ORIGINAL

NIAGARA MOHAWK NUCLEAR ENGINEERING

CALCULATION COVER SHEET

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Total 61 65
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RC 9/9/99

NINE MILE POINT NUCLEAR STATION Unit (1; 2 or 0=Both) : _1_ Discipline : Mechanical

Title	Calculation No.			
RPV Weld Flaw Evaluation Using GE Nuclear Energy NMP1 RPV Flaw Evaluation Handbook (GENE-B13-01805-124, Rev. 0)	S0VESSELM030			
	(Sub)system(s) RXVE	Building RX	Floor Elev. 340'	Index No. S0

Originator(s)
R. Corieri
Checker(s) / Approver(s)
A. Tsirigotis / L.P Prunotto

Rev	Description	Change No.	Prep'd By	Date	Chk	Date	App	Date
0	Initial Issue	1M00805	RC	5/24/99	[illegible]	5-25-99	[illegible]	5/25/99
1	SEE PAGES 3,4+ Added ATTACH. J	1M00861	RC	9/9/99	[illegible]	9-13-99	[illegible]	9/13/99

Computer Output/Microfilm Filed Separately (Yes / No / NA): NA Safety Class (SR / NSR / Qxx) : SR

Superseded Document(s) : N/A

Document Cross Reference(s) - For additional references see page(s) : N/A

Ref No	Document No.	Doc Type	Index	Sheet	Rev
1	NER-1M-063	NER	-	-	00
2	NER-1M-065	NER	-	-	00
3	S0VESSELM026	CALC	S0	-	00
4	104R859	DR	S22.1	001	09
5	N1-IST-LK-101	IST	-	-	03

General Reference(s) :
1. DER 1-1999-1451
2. DER 1-1999-1640
3. Correspondence from B. Branlund (GE Nuclear Energy) to R. Corieri, dated April 29, 1999 (Correspondence included with Configuration Change Package 1M00805)
4. Correspondence from R.B. Abbott to USNRC, dated December 10, 1998 (NMP1L 1391)

Remarks :

NER-1M-063 is GE Nuclear Energy RPV Flaw Evaluation Handbook for NMP1 (GENE-B13-01805-124, Rev. 0)
NER-1M-065 is MPM Report, "Updated NMP1 Vessel Weld Data for Flaw Evaluation Handbook (MPM-029934)

Confirmation Required (Yes / No) : NO See Page(s) :	Final Issue Status (APP / FIO / VOI) : APP	File Location (Calculation/Hold) : Calc	Operations Acceptance Required (Yes / N/A) : N/A

Evaluation Number(s): AR29233, AR35062 Copy of Applicability Review Attached (Yes / N/R)? N/R	Component ID(s) (As shown in MEL) : RPV-NR02
Key Words : Reactor, Vessel, Flaw, Fracture, Mechanics, GERIS, ASME XI, Handbook, Beltline, Weld, Examination	

FORMAT # NEP-DES-08-F01-03

Nine Mile Point Nuclear Station Unit: 1 Disposition:

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R. Corieri RC 9/9/99	A. Tsirigotis AT 9-13-99	S0VESSELM030	01

Ref.

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I - Flaw Evaluation Worksheet, Curve and GERIS Data Sheet .....Pages I1- I6
(Weld ID: RVWD-099, Flaw ID: 1-122/149)

J – GE Nuclear Energy Correspondence from Chris Minor to R.Corieri.....Pages J1-J4
File Code NMP1-99007, "Evaluation of Flaw Proximity After Projected Flaw Growth". R1

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PURPOSE:

The reactor pressure vessel (RPV) axial shell welds, 2-3% of the intersecting circumferential welds, and the shell-to-flange circumferential weld were ultrasonically inspected during the 15th refueling outage (RFO15), using the General Electric Remote Inspection System (GERIS) 2000 ID Inspection Tool. Volumetric examination of RPV shell welds are required by 10CFR50.55a and the ASME XI code. As a result of the RPV weld inspections, two (2) subsurface flaws in axial weld RVWD-140 and seven (7) subsurface flaws in shell-to-flange circumferential weld RVWD-099, were detected and determined to exceed the minimum inspection standards of ASME XI, Subsection IWB-3500. It is noted that this calculation evaluated a total of nine (9) flaw indications in accordance with IWB-3600, however there were actually only eight (8) flaws. This is due to flaw indications 1-109/1-139 and 1-122/1-149 being evaluated as two separate flaws, when in fact the flaw indications were identified as being the same flaw recorded from opposite sides of the weld centerline (Reference: DER 1-1999-1640). The flaws are oriented parallel to the weld axis. The flaws are characterized as subsurface planar flaws as defined by IWA-3320 Subsurface Planar Flaws. Refer to Figure 1-1 for the RPV weld location drawing. The purpose of this calculation is to perform structural flaw evaluations in accordance with ASME Section XI, Subsection IWB-3600, " Analytical Evaluation of Indication", for the detected flaws that did not meet the acceptance standards of IWB-3500. RI

METHODOLOGY:

Prior to RFO15, GE Nuclear Energy developed for NMP-1, flaw evaluation criteria entitled, "NMP-1 RPV Flaw Evaluation Handbook", (Reference 1). The flaw handbook includes analysis methods prescribed by ASME Section XI IWB-3600. The Reference 1 flaw handbook contains a series of flaw evaluation curves that are used to determine the allowable flaw sizes. The Reference 1 flaw handbook also contains flaw evaluation worksheets in Section B of the handbook. Completed flaw evaluation worksheets including the flaw evaluation curves for each flaw evaluated to the criteria in the flaw handbook are included as attachments to this calculation.

The flaw evaluation provided in the Reference 1 report, includes fatigue crack growth and irradiation embrittlement for up to both 20.3 and 28 effective full power years (EFPY). In general, inside surface flaws were found to be limiting for vessel shell welds. Evaluations were also performed for subsurface flaws for all selected weld regions.

The Reference 1 analysis uses the most limiting loading for Normal (Level A), Upset (Level B), Emergency (Level C), Faulted (Level D), and Test conditions. The leak test and bolt up conditions, which involve the combination of low operating temperatures and high safety factors, are the most limiting operating conditions for vessel welds. Leak test conditions, and bolt up conditions at the flange regions, were considered for fracture analysis. The minimum specified leak test temperature is 247°F at 1195 psig for 20.3 EFPY and 260°F at 1195 psig for 28 EFPY. Bolt-up conditions were analyzed at a service temperature of 100°F consistent with the pressure-temperature curves. Thermal transients during normal operation are bounded by the leak test and bolt up conditions, since the thermal stresses are more than offset by the associated higher fracture toughness values, K_{Ia}, due to higher metal service temperatures.

Loading associated with the analyses include:

- Membrane pressure stresses
- Bending Stress (near vessel flange)
- Weld residual bending stresses
- Clad residual stress (clad thickness = 7/32 in. nominal) on the inside surface only.

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

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Ref.

The analysis methods follow those prescribed in ASME Code Section XI IWB-3600. Applied stress intensity factors, K_I, were developed as a function of the flaw depth ratio, a/t (surface flaw) or 2a/t (subsurface), and aspect ratio, a/L. These were compared to the allowable fracture toughness, K_{Ia}, incorporating the Section XI safety factor of $\sqrt{10}$ for leak test, or $\sqrt{2}$ for bolt up, to determine allowable flaw sizes.

An upper bound on allowable flaw size was established at 1/3 depth of the low alloy steel (LAS) wall thickness to ensure that ASME Code Section III primary stress requirements were met. A lower bound for allowable flaw sizes is established by the minimum inspection standards of IWB-3500. If the flaw does not satisfy this standard, continued operation may still be justified if the flaw satisfies the IWB-3600 acceptance criteria, as developed in this report.

Variation of neutron flux as a function of azimuth and elevation was considered to remove any undue conservatism in determining the allowable flaw sizes. In the beltline region, the allowable flaw sizes were calculated for the vertical welds with the highest adjusted RT_{NDT} values.

CALCULATION INPUTS:

The design inputs are included in the Reference 1 GE Flaw Evaluation Handbook. Updated neutron fluence and material property data for the NMP-1 weld/plate material was developed in the Reference 2 report. Flaw data contained in this calculation are taken from the GERIS 2000 Indication Evaluation Data Sheets included as an attachment to each flaw evaluation worksheet.

CALCULATION ASSUMPTIONS:

The design inputs used by GE Nuclear Energy in the Flaw Evaluation Handbook (Reference 1) are correct and applicable to NMP-1.

CALCULATION RESULTS:

The two (2) subsurface flaws evaluated in weld RVWD-140 and the seven (7) subsurface flaws evaluated in weld RVWD-099, have been demonstrated to be well within the allowable flaw size limits established in the Reference 1 Flaw Evaluation Handbook. Therefore, the flaws are acceptable per ASME XI, IWB-3600. The flaws were determined to be acceptable until the end of plant life, i.e., for 28 Effective Full Power Years (EFPY).

An additional evaluation step (not contained in the GE Flaw Evaluation Handbook) was performed by GE to confirm the flaws are acceptable for 28 EFPY. GE Engineering provided the fatigue crack growths used in the flaw handbook for 28 EFPY to the GE Level III UT examiners. The GE Level III then re-performed the ASME XI, IWA-3300 flaw proximity evaluation to confirm that adjacent flaws do not link together between now and 28 EFPY. The evaluation concluded that no flaw combinations result when applying the projected fatigue crack growth dimensions. Attachment J provides the details of the evaluation. It is also evident from the fatigue crack growth and the current distance "S" of each flaw to the surface shown in the attached UT data sheets, that the flaws will not extend to the RPV surface. These additional flaw proximity evaluations confirm the flaws are acceptable for 28 EFPY. R1

Nine Mile Point Nuclear Station Unit: 1 Disposition:

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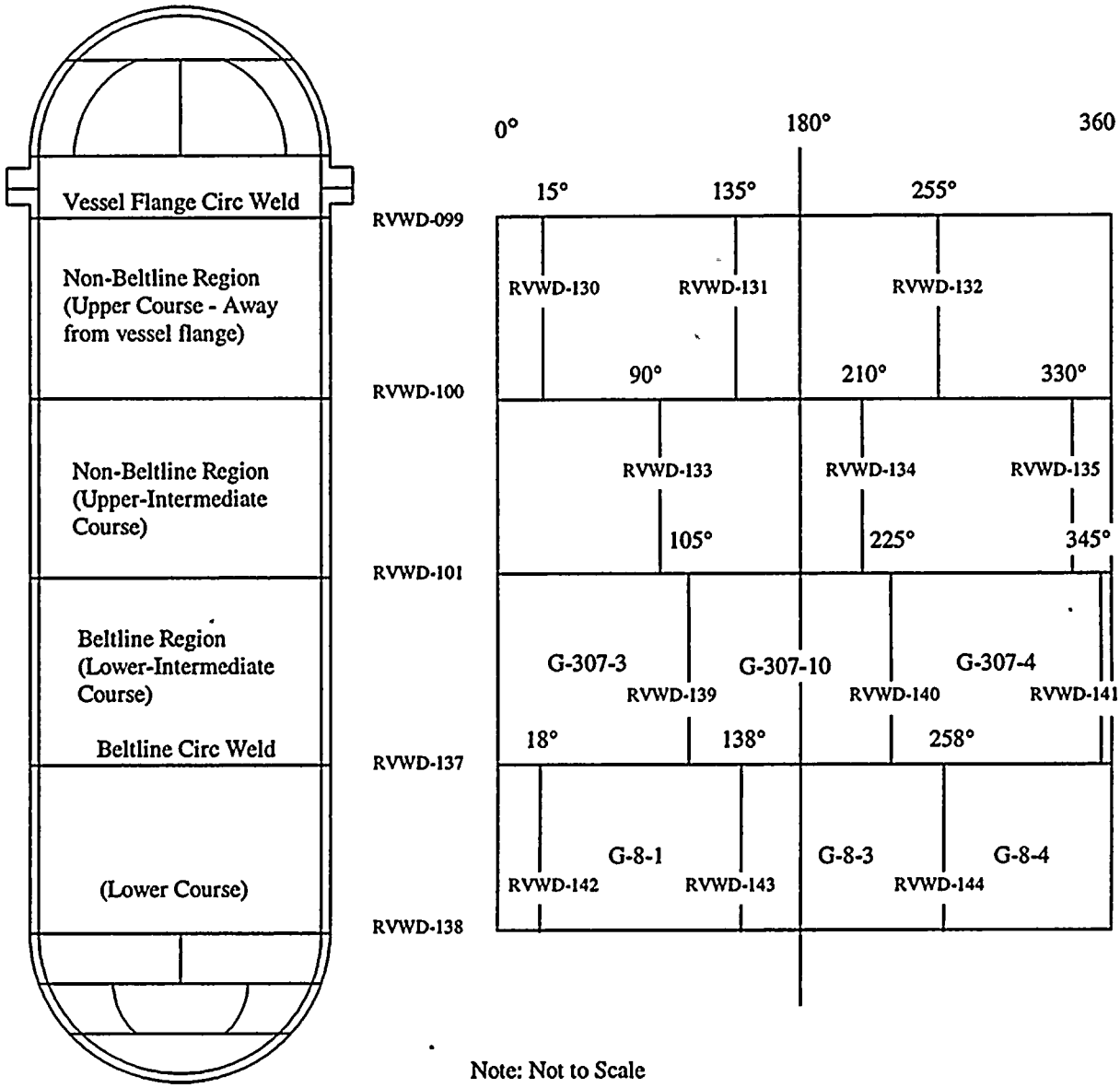
Ref.



Note: Not to Scale

Figure 1-1. Nine Mile Point Unit 1 vessel weld regions for flaw evaluation.

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
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Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT A

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 55

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RVWD-140
   Orientation: axial

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw.

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, NOTE (4)
   y=s/a=2"/(.396/2)=10.1>0.4, use Y=1.0 for Y>1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, $t_{clad.}$ = 0(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.98(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.98(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

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(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 55

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.396(in)
Half Depth, a = 0.198(in)
Flaw Length, L = 13.75(in)
Distance to Surface as defined in IWA-3300, S = 2 (in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.0144

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.372(in) *< 0.396" therefore unacceptable per Table IWB-3510-1 allowed a/t=2.33% for Y=1.0 tmeas=7.98 therefore a=7.98*2.33%=0.1859"*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
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Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 55

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1451 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

Figure # D-12 for 28 EFPY (End of plant life)

Inside Surface Flaw:
IWB-3600 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3600 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3600 Allowable Depth = 2a = 0.9(in) *>0.396" therefore Acceptable*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 55

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-140
Patch ID : V2B-01

Exam Data Sheet : 9-02
Ind. Data Sheet : 9-055
Indication : 55

Flaw Throughwall Dimension = 0.396
Flaw Length "l" = 13.75
Surface Separation "S" = 2.00

"T" nominal = 7.13
"T" measured = 7.98
Clad "T" nominal = 0.22

Attachment No A
Calc SQVESSELM030
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ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	1.86	2.33 Y
0.05	2.0	2.4	~	~
0.10	2.2	2.6	~	~
0.15	2.4	2.9	~	~
0.20	2.7	3.2	~	~
0.25	3.1	3.6	~	~
0.30	3.5	4.1	~	~
0.35	3.5	4.6	~	~
0.40	3.5	5.2	~	~
0.45	3.5	5.8	~	~
0.50	3.5	6.5	~	~
			Allowed	Allowed
			1.86	2.33

a = 0.198
a/l value = 0.014
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.33%
a/t = 2.48%

Flaw is unacceptable by Table IWB-3510-1.

Comments : Flaw is axial.
"T" Local measured = 8.20" with clad.
SEPARATION "S" FROM VESSEL OD SURFACE. CAM 5/10/99

Analyst: C. M
Level: III Date: 5/3/99

Reviewed By: J. C. Dio
Level: III Date: 5.3.99

EXAM-DS4 V 2 7/8/98

Attachment No A
Calc SOVESSEL M030
Rev 0 Disp
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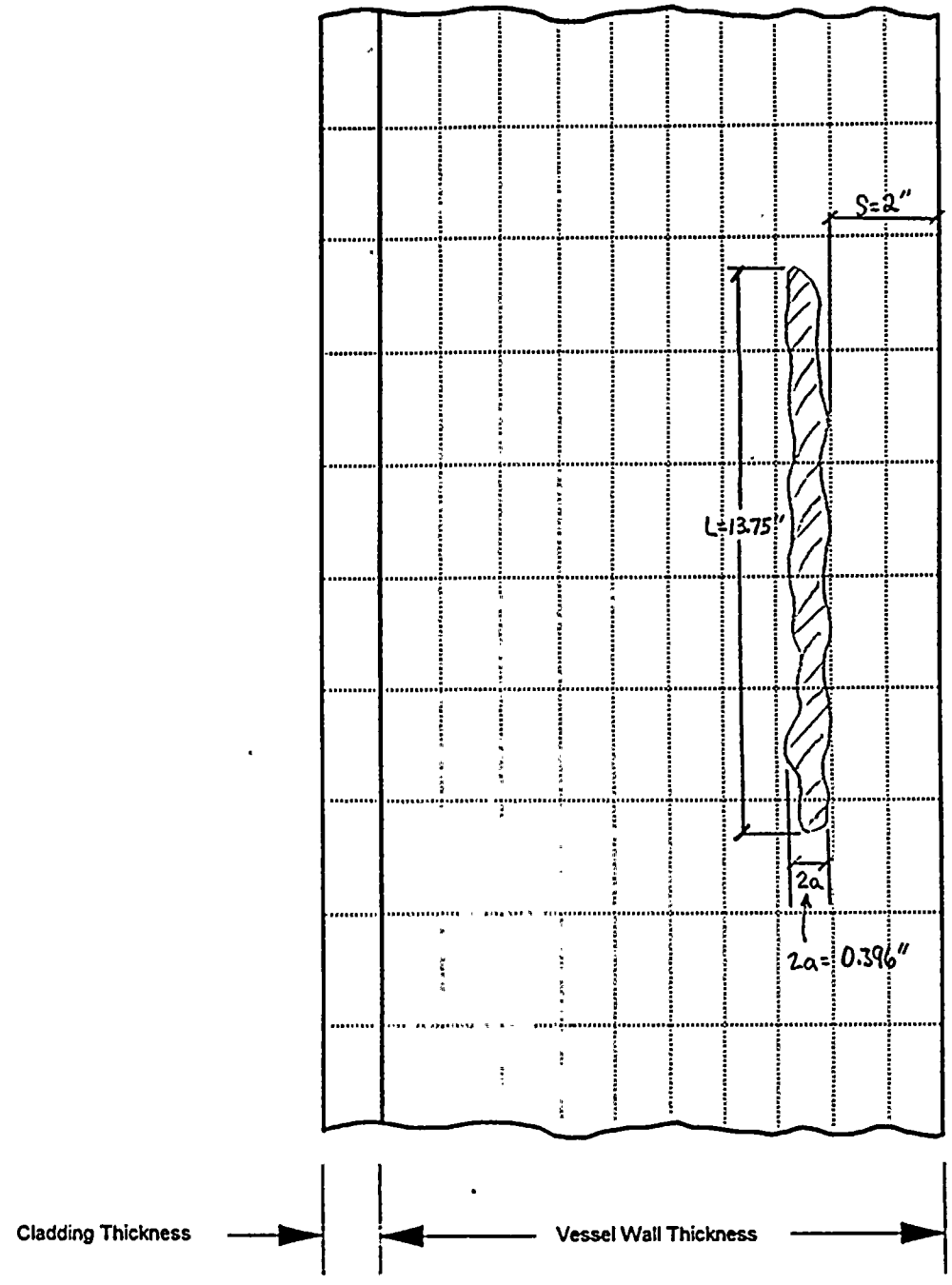
Vessel Flaw Sketch

Flaw ID: 55

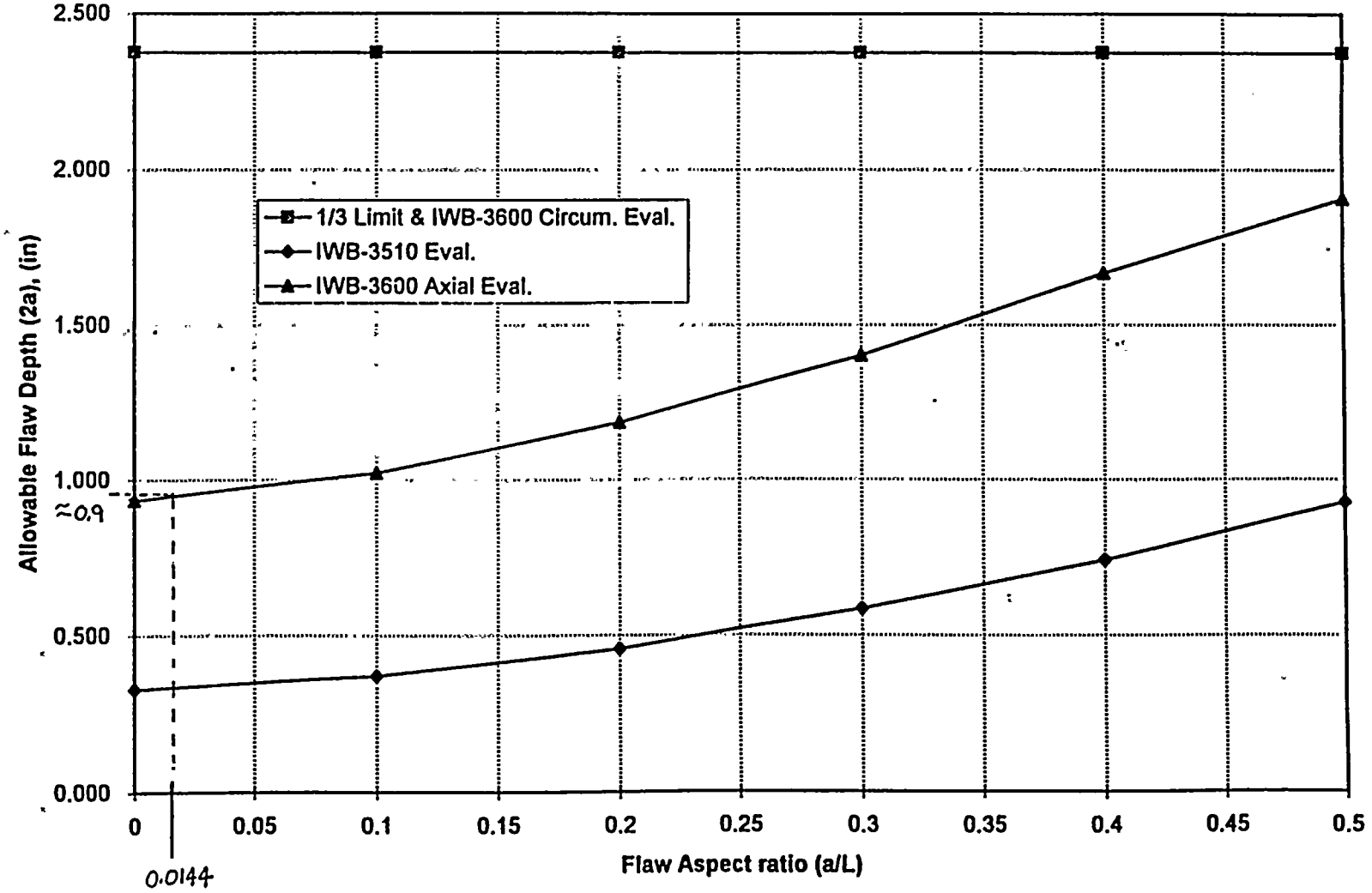


t_{clad} = 0.22

t_{LAS} = 7.98

Figure B-1. Form for Vessel Flaw Sketches.

Figure D-12. Lower-Intermediate Course at 225 Deg, Subsurface Flaw @ 28 EFPY



Attachment No A
Calc SOVESSELM030
Rev 0 Disp
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Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT B

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 9-015+016

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RVWD-140
   Orientation: axial

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw.

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, NOTE (4)
   y=s/a=2.2/(0.424/2)=10.4>0.4, use y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0(in)
   Low Alloy Steel Thickness, t_{LAS} = 8.00(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 8.00(in)

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 9-015+016

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.424(in)
Half Depth, a = 0.212(in)
Flaw Length, L = 3.0(in)
Distance to Surface as defined in IWA-3300, S = 2.20(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.071

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.396(in)*<0.424" Therefore, unacceptable*

*per IWB-3510-1, allowed a/t=2.48% for y=1.0 tmeas=8.00" therefore a=8*2.48%=0.198%*

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy — GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 9-015+016

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1451 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-12

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.0(in) *>0.424"*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 9-015+016

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-140
Patch ID : V2B-02A

Exam Data Sheet : 9-05
Ind. Data Sheet : 9-015, 9-016
Indication : 15->16

Attachment No B
Calc SQVESSELM030
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Flaw Throughwall Dimension = 0.424
Flaw Length "l" = 3.00
Surface Separation "S" = 2.20

"T" nominal = 7.13
"T" measured = 8.00
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	-	-
0.05	2.0	2.4	2.08	2.48 Y
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			2.08	2.48

a = 0.212
a/l value = 0.071
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.48%
a/t = 2.65%

Flaw is unacceptable by Table IWB-3510-1.

Comments : Flaw is axial.
"T" Local measured = 8.22" with clad.
Combined flaw indications 9-015 and 9-016 in accordance with IWA-3330.
Separation "S" from vessel OD surface.

Analyst: CA MK
Level: III Date: 5/4/99

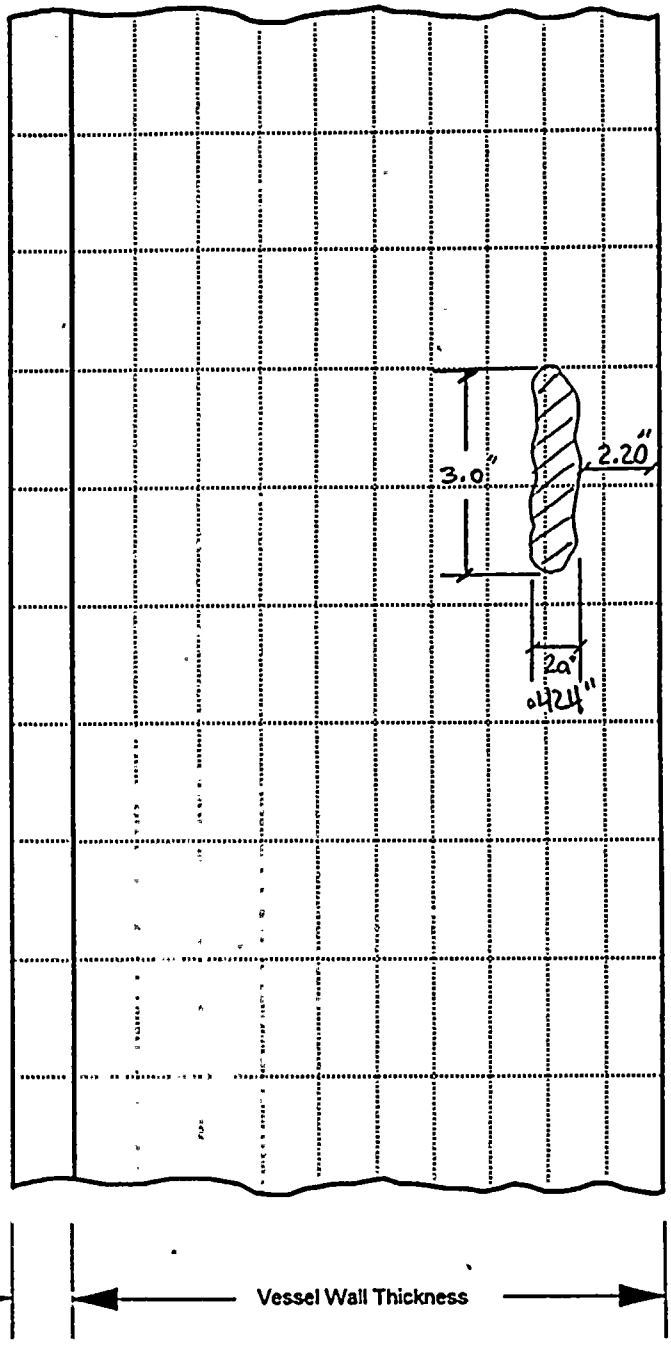
Reviewed By: JL C. Dial
Level: III Date: 5-3-99

EXAM-054 V 2 7/8/98

Attachment No B
Calc SOVESSELM030
Rev 0 Disp -
Page B6 of B7

Vessel Flaw Sketch

Flaw ID: 9-015+016

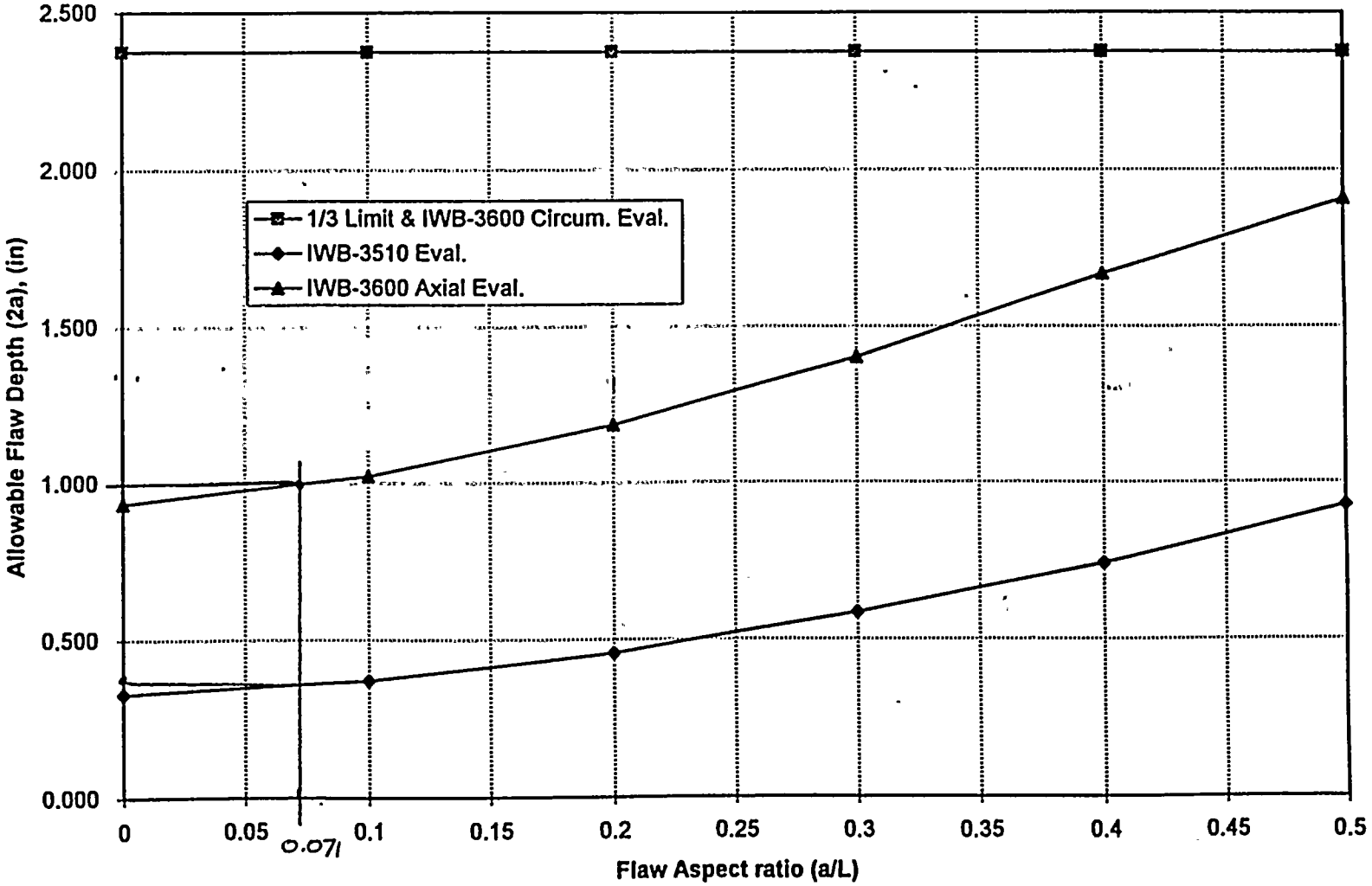


t_{clad} = 0.22

t_{LAS} = 8.00

Figure B-1. Form for Vessel Flaw Sketches.

Figure D-12. Lower-Intermediate Course at 225 Deg, Subsurface Flaw @ 28 EFPY



Attachment No B
Calc SOVESSEL-M030
Rev 0 Disp -
Page 81 of 81

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy — GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT C

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 109/139

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, Note (4)
   y=s/a=3.5/.198=17.68>0.4, use y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 109/139

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = .396(in)
Half Depth, a = .198(in)
Flaw Length, L = 6.75 (in)
Distance to Surface as defined in IWA-3300, S = 3.5(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = .029

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.340(in) *<0.396: per IWB-3510-1, allowed a/t=2.36% for Y=1.0 tmeas =7.20" therefore a=7.20*2.36%=.169*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 109/139

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.20(in) *>0.396"*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/97	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 109/139

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11 / C4-12

Exam Data Sheet : 1-15 / 1-16
Ind. Data Sheet : 1-109 / 1-139
Indication : 109 / 139

Flaw Throughwall Dimension = 0.396
Flaw Length "l" = 6.75
Surface Separation "S" = 3.50

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

Attachment No C
Calc SQVESSELM030
Rev 0 Disp —
Page C5 of C6

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	1.92	2.36 Y
0.05	2.0	2.4	-	-
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			1.92	2.36

a = 0.198
a/l value = 0.029
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.36%
a/t = 2.75%

Flaw is unacceptable by Table IWB-3510-1.

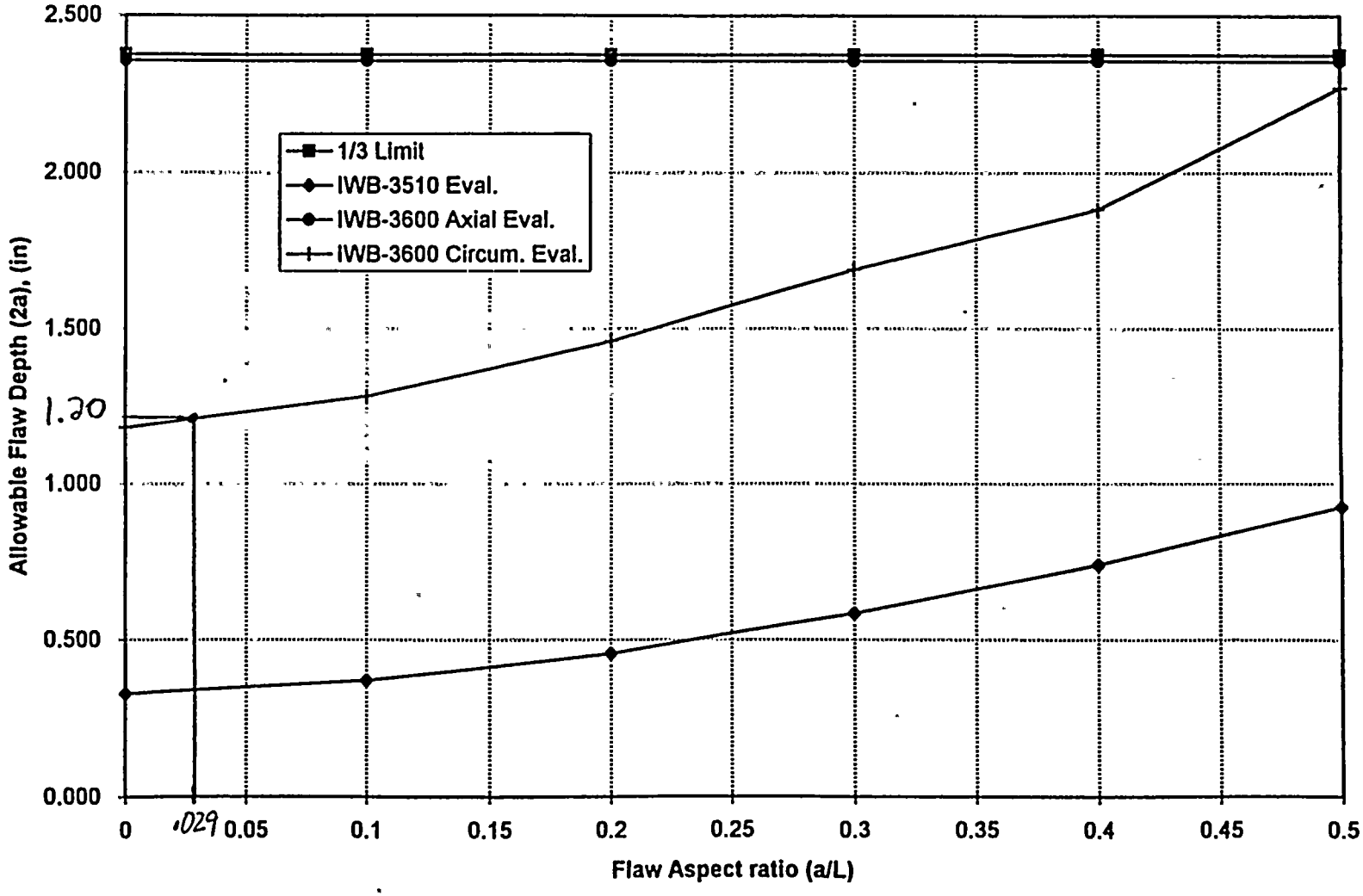
Comments : Flaw is circumferential.
Separation "S" measured to OD surface.
Throughwall dimension from data sheet 1-139.

Analyst [signature]
Level: III Date: 5/19/99

Reviewed By: [signature]
Level: III Date: 5-19-99

EXAM-084 V2 7/9/98

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No 2
Calc 30vessel1mo30
Rev 0 Disp —
Page C6 of C6

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri R 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy

GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT D

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-112

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, Note (4)
   y=s/a=3.2/0.297=10.77>0.4, Use y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-112

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.594(in)
Half Depth, a = 0.297(in)
Flaw Length, L = 1.25(in)
Distance to Surface as defined in IWA-3300, S = 3.20(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.238

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.504(in) *<0.594" per IWB-3510-1, allowed a/t=3.5%for y=1.0 tmeas =7.20" therefore a=7.20*3.5%=0.252"*

Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri 5/24/99	A. Tsirigotis 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy

GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-112

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

Figure # D-3

Inside Surface Flaw:

IWB-3600 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):

IWB-3600 Allowable Depth = a = N/A(in)

Subsurface Flaw:

IWB-3600 Allowable Depth = 2a = 1.55(in) *>0.594*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-112

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11

Exam Data Sheet : 1-15
Ind. Data Sheet : 1-112
Indication : 112

Attachment No D
Calc SQVESSELMO30
Rev 0 Disp 1
Page D5 of D6

Flaw Throughwall Dimension = 0.594
Flaw Length "l" = 1.25
Surface Separation "S" = 3.20

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	-	-
0.05	2.0	2.4	-	-
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	3.00	3.50 Y
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			3.00	3.50

a = 0.297
a/l value = 0.238
Y = 1.000

Flaw is Subsurface

Allowed a/t = 3.50%
a/t = 4.13%

Flaw is unacceptable by Table IWB-3510-1.

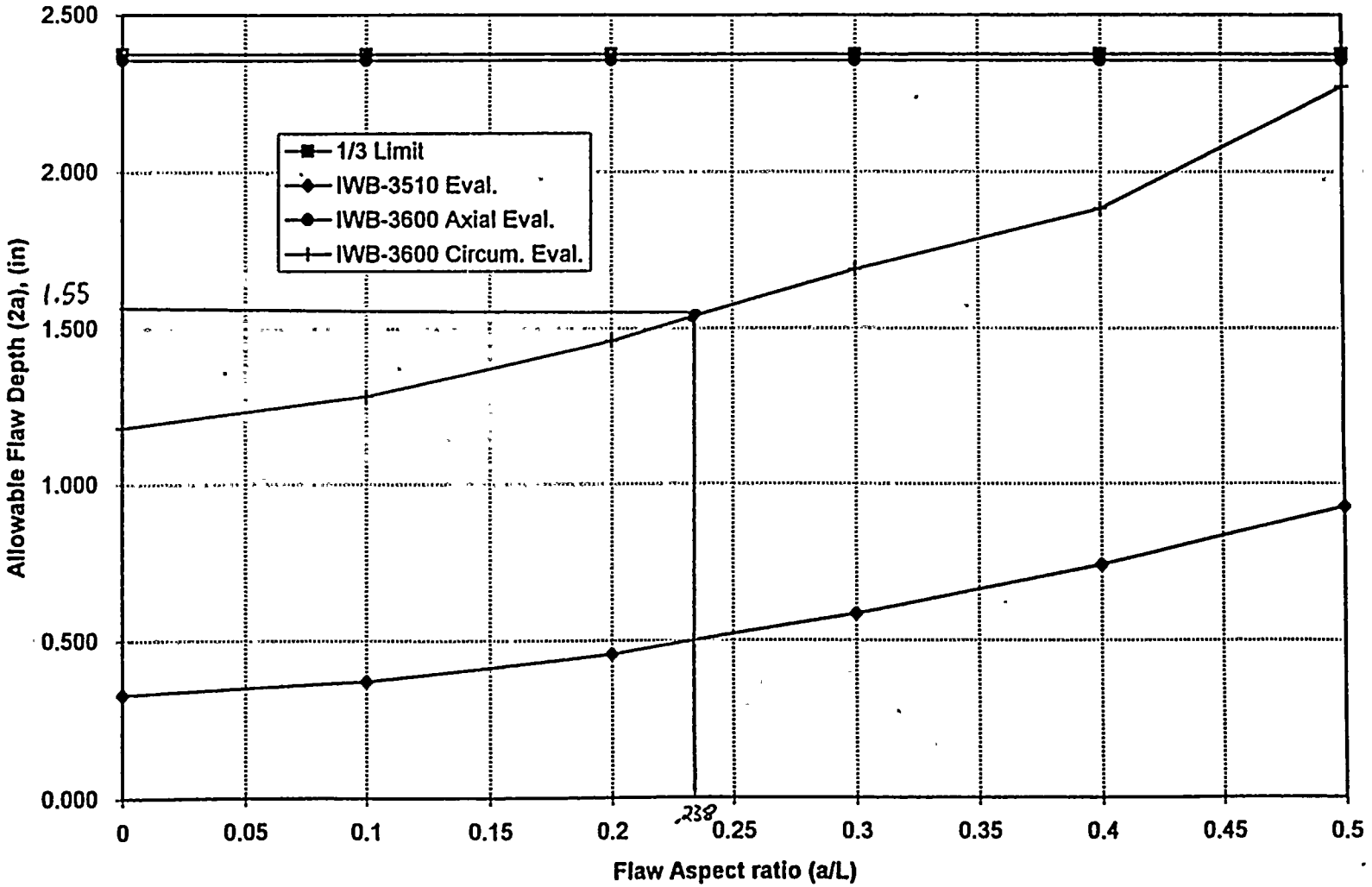
Comments : Flaw is circumferential.
Separation "S" measured to ID surface.

Analyst: C M Level: II Date: 5/16/99

Reviewed By: J C. Li Level: III Date: 5-19-99

EXAM-DS4 V.2 7/9/96

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No D
Calc SOVESSELMD30
Rev 0 Disp -
Page D6 of D6

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri R. 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT E

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-113

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsruface because per table IWB-3510-1, Note (4) y=s/a=3.20/.297=10.77>0.4, use y=1

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri R. 5/24/99	A. Tsirigotis A 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-113

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.594(in)
Half Depth, a = 0.297(in)
Flaw Length, L = 3.25(in)
Distance to Surface as defined in IWA-3300, S = 3.20(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.091

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.370(in) *<0.594 per IWB-3510-1, allowed a/t=2.57% for y=1.0 tmeas=7.20" therefore a=7.20*2.57%=0.185"*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-113

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.26(in) *>0.594*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-113

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit ≐ N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11

Exam Data Sheet : 1-15
Ind. Data Sheet : 1-113
Indication : 113

Attachment No E
Calc SQVESSELM030
Rev 0 Disp 1
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Flaw Throughwall Dimension = 0.594
Flaw Length "l" = 3.25
Surface Separation "S" = 3.20

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	-	-
0.05	2.0	2.4	2.17	2.57 Y
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			2.17	2.57

a = 0.297
a/l value = 0.091
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.57%
a/t = 4.13%

Flaw is unacceptable by Table IWB-3510-1.

Comments : Flaw is circumferential.
Separation "S" measured to ID surface.

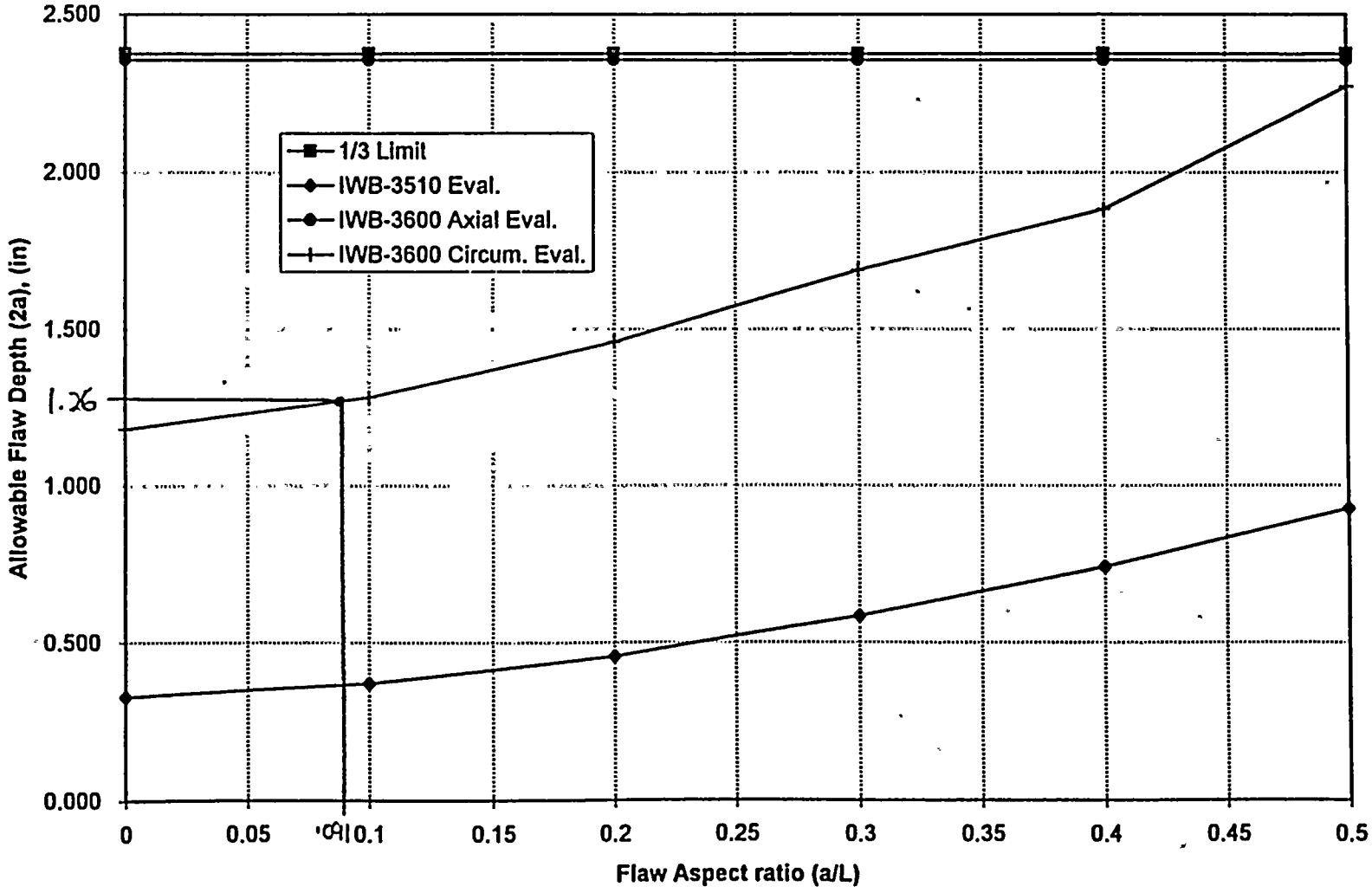
Analyst: [signature]
Level: III Date: 5/16/99

Reviewed By: [signature]
Level: III Date: 5-19-99

EXAM-D54 V.2 7/9/98

Evaluations

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No E
Calc SQVESSFLWD30
Rev 0 Disp -
Page E6 of E6

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT F

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-114

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface Flaw is subsurfase per table IWB-3510-1, Note (4)
   y=s/a=3.2/0.297=10.77>0.4, use y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-114

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.594(in)
Half Depth, a = 0.297(in)
Flaw Length, L = 3.50(in)
Distance to Surface as defined in IWA-3300, S = 3.20(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.085

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N.A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.366(in) *<0.594 per IWB-3510-1, allowed a/t=2.54% for y=1.0 tmeas =7.20" therefore a=7.20*2.54%=0.183"*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-114

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.24(in) *>0.594*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-114

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11

Exam Data Sheet : 1-15
Ind. Data Sheet : 1-114
Indication : 114

Attachment No F
Calc SQVESSELM030
Rev 0 Disp -
Page F5 of F6

Flaw Throughwall Dimension = 0.594
Flaw Length "l" = 3.50
Surface Separation "S" = 3.20

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	-	-
0.05	2.0	2.4	2.14	2.54 Y
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed 2.14	Allowed 2.54

a = 0.297
a/l value = 0.085
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.54%
a/t = 4.13%

Flaw is unacceptable by Table IWB-3510-1.

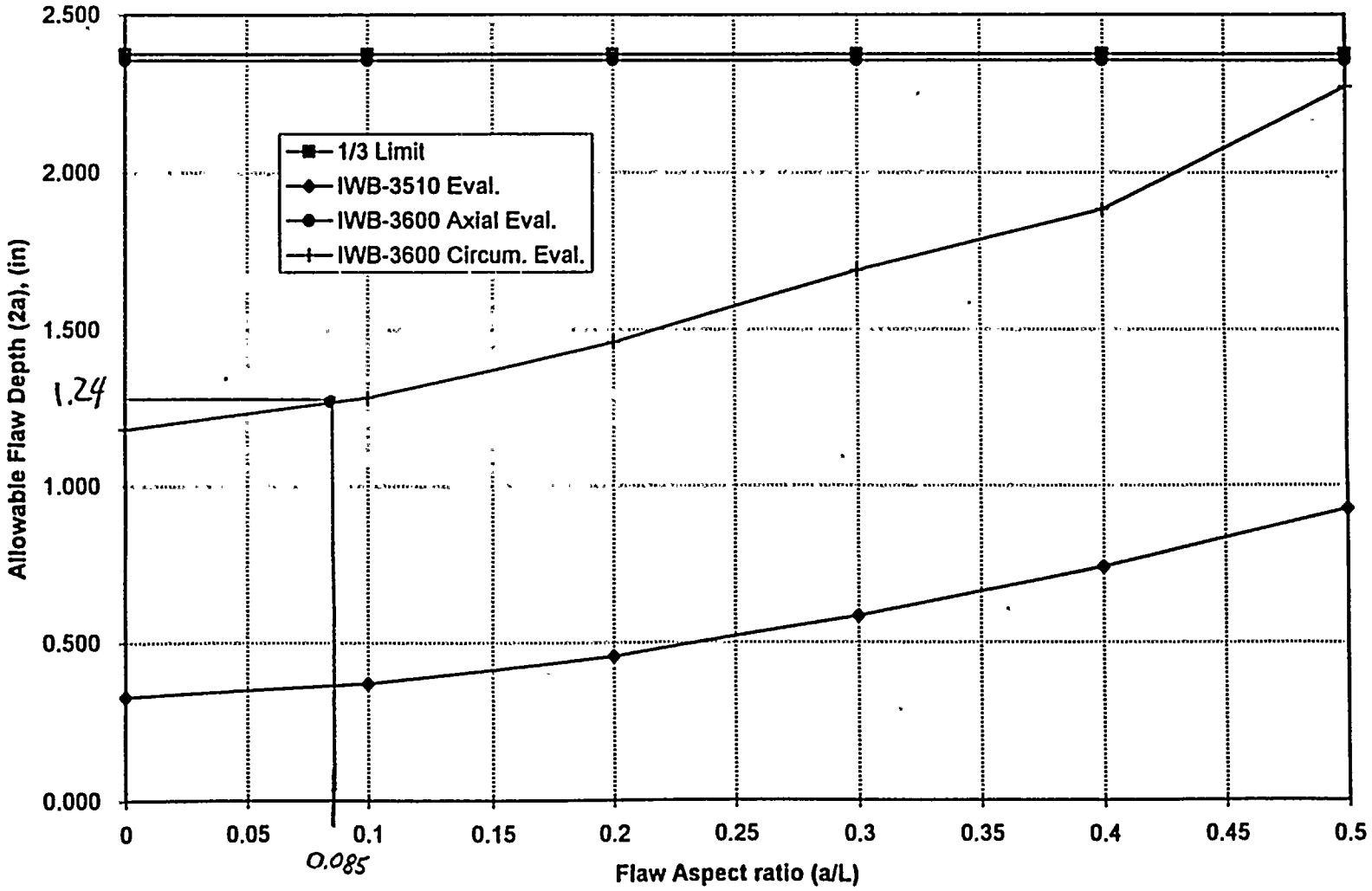
Comments : Flaw is circumferential.
Separation "S" measured to ID surface.

Analyst: [signature] Level: III Date: 5/16/96

Reviewed By: [signature] Level: III Date: 5-19-99

EXAM-054 V 2 7/96

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No F
Calc SOVESSELW030
Rev 0 Disp -
Page F6 of F6

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/25/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT G

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-115

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-35-10-1, Note (4)
   y=s/a=3.2/0.276=11.59>0.4, y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/25/99	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-115

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.552(in)
Half Depth, a = 0.276(in)
Flaw Length, L = 3.50(in)
Distance to Surface as defined in IWA-3300, S = 3.20(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.079

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = .363(in)*<0.552" per IWB-3510-1, allowed a/t=2.52% for y=1.0 tmeas=7.20" therefore a=7.20*2.52%=.181*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri R. Corieri	A. Tsirigotis A 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-115

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N.A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N.A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.23(in) *>0.552*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-115

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11

Exam Data Sheet : 1-15
Ind. Data Sheet : 1-115
Indication : 115

Attachment No 6
Calc SQVESSELWD30
Rev 0 Disp
Page 65 of 66

Flaw Throughwall Dimension = 0.552
Flaw Length "l" = 3.50
Surface Separation "S" = 3.20

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	-	-
0.05	2.0	2.4	2.12	2.52 Y
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			2.12	2.52

a = 0.276
a/l value = 0.079
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.52%
a/t = 3.83%

Flaw is unacceptable by Table IWB-3510-1.

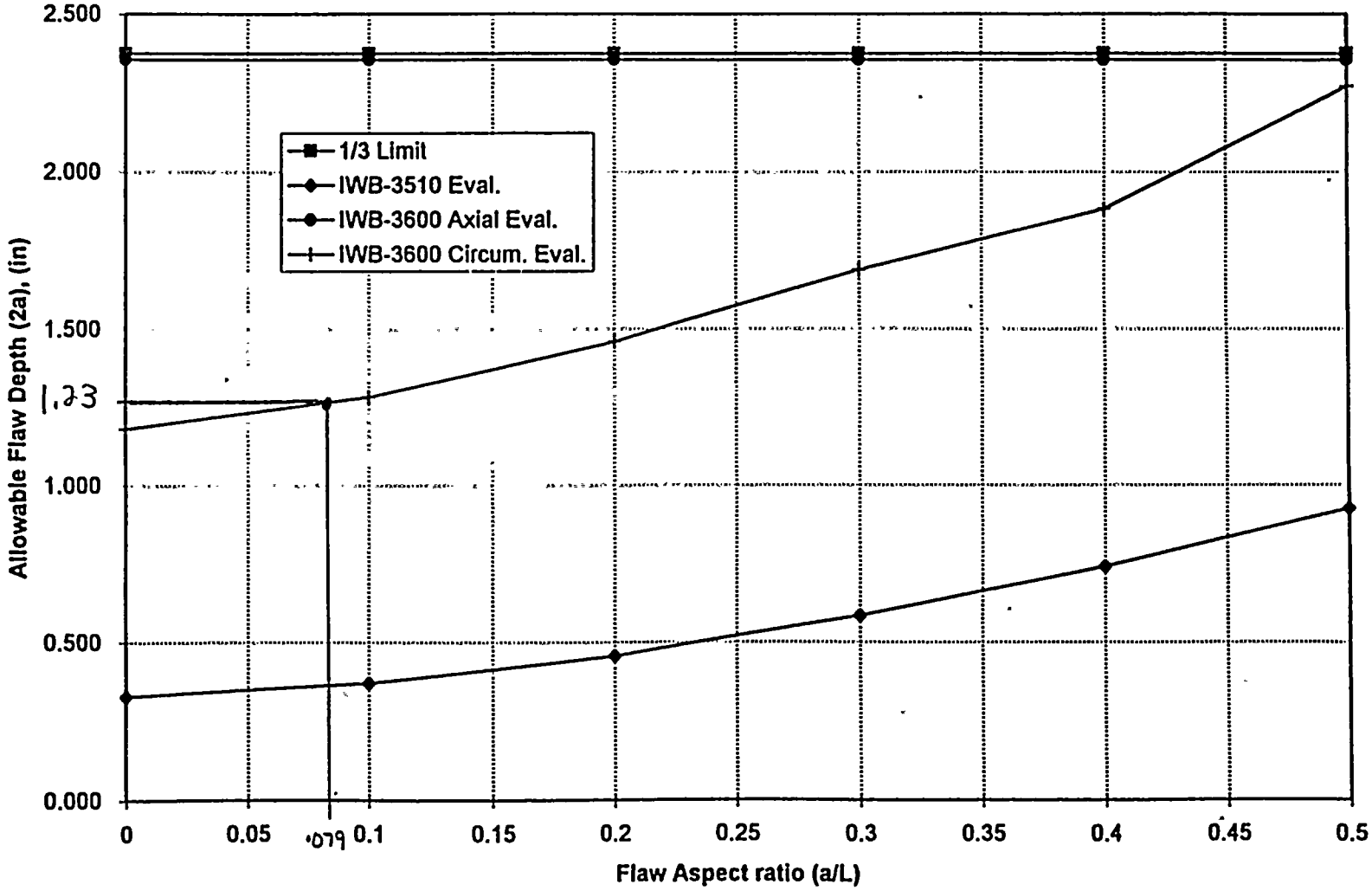
Comments : Flaw is circumferential.
Separation "S" measured to ID surface.

Analyst: C M T
Level: II Date: 5/18/99

Reviewed By: J. C. Dial
Level: III Date: 5-19-99

EXAM-054 V 2 7/9/98

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No 6
Calc SOVESSELWD30
Rev 0 Disp —
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Nine Mile Point Nuclear Station | Unit: 1 | Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT H

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-116

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, Note (4)
   y=s/a=2.5/0.276=9.06>0.4, y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-116

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.552(in)
Half Depth, a = 0.276(in)
Flaw Length, L = 2.50(in)
Distance to Surface as defined in IWA-3300, S = 2.50(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.110

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.383(in) *<0.552" per IWB-3510-1, allowed a/t=2.66% for y=1.0 tmeas=7.20 therefore a=7.20*2.66%=.192*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-116

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER# 1-1999-1640

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.31(in) *>0.552*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/21/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-116

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11

Exam Data Sheet : 1-15
Ind. Data Sheet : 1-116
Indication : 116

Attachment No H
Calc SQVESSELWQ30
Rev 0 Disp —
Page H5 of H6

Flaw Throughwall Dimension = 0.552
Flaw Length "l" = 2.50
Surface Separation "S" = 2.50

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	~	~
0.05	2.0	2.4	~	~
0.10	2.2	2.6	2.24	2.66 Y
0.15	2.4	2.9	~	~
0.20	2.7	3.2	~	~
0.25	3.1	3.6	~	~
0.30	3.5	4.1	~	~
0.35	3.5	4.6	~	~
0.40	3.5	5.2	~	~
0.45	3.5	5.8	~	~
0.50	3.5	6.5	~	~
			Allowed 2.24	Allowed 2.66

a = 0.276
a/l value = 0.110
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.66%
a/t = 3.83%

Flaw is unacceptable by Table IWB-3510-1.

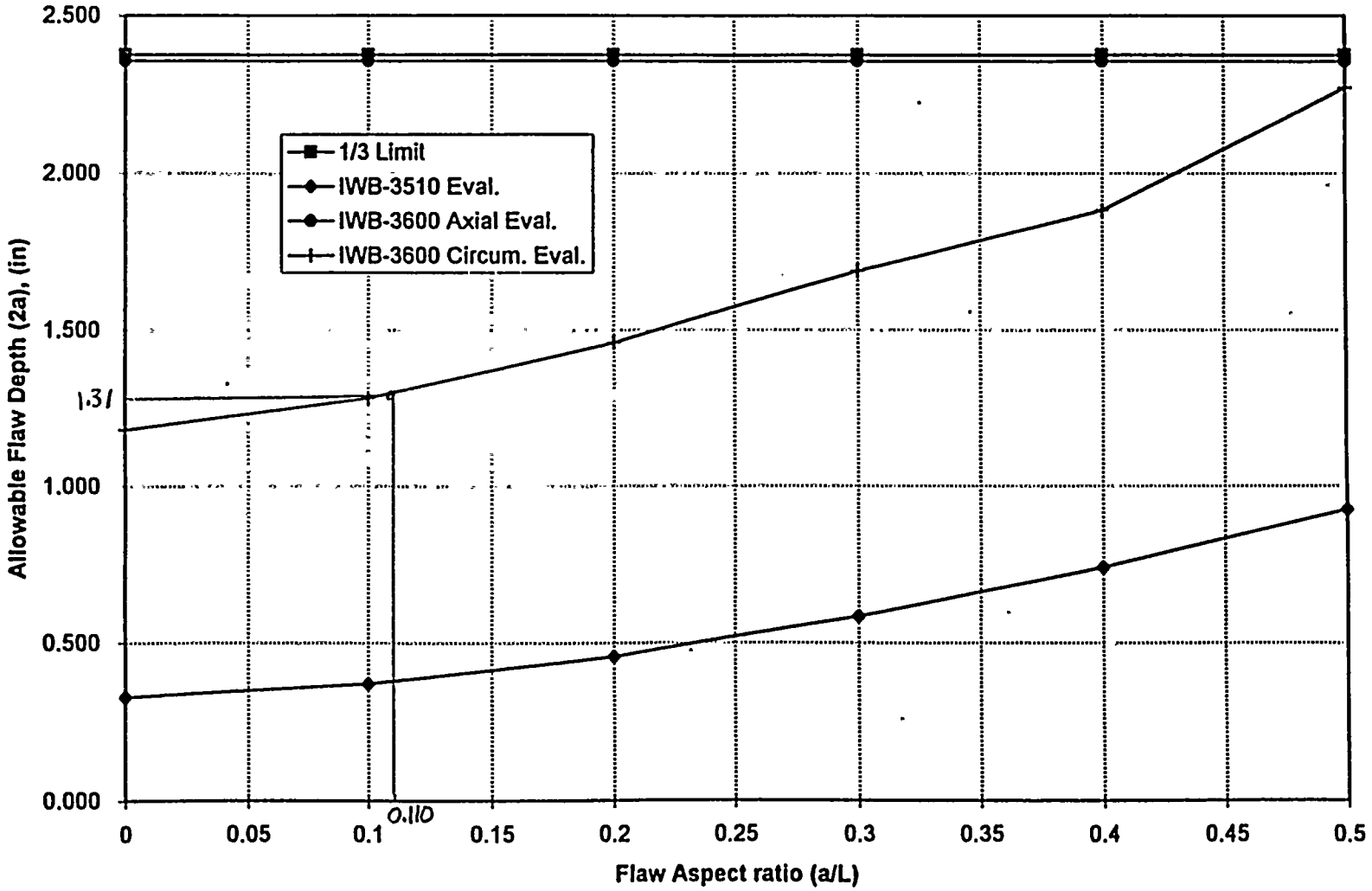
Comments : Flaw is circumferential.
Separation "S" measured to ID surface.

Analyst: [signature]
Level: III Date: 5/16/99

Reviewed By: [signature]
Level: III Date: 5.19.99

EXAM-DS4 V.2 7/9/98

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No H
Calc SQVESSELM030
Rev 0 Disp —
Page H6 of H6

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri Rc 5/24/99	A. Tsirigotis 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

ATTACHMENT I

NINE MILE POINT UNIT 1 FLAW EVALUATION WORKSHEET

Flaw ID: 1-122/149

1. Determine Region and Orientation of Flaw. The weld region should be identified by the nearest weld. The orientation is either [A]xial or [C]ircumferential. If the flaw is at a junction between two welds, the region with the more limiting acceptance criteria should be conservatively used.

   Region: RV-WD-099
   Orientation: circumferential

2. Sketch Flaw Geometry. Use the attached flaw sketch to draw the flaw. N/A

3. Classify Flaw. Combine flaws in close proximity to other flaws and to the surface per the proximity rule of IWA-3300, Section XI of the ASME Code. Classify flaw as either:

   Inside Surface
   Outside Surface
   Subsurface — Flaw is subsurface per table IWB-3510-1, Note (4)
   y=s/a=2.10/0.227=9.25>0.4, use y=1.0

4. Determine Vessel Wall Geometry. If the flaw is classified as subsurface or outside surface, input 0 for clad thickness, else enter the analysis value for clad thickness as listed in Table A-1 of Appendix A for the specified weld region.

   Cladding Thickness, t_{clad} = 0.00(in)
   Low Alloy Steel Thickness, t_{LAS} = 7.20(in)
   Total thickness, $t = t_{clad} + t_{LAS}$ = 7.20(in)

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-122 /149

5. Size Flaw. Calculate flaw depth, including any portion of the flaw extending into the cladding.

Surface Flaws:
Flaw Depth, a = N/A(in)
Flaw Length, L = N/A(in)

Subsurface Flaws:
Flaw Depth, 2a = 0.453(in)
Half Depth, a = 0.227(in)
Flaw Length, L = 7.75(in)
Distance to Surface as defined in IWA-3300, S = 2.10(in)

6. Calculate Aspect Ratio of Flaw.

Flaw Aspect Ratio, a/L = 0.029

7. IWB-3500 Flaw Evaluation. For the given a/L aspect ratio, determine the allowable flaw depth, a (surface) and 2a (subsurface), in accordance with IWB-3510 of the Code and record the value below. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3500" below. Otherwise, check the box "Unacceptable per IWB-3500" and continue to step 8.

Inside Surface Flaw:
IWB-3500 Allowable Depth = a = N/A(in)

Outside Surface Flaw (top head, head flange, vessel flange regions only):
IWB-3500 Allowable Depth = a = N/A(in)

Subsurface Flaw:
IWB-3500 Allowable Depth = 2a = 0.340(in)< *0.453" per IWB-3510-1, allowed a/t=2.36% for y=1.0 tmeas=7.2: therefore a=7.2*2.36%=0.1670*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5.25.99	S0VESSELM030	00

Ref. GE Nuclear Energy

GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-122 /149

ACCEPTABILITY:

☐ Acceptable per IWB-3500
☒ Unacceptable per IWB-3500 (Site Corrective Action Program Activity required)

DER1-1999-1640 Initiated

8. IWB-3600 Flaw Evaluation. Record the appropriate flaw acceptance diagram Figure number from Section 3.0. Record the allowable flaw depth, a or 2a, from the appropriate curve for the specified orientation. If the flaw depth recorded in step 5 is below the allowable value, check the box "Acceptable per IWB-3600" below. Otherwise, check the box "Unacceptable per IWB-3600", and proceed to step 9.

   NOTE: Outside surface flaws for vessel and bottom head regions are not considered limiting. Flaw specific analysis would be required if outside surface flaws were found in any region below the vessel flange.

   Figure # D-3

   Inside Surface Flaw:
   IWB-3600 Allowable Depth = a = N/A(in)

   Outside Surface Flaw (top head, head flange, vessel flange regions only):
   IWB-3600 Allowable Depth = a = N/A(in)

   Subsurface Flaw:
   IWB-3600 Allowable Depth = 2a = 1.20(in) *>0.453*

Nine Mile Point Nuclear Station Unit: 1 Disposition:

Originator/Date	Checker/Date	Calculation No.	Revision
R. Corieri RC 5/24/99	A. Tsirigotis AT 5-25-99	S0VESSELM030	00

Ref. GE Nuclear Energy GENE-B13-01805-124, Rev. 0
DRF # B13-02025-00

(Nine Mile Point Unit 1 Flaw Evaluation Worksheet cont'd)

Flaw ID: 1-122 /149

ACCEPTABILITY:

☒ Acceptable per IWB-3600 (for 28 EFPY)
☐ Unacceptable per IWB-3600

9. From figure identified above, record the 1/3 wall thickness limit below. If flaw depth is below 1/3 limit, flaw removal is acceptable. Otherwise, weld repair is necessary.

1/3 Limit = N/A(in)

From step 5 above:
Flaw depth = a = N/A(surface)
2a +s - (clad thickness, if applicable) = N/A(subsurface)

Flaw depth < 1/3 Limit: **Flaw removal acceptable (No weld repair)**
Flaw depth > 1/3 Limit: **Weld repair required**

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Nine Mile Point Unit-1
Weld ID : RV-WD-099
Patch ID : C4-11 / C4-12

Exam Data Sheet : 1-15 / 1-16
Ind. Data Sheet : 1-122 / 1-149
Indication : 122 / 149

Flaw Throughwall Dimension = 0.453
Flaw Length "l" = 7.75
Surface Separation "S" = 2.10

"T" nominal = 7.13
"T" measured = 7.20
Clad "T" nominal = 0.22

Attachment No I
Calc SQVESSELWQ30
Rev 0 Disp -
Page 15 of 16

ASME Section XI, 1983 Edition, Summer 83 Addenda
TABLE IWB-3510-1 for 4" and Greater

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.8	2.3	1.92	2.36 Y
0.05	2.0	2.4	-	-
0.10	2.2	2.6	-	-
0.15	2.4	2.9	-	-
0.20	2.7	3.2	-	-
0.25	3.1	3.6	-	-
0.30	3.5	4.1	-	-
0.35	3.5	4.6	-	-
0.40	3.5	5.2	-	-
0.45	3.5	5.8	-	-
0.50	3.5	6.5	-	-
			Allowed	Allowed
			1.92	2.36

a = 0.227
a/l value = 0.029
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.36%
a/t = 3.15%

Flaw is unacceptable by Table IWB-3510-1.

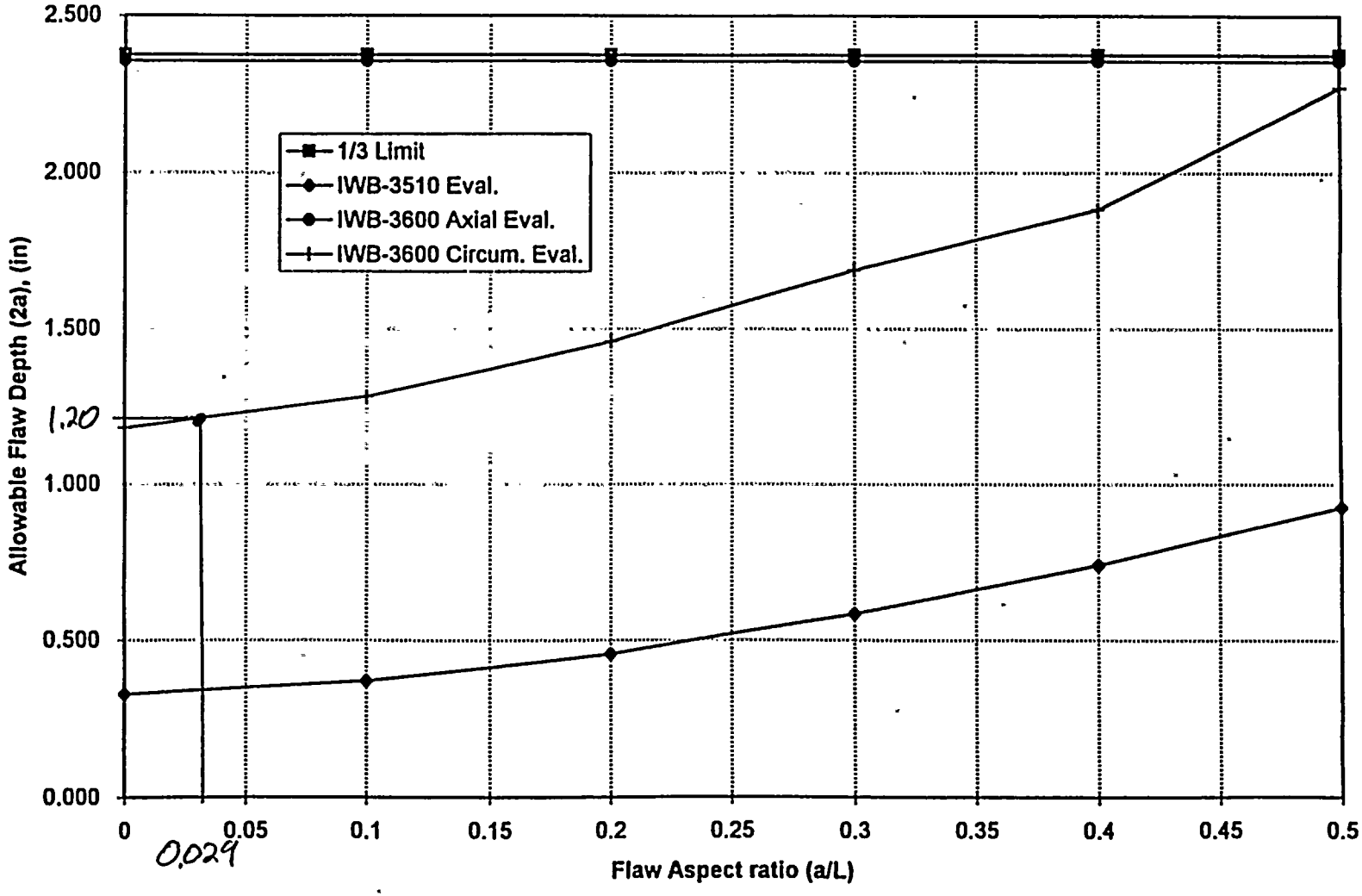
Comments : Flaw is circumferential.
Separation "S" measured to ID surface.
Indication continues from patch C4-11 into C4-12.
Throughwall dimension from data sheet 1-122.

Analyst [signature]
Level: II Date: 5/16/99

Reviewed By: [signature]
Level: III Date: 5-19-99

EXAM-054 V 2 7/8/96

Figure D-3. Non-Beltline, Vessel Flange Horizontal Weld Subsurface Flaw @ 28 EFPY



Attachment No I
Calc SQVESSELW030
Rev 0 Disp -
Page I6 of I6

GE Nuclear Energy

1611 Channel Avenue, Memphis, TN 38113

September 9, 1999
NMP1-99007

Mr. Roy Corieri
Niagara Mohawk
Nine Mile Point Nuclear Station

SUBJECT: Evaluation of Flaw Proximity After Projected Flaw Growth

Mr. Corieri:

I have reviewed the eight (8) flaws requiring analytical evaluation recorded during the GERIS 2000 examinations of the Nine Mile Point Unit-1 Reactor Pressure Vessel welds RV-WD-099 and RV-WD-140 using the projected flaw growths for 28 EFPY as documented in Reference 1.

The projected flaw growths for the 28 EFPY period is as follows: (Reference 1)

WELD ID	Allowable Flaw Depth Criterion	Fatigue Crack Growth	Fatigue Crack Growth (inches)
RV-WD-099 @ 28 EFPY Figure D-3	IWB-3600 Axial Evaluation	1.98e –2	0.0198 inches
	IWB-3600 Circ. Evaluation	8.64e –3	0.00864 inches
RV-WD-140 @ 28 EFPY Figure D-12	IWB-3600 Axial Evaluation	4.21e –3	0.00421 inches
	IWB-3600 Circ. Evaluation	7.61e –4	0.000761 inches

The flaws recorded were characterized as being fabrication related with the most likely cause of the flaw being thin film slag deposits or lack of fusion. All references to "fatigue crack growth" are due to the use of fatigue crack growth rates in the flaw analytic evaluation.

The projected circumferential flaw growth for weld RV-WD-099 is 8.64e-3 or 0.00864 inches. This flaw growth is the total predicted circumferential flaw growth. The total should be divided by 2 for the predicted growth at each end of a flaw. As shown in Figures 1 and 2 the separation distances for any two adjacent flaws recorded in the region of the analyzed flaws is greater than the combined projected flaw growth of any two adjacent flaws (2 x (0.00864" / 2)). Therefore no linkage of any flaws in the RV-WD-099 weld is projected.

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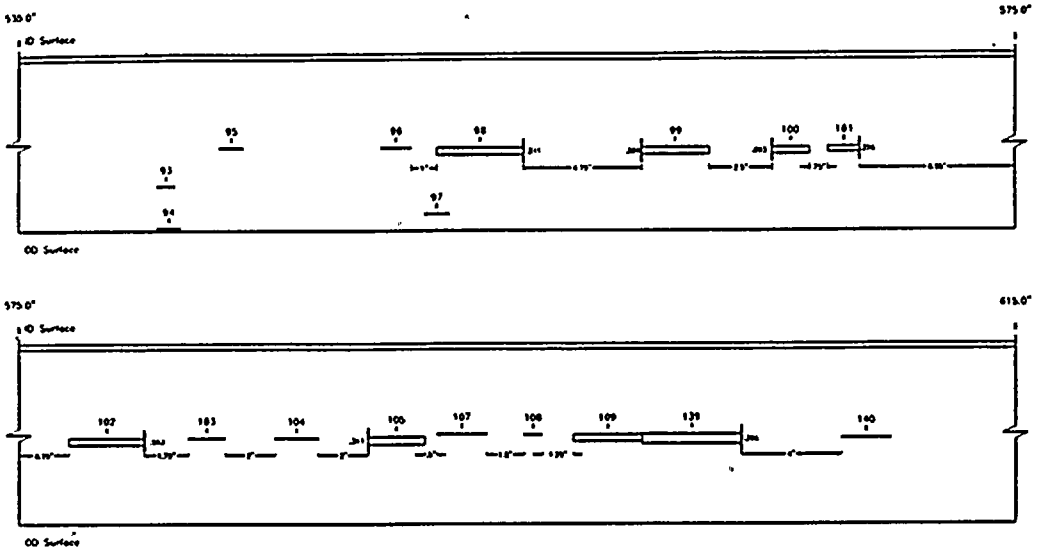

Figure 1 Weld RV-WD-099

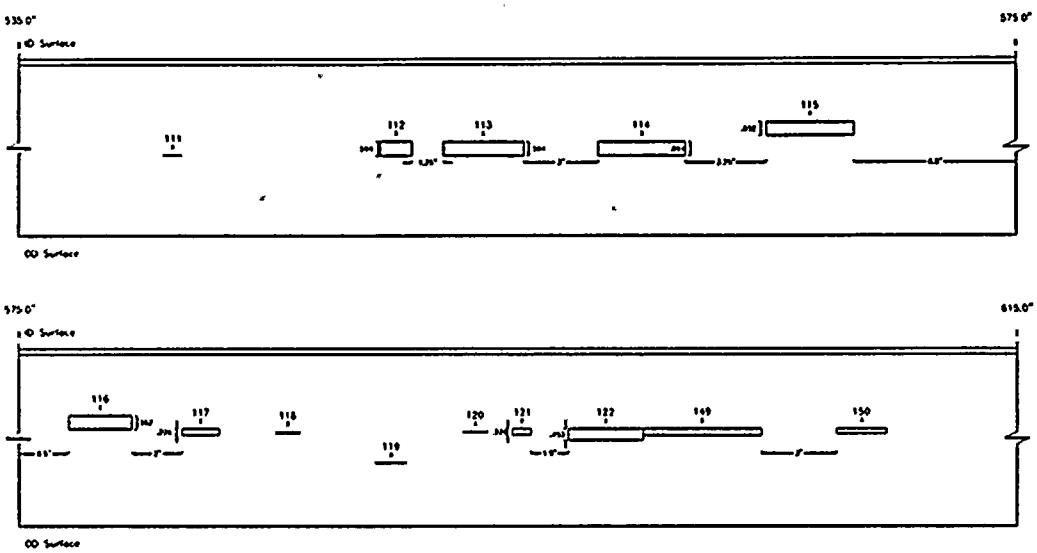

Figure 2 Weld RV-WD-099

The projected axial flaw growth for weld RV-WD-140 is 4.21e-3 or 0.00421 inches This flaw growth is the total predicted axial flaw growth. The total should be divided by 2 for the predicted growth at each end of a flaw. As shown in Figure 3 the separation distances for any two adjacent flaws recorded in the region of the analyzed flaws is greater than the combined projected flaw growth of any two adjacent flaws (2 x (0.00421" / 2)). Therefore no linkage of any flaws in the RV-WD-140 weld is projected.

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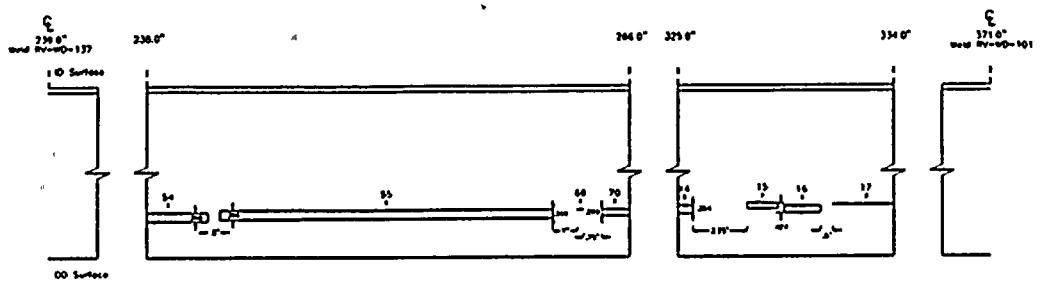

Figure 3 RV-WD-140

Note: Indications 15 and 16 are combined in accordance with IWA-3330.

The original evaluations used the requirements of IWA-3330 to determine flaw interactions. IWA-3330 Multiple Planar Flaws states: "(a) Discontinuous indications shall be considered single planar flaws if the distance between adjacent flaws is equal to or less than the dimension S, where S is determined as shown in Fig. IWA-3330-1." The dimension S as shown in Fig. IWA-3330-1 is the greater throughwall dimension of any two adjacent flaws.

The throughwall dimension of each of the eight flaws requiring analytic evaluation is greater than the total projected flaw growth dimension. IWA-3330's use of the dimension "S" as the criteria for combining flaws is therefore more conservative than the use of the projected flaw growth dimensions to determine flaw interactions. No additional flaw combinations resulted from the use of the projected flaw growth dimensions.

<u>References:</u>

1. Fax from Betty Branlund to Chris Minor, dated August 30, 1999, "RE: Fatigue Crack Growth for Welds RVWD-099 and RVWD-140," GE-NE, San Jose, CA. DRF B13-02025-00.

2. GENE Report, "Niagara Mohawk, Nine Mile Point Unit-1, RFO-15, Flaw Indications in the Nine Mile Point Unit-1 Reactor Pressure Vessel", August 1999, Revision 1.

3. Herlekar, Aroon, "Nine Mile Point Unit 1 RPV Flaw Evaluation Handbook,"GE-NE, San Jose, CA, April 1999, (GENE-B13-01805-124, Rev. 0).

GE Nuclear Energy

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ENCLOSURE 3

Analytical Evaluation of Rejectable Weld Indications in Recirculation System Piping (System 32)

In accordance with the requirements of ASME Code Section XI, Subsection IWB-3610 (1983 Edition with Summer 1983 Addenda), Niagara Mohawk Power Corporation (NMPC) is submitting to the NRC staff for review and approval a structural flaw evaluation of indications found in four (4) reactor recirculation system (System 32) Safe-end to elbow welds during RFO15. These structural flaw indication evaluations were performed using ASME Code Section XI, Subsection IWB-3610, 1986 edition without Addenda.

The NMP1 ISI Program invokes the 1983 edition with Summer 1983 Addenda. Both NUREG-0313 Revision 2 and Generic Letter 88-01 refer to the 1986 Edition of ASME Code Section XI, IWB-3600, for evaluation of flaws caused by intergranular stress corrosion cracking (IGSCC). The 1986 Code edition provides detailed requirements for evaluation of IGSCC indications. Therefore, the 1986 edition (without Addenda) of Section XI was used to evaluate the acceptability of the indications.

During RFO15, ultrasonic inspections were performed on reactor recirculation system welds (System 32) in accordance with Generic Letter 88-01 and ASME Code Section XI requirements (1983 edition with Summer 1983 Addenda). Initially, two (2) welds were identified with circumferential indications near the weld root that exceeded the acceptance criteria in the ASME Code, Section XI, paragraph IWB-3514.3. Per the requirements of Section XI, Article IWB-2430(a), expanded scope inspections were performed. The first expanded scope included five welds, during which, a third weld with a rejectable indication was identified. A second scope expansion was required to include 100 percent of the Category "B-J," B9.11 circumferential piping welds in System 32. During the second scope expansion, one (1) additional weld with a rejectable indication was identified. The affected welds are the following:

32-WD-046	Loop 12 - Safe-end to elbow weld (original scope)
32-WD-086	Loop 13 - Safe-end to elbow weld (original scope)
32-WD-126	Loop 14 - Safe-end to elbow weld (first expanded scope)
32-WD-168	Loop 15 - Safe-end to elbow weld (second expanded scope)

The subject Reactor Recirculation System piping was replaced in 1982-1983 with installation (fit-up) and quality assurance in accordance with ASME Code Section III, 1977 Edition (through Summer 1978 Addenda). Acceptance criteria for these welds are contained in ASME Code Section III, Subsection NB-4424. This subsection allows for weld conditions involving undercut, concavity and internal root weld condition ("root geometry"), while still meeting code acceptance criteria. The indications are from prior repairs during the 1982-1983 replacement and are a root condition that does not indicate the presence of IGSCC.

Comparison of the rejectable indication sizes verses acceptance criteria documented in calculation S12.9-32WDNOZZLE (see Attachment 3A) are tabulated below:

	Measured		Maximum Allowed		
Weld	Maximum Depth	Total Length	Depth	Length	Comments
32-WD-046	0.08"	67.5"	0.43"	81.0"	
	0.32"	0.5"			Subsurface Indication (see Note)
32-WD-086	0.20"	17.4"	0.43"	81.0"	
32-WD-126	0.19"	17.3"	0.42"	81.0"	
32-WD-168	0.18"	19.7"	0.42"	81.0"	

Note: The apparent subsurface indication exhibits a maximum depth of 0.32" depth 0.5" long at the 30" location. Concluded as not associated with the inside surface or the 67" flaw reported.

The above evaluation demonstrates that the indication sizes are less than those found acceptable in calculation S12.9-32WDNOZZLE. Therefore, the indications are acceptable in accordance with IWB-3600, and are acceptable for continued service through the present operating cycle. The welds have been changed to IGSCC Category "F" welds and future examinations of the four (4) welds will be performed in accordance with ASME Code Section XI, Subsection IWB-2420(b).

ATTACHMENT 3A