked used & yes Prepare Man  | J OK Revie   | The state of the s |  |
| Show determination of type of "a" to use  See a  See a  See a  See a  See a  | Hacked used & yes Prepare Man  | CONTRACTOR OF STREET   | The state of the s | y "w" = ν//  |
| Show determination of type of "a" to use  See a  9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was use  10. Code Flaw Dimensions EOK Reviewer 12  "t" = 6.3 "a" = 0.0071 "  11. Flaw Type EOK Reviewer 1   | Hacked  Hacked  Thomas Prepare The  Thomas "= 5.160"   | 'tmeasured'' = W   | /A "S" = 0.620   |  |
| Show determination of type of "a" to use  See a  9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was u  10. Code Flaw Dimensions BOK Reviewer 1.0  "" = 0.3 "0" = 0.0071"  11. Flaw Type BOK Reviewer 1.0  Surface Planar (UT/RT) Subsurface   | Hacked  sed Seves Prepare March  Thominal" = 5.160"  The Plana (UTRT)  | CONTRACTOR OF STREET   | /A "S" = 0.620   | Ψ" = N/  |
| Show determination of type of "a" to use  See a  9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was u  10. Code Flaw Dimensions BOK Reviewer 10  "t" = 6.3 "0" = 0.0071 "  11. Flaw Type BOK Reviewer 10 Surface Planar (UT/RT) Subsurface  12. Flaw Characterization Figure BOK Reviewer 1   | Hacked  sed Seves Prepare March  Thominal" = 5.160"  The Plana (UTRT)  | "tmeasured" = \( \mu \)  [] Laminar (UT/RT)  | /A "S" = 0,620 Linear (  |  |
| Show determination of type of "a" to use  See a  9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was u  10. Code Flaw Dimensions BOK Reviewer 12  "L" = B. 3 "Q" = 0.0071 "  11. Flaw Type BOK Reviewer  D Surface Planar (UT/RT)  12. Flaw Characterization Figure DOK Reviewer  D IWA-3310-1 DIWA-3330-1  W IWA-3320-1 DIWA-3340-1   | Hacked  Ised. Ves Prepare Marched  Thominal = 5.160 's  Plana (UTRT)   IWA-33  | "tmeasured" = \(\mu\)  [] Laminar (UT/RT)  [] 350-1 [] 360-1   | /A "S" = 0,620°  □ Linear ( □ 1\(\text{Linear}\) 1 \(\text{WA-3380-1}\) 1 \(\text{WA-3390-1}\)   | PT/MT/RT)  |
| Show determination of type of "a" to use  See a  9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was use  10. Code Flaw Dimensions BOK Reviewer 12  "t" = 6.3 "0" = 0.0071"  11. Flaw Type BOK Reviewer  Surface Planar (UT/RT)  12. Flaw Characterization Figure BOK Reviewer  WA-3330-1  WA-3340-1  13. Flaw Characterization Figure Number  | Hacked  Ised. Wyes Prepared Marched  Inominal = 5.160 's  Plana (UTRT)   IWA-33  IWA-33  IWA-33  | "tmeasured" = \(\mu\)  [] Laminar (UT/RT)  [] 350-1 [] 360-1   | /A "S" = 0,620 Linear (  | PT/MT/RT)  |
| Show determination of type of "a" to use    See   Output   | Hacked  Ised. Wyes Prepare The  Thominal = 5.160 's  Planar (UTRT)   IWA-33  IWA-33  ONL Flaw 1   IWA-33  es   no lif no, why?   | "tmeasured" = \( \mu\)  [] Laminar (UT/RT)  [] 350-1 [] 360-1 [] w 2 [] OK R   | A "S" = 0,620     Linear (   I\.'A-3380-1     I\.A-3390-1     Flaw 3   Flaw  | PT/MT/RT)  |
| Show determination of type of "a" to use    See   Owner  | Hacked  Inominal = 5.160 and the Pianal (UTRT)  Pianal (UTRT)  I IWA-33 IN Flaw 1 IN F | "tmeasured" = \( \mu\)  [] Laminar (UT/RT)  [] 350-1 [] 360-1 [] w 2   | A "S" = 0,620     Linear (   I\.'A-3380-1     I\.A-3390-1     Flaw 3   Flaw  | PT/MT/RT)  □ IWA-3400-1  4 □ Flaw 5  |
| Show determination of type of "a" to use    See   Owner  | Hacked  Inominal = 5.160 and the Pianal (UTRT)  Pianal (UTRT)  I IWA-33 IN Flaw 1 IN F | "tmeasured" = \( \mu\)  [] Laminar (UT/RT)  [] 350-1 [] 360-1 [] w 2 [] OK R   | A "S" = 0,620     Linear (   I\.'A-3380-1     I\.A-3390-1     Flaw 3   Flaw  | PT/MT/RT)  |
| Show determination of type of "a" to use    See   Oc.  | Hacked  sed. Eyes Prepare The  Thominal" = 5.160"  Planar (UTRT)  I IWA-33  I IWA-34  I IWA-35   | 'tmecsured' = W  Laminar (UT/RT)  350-1  360-1  w 2  Tok R  17. Review by and d  | A "S" = 0.620     Linear (   IN'A-3380-1     IWA-3390-1     Flaw 3   Flaw     eviewer 2     Linear (   | PTMT/RT)    IWA-3400-1   4   |
| Show determination of type of "a" to use    See   Owner  | Hacked  sed. Eyes Prepare The  Thominal" = 5.160"  Planar (UTRT)  I IWA-33  I IWA-34  I IWA-35   | 'tmecsured' = W  Laminar (UT/RT)  350-1  360-1  w 2  Tok R  17. Review by and d  | Linear (  Linear (  Linear (  IN'A-3380-1  IWA-3390-1  Flaw 3  Flaw  Linear (  IWA-3390-1  Flaw  Linear (  IWA-390-1  Flaw  Linear (  IWA- | PT/MT/RT)  □ IWA-3400-1  4 □ Flaw 5  3 - I   |
| Show determination of type of "a" to use    See   Oc.  | Hacked  sed. Eyes Prepare The  Thominal" = 5.160"  Planar (UTRT)  I IWA-33  I IWA-34  I IWA-35   | Laminar (UT/RT)  350-1 360-1 w 2  This review by and of applicable codes, mandar   | Linear (  Linear (  Linear (  IN'A-3380-1  IWA-3390-1  Flaw 3  Flaw  Linear (  Linear  | PT/MT/RT)  □ IWA-3400-1  4 □ Flaw 5  3 - 1 ~ 97  dology used is in accordance with   |

## Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining

|                       | or surrace and subsurra   |  |  |  |                                       |
|-----------------------|---|--|--|--|---------------------------------------|
|                       | ASME SE   |  | O ADDENDA The J  |  |                                       |
|                       | Report #_97-0136  | Evaluation Pe<br>Reviewed By   | erformed By Our  | Date: 3  | Date: 2/23/97                         |
| W1 an                 | gth of the flaw "" is deter and W2 for parallel scan d W values are from pag -1 . 7 (W2)1 . 4 (   | mined by finding ts.   | the difference between   |  |                                       |
| Thic                  | kness kness of the component value is from page _1 =_5 . 160 _ inches   |  |  | nom wall (circle                                   | one).                                 |
| Million management    | bration<br>measured angle in the c  | alibration block w   | as _45 . 0_ degrees  |  |                                       |
| The with (L) fr       | flaw exhibited 20% DAC<br>the transducer exit point<br>from the 0" reference. (U<br>servative.)   | at 6.40 and at -1.5 inches   | 6 . 42 inches MP. M<br>s (W) from the centerli                               | lax amplitude is<br>ne of the weld                 | at 6.42 inches MP<br>and 160.7 inches |
| 1)                    | Determine the upper d<br>6 . 40_ (metal path at<br>depth.   |  |  |  | = _4 . 5254_ inches                   |
| 2)                    | Determine the lower de 6 . 42 (metal path at depth.   |  |  | gle 0 . 7071                                       | = _4 . 5396_ inches                   |
| 3)                    | Determine the depth o<br>6 42 (metal path at<br>4 . 5396 inches depth   | maximum amplit   |  |  |                                       |
| 4)                    | Determine the distance $6.42$ (metal path at $4.5396$ (depth at m $\sqrt{a^2 - b^2} = 4.5396$ is $160.7$ (Lmax) + 4   | maximum amplitud<br>aximum amplitud<br>nches of surface of   | ude point) squared = 20<br>e point) squared = 20<br>distance to the flaw fro | 41 . 2164 (a²)<br>0 . 6080 (b²)<br>om the transduc | per exit point.                       |
| 5)                    | Determine S by picking S = 4.5254 (result >> OR << S = 5.160 (part "t") exam surface and the  | of 1) = distance be<br>- 4 . 5396 (resi  | etween exam surface  |  |                                       |
| 6)                    | Determine 2d in though<br>4 . 5396_ (from step 2  |  | om step 1) = _0 . 0142   | inches.  |                                       |
| 0.4d<br>Com<br>If S i | ermination of surface of $= (2d/2) * 0.4 = 0.00$ pare to S (from step 5) is less than 0.4d, the flaving greater than or equal to $0.3$ (for $a/t > 0.5$ , $t = 2$ ) | v is <b>surface</b> . a = 0 0.4a the flaw is   | 2d + S = in<br>sub-surface a = 2a<br>t = _5 . 160_ (part                     | 2 = _0 . 0071                                      | inches.                               |
|                       | 0.0071 (surf or sub s   | The same of the sa | S = _0 . 6204_   |  | Page 23 of 70                         |

flawtrig (for parallel scans) Rev 0



Date March 5, 1997

Location CSC-2

n Ad Hoc Evaluation Group

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RV CLOSURE HEND W. 4
EXAM 97-0109. PER TELLON APPROVAL TOM TOWES 1:00 PM.
During the 1997 inspection of Steam Consister 22 world N.A.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obvintes the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curva ure of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1,4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | - ID     | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.5758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas Jones Lvl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SF

Page 24 of 70

Report # 97-0/36R1

|  | 1  | AND ADDRESS OF THE OWNER, WHEN PARTY AND ADDRESS | orksheet  |   | 7  |
|--|--|--|---|---|--|
| ISI Report Number PT 2 97-0(36  ISI Interval MOK Reviewer  | 2. Flaw Number   | 3. Item N  | 52.7  | 2 //  | lumber of Pages  |
|  |  | 5. Code Edition and  | Addenda # OK R  | eviewer   |  |
|  | 1 preservice   | □ 80 W81 □   | 86 no addenda 🔊   | 89 no addenda Li of   | her  |
| Acceptance Standard OK Review 1WB-3510   |  | IWB-3512 🗆 I   | WB-3514 🗆 IW  | B-3515 □ IWE  | 3-3516 🗆 IWB-3518  |
| ☐ [WB-352]   | 1/   | [WC-3512 🗆 1   | WC-3513 🗆 IW  | C-3514 🖂 IWO  | 3515   |
| Calculations OK Reviewer   | / LIWC-3311 L  | 140-3312 01  |   |   |  |
|  | TOT EL.  | a  | belief. 1   |   |  |
| From attached  |  |  |   | = 0.6 a   | = 0.1803   |
| Flaw Type  | subsurface 7   | lanar  | trum  | n = 5.160   | " 5 = 2.140  |
| $\frac{a}{\ell} = \frac{0.1803}{0.6}$  | = 0.3005   | Round  | to 0,3  | 20  |  |
| use 4 to \$2   |  |  |   |   |  |
| $\frac{2}{7} = \frac{0.1}{5.1}$  | 803  | 0.0349   | Round   | to 3,   | 5%   |
| From Table :   | INB - 3510-1   |  |   |   |  |
| Me 470   | Y =  | 2 _ 2  | 2.1407 =<br>0.1803  | 11.9 =>   | Y = 1  |
|  |  | a  | 0.1803  |   |  |
| 0.30 4.44  |  |  |   |   |  |
| less than  | 4.470 . I  |  | l equal   |   |  |
| less than  | 4.470 . I  |  |   |   |  |
|  |  | nd cation  |   |   |  |
|  | a/t =  | ndication  |   |   |  |
| Results A OK Reviewer M  | a/t =calculated a/t %=   | 0.30<br>3.5%   |   |   |  |
| Results OK Reviewer  | all =  | 0.30<br>3.57.<br>4.47.   |   |   |  |
| Results AOK Reviewer Cod   | calculated $a/t \% =$ e allowable $a/t \% =$ ea: $(0.75 \cdot l \cdot w) =$  | 0.30<br>3.5%   |   |   |  |
| Results AOK Reviewer Cod   | calculated $a/t \% =$ e allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$   | 0.30<br>3.57.<br>4.47.<br>NA   | D 1WB-3511-1  | o 1WB-3511-2  | □ IWB-3512-1   |
| Cod  Iaminar flaw surface ar  Table used for analysis  WB-35  IWB-35   | calculated $a/t \% =$ e allowable $a/t \% =$ ea: $(0.75 \cdot t \cdot w) =$ fewer 10-1   | 0.30<br>3.57.<br>4.47.<br>NA   | D IWB-3511-1 D IWB-3514-3   | eptable   |  |
| Cod  laminar flaw surface ar  Table used for analysis OK Rev   | calculated $a/t \% =$ e allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ $10-1  \Box  IWB-3510-2$ $12-2  \Box  IWB-3514-1$ $15-1  \Box  IWB-3516-1$  | 0.30<br>3.57.<br>4.47.<br>NA   | D 1WB-3511-1  | = 1WB-3511-2<br>= 1WB-3514-4  | □ IWB-3512-1   |
| Cod  laminar flaw surface ar  Table used for analysis  Nok Rev  IWB-35  IWB-35  IWB-35  IWC-35   | calculated $a/t \% =$ e allowable $a/t \% =$ e allowable $a/t \% =$ ea: $(0.75 \cdot t \cdot w) =$ fewer $10-1  \Box  [WB-3510-2]$ $12-2  \Box  [WB-3514-1]$ $15-1  \Box  [WB-3516-1]$ $10-1  \Box  [WC-3510-2]$ $13-1  \Box  [WC-3510-2]$   | 0.30<br>3.57.<br>4.47.<br>NA<br>1WB-3510-3<br>1WB-3516-2<br>1WC-3510-3   | D IWB-3511-1 C IWB-3514-3 D IWB-3518-   | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2                                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Cod  laminar flaw surface ar  Table used for analysis  Nok Rev  IWB-35  IWB-35  IWB-35  IWC-35  IWC-35  IWC-35   | calculated a/t %= e allowable a/t %= ea: (0.75 t • w) = fewer 10-1   | 0.30<br>3.57.<br>4.47.<br>NA<br>1WB-3510-3<br>1WB-3516-2<br>1WC-3510-3   | D IWB-3511-1 D IWB-3514-3 D IWB-3518- D IWC-3511-   | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2                                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Cod  Iaminar flaw surface ar  Table used for analysis  WB-35  WB-35  WB-35  WB-35  WC-35  WC-35  WC-35  WC-35  WC-35  WC-35  WC-35   | calculated a/t %=  | 0.30<br>3.57.<br>4.47.<br>NA<br>DIWB-3510-3<br>DIWB-3516-2<br>DIWC-3510-3<br>DIWC-3510-3   | IWB-3511-1     IWB-3518-1   IWC-3511-1     Reviewer   | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Cod.  Iaminar flaw surface ar  Table used for analysis  WB-35  WB-35  WB-35  WB-35  WC-35  WC | calculated 0/t %= e allowable 0/t %= e allowable 0/t %= eea: (0.75 • t • w) =  | 0,30<br>3,57.<br>4,47.<br>NA<br>1WB-3510-3<br>1WB-3516-2<br>1WC-3510-3<br>1WC-3510-3<br>Vyes Preparer TY   | IWB-3511-1     IWB-3518-1   IWC-3511-1     Reviewer   | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Cod laminar flaw surface ar  Table used for analysis  WOK Reviewer  TWB-35   | calculated a/t %= e allowable al | 0.30 3.57. 4.47. NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   WC-3510-3   IWC-3510-3   | IWB-3511-1  | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Code laminar flaw surface ar  Table used for analysis  Nok Rev  No | calculated $0/t$ %=e allowable $0/t$ %=e allowable $0/t$ %=e a: $(0.75 \cdot t \cdot w) =$ ea: $(0.75 \cdot t \cdot w) =$   | 0.30 3.57. 4.47. NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   WB-3516-2   IWC-3510-3   WG-3510-3   WG-3510-3   WG-3510-3   WG-3510-3   WG-3510-3   WG-3510-3   | IWB-3511-1 G IWB-3514-3 D IWB-3518-1 D IWC-3511-4 Reviewer OK Reviewed                              | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6   |
| Cod  laminar flaw surface ar  Table used for analysis  Web-35  | calculated a/t %=  | 0, 30 3, 57. 4, 47. NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   Wes Preparer TY    Ewer   | IWB-3511-1  L IWB-3514-3  IWB-3518-  IWC-3511-1  Reviewer  OK Reviewed  ed  ed  ed  attached analy  | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6<br>☐ IWC-3512-2   |
| Cod laminar flaw surface ar  9. Table used for analysis  WOK Rev  10. Was linear interpolation used? I ye 11. Was 1WA-3200 Significant Digits For 12. The correct Code Edition and Adden 13. Statement of acceptability or rejectate  Accept.  Reject.   | calculated 0/t %=e allowable 0/t %=e allowable 0/t %=eea: (0.75 * t * w) =eea: (0.75   | 0, 30 3, 57. 4, 47. NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   Wes Preparer TY    Ewer   | IWB-3511-1 G IWB-3514-3 D IWB-3518- D IWC-3511- Reviewer OK Reviewed ed ed attached analy           | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6<br>☐ IWC-3512-2   |
| Cod  laminar flaw surface ar  7. Table used for analysis  Web-35  Web- | calculated 0/t %=e allowable 0/t %=e allowable 0/t %=eea: (0.75 * t * w) =eea: (0.75   | 0.30 3.57 4.47 NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3  | IWB-3511-1 G IWB-3514-3 D IWB-3518- D IWC-3511- Reviewer OK Reviewed ed ed attached analy           | IWB-3511-2<br>  IWB-3514-4<br>  IWB-3518-2<br>  IWC-3511-2                  | ☐ IWB-3512-1<br>☐ IWB-3514-6<br>☐ IWC-3512-2   |
| Cod laminar flaw surface ar  7. Table used for analysis  MOK Rev NB-35  IWB-35  IWB-35  IWC-35  IWC-35 | calculated 0/t %=e allowable 0/t %=e allowable 0/t %=eea: (0.75 * t * w) =eea: (0.75   | 0.30 3.57 4.47 NA    IWB-3510-3   IWB-3516-2   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3   IWC-3510-3  | IWB-3511-1  L IWB-3514-3  D IWB-3518-1  D IWC-3511-1  Reviewer  OK Reviewed  ed  ed  attached analy | IWB-3511-2   IWB-3518-2   IWC-3511-2   IWC-3511-2   If no. why?             | IWB-3512-1 IWB-3514-6 IWC-3512-2   |
| Cod laminar flaw surface ar  Table used for analysis  Nok Rev  Nok | calculated a/t %= e allowable a/t %= e allowable a/t %= ea: (0.75 t • w) = fewer  10-1   | O. 30 3. 57. 4. 47. NA    IWB-3510-3   IWB-3516-2   IWB-3516-2   IWC-3510-3   WB-3516-2   IWC-3510-3   WB-3516-2   IWC-3510-3   WB-3516-2   IWC-3510-3   WB-3516-2   IWC-3510-3   WB-3516-2   IWB-3516-2   IWB-3516-2 | IWB-3511-1  G IWB-3514-3  D IWB-3514-3  D IWC-3511-4  Reviewer  OK Reviewed  attached analy         | IWB-3511-2  IWB-3514-4  IWB-3518-2  IWC-3511-2  If no, why?  er  If no why? | ate    IWB-3512-1   IWB-3514-6   IWC-3512-2     IWC-3512-2   IWC-3512- |
| Cod laminar flaw surface are  Table used for analysis  Wok Rev  WB-35  W | calculated 0/t %=  | O. 30  3. 57.  4. 47.  NA  1WB-3510-3  1WB-3516-2  1WB-3516-2  1WC-3510-3  Observation  Very Preparer Ty  ever A  (a/t) calculate  (a/t) calcu | IWB-3511-1  G IWB-3514-3  D IWB-3514-3  D IWC-3511-4  Reviewer  OK Reviewed  attached analy         | IWB-3511-2  IWB-3514-4  IWB-3518-2  IWC-3511-2  If no. why?  er  If no why? | ate    IWB-3512-1   IWB-3514-6   IWC-3512-2     IWC-3512-2   IWC-3512- |

|   |  | ng Worksheet                         |  |  |
|---|--|--------------------------------------|--|--|
| ISI Report Number 97-0136 2. Flaw   | Number r   | 1                                    | 3. Item Number   | B 2.40   |
| ISI Interval WOK Reviewer 2 5. Code   | Edition and Addend   | OK Reviewer_<br>enda % 89 no addenda | E.J.   | 6. Method 18 UT C RT   |
| □ 2nd interval □ preservice □ 8 Flaw Sketch ☑ OK Reviewer □   | 0 W81 LJ 86 NO 200   | 1.748/" —                            | La Other   |  |
| Front View  |  | 7707                                 |  | AND ADDRESS AND ADDRESS OF THE ADDRE |
|   | 0  |                                      |  |  |
|   |  | 4                                    |  |  |
|   |  | 0.3606                               |  |  |
|   |  | *                                    |  |  |
|   |  |                                      | 2.1407   |  |
|   |  |                                      | 1  |  |
| Top View  |  |                                      | 2 well   | ***************************************  |
| 10p view  | ***********  |                                      | * weig   | CONTRACTOR AND ADDRESS AND ADD |
|   |  |                                      |  |  |
|   | 10   | ¥3.2"→<br>₩0.6"→                     |  |  |
| 8TM   | Head   | L                                    |  |  |
|   |  | 10.67                                |  |  |
|   |  |                                      |  |  |
|   |  |                                      |  |  |
| Side View   |  |                                      | 4 well   |  |
|   |  |                                      |  |  |
|   |  |                                      |  |  |
|   | . 0  |                                      |  |  |
| BTM   | Head   |                                      |  |  |
|   |  |                                      |  |  |
|   | -  |                                      |  | CONTRACTOR SANDE EDUCATION CONTRACTOR CONTRACTOR   |
|   |  |                                      |  |  |
| 8. Calculations OK Reviewer 4. J. Show determination of surface or subsurface                               | 11 1   | 0                                    |  |  |
| <00   | a Hacke  | V                                    |  |  |
| Show determination of type of "a" to use  | a Hache  | 0                                    |  |  |
| Show determination of type of a to day  | - Hacks  |                                      |  |  |
| see   | anaco  |                                      | -1   |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was us  | ed. Hes Preparer   | TEN J WOK Rev                        | iewer [J   |  |
| 10. Code Flaw Dimensions (DOK Reviewer 4) "" = 0,6 "" = 0,1803 ""   |  |                                      |  | 07 "W" = N/A   |
| 11. Flaw Type @OK Reviewer 5.   | nominal 3.10   |                                      | THE RESERVE OF THE PARTY OF THE |  |
| ☐ Surface Planar (UT/RT) Subsurface   | Plana (UT)RT)  | ☐ Laminar (UT/RT                     | ) □ Lines  | ar (PT/MT/RT)  |
| 12. Flaw Characterization Figure GOK Reviewer 1 IWA-3330-1  |  | A-0 :: 3-1                           | □ IWA-3380-1   | □ IWA-3400-1   |
| 13. Flaw Characterization Figure Number □ IWA-3340-1  | THE RESIDENCE OF THE PARTY OF T | A-3360-1<br>3 Flaw 2 C               | ☐ IWA-3390-1<br>☐ Flaw 3 ☐ Fla   | w 4 🔲 Flaw 5   |
| 14 Was FWA-3300 Flaw Characterization followed? West  | no If no, why?   | TOTAL J BOK                          | Reviewer &/ A  |  |
| 15. The correct Code Edition and Addenda was available an 16. Prepared by and date                          | d used. To ves rrepai  | 17. Review by and                    |  | - 11/ 6-2  |
| 0. 10.01  | -1- ha   | 1                                    | E. J. Thor   | ~ 3-1V-97  |
| - 1 cm Jours  | 2/23/47  | This review as over the              | at the results are correct and the me  | thodology used is in accordance with   |
| The results are correct and the methodology used is in accordance with app<br>specifications and procedures | ticable cores, standards,  | applicable vodes, stani              | lards, specifications and procedure  |  |
|   |  |                                      | Page 26 of 70  |  |
|   |  |                                      | Report # 97-0/36 K   |  |

NSP OASNOASNSIFSWRI DOC ISI Flaw Sizing Worksheet Revision 1

REVISION 11-11-94

#### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface  |   |
|--|---|
| ASME SECT XI 1989 WI NO ADDENDA TA SINITIAL TO VERIFY  |   |
| ISI Report # 97-0136 Evaluation Performed By John Jake: 2/23/97 Flaw # 7 Reviewed By: E.J. Date: 3-1V-97   | 7 |
| Length Length of the flaw "' is determined by finding the difference between L1 and L2 for perpendicular scans, W1 and W2 for parallel scans. L and W values are from page of the UT report.  (=3 . 5 (W2)2 . 9 (W1) = _0 . 6 inches.  |   |
| Thickness Thickness of the component at the location of the flaw, using UT or nom wcircle one). This value is from page _1_ of the UT report.  "t" = _5 . 160_ inches  |   |
| Calibration The measured angle in the calibration block was _45 . 0_ degrees   |   |
| Calculations using metal path  From page of the UT report, Scan #3  The flaw exhibited 20% DAC at _3 . 76 and _4 . 27 inches MP. Max amplitude is at _3 . 92 inches MP with the transducer exit point at3.2 inches (W) from the centerline of the weld and _235 . 5 inches (L) from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative.)                               |   |
| Determine the upper depth of the flaw from the exam surface.  3 . 76 (metal path at 20% upper) * COS of the measured angle _0 . 7071 = _2 . 6587 inches depth.   |   |
| 2) Determine the lower depth of the flaw from the exam surface.  4. 27 (metal path at 20% lower) * COS of the measured angle 0 7071 = 3.0193 inches depth.   |   |
| Determine the depth of the flaw from the exam surface at the maximum amplitude point. 3 . 92 (metal path at maximum amplitude point) * COS of the measured angle 0 . 7071 = 2 . 7718 inches depth.   |   |
| Determine the distance from 0" reference to the maximum amplitude point of the flaw.  4 27 (metal path at maximum amplitude point) squared = 18 2329 (a²)  2 7718 (depth at maximum amplitude point) squared = 7 6829 (b²)  Va² - b² = 3 2481 inches of surface distance to the flaw from the transducer exit point.  235 . 5 (Lmax) + 3 2481 (surf dist) = 238 7481 inches from 0" reference.                   |   |
| 5) Determine S by picking the smaller of the following; S = 2.6587 (result of 1) = distance between exam surface and the upper flaw tip >> OR <<   |   |
| $S = \underline{5.160}$ (part "t") - $\underline{3.0193}$ (result of 2) = $\underline{2.1407}$ distance between the side opposite exam surface and the lower flaw tip  |   |
| 6) Determine 2d in though wall thickness.  |   |
| Determination of surface or subsurface $0.4d = (2d/2) * 0.4 = 0.0721$ Compare to S (from step 5) If S is less than 0.4d, the flaw is surface. $a = 2d + S = $ inches. If S is greater than or equal to 0.4a the flaw is sub-surface. $a = 2a/2 = 0.1803$ inches. $l = 0.6 \text{ (for } a/l > 0.5, l = 2a)$ $a = 0.1803 \text{ (surf or sub sur) circle one)}$ $t = 5.160 \text{ (part thickness)}$ $S = 2.1407$ |   |



Date March 5, 1997

Location

CSC-2

From Ad Hoc Evaluation Group

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RV CLOSURE HEAD W. G. EXAM 97-0109. PER TELLOW APPROVAL TOM TOWES 1100 PM.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level ill that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

- The determination of length varies with the direction of scar, and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | C 62C    | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID .     | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas Jones Lvl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SP

Report # 97-0/36/E)

| 1. ISI Report Number 97 - 0134<br>PT 2 97 - 0134<br>4. ISI Interval NOK Reviewer  | ISI Flaw Dis   | position Worksheet   | 1   |   |
|---|--|--|---|---|
| Prince D Mr. C. ( ) (   | 2. Flaw Number 8   | The state of the s | 14/Total Nu   | imber of Pages  |
| PT 2 1T-0138  | 1. 150   | Code Edition and Addenda OK R  |   |   |
| ISI Interval On Reviewer third interval   |  | 3 80 W81 🗆 86 no addenda 🏂   | 89 no addenda 🗆 oth   | er  |
| . Acceptance Standard OK Re   | viewer M   |  |   |   |
| № IWB-3   |  | 3-3512 🗆 IWB-3514 🗀 IW   | B-3515 🗆 IWB-   | 3516 🗆 IWB-3518   |
| □ IWB-3:  | The second second second second  | C-3512 D IWC-3513 D IW   | C-3514 🗆 IWC-   | 3515  |
| Calculations OK Reviewer  |  | A A STATE OF THE PARTY OF THE P |   |   |
|   | ( ISI Flaw S   | izing worksheet:   | 1= 0.7"   | a = 0.1695  |
|   | Subsurface Pla   | -  |   | " S = 1.45"   |
| A 0.1645  | 0 2/2/ 0   |  | uon = - 1700  | V - 1. 73   |
| £ = 0.7   | = 0,2421 K   | ound to 0.24   |   |   |
| use 4 to 13   | 2 subsurface =   | Flaw:  |   |   |
| $\frac{a}{t} = \frac{0}{5}$   | 1695 = 0.0   | 328 Round  | to 3,3%   |   |
| From Table  | INB - 3510 -1 :  |  |   |   |
| 41 4 72 V   | , ,  | $=\frac{1.45}{0.1695}=8$   | '. 6 =>   | y = 1   |
| 0, 20 3.3 Y   |  | 0,1693   |   |   |
| 0.25 3.8Y   |  |  |   |   |
| equals to 1   |  | culated equals 3% for % at   |   |   |
| ACCEPTABLE  |  | 24   |   |   |
|   | Q/i  |  |   |   |
|   | calculated p/t %= 3  | 3 %  |   |   |
| Co  | de allowable $0/t \% = 3.3\%$  | < 42 2 3.5%  |   |   |
| laminar flaw surface  | 202: (0.75 ( . W) =  |  |   |   |
|   | A STATE OF THE PARTY OF THE PAR |  |   |   |
| 9. Table used for analysis X OK R   |  | IWB-3510-3 □ IWB-3511-1  | ☐ 1WB-3511-2  | □ (WB-3512-1  |
|   | 1512-2 D IWB-3514-1 D  | IWB-3514-2 🖂 IWB-3514-3  | □ IWB-3514-4  | □ (WB-3514-6  |
| □ IWB-  | 1515-1 [] IWB-3516-1 []  | IWB-3516-2   | □ IWB-3518-2  | D INDIDITIO   |
| □ IWB-3   | 210 ) P DUC 2010 2 P   |  |   | C (WC-3512-2  |
| □ IWB-1<br>□ IWC-1  |  | TWC-3510-3 D TWC-3511-   | □ fWC-3511-2  |   |
|   | es B no If no, why? By cose  | IWC-3510-3 D IWC-3511-   |   |   |
|   | es B no If no, why? By cose  | Vaction s D no A OK Reviewer   | If no why?  |   |
| ☐ IWB-1 IWC-1 IWC | res of no If no, why? By coser<br>For Limiting Values followed? of yes   | Vation s Dng AOK Reviewer  | If no why?  |   |
| ☐ IWB-<br>☐ IWC-<br>☐ IWC-<br>☐ IWC-<br>10. Was linear interpolation used? ☐ y<br>11. Was IWA-3200 Significant Digits I<br>12. The correct Code Edition and Adde  | ves ps no If no, why? By cbser<br>For Limiting Values followed? ps yes<br>and a was available and used. 20 yes   | Vation s Dng AOK Reviewer  | If no why?  |   |
| ☐ IWB-☐ IWC-☐ IWC | res on o If no, why? By coser<br>For Limiting Values followed? of yes<br>and a was available and used. To yes<br>ability with basis of OK Reviewer   | VACTION S CI NO MOK Reviewer Preparer MOK Review   | If no why?  |   |
| ☐ IWB-☐ IWC-☐ IWC | res pano If no, why? By cose? For Limiting Values followed? payer and a was available and used. payes ability with basis proc Reviewer  □/f)Code allowable ≥ (□.   | TWC-3510-3 D IWC-3511-A  Vaction  S D no MOK Reviewer  Preparer M MOK Review  // Calculated  | If no why?  |   |
| 10. Was linear interpolation used? 1 yc-1  11. Was IWA-3200 Significant Digits I  12. The correct Code Edition and Adde  13. Statement of acceptability or reject.  Accept. (1)   | res on o If no, why? By observer of Limiting Values followed? of yes ability with basis of North Reviewer of the control of t  | TWC-3510-3 DIWC-3511-A  Vaction S D no MOK Reviewer Preparer M MOK Review  // Calculated  // Calculated  | If no why?  |   |
| 10. Was linear interpolation used? 1 yc-1  11. Was IWA-3200 Significant Digits I  12. The correct Code Edition and Adde  13. Statement of acceptability or reject.  Accept. (1)   | res on o If no, why? By observer of Limiting Values followed? of yes ability with basis of North Reviewer of the control of t  | TWC-3510-3 D IWC-3511-A  Vaction  S D no MOK Reviewer  Preparer M MOK Review  // Calculated  | If no why?  |   |
| 10. Was linear interpolation used? 1 y 1 Was IWA-3200 Significant Digits I 12. The correct Code Edition and Adde 13. Statement of acceptability or reject.  Accept. (1)   | res on o If no, why? By observer of Limiting Values followed? of yes ability with basis of North Reviewer of the control of t  | TWC-3510-3 D IWC-3511-A  TOTAL OK Reviewer  Preparer M AOK Review  // Calculated  // Calculated  dbook (see attached analy   | If no why?  | CI (WC-3512-2   |
| ☐ IWB-☐ IWC-☐ IWC | For Limiting Values followed? By cobserved was available and used. Dyes ability with basis DOK Reviewer 10/1)Code allowable ≥ (0/1)Code allowable ≥ (0/1)  | TWC-3510-3 DIWC-3511-A  (Vactor) S D no MOK Reviewer Preparer M MOK Review  /†)calculated /†)calculated dbook (see attached analy view by and fate  17  17  17  17  17  18  Tresultafore person and the methodology  18  17  17  18  Tresultafore decrees and the methodology  | If not why?  If not why?  er  Sis)  Approved by and dat   | e 4 Merz  |
| ☐ IWB-☐ IWC-☐ IWC | This review a sames that is appendix in accordance with  | TWC-3510-3 DIWC-3511-A  (Vaction of OK Reviewer Mok Calculated Mok (see attached analy view by and date in the methodology of the popular of the codes, standards.  | If not why?  If not why?  er  SiS)  Approved by and date the separation were aware of the new position were aware of the new position were aware or and in a separation with the new position were aware or and in a separation with the new position was a correct and in a separation with the new position was a correct and in a separation with the new position was a correct and in a separation with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position with the new position was a separation with the new position | e A Mare  clived with this flav sizing and flav existy that the results and the eccuriance with applicable codes. |
| IWB-  IWC-    | in accordance with withres.  State of the property of the pro  | TWC-3510-3 DIWC-3511-  (vactor)  s D no MOK Reviewer  Preparer M MOK Review  /†)calculated  /†)calculated  dbook (see attached analy view by and late 1'  mappiled a codex standards  Page 29  | If not why?  If not why?  er  SiS)  Approved by and date the supposition were aware of the new possition were aware of the new thould be a correct and in a   | e A Mare  clived with this flav sizing and flav existy that the results and the eccuriance with applicable codes. |

| ISI Flow Sizi  | ng Worksheet   |
|--|--|
| 1 2 Pt. North  | - Carried and the second secon |
| TIZ 97-0136  | 3. Item Number B 2. 40   |
| 4 ISI Interval COK Reviewer 5 5. Code Edition and Addenda  | GOK Reviewer _ Co   6. Method  |
| Flaw Sketch DOK Reviewer 27 161.11   |  |
| Front View   | 73   |
|  | 115  |
| 0  | 1.45   |
|  | - X  |
|  | 0 7390"  |
|  | 0.336  |
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| Top View   | 12 well  |
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| BTM Head   |  |
| BTM Head   | F0.77  |
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| Side View  | 14 well  |
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| 8. Calculations 20 K Reviewer 4  |  |
| snow determination of surface or substitute affactles  |  |
| see allacted   |  |
| Show determination of type of "a" to use   |  |
| Show determination of type of "a" to use see a Harchel   |  |
| see allocate   |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was usedyes Preparer T   | Z. POK Reviewer 2  |
|  |  |
| "" = 0.7 "" = 0.1695 "transing" = 5.160  | "towa" = N/A "S" = 1.45 "W" = N/A  |
| 1 - 0,1 0 - 0,1013 Thomas 3,10   | Triggspace Polyto  |
| 11. Flaw Type OOK Reviewer Subsurface Plana (UTRT)   | ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure DOK Reviewer LJ   | P 1504 2400 I  |
| □ IWA-3310-1 □ IWA-3330-1 □ IWA  |  |
| ART A T T T T T T T T T T T T T T T T T  | Flaw 2   |
| 14 Was IWA-3300 Flaw Characterization followed? Lyes Cl no 1f no, why?   | A second  |
| 15. The correct Code Edition and Addenda was available and used. Bues Propage  | The J BOK Reviewer & )   |
| 16. Prepared by and date   | 1 17 Review by and date  |
| 1 Du Jouest 2/23/97  | 5 - thom 3-12-97   |
| , &  | 2.0.0  |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards specifications and procedures  |
| specifications and procedures.   | Page 30 of 70  |
|  |  |
|  | Report # 97-0136R)   |

NSP ONSNIGNSNSIFSWR! DOC ISI Flaw Sizing Worksheet Revision I

**REVISION 11-11-94** 

### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| F                       | or surface and subsurf   | ace single planar fla   | aws oriented in pla  | ne normal to pre   | ssure retainin               | g surface  |
|-------------------------|--|---|--|--|------------------------------|------------|
|                         | ASME S   | ECT XI 1989 W/ NO   |  |  |                              | , ,        |
|                         | eport #_97-0136<br>#_8   | Evaluation Pe<br>Reviewed By                                      | erformed By The  | Dan Jords  Date:   | 3-12-57                      | 2/23/9     |
| W1 a                    | ath<br>th of the flaw "" is dete<br>and W2 for parallel sca<br>d W values are from pa<br>3 . 6 (W2)2 . 9   | ermined by finding t<br>ns.<br>age of the UT n                    | he difference betw   |  |                              |            |
| Thick                   | kness kness of the componer value is from page _1 : _5 . 160_ inches   |   |  | or nom wall (cir   | cle one).                    |            |
| Section Control Section | pration<br>measured angle in the   | calibration block w   | as _ <b>45 . 0</b> _ degree                                      | es   |                              |            |
| The with                | ulations using metal<br>flaw exhibited 20% DA<br>the transducer exit poi<br>the 0" reference. (Usi   | C at 2.05 and nt at -3.3 inches                                   | 2 . 53 inches MP<br>(W) from the center                          | Max amplitude erline of the weld   | e is at 2 . 29<br>and _159.5 | inches (L) |
| 1)                      | Determine the upper 2 . 05 (metal path depth.  |   |  |  | 1_ = _1 . 4500               | _ inches   |
| 2)                      | Determine the lower _2 . 53 (metal path depth.   |   |  |  | _ = _1 . 7890                | _inches    |
| 3)                      | Determine the depth<br>2 . 29 (metal path<br>1 . 6193 inches de  | at maximum amplit   |  |  |                              |            |
| 4)                      | Determine the distantal 2.29 (metal path at $1.6193$ (depth at $1.6193$ $1.6193$ $1.6193$ $1.6193$ $1.6193$  | at maximum amplitud<br>maximum amplitud<br>inches of surface      | ide point) squared<br>e point) squared =<br>distance to the flav | = _5 . 2441_ (a <sup>2</sup><br>2 . 6221_ (b <sup>2</sup> )<br>w from the transc | ducer exit poin              | nt.        |
| 5)                      | Determine S by picking S = 1.4500 (resured S = 5.160 (part "texam surface and the surface state of the surface of the | It of 1) = distance b   | etween exam surf   |  |                              | pposite    |
| 6)                      | Determine 2d in thou<br>1 . 7890 (from ste   | igh wall thickness.<br>(b 2) - 1 . 4500 (fr                       | om step 1) = _0 . 3  | 3390_ inches   |                              |            |
| 0.4d<br>Com<br>If S i   | ermination of surface<br>= $(2d/2) * 0.4 = _0.0$<br>pare to S (from step 5 s less than 0.4d, the flas greater than or equal $0.7$ (for $a/l > 0.5$ , $l = 0.5$ )   | 0678_<br>)<br>aw is <b>surface</b> . a =<br>I to 0.4a the flaw is | 2d + S =<br>sub-surface. a =<br>t = _5 . 160_ (p                 | 2a / 2 = _0 . 16   | 95_inches.                   |            |
|                         | 0 . 1695 (surf or sub  |   | S = 1 . 4500   |  | [n 2]                        | . 70       |



March 5, 1997 Date

Location

CSC-2

Location

From Ad Hoc Evaluation Group

To File

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RV CLOSURE HEAD W. 4. EXAM 97-0109. PEN TELOM APPONDE JOSE RICKER 3/7/97 PER TELLON APPROVAL TOM TOWES 1:00

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- . The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- . The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100%
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67,50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1,49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications

Jeff Ricker Supt M&S

|   | ISI Flaw D   | isposition Worksh   | reet                   | 1   |
|---|--|---|------------------------|---|
| 1. ISI Report Number 97 - 0136 2.1  | Flaw Number 9  | 3. Item Number  | B2.40                  | 14. Total Number of Pages   |
| PI 2 9T - 01361<br>I. ISI Interval DOK Reviewer W.  | A / 5  | Code Edition and Addenda                                  | OK Reviewer            | 1   |
| second interval third interval  | □ preservice   | ☐ 80 W81 ☐ 86 no ad                                       | denda 28 89 no ad      | denda 🖸 other   |
| Acceptance Standard  MOK Reviewe W IWB-3510  IWB-3520  IWC-3510   | WB-3511  | WB-3512   | ☐ IWB-3515             | ☐ IWB-3516 ☐ IWB-3518   |
| Calculations OK Reviewer  | _  |   |                        |   |
| From attached I   | SI Flaw Si   | zing Workshe  | et: 1 = 0              | .5798" a = 0.289  |
|   |  | anar  | tim =                  | 5.160" S = 9.1124   |
| $\frac{\lambda}{\ell} = \frac{0.2849}{0.5798} =$  | 0.50   |   |                        |   |
| Use 4 to 12   | erub surface   | Flan:   |                        |   |
| $\frac{a}{t}$ $\frac{0.28}{5.16}$   | 0,0  | 562 Rou   | nd to                  | 5.6%  |
| From Table IW   | B - 3510 - 1   | \$  |                        |   |
| a/2 1/2 76  |  | S = 2.11.   | 24 = =                 | 7.3 => Y = 1  |
| 0.50 7.6 Y  |  | a 0, 22   | 899                    |   |
| By observation,   | Since a  | calculated  | enal-                  | 56% which   |
|   |  |   |                        |   |
| less than :   | t. 6% . In   | dication i  | o Accep                | table.  |
|   |  |   |                        |   |
| 8. Results OK Reviewer  |  | F75   |                        |   |
| 1   |  | 50  |                        |   |
|   |  | 670   |                        |   |
| Code al   | ICHT SELFT TO THE SELECTION OF THE SELEC | . 6 7.  |                        |   |
| laminar flaw surface area:  | (0.75   (* w) =  | NA  |                        |   |
| 9. Table used for analysis     OK Review   IWB-3510-1   IWB-3512-2   IWB-3515-1   IWC-3510-1                                | WB-3510-2   WB-3514-1   WB-3516-1  | □ IWB-3514-2 □ IW<br>□ IWB-3516-2 □ IW                    | B-3514-3 D IN          | WB-3511-2   |
| □ IWC-3513-   |  | 1 - 1   |                        | 1   |
| 10. Was linear interpolation used? 🗆 yes 🗷<br>11. Was IWA-3200 Significant Digits For Li                                    | miting Values followed?  | yes Do KOK Reviewe  | ok Reviewer            | why?  |
| 12. The correct Code Edition and Addenda w<br>13. Statement of acceptability or rejectability                               | with basis MOK Review  | er er   | OK INTEREST            |   |
|   | Code allowable ≥ (   |   |                        |   |
| the receipts  |  | 2.40  |                        |   |
|   | Code allowable () flaw evaluation ha   |   | ed analysis)           |   |
| 15. Prepared by and date  |  | review by and date  | 17. Appro              | ved by and date   |
|   | 1 1  | 0 / 1   |                        | - R-1 4Mm=  |
| lintran 2/25  | 197 Merriemann   | 1 DS/03/97<br>has time results are correctional time metr | havinton disposition w | assures that all involved with this flaw sizing and fla-<br>ere aware of the necessity that the results and the<br>are correct and in accurdance with applicable vales. |
| The results are correct and the methodology used is in accor-<br>applicable codes, standards, specifications and procedures | chance with specifications and pro   | with applicable codes, standards,<br>ocutures             | standards, sq          | ecifications and procedures   |
|   | V  |   | Caro 55 of             | 70  |

N EXISTUGATISMS(FDWR0 DOC 1S) Flaw Disposition Worksheet Revision 0

Report 97-013681

REVISION 10-26-94

|  | zing Worksheet   |                |  |
|--|--|----------------|--|
| I. ISI Report Number 97-0136 2. Flaw Number  | 9/   | 3. Item Number | 2.40   |
| ISI Interval TOK Reviewer C 5. Code Edition and Addend   | ta FOK Reviewer 11   |                | 6. Method & UT CRI   |
|  | 8214" ->   | crier          | I OFI UM   |
| Front View   |  |                |  |
| 0  |  |                |  |
|  | 4  |                |  |
|  | 0.5798"  |                |  |
|  |  |                |  |
|  | 7 2.   | 1124"          |  |
| MCC / Application regarded in the first contraction of the first contra |  |                |  |
|  |  |                | ***************************************  |
| Top View   |  |                |  |
|  |  |                |  |
| , 0  | K1.6">   |                |  |
| BTM Head   |  |                |  |
|  | *  |                |  |
|  | 0.5798"  |                |  |
|  |  |                |  |
| Side View  |  |                |  |
|  |  |                | and according to the Commission of State Commi |
|  |  |                |  |
| $\sim$   |  |                |  |
| BTM Head   |  |                |  |
| D. T. Ticke  |  |                |  |
|  |  |                |  |
|  |  |                | ACCOUNTS OF THE PARTY OF THE PA |
| Calculations WOK Reviewer  | ******************************   |                |  |
| Show determination of surface or subsurface  |  |                |  |
| see attached   |  |                |  |
| Show determination of type of "a" to use   | 0  |                |  |
| see attache  |  |                |  |
|  | 11/  | - 1            |  |
| I. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used.  | The BOK Reviewer   | 2)             |  |
| 0. Code Flaw Dimensions QOK Reviewer 17 "" = 0.5798"" "" = 0.2899" "" nominal" = 5.160   | "" = 1)/4  | "5" = 2 1/2    | 1" "w" = N/A   |
| 1. Flaw Type BOK Reviewer 17   | Timecaured V/H   | 211.2          | ~ 777  |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT)   | ☐ Laminar (UT/RT)  | ☐ Linear (P    | T/MT/RT)   |
|  |  | WA-3380-1      | □ IWA-3400-1   |
|  | A-3360-1   | WA-3390-1      | ☐ Flaw 5   |
| 4. Was IWA-3300 Flaw Characterization followed?  ye-yes no If no, why?   | . /  |                |  |
| <ol> <li>The extect Code Edition and Addenda was available and used. Seves Prepare.</li> <li>Prepared by and date</li> </ol>   | 17. Review by and date   | 1/             |  |
|  | C  | 1              | 3-12-97  |
| Tom Jould 2/23/97  | 6.0  | . Thom         |  |
| he results are correct and the methodology used is in accordance with applicable codes, standards,<br>nec(ficutions and procedures   | This review assures that the rend<br>applicable codes, standards, spec |                | logy used is in accordance with  |
|  | Pane   | 34 of 70       |  |
|  |  |                |  |

# Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|                                    | ASME SE   |   | ADDENDA The JI   |  |   |
|------------------------------------|---|---|--|--|---|
|                                    | eport #_97-0136<br>#9   | Evaluation Per<br>Reviewed By:_                                   | formed By John   | Date: 3                                | Date: 2/23/9  |
| W1 a                               | oth of the flaw "" is determined W2 for parallel scar W values are from pa  | rmined by finding thes. ge of the UT re                           | e difference between   |  |   |
| Thick                              | kness kness of the componen value is from page _1 = _5 . 160 _ inches   |   | ne flaw, using UT or r   | nom wall (circl                        | le one).  |
| THE RESERVE OF THE PERSON NAMED IN | pration<br>measured angle in the  | calibration block was   | s _45 . 0_ degrees   |  |   |
| The with                           | the transducer exit poir  | C at 3 . 49 and 4 at at -1 . 6 inches                             | . 31_inches MP. M<br>(W) from the centerlin                        | ax amplitude ne of the weld            | is at 3 .85 inches MF<br>and 91 .1 inches (L<br>DAC is conservative.) |
| 1)                                 | Determine the upper of 3 . 49 (metal path a depth.  |   |  | gle <u>0.7071</u>                      | = 2.4678 inches   |
| 2)                                 | Determine the lower of 4 . 31 (metal path a depth.  |   |  | gle _0 . 7071_                         | = 3.0476 inches   |
| 3)                                 | Determine the depth of 3 . 85 (metal path a 2 . 7223 inches dep   | at maximum amplitud   |  |  |   |
| 4)                                 | Determine the distance $3.85$ (metal path a $2.7223$ (depth at $\sqrt{a^2 - b^2} = 2.7224$ $91.1$ (Lmax) + 2                      | at maximum amplitude<br>maximum amplitude<br>inches of surface di | de point) squared = _7 point) squared = _7 istance to the flaw fro | 14 . 8225 (a . 4109 (b²) m the transdu | <sup>2</sup> )<br>ucer exit point.                                    |
| 5)                                 | Determine S by pickin<br>S = 2.4678 (result<br>>> OR <<<br>S = 5.160 (part "t"<br>exam surface and the                            | of 1) = distance beat<br>)3 . 0476_ (result                       | tween exam surface   |  |   |
| 6)                                 | Determine 2d in thougast 10476 (from step   |   | m step 1) = _0 . 5798  | _ inches.                              |   |
| 0.4d<br>Com<br>If S i              | rmination of surface<br>= (2d / 2) * 0.4 = 0.1<br>pare to S (from step 5)<br>s less than 0.4d, the fla<br>s greater than or equal | w is surface. a = 2 to 0.4a the flaw is s                         | ub-surface. a = 2a   | 2 = _0 . 2899                          | 9_inches.   |
|                                    | 0 . 5798 (for a/l > 0.5<br>0 . 2899 (surf or sub  |   | t = _5 . 160_ (part<br>S = _2 . 1124_                              | -                                      | age 35 of 20  |

Report # 97-0136R1



Date March 5, 1997

CC

Location CSC-2

Location

From Ad Hoc Evaluation Group

To File

ubject Use of revised ISI calculation worksheets and correction for curvature

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1,4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID .     | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2164   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas Jones Lvl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SF

Page 36 of 70

Report # 97-0/36/21

|  | 151 Flaw D  | disposition Workshe   |                       | 1  |  |
|--|---|---|-----------------------|--|--|
| ISI Report Number  | Plaw Number 10  | 3. Item Number  | 2.40                  | 14. Notal Number of Page   | s /  |
| PT 2 97 - 01361<br>ISI Interval & OK Reviewer  |   | Code Edition and Addenda  | OK Reviewer           | M.   |  |
| second interval third interval   | reservice   | □ 80 W81 □ 86 no adder  | ida 🗷 89 no ado       | ienda 🗆 other  |  |
| Acceptance Standard WOK Reviewer   |   | WB-3512 🗆 IWB-3514  | □ IWB-3515            | □ IWB-3516 □   | IWB-3518   |
| □ rwB-3 122<br>□ rwC-3 10  | ☐ IWB-3523<br>☐ IWC-3511 ☐ I  | WC-3512   | □ IWC-3514            | □ IWC-3515   |  |
| Calculations OK Reviewer   | F1146-3311 F11  | WC-3512 G 1WC-3515  | 11100011              |  |  |
|  | FOT The North   | de alad di de   | 0 .                   | . "  |  |
| From attached  | TIAN SI   | ging worksheet  | : { = 0.              | 6  a = 0.  | 251  |
| Flaw Type: Su  | bourface Pl   | anar  | trom = 5              | 160" S = 1.  | 5538   |
| $\frac{a}{1} = \frac{0.251}{0.6} =$  | 0.4183  | Round to  | 0.42                  |  |  |
| Use 1 to 12  | subsurface  | Flaw:   |                       |  |  |
| # % = O.   | 251   | 0.0486 RT   | ind to                | 4.9%   |  |
|  |   |   |                       |  |  |
| From Table IW  |   |   |                       |  |  |
| 0.40 5.87  | / Y =   | $\frac{S}{a} = \frac{1.555}{0.25}$  | = =                   | 6.2 => Y   | ' = 1  |
| 0.45 6.7)  |   | 0,25  | 1                     |  |  |
|  |   |   |                       |  |  |
|  |   |   |                       |  |  |
|  | since a   | alculated ex  | male 4                | 197 which  |  |
| By observation,  |   |   |                       |  | ù  |
|  |   |   |                       |  | ù  |
| By observation,<br>less thanks   | . 8% . In   | dication is   |                       |  | ù  |
| By observation, less than 5 Results AOK Reviewer   | . 8% . In   | dication is   |                       |  | Lio.   |
| By observation, less than s  Results DOK Reviewer  | . 8 % . In  | dication is   | Accept                |  | Li .   |
| By observation, less than s  Results DOK Reviewer  | . 8 % . In  | dication is   | Accept                |  | Lo   |
| By observation, less than s  Results DOK Reviewer  | a/t = 0 $college = 0$ $coll$  | dication is   | Accept                |  | Lo   |
| Results AOK Reviewer   | alt = 0 $colled a / t % = 0$  | dication is   | Accept<br>7%          | able.  |  |
| By observation,  less than s  Results DOK Reviewer   | alt = 0 $colled a / t % = 0$  | 0.42<br>4.9%<br>87. < 94% < 6.<br>VA  | A ccept               | VB-3511-2  | 512-1  |
| Results AOK Reviewer ca  Code al  laminar flaw surface area:  Table used for analysis AOK Review  IWD-3510-1  IWB-3512-2  IWB-3515-1   | $a/l = 0$   culated $a/t \% = 0$   lowable $a/t \% = 0$   $(0.75 \cdot 1 \cdot w) = 0$   or $0.75 \cdot 1 \cdot w = 0$   or $0.75 \cdot 1 \cdot w = 0.0$   or $0.75 \cdot 1 \cdot w $ | 0.42<br>4.9%<br>87. < 94% < 6.<br>VA  1WB-3510-3   IWB-1WB-3514-2   IWB-1WB-3516-2   IWB-3516-2   IWB-351   | A ccept               | VB-3511-2 1WB-3  | 512-1<br>514-6   |
| Results OK Reviewer  | a/t = 0 $ cu  = 0$  | 0.42<br>4.9%<br>8% < 94% < 6.<br>VA    IWB-3510-3   IWB-1WB-3514-2   IWB-1WB-3516-2   IWB-1WB-3510-3   IWC-3510-3  | A ccept               | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  WB-3510-1  WB-3515-1  UWC-3510-1  UWC-3510-1  UWC-3510-1  UWC-3510-1  | a/t = 0 $ cu  = 0$  | 0.42<br>4.9%<br>87. < 94% < 6.<br>VA  1WB-3510-3   IWB-1WB-3516-2   IWB-1WB-3516-2   IWB-1WB-3510-3   IWC-3510-3   | A ccept  7 %  8511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer ca  Code al  laminar flaw surface area:  Table used for analysis OK Review   IWD-3510-1   IWB-3515-1   IWC-3510-1   IWC-3510-1   IWC-3510-1   IWC-3513-1   IWC          | $a/t = \frac{1}{2}$ $ cu  $  | 0. 42<br>4. 9%<br>8% < 44% < 6.<br>VA  1 IWB-3510-3   IWB-1WB-3516-2   IWB-1WB-3516-2   IWB-1WB-3516-2   IWB-1WC-3510-3   IWC-1WC-3510-3   IWC-1WC-3  | A ccept  773  3511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  OK Review  IWD-3510-1  IWB-3515-1  IWC-3513-1  O. Was linear interpolation used? I yes 1. Was IWA-3200 Significant Digits For Li  The correct Code Edition and Addenda w  | lculated $a/t \% = \frac{a}{2}$ lowable $a/t \% = \frac{a}{2}$ $(0.75 t \cdot w) = \frac{a}{2}$ or $\frac{a}{2}$ $$   | 0.42<br>4.970<br>87. < 9470 < 6.7<br>VA  DIWB-3510-3 DIWB-10 1WB-3516-2 DIWB-10 1WC-3510-3 DIWC-10 1WC-10   | A ccept  7 %  8511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  OK Review  WP-3510-1  IWB-3513-1  IWC-3513-1  OWas linear interpolation used? yes 1  Was IWA-3200 Significant Digits For Li  The correct Code Edition and Addenda w  Statement of acceptability or rejectability  | lowable $a/t$ %= 1000 lowable $a/t$ %= 500 lowable $a/t$ %= 1000 lowable $a/t$ %= 1000 lowable $a/t$ %= 1000 lowable $a/t$ %= 1000 lowable $a/t$ lowable $a$  | 0. 42<br>4.9%<br>87. < 94% < 6.<br>VA    IWB-3510-3   IWB-1WB-3516-2   IWB-1WC-3510-3   IWC-3510-3   I  | A ccept  773  3511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  Nok Review  Note:  N | lculated $a/t$ %= $a/t$ lowable $a/t$ lowable $a/t$ lowable $a/t$ lowable $a/t$ with basis $a/t$ OK Review Code allowable $a/t$ lowable $a/t$ l   | di cation   is<br>  0. 42<br>  4. 970<br>  87. < 9470 < 6.<br>  148-3510-3   IWB-<br>  IWB-3516-2   IWB-<br>  IWC-3510-3   IWC-<br>  OK Reviewer   IWC-<br>  Ves   IWC-<br>  IWC-<br> | A ccept  773  3511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  NB-3510-1  NB-3515-1  NC-3510-1  N | code allowable $2/6$ . In $2/6$  | di cation   is  | A ccept  773  3511-1  | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  Twb-3510-1  Twb-3510-1  Twc-3510-1  | lculated $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ (0.75 $a/t$ • $a/t$ ) = $a/t$ (0.75 $a/t$ ) =   | di cation   15   17   187.   4   7   7   87.   4   7   7   87.   4   7   7   8   7   4   7   8   7   8   7   8   7   8   7   8   7   8   8  | A ccept  7.7.  8511-1 | VB-3511-2  | 512-1<br>514-6   |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  WB-3510-1  WB-3515-1  IWC-3510-1  IWC-3 | lculated $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ (0.75 $a/t$ • $a/t$ ) = $a/t$ (0.75 $a/t$ ) =   | di cation   is  | A ccept  7.7.  8511-1 | VB-3511-2  | 512-1<br>514-6   |
| Code al laminar flaw surface area:  O. Table used for analysis   OK Review   WP-3510-1   IWB-3510-1   IWC-3510-1   IWC-351 | lculated $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ (0.75 $a/t$ • $a/t$ ) = $a/t$ (0.75 $a/t$ ) =   | di cation   15   17   187.   4   7   7   87.   4   7   7   87.   4   7   7   87.   4   7   7   8   7   8   7   8   7   8   7   8   7   8   8  | A ccept  3511-1       | VB-3511-2  | 512-1<br>514-6<br>512-2                                |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  Tube 3510-1  WB-3510-1  | lculated $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ lowable $a/t$ %= $a/t$ (0.75 $a/t$ • $a/t$ ) = $a/t$ (0.75 $a/t$ ) =   | di cation   15   17   187.   4   7   7   87.   4   7   7   87.   4   7   7   87.   4   7   7   8   7   8   7   8   7   8   7   8   7   8   8  | A ccept  77.  8511-1  | vB-3511-2 IWB-3 vB-3514-4 IWB-3 vB-3518-2 vC-3511-2 IWC-3  why?  ved by and date   A  assures that all involved with this flater a region of the necessity that the rest | 512-1 514-6 512-2                                      |
| Results OK Reviewer  Ca  Code al  laminar flaw surface area:  Table used for analysis  Note Review  Note 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | Code allowable   Cod   | Control is  2. 42  4. 97.  87. < 94.70 < 6.  148  148-3510-3   IWB-188-3516-2   IWB-188-3516-2   IWB-188-3510-3   IWC-188-3510-3   IWC-188-351  | A ccept  773  8511-1  | VB-3511-2  | 512-1 514-6 512-2  May be sizing and flat also and the |

N J / ISINGAISINSIFDWR0 DOC ISI Flaw Disposition Worksheet Revision 0

Report 1 97-0/36R)

| ISI Flaw Sizing Worksheet  |  |
|--|--|
| 1. ISI Report Number 97-0/36 2. Flaw Number 10   | 3. Item Number B 2 40  |
| 4. ISI Interval GOK Reviewer 27 5. Code Edition and Addenda GOK Reviewer 27  | 6. Method 25 UT   RT   |
| 7. Flaw Sketch DOK Reviewer D 80 W81 86 no addenda 889 no addenda of   | ther LIMI  |
| Front View   |  |
| 2"   |  |
| 1  |  |
|  |  |
| 0,502  | 4  |
| T  | 5538   |
| I the state of the | 5530   |
|  | <b>*</b>   |
| Top View   |  |
| 100 100  | an ingenior and programming of allowing of the special plant and t |
|  |  |
| BTM HEAD (+3.9-*)  |  |
| The Had in it  |  |
| BIM #6067  |  |
|  |  |
|  |  |
|  |  |
| Side View  |  |
|  | uadid, a dada aggamman mentagia, mumma pan SPC a daga Maja-an-annia in an sasagi-ng annia in mentah dan daril  |
|  |  |
| 10   |  |
| 6TM Head 1-1   |  |
|  |  |
|  |  |
|  |  |
| 8. Calculations GOK Reviewer (1)   |  |
| Characteristics of energies or enthangling   |  |
| see a Hacked   |  |
| Show determination of time of "a" to use   |  |
| see a Hacked   |  |
|  |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used Dyes Preparer The DOK Reviewer  | J  |
| 10. Code Flaw Dimensions GOK Reviewer 1  | "S" = 1.5538 "W" = N/A   |
| 10. Code Flaw Dimensions GOK Reviewer 2] """ = 0,6" "" = 0,251" "tnominal" = 5,160" "treecsured" = N/A   | 2 = 1,3338 W - W/H   |
| 11. Flaw Type GOK Reviewer 1 Subsurface Plana (UT/RT) G Larninar (UT/RT)   | ☐ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure GOK Reviewer [1]  | WA-3380-1 D IWA-3400-1   |
| [ [ [WA-3310-1   | WA-3380-1  |
| 13. Flaw Characterization Figure Number Flaw 1 Flaw 2 Flaw 2   | Flaw 4 Flaw 5  |
| 14. Was IWA-3300 Flaw Characterization followed? Wyes Cl no If no, why?  15. The correct Code Edition and Addenda was available and used. Wyes Preparer OK Review.   | er in  |
| 16. Prepared by and date 17. Review by and date  | 1//  |
| - Tou land 1/20/07 E).   | Thom 3-12-97   |
| 10m John 2/21/11   | its are correct and the methodology used is in accordance with   |
| specifications and procedures.  applicable codes, standards, spec  | ifications and procedures  |
|  | 38 01 20   |
| Report   | 97-0136R)  |
| \$ management  | The second secon |

## Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

| ASME SECT XI 1989 WI NO ADDENDA THE INITIAL TO VERIFY  | 1   |
|--|-----|
| ISI Report # 97-0136 Evaluation Performed By Ton Jolly Date: 2/23 Flaw # 10 Date: 3-1297   | /9  |
| Length Length of the flaw "!" is determined by finding the difference between L1 and L2 for perpendicular scal W1 and W2 for parallel scans. L and W values are from page of the UT report.  t = _4 . 2 (W2)3 . 6 (W1) = _0 . 6 inches.  |     |
| Thickness Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1 of the UT report.  "t" = _5 . 160_ inches  |     |
| Calibration The measured angle in the calibration block was _45 . 0_ degrees   |     |
| Calculations using metal path  The flaw exhibited 20% DAC at 4 . 39 and 5 . 1 inches MP. Max amplitude is at 4 . 87 inches with the transducer exit point at -3 . 9 inches (W) from the centerline of the weld and 6 . 9 inches from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservation.)  | (L) |
| Determine the upper depth of the flaw from the exam surface.  4 . 39 (metal path at 20% upper) * COS of the measured angle 0 . 7071 = 3 . 1042 inchedepth.   | es  |
| Determine the lower depth of the flaw from the exam surface. 5 1 (metal path at 20% lower) * COS of the measured angle 0.7071 = 3.6062 inches depth.   |     |
| Determine the depth of the flaw from the exam surface at the maximum amplitude point.  4 . 87 (metal path at maximum amplitude point) * COS of the measured angle _0 . 7071 =  |     |
| Determine the distance from 0" reference to the maximum amplitude point of the flaw.  4 . 87 (metal path at maximum amplitude point) squared = 23 . 7169 (a²)  3 . 4436 (depth at maximum amplitude point) squared = 11 . 8584 (b²)  √ a² - b² = 3 . 4436 inches of surface distance to the flaw from the transducer exit point.  6 . 9 (Lmax) - 3 . 4436 (surf dist) = 3 . 4564 inches from 0" reference. |     |
| Determine S by picking the smaller of the following;  S = 3.1042 (result of 1) = distance between exam surface and the upper flaw tip  >> OR << S = 5.160 (part "t") - 3.6062 (result of 2) = 1.5538 distance between the side opposite exam surface and the lower flaw tip  |     |
| 6) Determine 2d in though wall thickness.  |     |
| Determination of surface or subsurface $0.4d = (2d/2) * 0.4 = _0.1004$<br>Compare to S (from step 5)<br>If S is less than 0.4d, the flaw is surface. $a = 2d + S =$  |     |
| t = 0.6  (for a/l > 0.5,  l = 2a) $a = 0.251  (surf or sub surf circle one)$ $t = 5.160  (part thickness)$ $S = 1.5538$ Page 39 of 70  | -   |



March 5, 1997 Date

CSC-2 Location

Ad Hoc Evaluation Group

File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RV CLOSURE HEAD W. 6
EXAM 97-0109. PER TELLON APPROVAL TOM TOWES 1:00 PM

During the 1997 inspection of Steam Generator 22, weid W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

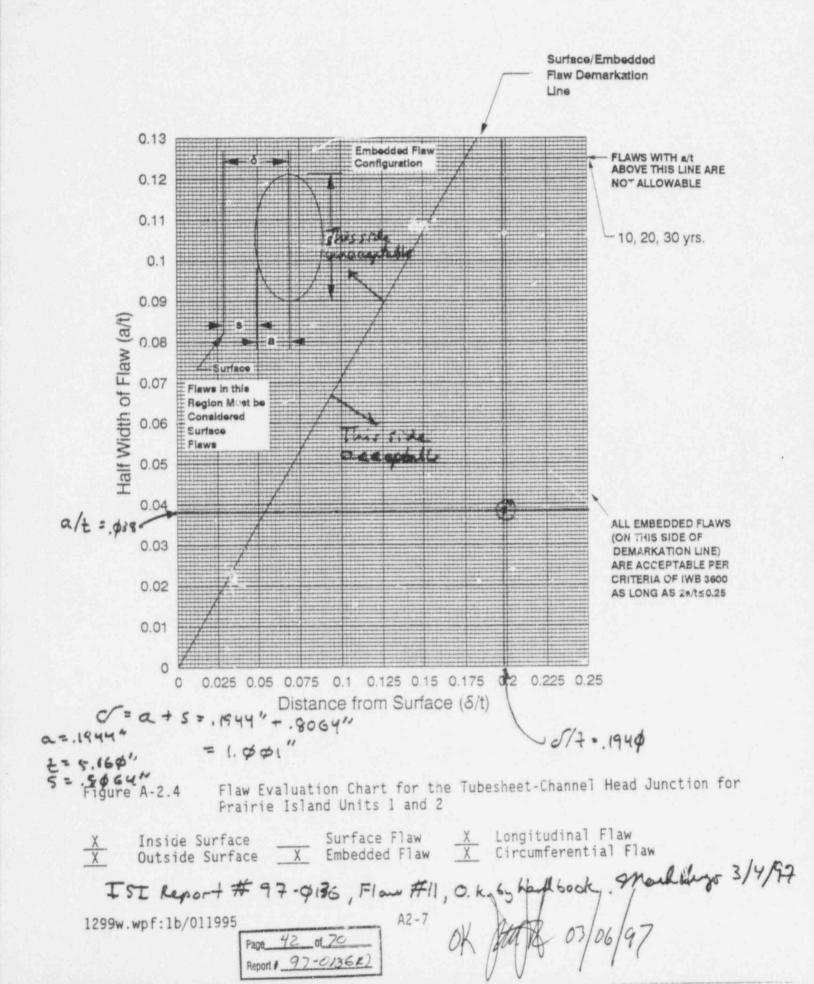
The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Jeff Ricker Supt M&SF

|  |  | ISI Flaw   | Disposition '  | Worksheet                    |   |   |
|--|--|--|--|------------------------------|---|---|
| ISI Report Number 97 97  | - 012 / 2. Plaw N                          | umber 11   | and the same of th | Number 82.4                  | O 14. fotal Nu  | imber of Pages  |
| ISI Interval WOK Revi  | ewer                                       |  | 5. Code Edition ar   | nd Addenda OK                | Reviewer H  |   |
| Acceptance Standard  | third interval                             | preservice   | □ 80 W81 L   | J 86 no addenda 23           | 89 no addenda 🗆 oth   |   |
| . Alexaplante statement  | M IWB-351                                  | IWB-3511 □   | IWB-3512 □   | IWB-3514 🗆 I                 | WB-3515 🗆 IWB-  | 3516 🗆 IWB-3518   |
|  | m  | The same of the sa | IWC-3512 □   | 1WC-3513 □ 1                 | WC-3514   IWC-  | 3515  |
| Calculations A OK Rev  | iewer .                                    |  |  |                              |   |   |
| From att   | eched Isī                                  | Haw  | Sizing W   |                              | l = 0.9"  |   |
| Flaw.  | Type: Sul                                  | sur-face   | Planas   | 1                            | nom = 5.160   | " S = 0.313   |
| $\frac{a}{\ell} = \frac{0.1}{0}$   | 9  | 0.2160   | Round  | to 0                         | . 22  | 0,8064  |
|  | to 12 sul                                  |  |  |                              |   | 13/1  |
| a 70   | = 0.194                                    | 4 =  | 0.037  | 7 Round                      | d to 3.   | 8%  |
|  | ible INB                                   | - 3510.  | - ( ;  |                              | W 3/6/  | 97 1.3/6/97   |
| ape  | 47.  | У =  | <u>s</u> =   | 0.8132                       | = 4.2   | => Y = 1  |
| 0,20   | 3.3 Y                                      |  |  |                              |   |   |
| 0.25   | 3.8 Y                                      |  |  | 0. 8064                      | = 4.1   | => Y=1  |
|  |  |  |  | 0.1944                       |   |   |
|  |  |  |  |                              |   |   |
| Results OK Review  | er   | a/t=   | 0.22   |                              |   |   |
|  | calculat                                   | red m / t %=   | 3.8%   |                              |   |   |
|  | Code allowa                                | ole/a/t %= 3.  | 37 2 47  | 23.8%                        |   |   |
| Jaminar flay   | v surface area: (0.7                       |  | NA   |                              |   |   |
| . Table used for analysis  | OK Reviewer                                | <b>A</b>   |  |                              | C (N/D 2411.2   | □ [WB-3512-1  |
|  | ₩ IWB-3510-1<br>□ IWB-3512-2               | WB-3510-2  | ☐ 1WB-3510-3<br>☐ 1WB-3514-2   | ☐ [WB-3511-1<br>☐ [WB-3514-3 | ☐ IWB-3511-2<br>☐ IWB-3514-4  | ☐ IWB-3514-6  |
|  | □ IWB-3515-1                               | □ IWB-3516-1   | □ IWB-3516-2   | D IWB-2518-1                 | ☐ IWB-3518-2<br>☐ IWC-3511-2  | □ [WC-3512-2  |
|  | ☐ IWC-3510-1<br>☐ IWC-3513-1               | □ IWC-3510-2   | □ IWC-3510-3   | □ IWC-3511-1                 | 177-3311-2  |   |
| 0. Was linear interpolation  | n used? D yes 🔊 no If                      | no, why? By  | observation  | d                            | 10/1  |   |
| 1. Was IWA-3200 Signifi  | cant Digits For Limiting                   | Values followed?   | yes on AO  | K Reviewer A                 | If he, why?   |   |
| 2. The correct Code Edition  | n and Addenda was ava                      | nable and used.  | ewer L   | T M OK Kevie                 | 4   |   |
| 3. Statement of acceptabil   |  |  |  |                              |   |   |
| Accept.  | 1 1  | e allowab <b>j</b> e ≥   | 4.20   |                              |   |   |
| A  |  | e allowable  |  |                              | veis)   |   |
| Reject. 2/28   | THE OFFICE                                 | we waluation   | nandook (se  |                              | 17. Approved by and dat   | te  |
| Reject. 2/23   | OEM flav                                   |  | no review by and d   | ate                          |   |   |
| Reject. 2/23   | OEM flav                                   |  | ng review by and di  | ote                          | 10.   | dm -  |
| Reject. 2/23   | OEM flav                                   |  | 03/03/97   |                              | This approval assures inci all in   | onlyed with this flaw sisting and the   |
| Reject. 228  | 2/25/97                                    | 6. Engineeri   | es that the fessilishere open<br>unce with applicable chairs   | ici and the methodalogy      | 2 Rie   | onlyed with this flaw string and flactions that the results and the recordance with applicable cooks. |
| Reject. 2/28 15. Prepared by and date  Lik Truch  The results are correct and the meth applicable codes, standards, specific NUSSUGAISMSIFDWRO.DOC | 2/25/97 entistings used is in accordance w | the state assuration in a specificulous sand   | es that the fessilishere open<br>unce with applicable chairs   | ici and the methodalogy      | This approved assures that all materials and me disposition were aware of the me methodology are correct and in a | onlyed with this flaw string and flactions that the results and the recordance with applicable cooks. |



| ISI Flaw Sizing Worksheet  |
|--|
| 1. ISI Report Number 2 97-0136 2. Flaw Number 11 3. Item Number B 2. 40  |
| 4. ISI Interval COK Reviewer Cf 5. Code Edition and Addenda COK Reviewer Cf 6. Method Court II   |
| 2nd interval 3rd interval preservice 80 W81 86 no addends \$89 no addends other PT 7. Flaw Sketch WOK Reviewer 4.  |
| 7. Flaw Sketch WOK Reviewer 17 72. 7464" -> 4  |
| 0 0.8132 0.8064 Sms  |
| o on o   |
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| 0.3889   |
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|  |
|  |
|  |
| Top View   |
|  |
|  |
| 2-17. U. (/ K-3.9-)  |
| BTM Head = 13.7-9  |
| F 0.7 -3   |
|  |
|  |
| Side View  |
|  |
| [24] [25] [4] [4] [4] [4] [4] [4] [4] [4] [4] [4   |
| $\sim$   |
| 2704 40 1  |
| DIM MEAN   |
| [[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[   |
|  |
|  |
| 8. Calculations EOK Reviewer 13  |
| Show determination of surface or subsurface  |
| see attached   |
|  |
| Show determination of type of "a" to use  See attached   |
| see attached   |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Si yes Preparer The J SOK Reviewer 21  |
|  |
| "" = 0.9" "a" = 0.1944" "tnomina" = 5.160" "tmeasured" = N/A "S" = 0.8137" "W" = N/A   |
| 11. Flaw Type @OK Reviewer 27  |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT) Linear (PT/MT/RT)  12. Flaw Characterization Figure SOK Reviewer  |
| □ [WA-3310-1 □ [WA-3330-1 □ [WA-3350-1 □ [WA-3380-1 □ [WA-3400-1   |
| WA-3320-1  |
| 14. Was IWA-3300 Flaw Characterization followed? Seves D no If no, why?  |
| 15. The correct Code Edition and Addenda was available and used. Tyes Preparet 1 DOK Reviewer 1  |
| 11/  |
| -TOM CHA 2/23/97 E.J. Thomas 3-16-97   |
| The results are correct and the methodology used is in accordance with applicable codes, standards.  This review assures that the results are correct and the methodology used is in accordance with |
| specifications and procedures applicable codes, standards, specifications and procedures   |
| Page 43 of 20  |
| 27-013681  |

port 97-0136K1

#### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| 1.15 (metal path at 20% upper) * COS of the measured angle 0.7071 = 0.8132 inches depth.  Determine the lower depth of the flaw from the exam surface.  1.70 (metal path at 20% lower) * COS of the measured angle 0.7071 = 1.2021 inches depth.  Determine the depth of the flaw from the exam surface at the maximum amplitude point.  1.49 (metal path at maximum amplitude point) * COS of the measured angle 0.7071 = 1.0536 inches depth.  Determine the distance from 0" reference to the maximum amplitude point of the flaw.  1.49 (metal path at maximum amplitude point) squared = 2.2201 (a²)  1.0536 (depth at maximum amplitude point) squared = 1.1101 (b²)  Va² - b² = 1.0536 inches of surface distance to the flaw from the transducer exit point.  73.8 (Lmax) - 1.0536 (surf dist) = 72.7464 inches from 0" reference.  Determine S by picking the smaller of the following;  S = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  > OR << S = 5.160 (part "t") - 1.2021 (result of 2) = 3.9579 distance between the side opposite exam surface and the lower flaw tip   |              | ASME SE  |  | O ADDENDATE IN   |  |   |
|--|--------------|--|--|--|--|---|
| Length of the flaw "i" is determined by finding the difference between L1 and L2 for perpendicular scans with and W2 for parallel scans.  and W values are from page of the UT report.  =4_4 (W2)3_5 (W1) =0_9 inches.  Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page1_ of the UT report.  **T* = 5_160 inches  **Dilibration**  The flaw exhibited 20% DAC at15 and1_70 inches MP. Max amplitude is at1_49 inches from the or reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative with the transducer exit point at39 inches (W) from the centerine of the weld and738 inches from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative with the transducer exit point at39 inches (W) from the centerline of the weld and738 inches from the 0" reference. (Use of 20% upper) * COS of the measured angle07071_ =08132 inches depth.  **Determine the lower depth of the flaw from the exam surface110 (metal path at 20% lower) * COS of the measured angle07071_ =1_2021 inches depth.  **Determine the depth of the flaw from the exam surface at the maximum amplitude point149 (metal path at a maximum amplitude point) * COS of the measured angle07071_ =1_0536 inches depth.  **Determine the distance from 0" reference to the maximum amplitude point of the flaw149 (metal path at maximum amplitude point) squared = _22201 (a^2)1_0536 (upth at maximum amplitude point) squared = _22201 (a^2)1_0536 (upth at maximum amplitude point) squared = _11101 (b^2)  |              | A STATE OF THE PARTY OF THE PAR | Evaluation P   | erformed By Tom  | Janes                                      | Date: 2/23/97                             |
| Length of the flaw "" is determined by finding the difference between L1 and L2 for perpendicular scans VI and W2 for parallel scans.  Land W values are from page of the UT report.  = _44_ (W2)35_ (W1) = _09_ inches.  Thickness  Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1 of the UT report.  **T' = _5160_ inches  **Calibration**  The measured angle in the calibration block was _450_ degrees  **Calculations using metal path**  The flaw exhibited 20% DAC at _115_ and _170_ inches MP. Max amplitude is at _149_ inches from the 0" reference (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative or the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative.   | Flav         | v #11  | Reviewed By  | 1. E. J. Thom  | Date: _ 3 ·                                | -14-97                                    |
| An and W values are from page of the UT report.  = 4.4 (Wz)3.5 (W1) = _0.9 inches.  Thickness  Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1 _ of the UT report.  The flaw value is from page _1 _ of the UT report.  The flaw exhibited 20% DAC at _1.15 _ and _1.70 _ inches MP. Max amplitude is at _1.49 _ inches low the the transducer exit point at _3.9 _ inches (W) from the centerine of the weld and _73.8 _ inches rom the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative.  1.15 _ (metal path at 20% upper) * COS of the measured angle _0.7071 = _0.8132 _ inches depth.  Determine the lower depth of the flaw from the exam surface1.70 _ (metal path at 20% lower) * COS of the measured angle _0.7071 = _1.2021 _ inches depth.  Determine the depth of the flaw from the exam surface at the maximum amplitude point.  1.49 _ (metal path at 20% lower) * COS of the measured angle _0.7071 = _1.2021 _ inches depth.  Determine the distance from 0" reference to the maximum amplitude point of the flaw.  1.49 _ (metal path at maximum amplitude point) * COS of the measured angle _0.7071 = _  1.0536 _ inches depth.  Determine the distance from 0" reference to the maximum amplitude point of the flaw1.49 _ (metal path at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ inches depth.  Determine Sy picking the maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _1.1101 _ (b^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude point) squared = _2.2201 _ (a^2) _  1.0536 _ (depth at maximum amplitude po   |              |  |  |  |  |   |
| and W values are from page of the UT report.  = _4_4 (W2)3_5 (W1) = _0_9 inches.  Thickness Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1 of the UT report.  **T = _5_160_ inches  **Lailbration** The measured angle in the calibration block was _45_0_ degrees  **Lailculations using metal path  |              |  |  | the difference between I   | _1 and L2 for                              | perpendicular scans,                      |
| ### A. 4 (W2)3.5 (W1) = _0.9 inches.  Thickness Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1 _ of the UT report.  ### = 5.160 inches  Calibration The measured angle in the calibration block was _45.0 _ degrees  Calculations using metal path  |              | Annual Control of the |  | report   | *  |   |
| Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1_ of the UT report. The transducer is from page _1_ of the UT report. The flaw is sufficient on the calibration block was _45.0_ degrees.    Calculations using metal path  |              |  |  |  |  |   |
| Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1_ of the UT report. The transducer is from page _1_ of the UT report. The flaw is sufficient on the calibration block was _45.0_ degrees.    Calculations using metal path  | PE. 1        |  |  |  |  |   |
| The measured angle in the calibration block was _45.0 degrees  Calculations using metal path   | Thic<br>This | ckness of the components value is from page _1_  |  |  | om wall (circle                            | e one).                                   |
| Calculations using metal path  From page of the UT report, Scan #4  The flaw exhibited 20% DAC at 1.5 and1.70 inches MP. Max amplitude is at 4 inches from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative of the upper depth of the flaw from the exam surface.  | Call         | bration  |  |  |  |   |
| The flaw exhibited 20% DAC at 1.15 and 1.70 inches MP. Max amplitude is at 1.49 inches Inches Inches MP to the transducer exit point at -3.9 inches (W) from the centerline of the weld and 73.8 inches from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative to the upper depth of the flaw from the exam surface.  1.15 (metal path at 20% upper) "COS of the measured angle 0.7071 = 0.8132 inches depth.  2) Determine the lower depth of the flaw from the exam surface.  1.70 (metal path at 20% lower) "COS of the measured angle 0.7071 = 1.2021 inches depth.  3) Determine the depth of the flaw from the exam surface at the maximum amplitude point.  1.49 (metal path at maximum amplitude point) "COS of the measured angle 0.7071 = 1.0536 inches depth.  4) Determine the distance from 0" reference to the maximum amplitude point of the flaw.  1.49 (metal path at maximum amplitude point) squared = 2.2201 (a²)  1.0536 (depth at maximum amplitude point) squared = 2.2201 (a²)  1.0536 (depth at maximum amplitude point) squared = 1.1101 (b²)  1.73 8 (Lmax) - 1.0536 (surf dist) = 72.7464 inches from 0" reference.  3) Determine S by picking the smaller of the following:  5 = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  2.0R <   | The          | measured angle in the  | calibration block w  | /as _45 . 0_ degrees   |  |   |
| 1. 15 (metal path at 20% upper) * COS of the measured angle 0. 7071 = 0.8132 inches depth.  Determine the lower depth of the flaw from the exam surface.  1. 70 (metal path at 20% lower) * COS of the measured angle 0. 7071 = 1.2021 inches depth.  Determine the depth of the flaw from the exam surface at the maximum amplitude point.  1. 49 (metal path at maximum amplitude point) * COS of the measured angle 0. 7071 = 1.0536 inches depth.  Determine the distance from 0" reference to the maximum amplitude point of the flaw.  1. 49 (metal path at maximum amplitude point) squared = 2.2201 (a²)  1. 0536 (depth at maximum amplitude point) squared = 2.2201 (a²)  1. 0536 (depth at maximum amplitude point) squared = 1.1101 (b²)  1. 0536 (surf dist) = 72.7464 inches from 0" reference.  Determine S by picking the smaller of the following;  S = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  > OR < S = 5. 160 (part "t") - 1. 2021 (result of 2) = 3.9579 distance between the side opposite exam surface and the lower flaw tip  Determine 2d in though wall thickness  1. 2021 (from step 2) - 0.8132 (from step 1) = 0.3889 inches.  Determination of surface or subsurface  1. 4d = (2d / 2) * 0.4 = 0.0778  Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. a = 2d + S =  | The with     | flaw exhibited 20% DAG<br>the transducer exit point  | at 1 15 and tat -3 9 inche   | 1.70 inches MP. Ma<br>s (W) from the centerline                                | x amplitude is<br>of the weld              | s at 1.49 inches MF<br>and 73.8 inches (L |
| 1.70 (metal path at 20% lower) * COS of the measured angle 0.7071 = 1.2021 inches depth.  Determine the depth of the flaw from the exam surface at the rnaximum amplitude point.  1.49 (metal path at maximum amplitude point) * COS of the measured angle 0.7071 = 1.0536 inches depth.  Determine the distance from 0" reference to the maximum amplitude point of the flaw.  1.49 (metal path at maximum amplitude point) squared = 2.2201 (a²)  1.0536 (depth at maximum amplitude point) squared = 1.1101 (b²)  Va² · b² = 1.0536 inches of surface distance to the flaw from the transducer exit point.  73.8 (Lmax) - 1.0536 (surf dist) = 72.7464 inches from 0" reference.  Determine S by picking the smaller of the following:  S = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  > OR <<  S = 5.160 (part "t") - 1.2021 (result of 2) = 3.9579 distance between the side opposite exam surface and the lower flaw tip  Determine 2d in though wall thickness.  1.2021 (from step 2) - 0.8132 (from step 1) = 0.3889 inches.  Determination of surface or subsurface  1.2021 (from step 5)  S is less than 0.4d, the flaw is surface. a = 2d + S =   | 1)           | 1 . 15 (metal path a   |  |  | le <u>0 7071</u>                           | = _0 . 8132_inches                        |
| 1.49 (metal path at maximum amplitude point) * COS of the measured angle _0 . 7071 =   | 2)           | _1 . 70_ (metal path a   |  |  | e_0.7071_                                  | = 1 . 2021 inches                         |
| 1. 49 (metal path at maximum amplitude point) squared = 2.2201 (a²)  1. 0536 (depth at maximum amplitude point) squared = 1.1101 (b²)  1. 0536 inches of surface distance to the flaw from the transducer exit point.  73. 8 (Lmax) - 1. 0536 (surf dist) = 72.7464 inches from 0" reference.  Determine S by picking the smaller of the following;  S = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  >> OR <<  S = 5. 160 (part "t") - 1. 2021 (result of 2) = 3.9579 distance between the side opposite exam surface and the lower flaw tip  Determine 2d in though wall thickness.  1. 2021 (from step 2) - 0. 8132 (from step 1) = 0.3889 inches.  Determination of surface or subsurface  1. 4d = (2d / 2) * 0.4 = 0.0778  Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. a = 2d + S =   | 3)           | 1 . 49 (metal path a   | t maximum amplit   |  |  |   |
| S = 0.8132 (result of 1) = distance between exam surface and the upper flaw tip  >> OR << S = 5.160 (part "t") - 1.2021 (result of 2) = 3.9579 distance between the side opposite exam surface and the lower flaw tip  Determine 2d in though wall thickness.  1.2021 (from step 2) - 0.8132 (from step 1) = 0.3889 inches.  Determination of surface or subsurface  1.4d = (2d / 2) * 0.4 = 0.0778  Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. a = 2d + S = inches.  S is greater than or equal to 0.4a the flaw is sub-surface. a = 2a / 2 = 0.1944 inches.  = 0.9 (for a/l > 0.5, l = 2a)  t = 5.160 (part thickness)  S = 0.91344 (surf of sub surf circle one)  S = 0.91347 (part thickness)   | 1)           | 1 . 49 (metal path a 1 . 0536 (depth at n $\sqrt{a^2 - b^2} = 1.0536$  | t maximum amplitud<br>naximum amplitud<br>nches of surface   | tude point) squared = _2<br>de point) squared = _1 . distance to the flaw from | . 2201_ (a²)<br>1101_ (b²)<br>the transduc | cer exit point.                           |
| Determine 2d in though wall thickness.  1 2021 (from step 2) - 0 8132 (from step 1) = 0 3889 inches.  Determination of surface or subsurface $1.2021 = 0.0778$ Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. $a = 2d + S = 0.0778$ S is greater than or equal to 0.4a the flaw is sub-surface. $a = 2a / 2 = 0.07944$ inches. $a = 0.9 = 0.05 = 0.05, l = 2a$ $a = 0.09 = 0.05 = 0.05$ $a = 0.09 = 0.05 = 0.05$ $a = 0.09 = 0.05$ $a = 0.00$   | 5)           | S = 0.8132 (result<br>>> OR <<<br>S = 5.160 (part "t")   | of 1) = distance b   | etween exam surface a  |  |   |
| Determination of surface or subsurface $1.4d = (2d/2) * 0.4 = 0.0778$ Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. $a = 2d + S =$   | 5)           | Determine 2d in thoug  | h wall thickness.  | rom step 1) = 0 . 3889   | inches.                                    |   |
| Compare to S (from step 5)  S is less than 0.4d, the flaw is surface. $a = 2d + S = $ inches.  S is greater than or equal to 0.4a the flaw is sub-surface. $a = 2a / 2 = 0.1944$ inches. $a = 0.9 \text{ (for } a/l > 0.5, l = 2a)$ $a = 0.1944 \text{ (surf or sub surf) circle one}$ $b = 0.1944 \text{ (surf or sub surf) circle one}$ $c = 0.1944 \text{ (surf or sub surf) circle one}$ $c = 0.1944 \text{ (surf or sub surf) circle one}$ $c = 0.1944 \text{ (surf or sub surf) circle one}$   |              |  |  |  |  |   |
| S is less than 0.4d, the flaw is surface. $a = 2d + S = \underline{\hspace{1cm}}$ inches.<br>S is greater than or equal to 0.4a the flaw is sub-surface. $a = 2a / 2 = \underline{\hspace{1cm}}$ 0.1944 inches.<br>$t = \underline{\hspace{1cm}}$ 1944 (surface) $t = \underline{\hspace{1cm}}$ 1945 (surface) $t = \underline{\hspace{1cm}}$ 1946 (surface) $t = \underline{\hspace{1cm}}$ 1947 (surface) $t = \underline{\hspace{1cm}}$ 1948 (surface) $t = \underline{\hspace{1cm}}$ 1958 (surface) $t = \hspace$ | .40          | $I = (2d/2) * 0.4 = _0.0$  | and the second of the second contract of the second of the |  |  |   |
| = 0.9 (for a/l > 0.5, l = 2a)  | fS           | is less than 0.4d, the flat  |  |  |  | _inches.                                  |
| = 0.1944 (surf or (sub surf) circle one) S = 0.8132 0.8064 cm  | 227          | 0.9 (for all > 0.5./=  | 2a)  | t = 5.160 (part th   | ickness)                                   |   |
|  | =            | 0 . 1944 (surf or sub s  | urf) circle one)   | S = 0 8132 0   | 8064 on                                    | had I                                     |
|  |              |  |  |  |  | Report 97-0/35                            |



March 5, 1997

CSC-2 Location

Location

From Ad Hoc Evaluation Group

To File

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RV CLOSURE HEAD W. L. EXAM 97-0109. PER TELLON APPROVAL JOHN TOWES 1100 PM.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100%
- · The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID .     | 0.1004 |
|         | -11  | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

|   | ISI Flaw                    | Disposition W  | orksheet                      |   |  |
|---|-----------------------------|--|-------------------------------|---|--|
| ISI Report Number 97 - 0136   | 2. Flaw Number 12           | 3. Item N  | umber B 2.4                   | D 14. Potal Ni  | umber of Pages   |
| ISI Interval & OK Reviewer  |                             | 5. Code Edition and  | Addenda A OK R                | leviewer M  |  |
| second interval interv  | as C preservice             | □ 80 W81 □   | 86 no addenda 📓               | 89 no addenda □ oth   | er   |
| Acceptance Standard OK Revi   |                             | IWB-3512 D I   | WB-3514 □ IV                  | VB-3515 □ IWB-  | 3516 🗆 IWB-3518  |
| ☐ IWB-352   | 2 🖂 IWB-3523                |  |                               |   |  |
| □ IWC-35  |                             | □ IWC-3512 □ I   | WC-3513 🗆 IV                  | VC-3514 🖂 IWC-  | 3515   |
| Calculations OK Reviewer  |                             |  |                               |   |  |
| From attached   |                             |  |                               |   |  |
| Flaw Type:  | Subsurface                  | Planar   | 7                             | nom = 5.160   | " S= 0,9899  |
| $\frac{2}{\ell} = \frac{0.2475}{0.6}$   | = 0.4125                    | Round.   | to 0.4                        | 1/  |  |
| Use 4 to 1:   | 2 subsurfa                  | ce Flan  | <i>;</i>                      |   |  |
| 4 % = 0   | . 2475<br>5. 160            | 0.048  | o Round                       | d to 4.   | 32   |
| From Table  |                             | - ( :  |                               |   |  |
| 4e at   | , ,                         | = 2 =  | 0.9899                        | = 4.0   | => Y = 1   |
| 0.40 5.8  |                             | a  | 0.2475                        |   |  |
| 0.45 6.   | 7 Y                         |  |                               |   |  |
| By observation  | . Since a                   | - calculate  | 1 const                       | 4.87  | which is   |
|   |                             |  |                               |   |  |
| less than   | 5.87. IN                    | dication   | is Acc                        | eptable.  |  |
|   |                             |  |                               |   |  |
| 8. Results OK Reviewer  |                             | 12 1/1   |                               |   |  |
|   | a/t =                       | 0.41   |                               |   |  |
|   | calculated a/t %=           | 4.8%   | , -, 07                       |   |  |
| Cod   | ie allowable 0/t %=_S       | 1.8% 2 9/1 lo  | < 6. + 10                     |   |  |
| laminar flaw surface a  |                             | NA   |                               |   |  |
| 9. Table used for analysis WOK Re   |                             | C DVD 2510.2   | □ [WB-3511-1                  | □ [WB-3511-2  | □ 1WB-3512-1   |
| <b>⊠</b> IWB-35   |                             | ☐ IWB-3510-3<br>☐ IWB-3514-2   | ☐ [WB-3514-3                  | □ IWB-3514-4  | □ IWB-3514-6   |
| □ IWB-3   |                             | □ 1WB-3516-2   | CJ [WB-3518-1,                | ☐ (WB-3518-2  | □ IWC-3512-2   |
| □ 1WC-35  |                             | □ !WC-3510-3   | □ IWC-3511-                   | □ IWC-3511-2  | □ 1WC-3314-4   |
| ☐ IWC-3:<br>10. Was linear interpolation used? ☐ ye   |                             | observation  |                               | 1   | A CONTRACTOR OF THE PARTY OF TH |
| 11. Was IWA-3200 Significant Digits Fo  | or Limiting Values followed | ? payes ono/paok   | Reviewer .                    | If no why?  |  |
| 12. The correct Code Edition and Adder  | nda was available and used. | yes Preparer 17  | OK Review                     | wer M.  |  |
| 13. Statement of acceptability or rejecta   |                             |  |                               |   |  |
| Accept. (C  | 1/t)Code allowable          | ≥ (a/t)calculate   | ed                            |   |  |
| П (с  | a/t)Code allowable          |  |                               |   |  |
| 1 1 1 0 1 0 0 1   | EM flaw evaluation          | 11 /   | attached analy                | vsis)   |  |
| □ Reject. □ 0   | TIAL TICKAL PLACEMENT OF    | hook (see  | attached anai                 |   |  |
| 15. Prepared by and date  |                             | ring review by and day   |                               | 17. Approved by and do  | ate (1.0)  |
|   | /25/97 WW                   | or o   | 7                             | This upproved assures that all it   | restreed with this flaw sizing and fla   |
| 15. Prepared by and date  Lintral  2.  The results are correct and the methodology used is to | 25/97 Thisternew as         | ring review by and day  07/07/9  fores that the respits drokerrels riance with applicable keeps. | and the methodology           | This approved assures that all indisposition were aware of the inmultaclosey are correct and in | washed with this flaw sizing and fla<br>eccessity that the results and the<br>accordance with applicable codes.  |
| 15. Prepared by and date  Lintrail  2   | 25/97 Thisternew as         | oring review by and day  | and the methodology cumiards. | This upproved assures that all it   | received with this flaw sizing and flat<br>eccessity that the results and the<br>occurature with applicable vales.   |

| ISI Flaw Sizin   | ng Worksheet   |
|--|--|
| 1. ISI Report Number PI2 97-0/36 2. Flaw Number /  | 2 3. Item Number B 2. 40   |
| 4. ISI Interval E OK Reviewer 4. 5. Code Edition and Addenda   | BOK Reviewer 6/ 6. Method BUT DRT  |
| 🗆 2nd interval 🖼 3rc interval 🗆 preservice 📗 80 W81 🗆 86 no adde   | mda 90 89 no addenda 🗆 other 💮 🌣 PT 🗆 MT   |
| 7. Flaw Sketch WOK Reviewer \$1 93.6   | 363" ->  1   |
|  | 0.9899"  |
| D  | 0.110.1  |
|  | T   T  |
|  | 0.495  |
|  | 0,7  |
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| Top View   |  |
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| , 0 -  | 0.6-4  |
| BTM Head I   |  |
| P  | 0.67   |
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| Side View  | 1  |
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| $\cap$   |  |
| BTM Head   |  |
| BIM Head   |  |
|  |  |
|  |  |
|  |  |
| 8. Calculations BOK Reviewer 22  |  |
|  |  |
| Show determination of surface or subsurface  See a Hache   |  |
| see alleur   |  |
| Show determination of type of "a" to use   |  |
| Show determination of type of "a" to use  See attache  |  |
| )ee and  |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Sees Preparer 7  | has BOK Reviewer &   |
|  |  |
| "1" = 0.6 "a" = 0.2475 "transina" = 5.160  | ""tmeasured" = N/A "S" = 0.9899 "W" = N/A  |
| 11 Flaw Type DOK Reviewer 27   |  |
| ☐ Surface Planar (UT/RT) Subsurface Planar (UT/RT)   | ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure WOK Reviewer 17 IWA-3310-1 IWA-3330-1 IWA   | -3350-1 🗆 IWA-3380-1 🗆 IWA-3400-1  |
| ™ IWA-3320-1 □ IWA-3340-1 □ IWA  | -3360-1 D IWA-3390-1   |
| 10. I the Cite seem bearing I that a resistor  | Flaw 2   |
| 14. Was IWA-3300 Flaw Characterization followed?  yes □ no If no, why?  15. The correct Code Edition and Addenda was available and used.  yes Preparef | FYRE J BOK Reviewer &  |
| 16. Prepared by and date   | 17. Review by and date   |
| Tou Jours 2/23/97  | 17. Review by and date  Shown 3-12-97  |
| 10m Jours 2/23/1/  | C. O. V.   |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with  |
| specifications and procedures.   | applicable codes, riandards, precifications and procedures  Page 47 of 20  |
|  | A A CONTRACTOR OF THE PROPERTY |
|  |  |

### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar mass oriented in plane normal to pressure retaining surface

|                    | ASME SEC   | T XI 1989 W/ NO  | ADDENDA The  | JINITIAL TO V  | ERIFY  |
|--------------------|--|--|--|--|--|
| ISI Re             | port #_97-0136<br>#12  | Evaluation Perf<br>Reviewed By:_                             | ormed By   | n Ouss<br>Date:  | Date: 2/23/97                                    |
| W1 and             | h of the flaw ";" is determed W2 for parallel scans. W values are from page . 7_(W2)3 . 1_(W   | ined by finding the  | e difference betwe                                   |  |  |
| This va            | ness ness of the component a alue is from page _1 _ c 5 . 160 _ inches   | t the location of the of the UT report.                      | e flaw, using UT                                     | or nom wall (circ  | le one).   |
| Calibr<br>The m    | ration<br>leasured angle in the cal  | ibration block was   | _45 . 0_ degrees                                     | 5  |  |
| The fla<br>with th | lations using metal paraw exhibited 20% DAC are transducer exit point and the 0" reference. (Use of                                    | at 1.40 and 2<br>at -3.4 inches (                            | . 10_ inches MP.<br>W) from the center               | Max amplitude<br>erline of the weld                                    | is at 2.07 inches MF<br>and 95.1 inches (L)      |
|                    | Determine the upper de 1 . 40 (metal path at 2 depth.  |  |  |  | = 0.9899 inches                                  |
|                    | Determine the lower dep<br>2 . 10 (metal path at 2<br>depth.   |  |  |  | _ = _1 . 4849_ inches                            |
|                    | Determine the depth of to 2 . 07 (metal path at roll 1 . 4637 inches depth   | naximum amplitud   |  |  |  |
|                    | Determine the distance $2.07$ (metal path at r $1.4637$ (depth at ma $\sqrt{a^2 - b^2} = 1.4637$ inc $95.1$ (Lmax) - $1.46$            | naximum amplitud<br>ximum amplitude p<br>ches of surface dis | e point) squared point) squared = stance to the flaw | = 4 . 2849 (a <sup>2</sup> 2 . 1424 (b <sup>2</sup> ) from the transdi | ucer exit point.                                 |
|                    | Determine S by picking S = _0 . 9899 (result of >> OR << S = _5 . 160 (part "t") - exam surface and the lo                             | 1) = distance bet<br>1 . 4849 (result                        | ween exam surfa                                      |  |  |
|                    | Determine 2d in though<br>1 . 4849 (from step 2)   |  | n step 1) = _0 . 49                                  | 5_ inches.   |  |
| 0.4d =<br>Compa    | rmination of surface or<br>(2d / 2) * 0.4 = _0 . 099<br>are to S (from step 5)<br>less than 0.4d, the flaw<br>greater than or equal to | is <b>surface</b> . a = 20                                   | i + S =<br>ub-surface. a = 2                         | inches.<br>2a / 2 = _0 . <b>247</b>                                    | 5_inches   |
| t = 0 $a = 0$      | 0.6 (for a/l > 0.5, l = 2a<br>0.2475 (surf or sub sur  |  | t = _5 . 160_ (pa<br>S = _0 . 9899_                  | art thickness)   | Page 48 of 20                                    |
|                    |  |  |  |  | "W commended bases of the antique of the comment |

From Ad Hoc Evaluation Group



Date March 5, 1997

3/7/97

Location CSC-2

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

This Evaluation SHALL PRATHIN TO RV CLOSURE HEAD W. 6
ELAM 97-0109. PER TELLON APPROVAL TOM TOWES 1100 PM
DUDGE the 1997 inspection of Steam Congretor 22 world NA CONCENTRATION OF STEAM CONCENTRATION OF STE

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

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| Report  | ind # | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|-------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
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The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

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The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas lones I VI III

in Tran ISI Program Mng

Jeff Ricker Supt M&SP

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| IWB-3522   IWB-3523   IWC-3513   IWC-3513   IWC-3514   IWC-3515     Trem attached ISI Flaw Sizing Worksheet: \( \left\) = 0.7" \( a = 0.2 \)   Flaw Type: Subsurface Planar   Then = 5.160" \( \int \) = 2 \\   \frac{a}{l} = \frac{0.2122}{0.7} = 0.3031 \) Round to 0.30 \\   Use 4 to 12 Subsurface Flaw: \\   \frac{a}{l} = \frac{0.2122}{5.160} = 0.0411 \) Round to 4.1% \\   \frac{A}{l} = \frac{467}{0.30} + 47 \)   By observation, Since \( \frac{A}{l} = \frac{2.2627}{0.2122} = 10.7 \) = \( \frac{A}{l} = \frac{10.7}{0.2122} =  | = 1        |
|--|------------|
| Second interval   But third interval   Preservice   BOW8    80 no addenda   80 no addenda   Other  | 262<br>= 1 |
| Second interval   Strict interval   Preservice   30 w81   36 no addenda   88 no addenda   other  | 262<br>= 1 |
| INB-3512   INB-3512   INB-3512   INB-3514   INB-3515   INB-3516  | 262<br>= 1 |
| Calculations NOK Reviewer 18 - 1 WC-3513   1 WC-3513   1 WC-3515   | = 1        |
| Trom attached IsI Flaw Sizing Worksheet: \$\leq 0.7" a = 0.2  Flaw Type: Subsurface Planar thom = 5.160" \$\leq 2  \[ \frac{a}{l} = \frac{0.2122}{0.7} = 0.3031 \] Round to 0.30  Use 4 to 12 Subsurface Flaw: \[ \frac{a}{l} = \frac{9}{0.2122} = 0.0411 \] Round to 4.1%  From Table Iw8 - 3510 - 1: \[ \frac{\gamma_{l}}{2} = \frac{4.70}{0.30} \]  \[ \frac{4470}{0.30} \]  By observation, Since \( \frac{a}{l} \) Calculated equals 4.1% which is less than 4.4%. Indication is Acceptable.  \[ \frac{a}{l} = \frac{0.30}{0.30} \]  Code allowable of 1% = \frac{4.170}{0.470} \]  Seesults \[ \frac{a}{l} \]  Results \[ \frac{a}{l} \]  Code allowable of 1% = \frac{4.470}{0.4470} \]  Indication is Acceptable.  | = 1        |
| From attached ISI Flaw Sizing Worksheet: $l = 0.7$ " $a = 0.2$ Flaw Type: Subsurface Planar thom = 5.160" $l = 2$ $\frac{a}{l} = \frac{0.2122}{0.7} = 0.3031$ Round to 0.30  Use 4 to 12 subsurface Flaw: $\frac{a}{l} = \frac{0.2122}{5.160} = 0.0411$ Round to 4.1%  From Table IWB - 3510 - 1: $\frac{4/2}{0.30} = \frac{4/2}{0.3022} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ Code allowable of $\frac{a}{l} = \frac{0.30}{0.2122} = 10.7 \Rightarrow y$ Implication is Acceptable.  Results $\frac{a}{l} = \frac{a}{l} =$   | = 1        |
| Flaw Type! Substract Planar then = 5.160° $l = 2$ $\frac{a}{l} = \frac{0.2122}{0.7} = 0.3031$ Round to 0.30  Use 4 to 12 Substract Flaw: $\frac{a}{l} = \frac{0.2122}{5.160} = 0.0411$ Round to 4.1%  From Table IwB - 3510 - 1: $\frac{4k}{l} = \frac{447}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation is than 4.4%. Indication is Acceptable. $\frac{a}{l} = \frac{0.30}{0.300} = \frac{0.300}{0.300} =$  | = 1        |
| Flaw Type! Substract Planar then = 5.160° $l = 2$ $\frac{a}{l} = \frac{0.2122}{0.7} = 0.3031$ Round to 0.30  Use 4 to 12 Substract Flaw: $\frac{a}{l} = \frac{0.2122}{5.160} = 0.0411$ Round to 4.1%  From Table IwB - 3510 - 1: $\frac{4k}{l} = \frac{447}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a}{l} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation is than 4.4%. Indication is Acceptable. $\frac{a}{l} = \frac{0.30}{0.300} = \frac{0.300}{0.300} =$  | = 1        |
| $\frac{a}{1} = \frac{0.2122}{0.77} = 0.3031 \text{ Round to } 0.30$ Use 4 to 12 subsurface Flaw: $\frac{a}{1} = \frac{0.2122}{5.160} = 0.0411 \text{ Round to } 4.1\%$ From Table Iw8 - 3510 - 1: $\frac{a/4}{0.30} = \frac{4/7}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{a/4}{0.2122} = 10.7 \Rightarrow y$ is less than 4.4%. Indication is Acceptable.  8 Results AOK Reviewer $\frac{a/1}{0.2122} = 0.300$ calculated of the 4.1%. $\frac{a/1}{0.2122} = 10.7 \Rightarrow y$ Code allowable of the 4.1%. $\frac{a/1}{0.2122} = 10.7 \Rightarrow y$ I aminar flaw surface area: (0.75) 1.0 w) = NA  | = 1        |
| Use 4 to 12 subsurface Flaw: $\frac{A}{t} = \frac{0.2122}{5.160} = 0.0411$ Round to 4.1%  From Table IWB - 35W - 1: $\frac{4k}{0.30} = \frac{4.47}{0.3022} = 10.7 \Rightarrow y$ By observation, Since $\frac{4}{t}$ calculated equals 4.1% whis less than 4.4%. Indication is Acceptable.  8 Results AOK Reviewer $\frac{A}{t} = \frac{0.30}{0.3022} = 0.30$ calculated of 1% = 4.1%.  Code allowable of 1% = 4.1%.  Implies the answer of the contraction o  |            |
| Trom Table IWB - 35 W - 1: $\frac{4}{10} = \frac{4}{10} = \frac{1}{10} = 1$  |            |
| From Table IWB - 35 to -1: $\frac{4l}{4l}$ $\frac{4l}{4l}$ $\frac{7}{6}$ $y = \frac{S}{A} = \frac{2.2627}{0.2122} = 10.7 \Rightarrow y$ By observation, Since $\frac{4l}{4l}$ calculated equals $\frac{4.17}{6}$ which is less than $\frac{4.47}{6}$ . Indication is Acceptable.  8. Results $\frac{1}{4l}$ OK Reviewer $\frac{1}{4l}$ $\frac{1}{4$  |            |
| By observation, Since $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ and $\frac{4}{10}$ are $\frac{4}{10}$ ar  |            |
| By observation, Since % calculated equals 4.1% who is less than 4.4%. Indication is Acceptable.  8 Results AOK Reviewer  all = 0.30  calculated oft %= 4.1%  Code allowable aft %= 4.4%  laminar flaw surface area: (0.75 1.0 w) = NA  |            |
| By observation, Since % calculated equals 4.1% who is less than 4.4%. Indication is Acceptable.  8 Results AOK Reviewer  all = 0.30  calculated oft %= 4.1%  Code allowable aft %= 4.4%  laminar flaw surface area: (0.75 1.0 w) = NA  |            |
| By observation, Since 24 calculated equals 4.170 who is less than 4.470. Indication is Acceptable.  Results DOK Reviewer  Code allowable a/t %= 4.170  Laminar flaw surface area: (0.75) 1.0 w) = NA  Table used for analysis DOK Reviewer  Table used for analysis DOK Reviewer   |            |
| Results NOK Reviewer  Calculated $0/t\% = 4.176$ Code allowable $0/t\% = 4.476$ Laminar flaw surface area: $(0.75 \cdot 1 \cdot w) = NA$ Table used for analysis OK Reviewer   |            |
| Results OK Reviewer $all = 0.30$ $calculated 0/t \% = 4.176$ $Code allowable 0/t \% = 4.476$ $laminar flaw surface area: (0.75 1 · w) = NA$ Table used for analysis OK Reviewer  | ish        |
| Results OK Reviewer $all = 0.30$ $calculated 0/t \% = 4.176$ $Code allowable 0/t \% = 4.476$ $laminar flaw surface area: (0.75 1 · w) = NA$ Table used for analysis OK Reviewer  |            |
| calculated $C/t \% = 4 \cdot 1 \%$ Code allowable $a/t \% = 4 \cdot 4 \%$ laminar flaw surface area: $(0.75 \cdot 1 \cdot w) = NA$   |            |
| calculated $C/t \% = 4 \cdot 1.76$ Code allowable $O/t \% = 4 \cdot 4.76$ laminar flaw surface area: $(0.75 \cdot 1.6 \cdot W) = 1.00 \cdot $ |            |
| Code allowable a/t %= 4 · 4 7 a  laminar flaw surface area: (0.75 * t * w) = NA  P. Table used for analysis OK Reviewer  |            |
| Iaminar flaw surface area: (0.75 10 W) = NA  |            |
| Table used for analysis OK Reviewer  |            |
|  |            |
| [WB-3510-1   | 2-1        |
| □ IWB-3512-2 □ IWB-3514-1 □ IWB-3514-2 □ IWB-3514-3 □ IWB-3514-4 □ IWB-351   | 4-6        |
| IWB-3515-1   | 2-2        |
| □ IWC-3513-1   |            |
| 10. Was linear interpolation used?  yes on If no, why? by observer of OK Reviewer If no, wh/?  |            |
| 11. Was IWA-3200 Significant Digits For Limiting Values followed? Syes I no OK Reviewer If no. \\(\psi\)/?  12. The correct Code Edition and Addenda was available and used. Syes Preparer IX OK Reviewer  |            |
| 3. Statement of acceptability or rejectability with basis OK Reviewer  |            |
| Statement of accept. $\square$ ( $\square$ /†)Code allowable $\ge (\square$ /†)calculated  |            |
|  |            |
| Reject.   (a/t)Code allowable (a/t)calculated  (a/t)calculated   |            |
| OEM flaw evaluation handbook (see attached analysis)  15 Prepared by and date 17. Approved by and date   |            |
| 15. Prepared by and date   |            |
| Tintraid 2/25/97 Miles when the results are told for told the methodology disposition were aware of the necessity that the results   | 2          |
| This series and the methodology used is in accordance with applicable codes, standards, applicable codes, standards, specifications and procedures applicable codes, standards, specifications and procedures.   | _7         |
| N J USINGAISINS (FDWR0 DOC 1SI Flaw Disposition Worksheet Revision 0   | Office and |

| ISI Flaw Sizin   | g Wo   sheet  |
|--|---|
| 1. ISI Report Number PT 2 97-0136 2. Flaw Number   | 3. Item Number B 2. 40  |
| 4. ISI Interval COK Reviewer PJ 5. Code Edition and Addenda  |   |
| the street and the st | 8261" -> \  |
| Front View   |   |
| n  | 2.2627"   |
|  | 1 1   |
|  | 0.4243  |
|  |   |
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|  |   |
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| Top View   | 1 & well  |
| Assignment as the man enter continues of   |   |
|  |   |
| _ ,  | K-3.0->   |
| BIM Head   | 4 1   |
| *  | K-3.0">   |
|  |   |
| Service and the service and th |   |
|  |   |
| Side View  | 1 ct weld   |
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| Bim Head   |   |
| D. 11. 11.00x  |   |
| (1) 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | 그리는 이렇게 하고 있는 것이 없는 것이다.  |
|  |   |
|  |   |
| 8. Calculations OK Reviewer 1.2 Show determination of surface or subsurface // / / / / / / / / / / / / / / / / /   |   |
| Show determination of surface or subsurface  See attached  |   |
| see and  |   |
| Show determination of type of "a" to use   |   |
| Show determination of type of "a" to use  see a Hacked   |   |
|  | . 1 - 4 - 51  |
| 9. ISI-FE-1 Par graph 7.0 - "R supding-Off Method" was used. * xes Preparer V  | WOK Reviewer  |
| 10. Code Flaw Dimensions CPOK Reviewer   | "t measured" = N/A "S" = 2.2:27 "W" = N/A   |
| 11 Flaw Time DOK Reviewer 17   |   |
| Surface Planar (UT/RT) Subsurface Planar (UDRT)  | ☐ Laminar (UT/RT) ☐ Linear (P1 MT/RT)   |
| 12. Flaw Characterization Figure GOK Reviewer GOK Reviewe |   |
| ■ IWA-3320-1 □ IWA-3340-1 □ IWA-   | 3360-1  |
| 14 Was IWA-3300 Flaw Characterization followed? Twees D no 1f no, why?   | 1   |
| 15. The correct Code Edition and Addenda was available and used. Preparer  | 17. Review by and date  |
| 16. Prepared by and date   | E) Thomas 3-12-97   |
| 10m Jouls 2/23/97  | E. J. A wome  |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with applicable code: standards, specifications and procedures |
| specifications and procedures.   | E1 . 70   |
|  | Page 5/01/05  |
|  | Quant # 7   -0/3 5 1/1  |

NSP ONSINGAISMSIFSWRI DOC ISI Flaw Sizing Workshort Revision I

# Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|   | ASME SEC   | T XI 1989 V/ NO                                      | ADDENDA TAL INI                             | TIAL TO VERI                  | FY                                      |  |  |  |  |
|---|--|--|---|-------------------------------|---|--|--|--|--|
|   | eport #_97-0136<br>#13   | Evaluation Peri<br>Reviewed By:_                     | formed By, 10th                             | Date: 3-1                     | Date: 2/23/97                           |  |  |  |  |
| W1 a  | th of the flaw "!" is determined W2 for parallel scans d W values are from page 3 . 5 (W2)2 . 8 (W   | of the UT rep  | port.                                       | 1 and L2 for pe               | erpendicular scans,                     |  |  |  |  |
| Thick   | kness kness of the component at value is from page 1 c 5 . 160 inches  |  | e flaw, using UT or no                      | m wall (circle o              | ne).                                    |  |  |  |  |
| DESCRIPTION AND DESCRIPTION OF  | pration<br>measured angle in the call  | bration block was                                    | <b>45.0</b> degrees                         |                               |   |  |  |  |  |
| The f<br>with f<br>(L) fr   | ulations using metal pat<br>flaw exhibited 20% DAC a<br>the transducer exit point a<br>om the 0" reference. (Use<br>ervative.)   | t <u>3.20</u> and <u>3</u><br>t <u>-3.0</u> inches ( | . 80 inches MP. Max Who from the centerline | amplitude is a of the weld an | t 3 . 64 inches MP<br>d _111 . 4 inches |  |  |  |  |
| 1)  | Determine the upper dep<br>3 20 (metal path at ?<br>depth.   |  |   | e_0.7071_=                    | _2 . 2627_ inches                       |  |  |  |  |
| Determine the lower depth of the flaw from the exam surface. 3.80 (metal path at 20% lower) * COS of the measured angle 0.7071 = 2.6870 inches depth. |  |  |   |                               |   |  |  |  |  |
| 3)  | Determine the depth of the flaw from the exam surface at the maximum amplitude point.  3 . 64 (metal path at maximum amplitude point) * COS of the measured angle _0 . 7071 = _2 . 5738 inches depth.  |  |   |                               |   |  |  |  |  |
| 4)  | Determine the distance from 0" reference to the maximum amplitude point of the flaw.  3. 64 (metal path at maximum amplitude point) squared = 13.2496 (a²)  2.5738 (depth at maximum amplitude point) squared = 6.6244 (b²)  \[ \frac{1}{2} - b^2 = 2.5739 \]  inches of surface distance to the flaw from the transducer exit point.  111. 4 (Lmax) - 2.5739 (surf dist) = 108.8261 inches from 0" reference. |  |   |                               |   |  |  |  |  |
| 5)  | Determine S by picking t<br>S = 2.2627 (result of<br>>> OR <<<br>S = 5.160 (part "t") -<br>exam surface and the local  | 1) = distance bet<br>2 . 6870_ (result               | ween exam surface an                        |                               |   |  |  |  |  |
| 6)  | Determine 2d in though (2 . 6870 (from step 2)   |  | n step 1) = _0 . 4243_                      | inches.                       |   |  |  |  |  |
| 0.4d<br>Com   | rmination of surface or s<br>= (2d / 2) * 0.4 = _0 . 084!<br>pare to S (from step 5)<br>s less than 0.4d, the flaw is<br>s greater than or equal to  | s surface. a = 20                                    |   |                               | nches.                                  |  |  |  |  |
|   | 0 . 7_ (for a/l > 0.5, l = 2a<br>0 . 2122_ (surf or sub sur  |  | t = _5 . 160_ (part thi<br>S = _2 . 2627_   | ckness)                       | Page 52 06 70                           |  |  |  |  |



Date March 5, 1997

Ad Hoc Evaluation Group

Location CSC-2

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTHIN TO RV CLOSURE HEAD W. L. EXAM 97-0109. PER TELLON APPROVAL TOM TOWES 1100 PM.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

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Consideration of the effect of the curvature of the vessel on depth determination for indications

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|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
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|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 3800.0 | 0.8132   | 0.8064   | OD       | 0.0778 |
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|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |
|         |      |      |      |        |        |           |        |          |          |          |        |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas Jones Lyl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SP

Page 53 of 70
Report # 97-0136R)

|   | / ISI Flaw Di  | sposition Workst                                 | neet  | <b>A</b>   |          |
|---|--|--|---|--|----------|
| . ISI Report Number   | 2. Flaw Number   | 3. Item Number                                   | 82,40   | 14. Potal Number of Pages  | 1        |
| PI 2 97 - 0134 ISI Interval XIOK Reviewer   |  | Code Edition and Addenda                         |   | - M  |          |
| second interval  third inte   | Albert speciments 17   | □ 80 W81 □ 86 no ad                              | denda 🔊 89 no add                                   | enda other   | -        |
|   | eviewer  | B-3512 🗆 IWB-3514                                | ☐ IWB-3515  | □ IWB-3516 □ IWB-  | 3518     |
| Ø IWB-3<br>□ IWB-3  |  | B-3312 CI 14 B-3314                              | G 1110-3313   | L 1110 3310 L 1110   | 2210     |
| □ IWC-3   | 3510 🗆 IWC-3511 🗆 IW   | C-3512 🗆 IWC-3513                                | □ IWC-3514  | ☐ IWC-3515   |          |
| Calculations X OK Reviewer  | A  |  |   |  |          |
| From attached   | IST Flaw sizin   | g worksheet                                      | 1 l = 0.5   | 444" a = 0.2   | 72.      |
|   | subsurface Pl  | anar   | truem = 5   | . 160" s = 0.99  | 970      |
| $\frac{a}{l} = \frac{0.2722}{0.5444}$   | = 0.50   |  |   |  |          |
| uce 4 to 1.   | 2 subsurface   | Flaw:  |   |  |          |
| $\frac{a}{t}$ $70 = \frac{0}{s}$  | . 2722 = 0<br>5.160  | .0528  | Round 7   | 6 5.3%   |          |
|   | TWB - 3510 -   | 1 :  |   |  |          |
| 0.5 7.6   | 6 Y = -  | = 0.49   | 770 = :   | 3.7 => Y=1   | 1        |
| 0.5 7.6   | У  | 0.2  | 722   |  |          |
| By observation  | n, since 4/t   | cal unlated                                      | equals  | 5.3% which   |          |
| ~   |  |  |   |  |          |
| uss man   | 7.67. In   | a Cathon   | is neces  | 17466  |          |
|   |  |  |   |  |          |
| Results OK Reviewer   | a/t = 0.   | 50   |   |  |          |
|   | calculated a/t %= 5.   | 3 %  |   |  |          |
|   |  | 67.  |   |  |          |
|   | /  |  |   |  |          |
|   | 4  | )A   |   |  |          |
| Table used for analysis   | -3512-2  | [WB-3514-2 □ IW<br>IWB-3516-2 □ IW               | B-3514-3   IW                                       | VB-3511-2 □ IWB-3512-1<br>VD- 514-4 □ IWB-3514-6<br>VB-3518-2<br>VC-3511-2 □ IWC-3512-2  |          |
| □ IWC   | -3513-1  | 1  |   |  |          |
| 0. Was linear interpolation used?   | yes on If no, why? By 0  | bse gration                                      | er W. 15 of   | why?   |          |
| 1. Was IWA-3200 Significant Digits  | For Limiting Values followed? A yes  | Preparer TV M                                    | OK Reviewer   |  |          |
| 2. The correct Code Edition and Add   | rability with basis Of OK Daviews  | N. K   |   | A CONTRACTOR OF THE PARTY OF TH |          |
|   | tability with basis OK Reviewer  |  |   |  |          |
|   | (a/t)Code allowable ≥ (c   |  |   |  |          |
|   | (a/t)Code allowable f (c   | 1/f)calculated                                   |   |  |          |
|   | OEM flaw evaluation har  |  | ed analysis)  |  |          |
| 5. Prepared by and date   | 16 Engineering r   |  | 17. Approv  | red by and date  |          |
|   | 11 1   | 17/11/12   |   | Acet C/16m   | 0        |
| linfran 2,  | 125/97 Mary Walls in   | of 10 5/9/<br>who refults and compar and the met | According disposition see                           | assures that all involved with this flaw sizing or aware of the necessity that the results and it  | (PIE     |
| The results are correct and the methodology used  | and the same of th | nth applicable codes, standards,                 | hodology disposition we methodology a standards and | re aware of the necessity that the results and to<br>tre correct and in accordance with applicable<br>effortione and procedures  | eneles.  |
| The results are correct and the methodulogy used applicable voides, standards, specifications and pri | scedures specification and price   | nth applicable codes, standards,                 | hodology disposition we methodology a standards son | re aware of the necessity that the results and to<br>the covered and in accordance with applicable<br>according to the procedures.  REVISION   | energia. |

| ISI Flaw Sizi  | ng Worksheet   |
|--|--|
| 1. ISI Report Number 97-0136 2. Flaw Number  | 3. Item Number B 2. 40   |
| 4. ISI Interval GOK Reviewer 5 5. Code Edition and Addenda   | GOK Reviewer 1/ 6. Method & UT ORT   |
| ☐ 2nd interval 📆 3rd interval 🖂 preservice ☐ 80 W81 ☐ 86 no adde   | enda 😘 89 no addenda 🖸 other 💮 💮 PT 🖸 MT   |
| 7. Flaw Sketch GOK Reviewer 17 156.  | 0757"->  \   |
| 17016 1 100  | 0.9970"  |
| 7  | 0.777  |
|  | 7, 1   |
|  | 0.5445   |
|  |  |
|  |  |
|  |  |
| And the state of t |  |
|  |  |
| Top View   | 1 & well   |
|  |  |
|  | 1 . "1   |
| 27 16.0  | F2.3-3   |
| BIM Head.  | (7)  |
|  | EAS-3  |
|  | 0.5444"  |
|  |  |
|  |  |
| Side View  |  |
| Accordance to the second second  | 1 quell  |
|  |  |
| , 0  |  |
| BTM Head   |  |
| DIM HEAD   |  |
|  |  |
|  |  |
|  |  |
| 2 Calculations POK Paylower (4)  |  |
| 8. Calculations ② OK Reviewer 3  |  |
| the class  |  |
| see allained   |  |
| Show determination of type of "a" to use   |  |
| Show determination of type of "a" to use  see a Hacked   |  |
| see all with   |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Ves Preparer   | The J DOK Reviewer E)  |
|  |  |
| "1" = 0.5444" " = 0.2721 "transing" = 5.160  | "tmecsured" = W/A "S" = 0,9970 "W" = N/A   |
| 11. Flaw Type GrOK Reviewer 27   |  |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT)   | □ Laminar (UT/RT) □ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure GOK Reviewer 57  □ IWA-3310-1 □ IWA-3330-1 □ IWA  | -3350-1 🔲 IWA-3380-1 🖂 IWA-3400-1  |
| ₩ IWA-3320-1 □ IWA-3340-1 □ IWA  | -3360-1  |
| 13. Flaw Characterization Figure Number ☐ Flaw 1 ☐ I 14. Was IWA-3300 Flaw Characterization followed? Bases ☐ no If no, why?   | Flaw 2 Flaw 3 Flaw 4 Flaw 5  |
| 14. Was IWA-3300 Flaw Characterization followed? 15. The correct Code Edition and Addenda was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edition and Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The correct Code Edward was available and used. 15. The code Edward was available and used. 15.  | The J WOK Reviewer 27  |
| 16. Prepared by and date   | 17 Review by and date  |
| 1 1 100  | E) Show 3-12-97  |
| Tom Jan 2/23/97  | 2.0.7  |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with applicable codes, standards, specifications and procedures |
| specifications and procedures.   | Page 55 of 70  |
|  |  |
|  | Report # 97-0/3681   |

## Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|                             |                                      | ASME SI  | ECT XI 1989 W/  |             | The second secon | and the same of th | /                        |   |  |
|-----------------------------|--------------------------------------|--|---|-------------|--|--|--------------------------|---|--|
|                             | eport #_9<br>#14                     | 7-0136   | Evaluation F<br>Reviewed B  | Perfo       | ormed By. A.   | Om   | Date: 3                  | Date: 2/23/99                           |  |
| W1 a                        | th of the find W2 for W value        | r parallel scar<br>s are from pa                         | rmined by finding   | the         | difference beh   |  |                          | perpendicular scans,                    |  |
| This v                      | ness of th                           | om page 1  | t at the location o<br>_ of the UT repor  |             | e flaw, using UT   | T or non   | n wall (circle           | e one).                                 |  |
| Aller and a second          | ration<br>neasured                   | angle in the   | calibration block   | was         | _45 . 0_ degre   | es   |                          |   |  |
| The fl<br>with the (L) from | aw exhib<br>he transd                | ited 20% DAG<br>ucer exit poir                           |   | 2.<br>es (V | 18 inches MR<br>W) from the cer  | P. Max   | amplitude is of the weld | s at 1.59 inches MP<br>and 157.2 inches |  |
| 1)                          |                                      |  | depth of the flaw<br>t 20% upper) * C   |             |  |  | 0.7071                   | = <u>0</u> .9970_inches                 |  |
| 2)                          |                                      |  | lepth of the flaw f<br>t 20% lower) * Co  |             |  |  | 0.7071                   | = <u>1</u> . <u>5415</u> inches         |  |
| 3)                          | _1.59_                               |  | of the flaw from the transfer to the flaw from the transfer to the flaw from the flaw |             |  |  |                          | litude point.                           |  |
| 4)                          |                                      |  |   |             |  |  |                          |   |  |
| 5)                          | S = 0.<br>>> OR<br>S = 5.            | 9970_ (result<br><<<br>160_ (part "t"                    | g the smaller of to of 1) = distance of 1) = 1.5415 (religion flaw tip  | betw        | veen exam surf   |  |                          | flaw tip<br>en the side opposite        |  |
| 6)                          |                                      |  | th wall thickness.<br>2)0 . 9970_ (1  |             | step 1) = _0 .   | 5445_ i  | nches.                   |   |  |
| 0.4d =<br>Comp<br>If S is   | = (2d / 2)<br>pare to S<br>less than | * 0.4 = _ <b>0.1</b><br>(from step 5)<br>1 0.4d, the fla | or subsurface 089 w is surface. a = to 0.4a the flaw is   | = 2d        | + S =<br>b-surface. a =  | inche<br>= 2a / 2  | es.<br>= _0 . 2722       | _inches.                                |  |
| d = _(                      | 0.5444_                              | (for a/l > 0.5)<br>(surf or sub                          | (= 2a)<br>sur circle one)   |             | t = _5 . 160_ (<br>S = _0 . 9970_  |  | kness)                   | Page 56 of 70<br>Report # 97-0/36K/     |  |



Date March 5, 1997

Ad Hoc Evaluation Group

Location CSC-2

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PEATHIN TO RV CLOSURE HEAD W. L. EXAM 97-0109. PER TELLON APPROVAL TOWN TOWES 1100 PM.

During the 1997 inspection of Steam Generator 22 weld W.A. several indications. PMC.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID .     | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 11   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact or the acceptability of the indications.

Thomas Jones Lvl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SP

eport (97-01368)

|  | ENG # 10011   | Disposition Wor  | Reflect   |  |
|--|---|--|---|--|
| ISI Report Number  | 2. Flaw Number  | 3. Item Numb   | B2.40   | 14. Total Number of Pages  |
| ISI Report Number PT 2 97 - 0136 ISI Interval M OK Reviewer  |   |  | denda OK Reviewer   | 4  |
| Second interval  |   | □ 80 W81 □ 86  | no addenda 🔠 89 no add  | denda Cl other   |
| Acceptance Standard OK Revi  | WB-3511   | IWB-3512   | -3514 🗆 IWB-3515  | □ IWB-3516 □ IWB-3518  |
| Ø IWB-351<br>□ IWB-352   |   | IMD-3312 C IMD   | -3514 W 144 B-3515  | G 146-3310 G 146-3310  |
| ☐ IWC-351  |   | IWC-3512 D IWC   | 3513 🗆 IWC-3514   | □ IWC-3515   |
| Calculations OK Reviewer   | 4-  |  |   |  |
| From attached  | ISI Flaw Siz  | ine work shee  | + 1 - 02  | 676" a = 0.1838  |
|  |   |  |   |  |
| +law Type:   | Subsurface P  | lanar  | -tuon = 5.  | 160" 5 = 1.2144  |
|  |   |  |   |  |
| $\frac{a}{\ell} = \frac{0.1838}{0.3676}$   | = 0.50  |  |   |  |
|  |   | LUL S  |   |  |
| uce 4 to 12  | subsurface  | Flaw:  |   |  |
| a o 0.1  | 338   | 1201 0   |   | 17   |
| + 6 = -  | $\frac{338}{160} = 0.$  | 0336 Xo  | una To 3  | 16/0   |
|  |   |  |   |  |
| From Table :   | TMB - 32 10 -   | - 1  |   |  |
| 1 1/7  |   | \$ 1.2   | 144   |  |
| 是 社  | y =   | 7 = -  | = 6   | . 6 => Y = 1   |
| 0,50 7.6 Y   |   | 0.1  | 835   |  |
| 0,50 1,07  |   |  |   |  |
| 2  |   | 1. 1 1   |   |  |
| by observation   | , since ?   | It calcula   | 1+1   | 1 3 107 1 1  |
|  |   |  | irea equa   | 45 3.6 10 W. W.C.  |
| in law Hon   | 7 17  | T 1: 1   | irea equa   | ls 3.6% which  |
| is lek tha   | n 7.6%.   | Indicate   | in is Ac  | ceptable   |
| is lex tha   | n 7.67.   | Indicate   | in is Ac  | ceptable   |
| is less tha  | n 7.67.   | Indicate   | in is to  | ceptable   |
| is lex tha   | n 7.67.   | Indicate   | in is Ac  | ceptable   |
| is lex tha   | 7.67.   | Indicate 0.50  | in is to  | ceptable   |
| is lex tha   | n 7.67.   | Indicate 0.50  | in is the   | ceptable   |
| Results & OK Reviewer  | alt =   | Judicate 0.50 3.6?   | in is Ac  | ceptable   |
| Results & OK Reviewer A  | 7.67. $a/t = $ calculated $a/t % = $ le allowable $a/t % =$   | Didicate 0.50 3.67. 7.67.  | in is the   | ceptable   |
| Results & OK Reviewer Cod  | all =   | Judicate 0.50 3.6?   | in is Ac  | ceptable   |
| Cod  laminar flaw surface at  Table used for analysis OK Reviewer  IWB-35  | $7.67.$ $alt = $ calculated $a/t \% = $ le allowable $a/t \% = $ rea: $(0.75 \cdot t \cdot w) = $ viewer $10.11  10.188-3510-2$   | 0.50<br>3.67.<br>7.67.<br>NA   | 1 (WB-3511-1 D IV   | vB-3511-2 0 IWB-3512-1   |
| Cod laminar flaw surface at Table used for analysis OK Reviewer  WB-35   | $a/t = $ calculated $a/t \% = $ le allowable $a/t \% = $ rea: $(0.75 \cdot t \cdot w) = $ viewer $a/t = $ $a/$  | 0.50<br>3:67-<br>7:670<br>NA   | 1 (WB-3511-1 D IV<br>1 (WB-3514-3 D IV  | ceptable   |
| Cod laminar flaw surface at Table used for analysis OK Reviewer  IWB-35  | $7.67.$ $a/t =$ calculated $a/t \% =$ le allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ viewer $10-1$ $12 \text{ IWB-3510-2}$ $512-2$ $1 \text{ IWB-3516-1}$ $1 \text{ IWB-3516-1}$   | 0.50<br>3.67.<br>7.67.<br>NA   | 1 (WB-3511-1 D IV<br>1 (WB-3514-3 D IV<br>2 (WB-3518-1 D IV   | VB-3511-2 CI IWB-3512-1<br>VB-3514-4 CI IWB-3514-6   |
| Results OK Reviewer  Cod  laminar flaw surface at  Table used for analysis  WB-35  WB-35  WB-35  WB-35  WB-35  | $7.67.$ $a/t =$ calculated $a/t \% =$ le allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ viewer $10-1$ $1 \cdot 1 \cdot w =$ $10-1$ $1 \cdot 1 \cdot$   | Didicate  0.50  3.67-  7.67-  NA  1WB-3510-3  1WB-3514-2  1WB-3516-2  1WC-3510-3   | 1 (WB-3511-1 D IV<br>1 (WB-3514-3 D IV<br>1 (WB-3518-1 D IV   | VB-3511-2 D IWB-3512-1<br>VB-3514-4 D IWB-3514-6<br>VB-3518-2  |
| Results OK Reviewer  Cod  laminar flaw surface an  Table used for analysis  WB-35  WB-35  WB-35  WW-35  WW-35  WW-35  WW-35  | $7.67.$ $a/t =$ calculated $a/t \% =$ le allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ viewer $510-1$ $1 \cdot 1 \cdot 1 \cdot 3 \cdot 10 \cdot 2$ $512-2$ $1 \cdot 1 \cdot 1 \cdot 3 \cdot 10 \cdot 2$ $513-1$ $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10$ $1 \cdot 1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ $1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$   | Didicate  0.50  3.67-  7.67-  NA  1 1WB-3510-3  1 1WB-3514-2  1 1WB-3516-2  1 1WC-3510-3  0 55er Atom  | 1 (WB-3511-1<br>1 (WB-3514-3<br>1 (WB-3518-1<br>1 (WC-3511-1  | VB-3511-2 D IWB-3512-1<br>VB-3514-4 D IWB-3514-6<br>VB-3518-2  |
| Cod laminar flaw surface at Table used for analysis  Table used for analysis  WB-35  WB-35  WB-35  WC-35  WC-35  Was linear interpolation used? Dye  Was IWA-3200 Significant Digits For   | $7.67.$ $3/t =$ calculated $3/t \% =$ le allowable $3/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ viewer $510-1$ $1 \text{ IWB-3510-2}$ $512-2$ $1 \text{ IWB-3516-1}$ $515-1$ $1 \text{ IWB-3516-1}$ $510-1$ $1 \text{ IWC-3510-2}$ $513-1$ is a no If no, why? By or Limiting Values followed?  | 0.50<br>3:67-<br>7.67-<br>NA<br>1WB-3510-3<br>1WB-3516-2<br>1WC-3510-3<br>0bservation  | 1 (WB-3511-1<br>1 (WB-3514-3<br>1 (WB-3518-1<br>1 (WC-3511-1  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Cod laminar flaw surface at Table used for analysis  OK Reviewer  WB-35  IWB-35  IWC-35  IWC-35  O. Was linear interpolation used? Dye 1. Was IWA-3200 Significant Digits For 2. The correct Code Edition and Adden  | $7.67.$ $2/t =$ calculated $a/t \% =$ de allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ viewer  110-1   | 0.50 3:67- 7:67- NA    1WB-3510-3   1WB-3516-2   1WB-3516-2   1WC-3510-3   1WC-3510 | 1 (WB-3511-1  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Results OK Reviewer  Cod laminar flaw surface at Table used for analysis  WB-35  WB-35  WW-35  WW-35 | Calculated a/t %=   calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=     calculated a/t %=   | 0,50 3:67- 7:67- NA    1WB-3510-3   0   1WB-3516-2   0   1WB-3516-2   0   1WC-3510-3   0    | 1 (WB-3511-1  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Cod laminar flaw surface an Table used for analysis  Table used for analysis  WB-35  W | 7.67. $a/t = $ $calculated a/t %= $ $de allowable a/t %= $ $de al$  | 0,50 3:67- 7:670 NA    1WB-3510-3   1WB-3516-2   1WC-3510-3   1WC-3510 | 1 (WB-3511-1  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Cod laminar flaw surface at Table used for analysis  OK Reviewer  WB-35  WB-35  WB-35  WC-35  WW-35  | calculated $a/t \% =$ le allowable $a/t \% =$ le allowable $a/t \% =$ rea: $(0.75 \cdot t \cdot w) =$ rea: $(0.7$ | 0.50 3.67- 7.67- NA    IWB-3510-3   DIWB-3516-2   DIWB-3516-2   DIWB-3510-3   DIWB-351 | IWB-3511-1  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Cod laminar flaw surface as Table used for analysis  Table used for analysis  WB-35  W | calculated $a/t$ %=  calculated $a/t$ %=  le allowable $a/t$ %=  rea: $(0.75 \cdot t \cdot w) =$ rea:   | Didicate  0.50  3.67-  7.67-  NA    IWB-3510-3   IWB-3514-2   IWB-3516-2   IWC-3510-3   IWC-3510 | I (WB-3511-1   IV I (WB-3514-3   IV I (WB-3518-1   IV I (WC-3511-1   IV Viewer  | VB-3511-2 D IWB-3512-1<br>VB-3514-4 D IWB-3514-6<br>VB-3518-2<br>WC-3511-2 D IWC-3512-2  |
| Cod laminar flaw surface as Table used for analysis  Table used for analysis  WB-35  W | calculated $a/t$ %=  calculated $a/t$ %=  le allowable $a/t$ %=  rea: $(0.75 \cdot t \cdot w) =$ rea:   | 0.50 3.67- 7.67- NA    IWB-3510-3   DIWB-3516-2   DIWB-3516-2   DIWB-3510-3   DIWB-351 | I (WB-3511-1   IV I (WB-3514-3   IV I (WB-3518-1   IV I (WC-3511-1   IV Viewer  | VB-3511-2   IWB-3512-1<br>VB-3514-4   IWB-3514-6<br>VB-3518-2<br>VC-3511-2   IWC-3512-2  |
| Cod laminar flaw surface as Table used for analysis  Table used for analysis  WB-35  W | calculated $a/t$ %=  calculated $a/t$ %=  le allowable $a/t$ %=  rea: $(0.75 \cdot t \cdot w) =$ rea:   | Didicate  0.50  3.67-  7.67-  NA    IWB-3510-3   IWB-3514-2   IWB-3516-2   IWC-3510-3   IWC-3510 | I (WB-3511-1   IV I (WB-3514-3   IV I (WB-3518-1   IV I (WC-3511-1   IV Viewer  | VB-3511-2 D IWB-3512-1<br>VB-3514-4 D IWB-3514-6<br>VB-3518-2<br>WC-3511-2 D IWC-3512-2  |
| Cod laminar flaw surface at Table used for analysis  OK Reviewer  WB-35  | calculated $a/t$ %=  calculated $a/t$ %=  le allowable $a/t$ %=  rea: $(0.75 \cdot t \cdot w) =$ rea:   | Discording to the state of the  | i (WB-3511-1   IV 1 (WB-3514-3   IV 1 (WB-3518-1   IV 2 (WB-3518-1   IV 2 (WB-3518-1   IV 3 (WC-3511-1   IV 4 (OK Reviewer   If no 4 (OK Reviewer   IV 4 (OK Reviewer   IV 5 (OK Reviewer   IV 6 (OK Reviewer   IV 6 (OK Reviewer   IV 7 (OK Reviewer   IV 6 (OK Reviewer   IV 7 (OK Reviewer   IV 6 (OK Reviewer   IV 7 (OK Reviewer   IV 6 (OK Reviewer | VB-3511-2  |
| Cod laminar flaw surface and Table used for analysis  OK Reviewer  Table used for analysis  OK Reviewer  WB-35  WB | calculated a/t %= le allowable a/t %= rea: (0.75 • 1 • w) = viewer filo-1   | Discording to the state of the  | I [WB-3511-1  | VB-3511-2  |
| Cod laminar flaw surface as Table used for analysis  Table used for analysis  WB-35  W | calculated a/t %=  calculated a/t %=  le allowable a/t %=  rea: (0.75 • t • w) =  viewer  10-1  | O. SO  3:67-  7:67-  NA    IWB-3510-3   IWB-3514-2   IWB-3516-2   IWC-3510-3   IWB-3516-2   IWC-3510-3   IWB-3516-2   IWC-3510-3   IWB-3516-2   IWC-3510-3   IWB-3516-2   IWC-3510-3   IWB-3516-2   IWC-3510-3   IWB-3510-3   IWB- | I [WB-3511-1  | ved by and date  Why?  wed by and date  Amage  assures that all involved with this flaw sizing and flare aware of the necessity that the results and the are correct and in accordance with applicable codes refreshious and procedures. |

| ISI Flaw S   | izing Worksheet  |
|--|--|
| Lorent March 1   | 15 3. Item Number B 2.40   |
| 1. ISI Interval DOK Reviewer W 5. Code Edition and Adder   | ada 2 OK Reviewer 10 6. Method 10 LT   RT   RT   Iddenda 10 89 no addenda   other   O PT   MT  |
|  |  |
| Front View   | 0.6887"->  |
|  |  |
| 0  |  |
|  | 0.3677   |
|  |  |
|  | 1,2144   |
|  | 142199   |
|  |  |
| Toe View   | The state of the s |
| Top view   | & well   |
|  | 4  |
| BTM Head   | ← 3.8→   |
| BTM Head   |  |
|  | F-0-57   |
|  | 0.3676"  |
| Marine and the second s |  |
|  |  |
| Side View  | , ch weld  |
|  |  |
|  |  |
| BTM Head   |  |
| D'IN THEOR   |  |
|  |  |
|  |  |
|  |  |
| 8. Calculations GOK Reviewer 1   |  |
| Show determination of surface or subsurface  See a Hacked  |  |
| see attached   |  |
| Show determination of type of "a" to use   |  |
| see attached   |  |
| see another  |  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Preparer   | The J GOK Reviewer [   |
| "1" = 0. 3676" a" = 0.1838" "tnomina" = 5.16   | "" "= NA "" = 1.2144" "w" = 1/A  |
| 11. Flaw Type @OK Reviewer 11  | D Imposured N/A 3 1.2.11   |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT)   | ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)  |
| 12. Flaw Characterization Figure   OK Reviewer   C   | WA-3350-1  |
| 76-TWA-3320-1 □ TWA-3340-1 □ T   | WA-3360-1 🗆 IWA-3390-1   |
| 13. Flaw Characterization Figure Number      □ Flaw 1      14. Was IWA-3300 Flaw Characterization followed?      □ roll fno. why?  | □ Flaw 2 □ Flaw 3 □ Flaw 4 □ Flaw 5  |
| 15. The correct Code Edition and Addenda was available and used. we yes Prep   |  |
| 16. Prepared by and date   | 17. Review by and date  Shown 3-12-97  |
| Tom Joul 2/23/97   | E. d. Luma   |
| The results are correct and the methodology used is in accordance with applicable codes, standards.  | This review assures that the results are correct and the methodology used is in accordance with  |
| specifications and procedures.   | applicable codes, standards, mestifications and procedures   |
|  | Renort 97-0/36R)   |
|  | 100011   |

#### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

| For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface   |
|---|
| ASME SECT XI 1989 WI NO ADDENDA THE INITIAL TO VERIFY   |
| ISI Report # 97-0136 Evaluation Performed By: TION ONE Date: 2/23/97 Flaw # 15 Reviewed By: E. J. From Date: 3-12-97  |
| Length Length of the flaw "!" is determined by finding the difference between L1 and L2 for perpendicular scans, W1 and W2 for parallel scans. L and W values are from page of the UT report.  (=3 . 9 (W2)3 . 6 (W1) = _0 . 3 inches.  |
| Thickness Thickness of the component at the location of the flaw, using UT or nom wall (circle one). This value is from page _1_ of the UT report  "t" = _5 . 160_ inches   |
| Calibration The measured angle in the calibration block was _45 . 0_ degrees  |
| Calculations using metal path  From page of the UT report, Scan # _4  The flaw exhibited 20% DAC at _5 . 06 and _5 . 58 inches MP. Max amplitude is at _5 . 39 inches MP with the transducer exit point at3 . 8 inches (W) from the centerline of the weld and _144 . 5 inches (L) from the 0" reference. (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is conservative.)        |
| 1) Determine the upper depth of the flaw from the exam surface.  _5 . 06 (metal path at 20% upper) * COS of the measured angle _0 . 7071 = _3 . 5779 inches depth.  |
| Determine the lower depth of the flaw from the exam surface. 5 . 58 (metal path at 20% lower) * COS of the measured angle 0 . 7071 = 3 . 9456 inches depth.   |
| Determine the depth of the flaw from the exam surface at the maximum amplitude point. 5 . 39 (metal path at maximum amplitude point) * COS of the measured angle _0 . 7071 = _3 . 8113 inches depth.  |
| Determine the distance from 0" reference to the maximum amplitude point of the flaw.  5.39 (metal path at maximum amplitude point) squared = 29.0521 (a²)  3.8113 (depth at maximum amplitude point) squared = 14.5260 (b²)  √a² - b² = 3.8113 inches of surface distance to the flaw from the transducer exit point.  144.5 (Lmax) - 3.8113 (surf dist) = 140.6887 inches from 0" reference. |
| Determine S by picking the smaller of the following;  S = 3.5779 (result of 1) = distance between exam surface and the upper flaw tip  >> OR << S = 5.160 (part "t") - 3.9456 (result of 2) = 1.2144 distance between the side opposite exam surface and the lower flaw tip   |
| 6) Determine 2d in though wall thickness3 . 9456_ (from step 2)3 . 5779_ (from step 1) = _0 . 3677_ inches.   |
| Determination of surface or subsurface $0.4d = (2d/2) * 0.4 = _0.0735$<br>Compare to S (from step 5)<br>If S is less than 0.4d, the flaw is surface. $a = 2d + S =$   |
| t = 0.3676 (for a/l > 0.8 (= 2a) $t = 5.160$ (part thickness)<br>a = 0.1838 (surf or sub surf circle one) $S = 1.2144$  |



Date March 5, 1997

Location

CSC-2

From Ad Hoc Evaluation Group

To File

Location

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RV CLOSURE HEND W. L. EXAM 97-0109. PER TELLON APPROVAL TOWN TOWNS 1:00 PM.
During the 1997 inspection of Steam Generator 22 weld W.A. several indications.

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits;

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC.
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID       | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID .     | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

Thomas Jones Lvl III

Tin Tran ISI Program Mngr

Jeff Ricker Supt M&SP

Page 61 of 10

Report # 97 -0136R1

| ISI Flaw Disposition V  | Vorksheet /   |
|---|---|
| 1. ISI Report Number 27 A. 2 / 2. Flaw Number 16 3. Item 1  | Number B 2. 40 14. Total Number of Pages 1  |
| ISI Interval & OK Reviewer 4 5. Code Edition an   | d Addenda ZOK Reviewer / /  |
| second interval  third interval  preservice  80 W81   | 86 no addenda 2 89 no addenda O other   |
| Acceptance Standard OK Reviewer WB-3511   | [WB-3514 □ [WB-3515 □ [WB-3516 □ [WB-3518   |
| □ IWB-3522 □ IWB-3523   |   |
| □ IWC-3510 □ IWC-3511 □ IWC-3512 □  | IWC-3513  |
| Calculations OK Reviewer  |   |
| From attached ISI Flaw Sizing Nor.  | Esheet ! l= 0.4" a= 0.1485  |
|   |   |
| Flaw Type: Subsurface Planar  | $\tau_{nom} = 5.160  S = 1.6758$  |
|   |   |
| $\frac{a}{\ell} = \frac{0.1485}{0.4} = 0.3713$ Round  | 70 0,37   |
|   |   |
| use 4 to 12 subsurface Han  |   |
| $\frac{a}{t}\% = \frac{0.1485}{5.160} = 0.0288$   | 2 0-1 + 2 00/   |
| t 6 = - 0,0280  | Round 10 2.910  |
|   |   |
| From Table IWB - 3510 -1:   |   |
| al ali 7  |   |
| Me aft %.   | 1.6758 - 1/2 => V-1   |
| 0.35 5.17 /= a =  | 1.6758 = 11.3 => Y=1  |
|   | 0117 43   |
| 0.40 5.8 Y  |   |
| By observation, since of calcu  | ulated equals 2.9% which  |
|   |   |
| is less than 5.1%. Indica   | iction is Acceptable  |
|   |   |
|   |   |
| 8. Results OK Reviewer W.   |   |
| all = 0.37  |   |
| calculated a/t %= 2.970   |   |
| Code allowable a/t %= 5.17. < 447.  | (5.3/4  |
| laminar flaw surface area: (0.75) ( • w) = NA   |   |
| 9. Table used for analysis OK Reviewer //   | □ IWB-3511-1 □ IWB-3511-2 □ IWB-3512-1  |
| WB-3510-1   | ☐ IWB-3511-1 ☐ IWB-3511-2 ☐ IWB-3512-1 ☐ IWB-3514-3 ☐ IWB-3514-4 ☐ IWB-3514-6   |
| ☐ IWB-3515-1 ☐ IWB-3516-1 ☐ IWB-3516-2  | □ IWB-3518-1 □ IWB-3518-2   |
| □ IWC-3510-1 □ IWC-3510-2 □ IWC-3510-3  | □ IWC-3511-1 □ IWC-3511-2 □ IWC-3512-2  |
| 10. Was linear interpolation used? Uyes 20 no If no, why? By observation  | bol 1   |
| 11. Was IWA-3200 Significant Digits For Limiting Values followed? A yes ond Ol                                      | Reviewer If no why?   |
| 12. The correct Code Edition and Addenda was available and used.  yes Preparer 17                                   | OK Reviewer   |
| 13. Statement of acceptability or rejectability with basis OK Reviewer  |   |
| $\boxtimes$ Accept. $\boxtimes$ ( $\square$ /†)Code allowable $\ge (\square$ /†)calcular                            | ed  |
| [] (a/t) Code allowable \$ (a/t) calcula  |   |
| Reject.   OEM flaw evaluation handbook (see   |   |
| 15. Prepared by and date 16 Engineering review by and da  |   |
|   | N-1 amon  |
| distract 2 0/01/2 NOTIFICE  | 7 do Val  |
|   | This approval assures that all involved with this flow sizing and flow it and the methodology disposition were aware of the necessity that the results only order |
| The results are correct and the methodology used is in accordance with used is in accordance with applicable codes. |   |
| applicable codes, standards, specifications and procedures.   specifications and procedures                         | Page 62 of 20   |
| N J USPJGAISPUSIFDWR0 DOC ISI Flaw Disposition Worksheet Revision 0   | REVISION 10-2   |

| ISI Flaw Sizir   | ng Worksheet   |
|--|--|
| ISI Report Number 97-0136 2. Flaw Number   | 6 3. Item Number B 2. 40   |
| ISI Interval Z OK Reviewer 2 5. Code Edition and Addenda   | GOK Reviewer 6 6. Method DEUT CI RT  |
| □ 2nd interval ♀ 3rd interval □ preservice □ 80 W81 □ 86 no adde   | nda 🐼 89 no addenda □ other □ PT □ M   |
| Flaw Sketch @OK Reviewer 2 210   | 1.5261 -> V  |
| Front View   | 1.67581  |
| 2  | 1.612  |
|  | 1 1  |
|  | 0.297  |
|  | 0.21   |
|  |  |
|  |  |
| On the state of th |  |
|  |  |
| Top View   | 1  |
| Formation we will be a second and the second and th |  |
|  |  |
| , 0  | 0.4-7  |
| BTM Head -   |  |
| Direction K  | 0.4-7  |
|  |  |
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| Control of the second s |  |
| S. 1. T  |  |
| Side View  |  |
|  |  |
|  |  |
|  |  |
| BTM Head   |  |
|  |  |
|  |  |
| AND Mindage to Compressions address to other   | THE RESERVE OF THE PARTY OF THE |
|  |  |
| 8. Calculations BOK Reviewer   |  |
| Ob an data amainst an of metaga as a mineriotaca   |  |
| show determination of surface of substitute stee attached  |  |
|  |  |
| Show determination of type of "a" to use   |  |
| Show determination of type of "a" to use  See attached   | 그 그 그 그 그 그 그는 그는 그는 그 그 그 그 그 그 그 그 그   |
|  | 4 -1 51  |
| 9. ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Dees Preparer  | The JOK Reviewer 2   |
| 10. Code Flaw Dimensions OK Reviewer 4.7   | ""tmocoured" = N/A "S" = 1.6758" "W" = N/A   |
| "" = 0.4 "a" = 0.1485 "Transition" = 5.160   | Imecsured = N/A 3 - 1/6/30 W - N/1   |
| 11. Flaw Type BOK Reviewer 2.1 Subsurface Planar (UT)RT)   | ☐ Laminar (UT/RT) ☐ Linear (PT/MT/RT)  |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT)  12. Flaw Characterization Figure GOK Reviewer  |  |
| □ IWA-3310-1 □ IWA-3330-1 □ IWA  |  |
| ■ IWA-3320-1 □ IWA-3340-1 □ IWA  | 3360-1   |
| 13. Flaw Characterization Figure Number   SFlaw 1 □ 1  14. Was FWA-3300 Flaw Characterization followed? ✓ yes □ no If no, why?   | 11377 6  |
| 15. The correct Code Edition and Addenda was available and used. Yes Preparet  | The J GOK Reviewer J   |
| 6. Prepared by and date  | 1.17. Review by and date //  |
| -Tou Joues 2/23/97   | E. J. Thom 3-12-97   |
| 1 Ch 2000 2/23/1/  | ~  |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with applicable odes, standards, specifications and procedures  |
| specifications and procedures.   | (2 , )   |
|  | Page 53 of state of the state o |
|  | Report 1 97-0136R)   |

NSP ONSTUGALSNISIFSWR1 DOC 151 Flaw Sizing Worksheet Revision 1

### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2" For surface and subsurface single planar flaws oriented in plane normal to pressure retaining surface

|                   | ASME SECT  |   | NDA TUSINITIAL TO VI  |  |
|-------------------|--|---|---|--|
|                   | Report #_97-0136<br>w #16  |   | By Tom Janks  |  |
| Len<br>W1<br>L ar | gth gth of the flaw "/" is determined W2 for parallel scans. and W values are from page 3.9 (W2)3.5 (W                               | ned by finding the difference of the UT report.                                 |   |  |
| Thic<br>Thic      | ckness ckness of the component at s value is from page _1 _ o = _5 . 160 _ inches  | the location of the flaw,   | using UT or nom wall (circle  | le one).                                 |
| deli-Arte-Amount  | ibration   |   |   |  |
| The               | measured angle in the call   | bration block was _45.  | 0_degraes   |  |
| The with (L) i    | culations using metal pat<br>flaw exhibited 20% DAC at<br>the transducer exit point at<br>from the 0" reference. (Use<br>servative.) | t 2.37 and 2.79 in<br>t -3.7 inches (W) from                                    | nches MP Max amplitude m the centerline of the weld   | is at 2.65 inches MP<br>and 212.4 inches |
| 1)                | Determine the upper dep<br>2 . 37 (metal path at 2<br>depth.   |   | exam surface. measured angle _0 . 7071  | = <u>1 . 6758</u> inches                 |
| 2)                | Determine the lower dep<br>_2 . 79_ (metal path at 2<br>depth.   |   | xam surface.<br>measured angle <u>0 . 7071</u>  | = _1 . 9728_ inches                      |
| 3)                |  | naximum amplitude poin  | urface at the maximum amp<br>t) * COS of the measured a   |  |
| 4)                | 2.65 (metal path at m<br>1.8738 (depth at max<br>$\sqrt{a^2 - b^2} = 1.8739$ inc   | naximum amplitude point<br>kimum amplitude point) s<br>thes of surface distance | maximum amplitude point of<br>t) squared = 7.0225 (a <sup>2</sup><br>squared = 3.5111 (b <sup>2</sup> )<br>to the flaw from the transdu<br>.5261 inches from 0" refer | ucer exit point.                         |
| 5)                | >> OR <<   | 1) = distance between e<br>1 . 9728 (result of 2) =                             | ng;<br>exam surface and the upper<br>= _3 . 1872_ distance between  |  |
| 6)                | Determine 2d in though (<br>1 . 9728_ (from step 2)  | wall thickness1 . 6758_ (from step  | 1) = <u>0 . 297</u> inches.   |  |
| 0.40<br>Cor       | d = (2d / 2) * 0.4 = _0 . 0594<br>mpare to S (from step 5)<br>is less than 0.4d, the flaw is<br>is greater than or equal to          | s surface. a = 2d   | inches. ce. a = 2a / 2 = _0 . 148   | 5_inches.                                |
|                   | 0 . 4 (for a/! > 0.5, ! = 2a)  |   | 160_ (part thickness) . 6758_   | Page 64 of 70                            |



March 5, 1997 Date

CSC-2

Location

Location

From Ad Hoc Evaluation Group

To File

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RU CLOSURE HEAD W. L. EXAM 97-0109. PER TELLOW APPROVAL JOFF RICKER 3/7/97 PER TELCON APPROVAL TOPE TOWES 1:00

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100% DAC
- · The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

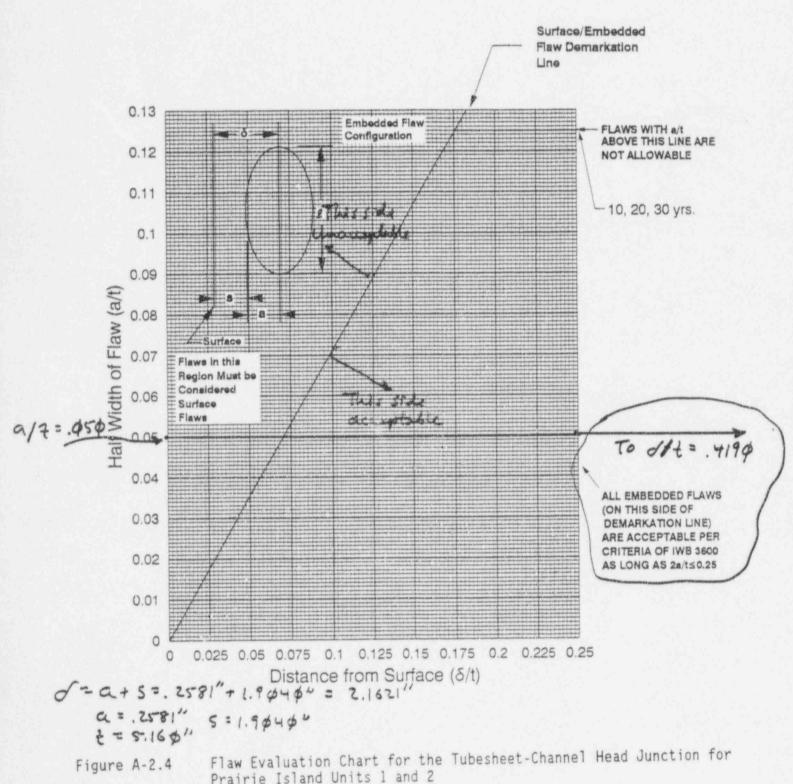
| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID .     | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID .     | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1.1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications.

|  | ISI Flaw   | Disposition Wo   | rksheet  |  |   |
|--|--|--|--|--|---|
| ISI Report Number  | 2. Flaw Number   |  |  | 14 Total Number  | of Pages  |
| PT 2 97-013 4<br>ISI Interval #OK Reviewer #   |  |  | ddenda POK Review  | er M   |   |
| Second interval third inter  | representation 11  | □ 80 W81 □ 86  | no addenda 2 89 no   | addenda 🗆 other  |   |
| Acceptance Standard OK Re  | vjewer   | mm 1512 C 1917   | 2514 CT 191/D 26   | 16 FT 13/FD 2616   | m mvp 3519  |
| ₩8-35<br>□ IWB-35  |  | [WB-3512 □ IWI   | 3-3514 🗆 IWB-35  | 15 🖸 IWB-3516  | □ 1WB-3518  |
| □ IWC-3  | The second secon | IWC-3512 🗆 IW  | C-3513 🗆 IWC-35  | 14 🔲 IWC-3515  |   |
| Calculations OK Reviewer   |  |  |  |  |   |
| From attached  | L ISI Flaw   | Sizing Wor   | ksheet: 1:   | = 0.8" a   | = 0.2581  |
|  | Subsurface 7   |  |  |  |   |
| $\frac{a}{\ell} = \frac{0.2581}{0.8}$  |  |  |  |  | 1.9040  |
|  |  |  | 10 0132  |  | M 3/6/9   |
| ulse 4 to 1.   |  |  |  |  | 10.3/6/47   |
| 470 = 6  | $\frac{0.2531}{5.160} = 0$   | .0500 x  | Round to   |  |   |
| From Table   | IWB - 3510   | -1:  | 1.9040   | 7.4 M:   | 3/6/97 4 3/0  |
| 4/1 4/t  | 7. ×   | <u>s</u> = -   | 1. 9445  | #5 m   | Y = 1   |
| 0.30 4.  | 7 <del>.</del> 4   | a  | 0. 2581  |  |   |
| 0.35 5.  | 44 } Interp  | clation  | Me = 0.32  | 1 4% =   | 450   |
|  |  |  |  |  | 4,77 M  |
|  |  |  |  |  |   |
|  |  |  |  |  | 411/2   |
|  |  |  |  |  | 13/9  |
|  |  |  |  |  | 13/9  |
| 1  |  |  |  |  | 13/3  |
| 1  |  |  |  |  | 4.7   |
| Danille W.O.K. Reviewer  |  |  |  |  | 4.3   |
| Results OK Reviewer  | a/t =  | 0.32   |  |  | 4.3   |
| Results OK Reviewer  | calculated 0/t %=  |  | ~  |  | 4.7   |
| 1  | calculated a/t %=  | 5.0%   | 7 7 2/2/97   |  | 4.3   |
| Co   | calculated a/t %=  | 5.0%   | % 3/3/97   |  | 4.3   |
| Co<br>laminar flaw surface   | calculated a/t %=  | 5.0%   | % 3/3/97   |  | 4.3   |
| Collaminar flaw surface Table used for analysis #OK R  | calculated a/t %= de allowable a/t %= area: (0 75 t • w) = eviewer   | 5.0%<br>1.070<br>NA  |  | IWB-3511-2   | 1 IWB-3512-1  |
| Co<br>laminar flaw surface   | calculated a/t %=  de allowable a/t %=  area: (0.75 t • w) =  eviewer  3510-1 IWB-3510-2   | 5.0%   | ☐ [WB-35]]-1 ☐ [WB-35]4-3 ☐  | IWB-3514-4 D   | 4.3   |
| larminar flaw surface Table used for analysis OK R   | calculated a/t %=  de allowable a/t %=  area: (0 75 1 · w) =  eviewer  3510-1  | 5,0 %<br>188-3510-3<br>1WB-3514-2<br>1WB-3516-2  | ☐ IWB-3511-1 ☐ IWB-3514-3 ☐ IWB-3518-1 ☐   | IWB-3514-4 IWB-3518-2  | 1 IWB-3512-1<br>1 IWB-3514-6  |
| Table used for analysis WB-  | calculated a/t %=  ode allowable a/t %=  area: (0 75 t • w) =  eviewer  3510-1   | 5,0 %<br>1,0 4,7<br>NA<br>1WB-3510-3<br>1WB-3514-2   | ☐ IWB-3511-1 ☐ IWB-3514-3 ☐ IWB-3518-  | IWB-3514-4 [IWB-3518-2   | 1 IWB-3512-1  |
| Table used for analysis  Table used for analysis  Tok R  WB-  WB-  WB-  WB-  WB-  WB-  WB-   | calculated a/t %=  de allowable a/t %=  area: (0 75 t • w) =  eviewer  3510-1  | 5,0 %<br>188-3510-3<br>1WB-3514-2<br>1WB-3516-2  | ☐ IWB-3511-1 ☐ IWB-3514-3 ☐ IWB-3518-1 ☐   | IWB-3514-4 IWB-3518-2  | 1 IWB-3512-1<br>1 IWB-3514-6  |
| Table used for analysis  Table used for analysis  IWB-  IWB-  IWB-  IWC-  IWC- | calculated a/t %=  de allowable a/t %=  area: (0 75 t · w) =  eviewer  3510-1  | (WB-3510-3<br>(WB-3514-2<br>(WB-3516-2<br>(WB-3516-2<br>(WC-3510-3   | ☐ IWB-3511-1 ☐ IWB-3514-3 ☐ IWB-3518-1 ☐ IWC-3511-1 ☐  | IWB-3514-4 IWB-3518-2  | 1 IWB-3512-1<br>1 IWB-3514-6  |
| Table used for analysis  Table used for analysis  WB-  IWB-  IWC-  IWC-  Was linear interpolation used?  | calculated a/t %=  ode allowable a/t %=  area: (0 75 t • w) =  eviewer  3510-1   | 5,0 %<br>AA    IWB-3510-3   IWB-3514-2   IWB-3516-2   IWC-3510-3   | ☐ IWB-3511-1 ☐ IWB-3514-3 ☐ IWB-3518-1 ☐ IWC-3511-1 ☐  | I IWB-3514-4 C<br>I IWB-3518-2<br>I IWC-3511-2 C   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| Table used for analysis WB-  IWB-  IWB-  IWC-  WC-  Was linear interpolation used? 1. Was 1WA-3200 Significant Digits 2. The correct Code Edition and Addi   | calculated a/t %=  ode allowable a/t %=  area: (0 75 t • w) =  eviewer  3510-1   | 5,0 70  NA  (WB-3510-3  (WB-3514-2  (WB-3516-2  (WC-3510-3  Wyes Cook F  | ☐ IWB-3511-1 ☐ IWB-3518-1 ☐ IWB-3518-1 ☐ IWC-3511-1 ☐ IWC-3511-1 ☐   | I IWB-3514-4 C<br>I IWB-3518-2<br>I IWC-3511-2 C   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| larminar flaw surface  Table used for analysis  OK R  IWB- IWB- IWC- IWC- IWC- IWC- IWC- IWC- TWC- TWC- TWC- TWC- TWC- TWC- TWC- T   | calculated 0/t %=  ode allowable 0/t %=  area: (0 75   t • w) =  eviewer  3510-1   | 1WB-3510-3<br>  1WB-3510-3<br>  1WB-3514-2<br>  1WB-3516-2<br>  1WC-3510-3   | ☐ IWB-3511-1 ☐ IWB-3518-1 ☐ IWB-3518-1 ☐ IWC-3511-1 ☐ IW  | I IWB-3514-4 C<br>I IWB-3518-2<br>I IWC-3511-2 C   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| laminar flaw surface  Table used for analysis  Tok R  IWB-  IWB-  IWC-   | calculated 0/t %=  de allowable 0/t %=  area: (0 75  | 1WB-3510-3   1WB-3516-2   1WC-3510-3   WC-3510-3   W | IWB-3511-1   | I IWB-3514-4 C<br>I IWB-3518-2<br>I IWC-3511-2 C   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| laminar flaw surface  Table used for analysis  OK R  IWB- IWB- IWC- IWC-  O. Was linear interpolation used?  I. Was IWA-3200 Significant Digits  The sorrect Code Edition and Addi  Statement of acceptability or reject  Accept.  | calculated 0/t %=  ode allowable 0/t %=  area: (0 75  t • w) =  eviewer  3510-1  | 1WB-3510-3   1WB-3516-2   1WC-3510-3   WC-3510-3   W | ☐ IWB-3511-1 ☐ IWB-3518-1 ☐ IWB-3518-1 ☐ IWC-3511-1 ☐ IW  | I IWB-3514-4<br>I IWB-3518-2<br>I IWC-3511-2   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| laminar flaw surface  Table used for analysis  OK R  IWB- IWB- IWC- IWC-  O. Was linear interpolation used?  I. Was IWA-3200 Significant Digits  The sorrect Code Edition and Addi  Statement of acceptability or reject  Accept.  | calculated $a/t$ %=  ode allowable $a/t$ %=  area: $(0.75 t \cdot w) =$ eviewer $3510-1$ $1WB-3510-2$ $3512-2$ $1WB-3516-1$ $3515-1$ $1WB-3516-1$ $3515-1$ $1WC-3510-2$ $3513-1$ yes $a$ no If no, why?  For Limiting Values followed?  enda was available and used.  ability with basis $a$ OK Revi $a$   | 1   1   1   2   3   1   3   4   7   7   7   7   7   7   7   7   7  | C IWB-3511-1 C IWB-3514-3 C IWB-3518-1 C IWC-3511-1 C IWC | I IWB-3514-4 I IWB-3518-2 I IWC-3511-2 I IWC | 1 IWB-3512-1<br>1 IWB-3514-6  |
| laminar flaw surface  Table used for analysis  OK R  IWB- IWB- IWC- IWC- IWC- IWC- IWC- IWC- IWC- Accept.  Reject. 2/23/47   | calculated $a/t$ %=  ode allowable $a/t$ %=  area: $(0.75 t \cdot w) =$ eviewer $3510-1$ $1WB-3510-2$ $3512-2$ $1WB-3516-1$ $3515-1$ $1WB-3516-1$ $3515-1$ $1WC-3510-2$ $3513-1$ yes $a$ no If no, why?  For Limiting Values followed?  enda was available and used.  ability with basis $a$ OK Revi $a$   | 1WB-3510-3   1WB-3516-2   1WC-3510-3   WC-3510-3   W | C IWB-3511-1 C IWB-3514-3 C IWB-3518-1 C IWC-3511-1 C IWC | I IWB-3514-4<br>I IWB-3518-2<br>I IWC-3511-2   | 1 IWB-3512-1<br>1 IWB-3514-6  |
| laminar flaw surface  Table used for analysis  OK R  IWB- IWB- IWC- IWC-  Was linear interpolation used?  Was IWA-3200 Significant Digits  The sorrect Code Edition and Adda  Statement of acceptability or reject  Accept.  Reject. 2/23/47   | calculated $a/t$ %=  ode allowable $a/t$ %=  area: $(0.75 t \cdot w) =$ eviewer $3510-1$ $1WB-3510-2$ $3512-2$ $1WB-3516-1$ $3515-1$ $1WB-3516-1$ $3515-1$ $1WC-3510-2$ $3513-1$ yes $a$ no If no, why?  For Limiting Values followed?  enda was available and used.  ability with basis $a$ OK Revi $a$   | 1   1   1   2   3   1   3   4   7   7   7   7   7   7   7   7   7  | C IWB-3511-1 C IWB-3514-3 C IWB-3518-1 C IWC-3511-1 C IWC | I IWB-3514-4 I IWB-3518-2 I IWC-3511-2  f no, why?   | 1 IWB-3512-1<br>1 IWB-3514-6<br>1 IWC-3512-2  |
| laminar flaw surface  Table used for analysis  IWB- IWB- IWC- IWC- IWC- IWC- IWC- IWC- IWC- IWC  | calculated a/t %=  ode allowable a/t %=  area: (0.75 1 · w) =  eviewer  3510-1   | WB-3510-3   WB-3516-2   WB-3516-2   WC-3510-3   WC-3 | C IWB-3511-1 C IWB-3514-3 C IWB-3518-1 C IWC-3511-1 C IWC | proved by and date  proved by and date  proved asseres that all involved on were aware of the necessity lays are correct and in accords, specifications are procedure.   | With this flave sizing and flave that the results and the anex with applicable codes.   |
| laminar flaw surface  O Table used for analysis  O K R  I WB-  I WB-  I WC-  I WC-  I WC-  I WC-  I Was IwA-3200 Significant Digits  I The correct Code Edition and Add  Statement of acceptability or reject  Accept.   | calculated a/t %=  ode allowable a/t %=  area: (0.75 1 · w) =  eviewer  3510-1   | WB-3510-3   WB-3516-2   WB-3516-2   WC-3510-3   WC-3 | C IWB-3511-1 C IWB-3514-3 C IWB-3518-1 C IWC-3511-1 C IWC | proved by and date   | With this flave sizing and flave that the results and the answer with applicable codes. |



X Longitudinal Flaw
X Circumferential Flaw Inside Surface Surface Flaw
Outside Surface X Embedded Flaw

ISI Report#97-0136, Flaw #17, O.K, G, happed Gook, grandburgo 3/4/97 1299w.wpf:1b/011995

Report # 97-0136 E)

| ISI Flaw Sizin   | ng Worksheet  |
|--|---|
| 1 for Base Manhar  | 3. Item Number B 2.40   |
| 1. ISI Interval GOK Reviewer 23 5. Code Edition and Addenda  | DOK Reviewer 11 6. Method 62 UT C RT  |
| ☐ 2nd interval 33rd interval ☐ preservice ☐ 80 W81 ☐ 86 no adder   | nda 🕷 89 no addenda 🗆 other 💮 🗆 PT 🗆 MT   |
| 7. Flaw Sketch GOK Reviewer 57 146.  | 2584" -   |
| Front View   | 19445 1.9040 mm   |
| D  | 1.7070 om   |
|  | Management  |
|  | 0,5/62'   |
|  | 2   |
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|  |   |
| Top View   |   |
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|  | 요즘 아이를 살아가는 그 사람이 맛있었다. 하고 있었다.   |
| Flator and the second |   |
|  |   |
| Side View  | 1   |
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|  |   |
| BTM Head   |   |
| BTM Head   | 크리 이 그 집 하고 있는데 하나 그 이 가게 되었다면서   |
|  | 이 그 사이가 되었다면 하다는 사람이 되었다면 되었다면?   |
|  |   |
|  |   |
|  |   |
| and the training of  |   |
| 8. Calculations GOK Reviewer 5.1 Show determination of surface or subsurface   |   |
| see attacked   |   |
| see attacked   |   |
|  |   |
| Show determination of type of "a" to use   |   |
| see attached   |   |
| 300 00   | -1/11   |
| 9 ISI-FE-1 Paragraph 7.0 - "Rounding-Off Method" was used. Sixes Preparer T  | The BOK Reviewer 1,9040" orhi   |
| 10 Code Flaw Dimensions WOK Reviewer   | 1,10,0  |
| "t" = 6.8" "a" = 0.258/" "tnomino" = 5.160"  | "tmassing" = N/A "S" = 19445 "W" = N/A  |
| 11 Flaw Type FOK Reviewer G. 1   |   |
| Surface Planar (UT/RT) Subsurface Planar (UT/RT)   | □ Laminar (UT/RT) □ Linear (PT/MT/RT)   |
| 12. Flaw Characterization Figure CYOK Reviewer (2)   | 3350-1  |
| ☐ IWA-3310-1 ☐ IWA-3330-1 ☐ IWA-<br>■ IWA-3320-1 ☐ IWA-3340-1 ☐ IWA-   | 2000.   |
| Page 111 / 2 July 1  | law 2   |
| 14. Was IWA-3300 Flaw Characterization followed? Lyes ono If no, why?  |   |
| 15. The correct Code Edition and Addenda was available and used. A wes Preparer  | The J (90K Reviewer 27)   |
| 16. Prepared by and date   | 17. Review by and date  |
| Tou (ould 2/23/97  | & d. Thomas 3-1011  |
| 10h John 2/23/7/   | V   |
| The results are correct and the methodology used is in accordance with applicable codes, standards,  | This review assures that the results are correct and the methodology used is in accordance with |
| mecifications and procedures.  | applicable codes, standards, specifications and procedures                                      |
|  | Page Of Other Page  |
|  | Report 97-0136R)  |

#### Flaw Sizing Calculations Using Metal Path for Vessel Welds > 2"

|                  | ASME S   | ECT XI 1989 WI NO ADDENDA THE INITIAL TO VERIFY   |
|------------------|--|---|
|                  | eport #_97-0136<br>#17   | Evaluation Performed By Tom Jak Date: 2/23/9, Reviewed By: E.J. Thum Date: 3-12-97  |
| V1 a             | ith of the flaw "/" is dete<br>and W2 for parallel sca<br>d W values are from pa   | ermined by finding the difference between L1 and L2 for perpendicular scans   |
| Thic<br>Thick    | kness  | nt at the location of the flaw, using UT or nom wall (circle one).  |
| delical comments | oration<br>measured angle in the   | calibration block was _45 . 0_ degrees  |
| The vith         | flaw exhibited 20% DA<br>the transducer exit poi   | path From page of the UT report, Scan #4 C at _2 . 75 and _3 . 48 inches MP. Max amplitude is at _3 . 17 inches M at _3 . 7 inches (W) from the centerline of the weld and _148 . 5 inches (Use of 20% DAC vs. 50% max amp for indications > 100% DAC is  |
| )                |  | depth of the flaw from the exam surface. at 20% upper) * COS of the measured angle _0 . 7071 = _1 . 9445 inches   |
| ?)               |  | depth of the flaw from the exam surface. at 20% lower) * COS of the measured angle _0 . 7071 = _2 . 4607_ inches  |
| )                |  | of the flaw from the exam surface at the maximum amplitude point. at maximum amplitude point) * COS of the measured angle _0 . 7071 = epth.   |
| )                | $\frac{3 \cdot 17}{2 \cdot 2415}$ (metal path at $\sqrt{a^2 - b^2} = \frac{2 \cdot 2416}{2 \cdot 2416}$                            | ce from 0" reference to the maximum amplitude point of the flaw. at maximum amplitude point) squared = 10.0489 (a²) maximum amplitude point) squared = 5.0243 (b²) inches of surface distance to the flaw from the transducer exit point. 2.2416 (surf dist) = 146.2584 inches from 0" reference. |
| j)               | S = 1.9445 (result >> OR <<  | ing the smaller of the following; It of 1) = distance between exam surface and the upper flaw tip  (*) - 2 4607 (result of 2) = 2 . 6993 distance between the side opposite e lower flaw tip  |
| 3)               | Determine 2d in thou<br>2 . 4607_ (from step   | igh wall thickness.<br>p 2)1 . 9445_ (from step 1) = _0 . 5162_ inches.   |
| .4d<br>com       | rmination of surface<br>= (2d / 2) * 0.4 = 0.1<br>pare to S (from step 5)<br>s less than 0.4d, the flas<br>s greater than or equal | 1032  |
|                  | 0.8 (for a/l > 0.5, l =  |   |



March 5, 1997

CSC-2 Location

Location

Ad Hoc Evaluation Group

To File

Subject Use of revised ISI calculation worksheets and correction for curvature

THIS EVALUATION SHALL PERTAIN TO RU CLOSURE HEAD W. 6
EXAM 97-0109. PEN TELLOW ARRIVANIE JOFF RICKER 3/7/97 PER TELCON APPROUNT TOM TOWES 1100/

During the 1997 inspection of Steam Generator 22, weld W-A, several indications were reported under reports 97-0136 and 97-0137. Using procedure ISI-FE-1 Rev 2 to perform the flaw evaluation, it was determined by the level III that the applicable worksheet (Figure 7) could be improved upon for these calculations. As a result, two new worksheets were developed that have the following benefits:

- The determination of length varies with the direction of scan and is addressed by the new sheets. Length of the flaw is determined by finding the difference between L1 and L2 for perpendicular scans, and W1 and W2 for parallel scans.
- . The level of recording in relation to DAC is corrected for flaws less than 100% DAC and also provides a conservative recording level for flaws in excess of 100%
- The methodology to calculate depth is based on metal path and obviates the need to convert screen divisions into depth relating the calibration block to the component.

Consideration of the effect of the curvature of the vessel on depth determination for indications

| Report  | ind# | scan | type | Max MP | Radius | surf dist | diff   | prev "S" | corr "S" | "S" from | 0.4d   |
|---------|------|------|------|--------|--------|-----------|--------|----------|----------|----------|--------|
| 97-0136 | 6    | 3    | circ | 6.42   | 67.50  | 4.5396    | 0.1556 | 0.6204   | 0.7760   | ID       | 0.0028 |
|         | 7    | 3    | circ | 3.92   | 67.50  | 3.2481    | 0.0811 | 2.1407   | 2.2218   | ID.      | 0.0721 |
|         | 8    | 3    | circ | 2.29   | 67.50  | 1.6193    | 0.0203 | 1.4500   | 1.4297   | OD       | 0.0678 |
|         | 9    | 3    | circ | 3.85   | 67.50  | 2.7224    | 0.0540 | 2.1124   | 2.1664   | ID       | 0.1160 |
|         | 10   | 4    | circ | 4.87   | 67.50  | 3.4436    | 0.0879 | 1.5538   | 1.6417   | ID       | 0.1004 |
|         | 11   | 4    | circ | 1.49   | 67.50  | 1.0536    | 0.0068 | 0.8132   | 0.8064   | OD       | 0.0778 |
|         | 12   | 4    | circ | 2.07   | 67.50  | 1.4637    | 0.0135 | 0.9899   | 0.9764   | OD       | 0.0990 |
|         | 13   | 4    | circ | 3.64   | 67.50  | 2.5739    | 0.0473 | 2.2627   | 2.2154   | OD       | 0.0849 |
|         | 14   | 4    | circ | 1.59   | 67.50  | 1 1243    | 0.0068 | 0.9970   | 0.9902   | OD       | 0.1089 |
|         | 15   | 4    | circ | 5.39   | 67.50  | 3.8113    | 0.1082 | 1.2144   | 1.3226   | ID       | 0.0735 |
|         | 16   | 4    | circ | 2.65   | 67.50  | 1.8739    | 0.0270 | 1.6758   | 1.6488   | OD       | 0.0594 |
|         | 17   | 4    | circ | 3.17   | 67.50  | 2.2416    | 0.0405 | 1.9445   | 1.9040   | OD       | 0.1032 |

The information provided above was developed in response to comments from the reviewer of the ISI UT calculation worksheets.

The original worksheets did not consider curvature when determining indication depth on the circumferential scans.

The corrected values for "S" were reviewed against the calculations for surface proximity and value for "Y" and found to have no impact on the acceptability of the indications

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70 m 70