ENCLOSURE

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

SUPPLEMENTAL INFORMATION FOR
REACTOR PRESSURE VESSEL (RPV)
SHELL WELDS AUGMENTED EXAMINATION AND
INSERVICE INSPECTION (ISI) RELIEF REQUEST 3-ISI-17

TVA CALCULATION MD-Q3001-940005

VESSEL WELD FLAW EVALUATION FOR BROWNS FERRY NUCLEAR PLANT UNIT 3

QA Record

TVA 10697 (DNE-QA-6-86) DNE CALCULATIONS Page 1

Title	Plant/Unit
VESSEL WELD FLAW EVALUATION FOR BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 3	BFN/UNIT 3

Preparing Organization	KEY NOUNS (Consult RIMS Descriptors List)
NE MECH/NUC	Reactor Vessel, Welding
Branch/Project Identifiers	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.
MD-Q3001-940005	Rev (for RIMS' use) RIMS ACCESSION NUMBER
	RO R14 '94 0208 105
Applicable Design Document(s)	R
ASME Code Section XI	R
SAR Section(s) / UNID System(s) 001	R

Revision 0	R1	R2	R3	Safety-related? Yes (X) No ( )
ECN No. (or Indicate Not Applicable) N/A				Statement of Problem
Prepared E. R. Winters				Evaluate Reactor Pressure Vessel weld flaws as identified in GE Nuclear Nonconformance Report NCR No. 1C7LA-05 for BFN Unit 3.
Checked Gary A. Lenahy 2/4/94				
Reviewed John [illegible] 2/4/94				
Approved Thomas B. Hadlock				
Date 2/7/94				
USE FORM TVA 10534 / List all pages added by this revision				
IF MORE SPACE REQUIRED / List all pages deleted by this revision				
List all pages changed by this revision				

ORIGINAL

ABSTRACT [These calculations contain an unverified assumption(s) that must be verified later. Yes ( ) No (X)]
Calculation contains special requirements or limiting condition? Yes ( ) No (X)

A structural flaw evaluation was performed in accordance with ASME Code Section XI IWB-3600 (1986 edition) on BFN Unit 3 RPV weld flaws identified in GE NCR No. 1C7LA-05. All flaws were determined to meet the IWB-3600 acceptance criteria. Continued operation is justified up to 12 effective full power years. Re-inspection of weld flaws is required at next 10-year interval.

( ) Microfilm and store calculations in RIMS Service Center Microfilm and destroy. ( )
( ) Microfilm and return calculations to: Address:

cc: E. R. Winters, EDB 2A-BFN
RIMS, ET SLP-K

ENGINEERING RECORDS PROCESSING
CALCULATION CONTROL
EDB 1B-BFN

PLDNE106/230/2

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

MD-Q3001-940005 — Calculation No.

0 — Revision

Method of design verification (independent review) used (check method used):

1. Design Review ✓
2. Alternate Calculation
3. Qualification Test

Comments:

THIS CALCULATION IS PERFORMED IN ACCORDANCE WITH ASME SECTION XI REQUIREMENTS & THOSE STEPS APPLICABLE IN NEP-3.1. METHODOLOGY IS SOUND & ASSUMPTIONS PROPERLY DOCUMENTED.

Design Verifier (Independent Reviewer)

2-4-94 — Date

6431k

CLASSIFICATION, CATEGORIZATION AND MAINTENANCE OF DESIGN CALCULATIONS

M/NE-I-25.3.1
Attachment 1
Page 1 of 2

CALCULATION CLASSIFICATION & CATEGORIZATION

CALCULATION INFORMATION:

PLANT/UNIT BFN UNIT 3 IDENTIFIER MD-Q3001-940005 REV. 0
RIMS NO. R14940208105 ISSUE DATE 2-8-94

TITLE Vessel Weld Flaw Evaluation for BFN UNIT-3

SYSTEM(S), COMPONENT, FEATURE OR SUBJECT OF CALCULATION

	SYSTEM/DESCRIPTION
( ) SAFETY SYSTEM	SYSTEM NO.
( ) SAFETY RELATED FEATURE	
( ) NON-SAFETY SYSTEM	SYSTEM NO.
( ) NON-SAFETY RELATED FEATURE	
( ) PLANT ENVIRONMENT (EQ, ETC.)	
( ) APPENDIX R	
( ) CIVIL STRUCTURES	
( ) INSTRUMENTATION (PAM, ETC.)	
( ) LICENSING	
(X) OTHER	Reactor Pressure Vessel

CALCULATION CATEGORY HCC 50

FINAL CLASSIFICATION

(✓) ESSENTIAL ( ) FILE ONLY
( ) DESIRABLE ( ) SUPERSEDED

SUBMITTED ER Winters DATE 1-21-94
REVIEWED T. A. Lang DATE 2-4-94
APPROVED JE Crosler DATE 2/7/94

2805Q

Attachment 1
CALCULATION CLASSIFICATION & CATEGORIZATION

IDENTIFIER: MD-Q3001-940005 R0

PRELIMINARY CLASSIFICATION

(X) ESSENTIAL ( ) FILE ONLY

( ) DESIRABLE ( ) SUPERSEDED

CALCULATION CLASSIFICATION JUSTIFICATION:

SUBMITTER This calculation documents an evaluation to determine the acceptability of weld flaws found during an ultrasonic evaluation of BFN UNIT-3 RPV.

REVIEWER (✓) AGREE WITH CLASSIFICATION ( ) DISAGREE - COMMENTS REQUIRED

APPROVER (✓) AGREE WITH CLASSIFICATION ( ) DISAGREE - COMMENTS REQUIRED
2/7/94

TVA

REVISION LOG

Title: Vessel Weld Flaw Evaluation BFN Unit-3

MD-Q3001-94005

Revision No.	DESCRIPTION OF REVISION	Date Approved
0	INITIAL ISSUE	

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Total pages 38

Purpose

A structural flaw examination was performed in accordance with ASME Code Section XI (1986) for all axial and circumferential welds in the BFN Unit 3 Reactor Pressure Vessel (RPV). A detected flaw is first evaluated in accordance with paragraph IWB-3500 of ASME Code Section XI. If the flaw does not meet the requirements of IWB-3500, it is identified in a nonconformance report and evaluated per paragraph IWB-3600 for continued plant operation.

This calculation documents an evaluation of welds found in the BFN Unit 3 RPV examination not meeting the IWB-3500 requirements as identified in GE NCR No. 1C7LA-05 (Ref. 2). Each weld flaw will be evaluated per paragraph IWB-3600 to justify continued operation up to 12 effective full power years (EFPY). Allowable flaw curves developed as a function of flaw depth (a or 2a) versus aspect ratio (a/l) will be used to determine the IWB-3600 acceptance. Flaw acceptance diagrams and developement methodology can be found in the GE Nuclear BFN Unit3 Flow Evaluation Handbook (Ref. 1).

References

1. Vessel Flaw Evaluation for BFN Unit-3, Calculation MD-Q3001-920553 R0

2. GE Nuclear Nonconformance Report on BFN Unit-3 RPV examination, NCR No: 1C7LA-05 Proj: CO387

3. BFNP Technical Specifications Unit 3, through Amendment 174, Section 3.6.A Bases

4. Reactor Thermal Cycles, GE drawing 729E762 R0

Assumptions

1. GE Nuclear flaw acceptance diagrams have been adjusted to account for fatigue crack growth up to 12 EFPY at 10 cycles per year. (Ref. 1)

Documentaion of Assumptions

1. Initial vessel design was based on a fatigue crack growth analysis corresponding to 12 EFPY (Ref. 3) and 120 thermal startup cycles (Ref.4). The calculated EFPY for BFN Unit 3, last run date of 5-09-85, is 4.75. (per Reactor Engineering)

Terms and Definitions for "GERIS 2000 Examination Summary Sheet"

Ind No.

Sequential number identification for the applicable indication

Oriented

Describes the orientation of the indication relative to the RPV (i.e. circ. is a indication oriented in the vessel circumferential direction)

Type

Describes the type of indication (surface or subsurface) as determined by ASME Section XI, IWB-3500.

X Position

The location of the flaw in the circumferential direction in inches from vessel 0° azimuth.

Y Position

The location of the indication relative to RPV 0" (inside surface of the RPV Bottom Head) in inches.

Z Position

The location of the flaw relative to the RPV deposited clad surface.

"S"

The separation distance from the upper flaw extremity to the clad/base material interface as defined by ASME Section XI.

T-Wall

The total through wall dimension of the indication. This value is also the 2A dimension referenced by ASME Section XI and the Flaw Analysis Handbook.

Length

This dimension represents the total length of the flaw.

T Meas

Represents the actual wall thickness of the RPV in the area of the indication minus the deposited clad.

a/l

The value of the required ASME Section XI, IWB-3500 calculation for flaw evaluation. This value is derived using the following formula [(T wall/2)/Length]

% a/t Calculated

The value of the required ASME Section XI, IWB-3500 calculation for flaw evaluation. This value is derived using the following formula [(T wall/2)/T Meas]

% a/t Allowed

This value is the allowed a/t percentage as identified in ASME Section XI, Table IWB-3510-1 "Allowable Planar Flaws". The value given is the linear interpolation of the percentage values for Table IWB-3510-1 as permissible and in accordance with IWA-3200.

NOTE: The final calculated values shown on the summary sheets have been rounded off in accordance with ASME Section XI, IWA-3200.

GE Nuclear Energy

GERIS 2000 Examination Summary Sheet

Project: TVA, Browns Ferry Nuclear Plant, Unit 3
System: Reactor Pressure Vessel
Weld ID: V-4-B **ASME Code Category:** B-A

Calibration Sheets: C-001

Supporting Data: Examination Data Sheets E-14-00 and E-14-01, Indication Data Sheets 14-001 thru 14-005 and G-100 thru G-108, Indication Evaluation Sheets, Screen Prints, Exam Patch Location Map, Exam Coverage Plots and GERIS 2000 Setup Records.

Examination Summary

The ultrasonic examination of weld V-4-B resulted in one (1) recorded indication that exceeds the allowable standards of IWB-3500, ASME Section XI, 1986 Edition, No Addenda.

The ASME Section XI required examination volume was examined with the GERIS 2000 System from the RPV inside surface utilizing Procedure No. GE-UT-700, Rev. 2. This examination was limited due to the N11-A Nozzle at 40°. The total examination coverage was calculated to be 83%.

The GERIS 2000 utilizes an array of search units arranged to effectively examine the weld and adjacent base material parallel and perpendicular to the weld axis in two directions. The transducer package consisted of 0° longitudinal, 45° and 60° shear wave, and 70° refracted longitudinal (RL) wave search units.

The one indication evaluated as being reportable to IWB-3500, ASME Section XI, 1986 Edition, No Addenda was recorded and sized in accordance with GE-UT-700, Rev. 2 and GE-UT-701, Rev. 2. This indication was recorded during the examination of both welds V-4-B as 14-002 and C-3-4 as 12-015. The flaw dimensions were determined from weld C-3-4 Indication Data Sheet 12-015 with the results tabulated below:

Ind. No.	Oriented	Type	X Pos	Y Pos	Z Pos	"S"	T wall	Length	T Meas	a/l	% a/t Calculated	% a/t Allowed
12-015	circ.	subsurface	94.35"	525.43"	1.13"	0.94"	.44"	1.75"	6.53"	0.13	3.4	2.71

This indication was sized with the 70°RL utilizing the PATT technique. It was also recorded with the 45° and 60° shear waves.

The GERIS 2000 also recorded an indication with the 0° weld metal scan that was evaluated and found to be acceptable per the referencing Code section. Geometric indications from the stabilizer bracket at 45° were recorded with the 0° weld metal, 45° and 60° shear wave scans.

No manual supplemental examination was performed from the RPV outside surface due to access restrictions.

Fabrication records and previous examination results were reviewed prior to the completion of this examination summary.

GERIS Analyst: Melissa Kimball LEVEL: III DATE: 12-21-93	GE Reviewer: R.O. Forman LEVEL: II DATE: 12-21-93
UTILITY Review: TITLE: DATE:	ANII Review: TITLE: DATE:

GE Nuclear Energy

GERIS 2000 Examination Summary Sheet

Project: TVA, Browns Ferry Nuclear Plant, Unit 3
System: Reactor Pressure Vessel
Weld ID: C-2-3 *ASME Code Category:* B-A

Calibration Sheets: C-004

Supporting Data: Examination Data Sheets E-08-00 thru E-08-26, Indication Data Sheets 08-001 thru 08-110, Indication Evaluation Sheets, Screen Prints, Exam Patch Location Map, Exam Coverage Plots and GERIS 2000 Setup Records.

Examination Summary

The ultrasonic examination of weld C-2-3 resulted in two (2) recorded indications that exceed the allowable standards of IWB-3500, ASME Section XI, 1986 Edition, No Addenda.

The ASME Section XI required examination volume was examined with the GERIS 2000 System from the RPV inside surface utilizing Procedure No. GE-UT-700, Rev. 2. This examination was limited due to the core spray downcomers and surveillance specimen brackets. The total examination coverage was calculated to be 80%.

The GERIS 2000 utilizes an array of search units arranged to effectively examine the weld and adjacent base material parallel and perpendicular to the weld axis in two directions. The transducer package consisted of 0° longitudinal, 45° and 60° shear wave, and 70° refracted longitudinal (RL) wave search units.

The two (2) unacceptable indications were recorded and sized in accordance with GE-UT-700, Rev. 2 and GE-UT-701, Rev. 2 with the results tabulated below:

Ind. No.	Oriented	Type	X Pos	Y Pos	Z Pos	"S"	T wall	Length	T Meas	a/l	% a/t Calculated	% a/t Allowed
08-026	circ.	subsurface	198.50"	392.42"	1.77"	1.56"	.41"	1.50"	6.60"	.137	3.11	2.79
08-067	circ.	subsurface	558.25"	392.85"	1.65"	1.47"	.37"	1.50"	6.55"	.123	2.82	2.68

Indication 08-026 was sized with 60° shear wave channel 11 utilizing the PATT technique. This indication was also recorded with 70°RL channel 3 as 08-023 and seen with 45° shear wave channel 7.

Indication 08-067 was sized with 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 45° shear wave channel 7 as 08-073 and seen with 60° shear wave channel 11.

The GERIS 2000 also recorded indications with the 0° weld metal scans, 70°RL, 45° and 60° shear wave scans that were evaluated and found to be acceptable per the referencing Code section.

No manual supplemental examination was performed from the RPV outside surface due to access restrictions.

Fabrication records and previous examination results were reviewed prior to the completion of this examination summary.

GERIS Analyst: Teresa Kimball	GE Reviewer: R.O. Forman
LEVEL: III DATE: 12-19-93	LEVEL: II DATE: 12-20-93
UTILITY Review:	ANII Review:
TITLE: DATE:	TITLE: DATE:

GE Nuclear Energy

GERIS 2000 Examination Summary Sheet

Project: TVA, Browns Ferry Nuclear Plant, Unit 3
System: Reactor Pressure Vessel
Weld ID: C-3-4 **ASME Code Category:** B-A

Calibration Sheets: C-001, C-004, C-115, C-116, and C-117

Supporting Data: Examination Data Sheets E-12-00 thru E-12-15, Indication Data Sheets 12-001 thru 12-163, Indication Evaluation Sheets, Screen Prints, Exam Patch Location Map, Exam Coverage Plots, GERIS 2000 Setup Records and Manual Data Sheets D-034, D-035, D-036, D-037, D-040, D-041, D-044and D-045.

Examination Summary

The ultrasonic examination of weld C-3-4 resulted in six (6) recorded indications that exceed the allowable standards of IWB-3500, ASME Section XI, 1986 Edition, No Addenda.

The ASME Section XI required examination volume was examined with the GERIS 2000 System from the RPV inside surface utilizing Procedure No. GE-UT-700, Rev. 2. This examination was limited due to the Guide Rods at 0° and 180°. The total examination coverage was calculated to be 97%.

The GERIS 2000 utilizes an array of search units arranged to effectively examine the weld and adjacent base material parallel and perpendicular to the weld axis in two directions. The transducer package consisted of 0° longitudinal, 45° and 60° shear wave, and 70° refracted longitudinal (RL) wave search units.

The six (6) unacceptable indications were recorded and sized in accordance with GE-UT-700, Rev. 2 and GE-UT-701, Rev. 2 with the results tabulated below:

	Ind. No.	Oriented	Type	X Pos	Y Pos	Z Pos	"S"	T wall	Length	T Meas	a/t	% a/t Calculated	% a/t Allowed
1.	12-015	circ.	subsurface	94.35"	525.43"	1.16	.75"	.444"	1.75"	6.53"	0.13	3.4	2.71
4.	12-069	circ.	subsurface	424.65"	524.58"	2.30"	1.94"	.34"	1.75"	6.51"	0.10	2.66	2.48
5.	12-116	circ.	subsurface	617.15"	526.14"	3.85"	2.6	.62"	.75"	6.49"	0.21	4.81	3.50
6.	12-144	circ.	subsurface	760.10"	525.11"	.78"	.75"	.325"	2.00"	6.44"	0.10	2.45	2.39
7.	12-145	circ.	subsurface	763.85"	525.68"	.80"	2.40"	.39"	2.40"	6.44"	0.10	3.03	2.39
8.	12-148	circ.	subsurface	771.35"	525.07"	.87"	.43"	.511"	2.75"	6.44"	0.10	3.97	2.46

Indication 12-015 was sized with 70° RL channel 5 utilizing the PATT technique. This indication was also recorded as 12-016 and 12-020. Indication 12-015 was also recorded within the exam volume of weld V-4-B.

Indication 12-069 was sized with 45° shear wave channel 9 utilizing the SPOT technique.

Indication 12-116 and 12-117 is a combined indication in accordance with IWA-3390 and is included in the table above as 12-116. Indication 12-116 and 12-117 were sized with 45° shear wave channel 7 utilizing the SPOT technique.

Indication 12-144 was sized with 70° RL channel 5 utilizing the PATT technique. This indication was also recorded as 12-130, 12-150, and 12-157.

GERIS Analyst: [signature] LEVEL: III DATE: 12/21/93	GE Reviewer: Teresa Kimball LEVEL: III DATE: 12-21-93
UTILITY Review: TITLE: DATE:	ANII Review: TITLE: DATE:

GERIS 2000 Examination Summary
(Continuation)

Indication 12-145 was sized with 70° RL channel 4 utilizing the PATT technique. This indication was also recorded as 12-131, 12-158, 12-161, 12-162 and 12-163.

Indication 12-148 was sized with 70° RL channel 5 utilizing the PATT technique. This indication was also recorded as 12-132 and 12-160.

The GERIS 2000 also recorded indications with the 0° weld metal scans, 70° RL, 45° and 60° shear wave scans that were evaluated and found to be acceptable per the referencing Code section. Geometric indications from the OD surface, Nozzles N11-A, N11-B and N4-F were recorded with the 45° and 60° shear wave scans.

Selected areas were rescanned using 45° RL search units .

The manual technique utilized 0° longitudinal, 45° and 60° shear wave search units both parallel and perpendicular to the weld axis in two directions to effectively examine the weld and adjacent base material.

No indications were recorded with the manual technique.

Fabrication records and previous examination results were reviewed prior to the completion of this examination summary.

GE Nuclear Energy

GERIS 2000 Examination Summary Sheet

Project: TVA, Browns Ferry Nuclear Plant, Unit 3
System: Reactor Pressure Vessel
Weld ID: C-4-5 **ASME Code Category:** B-A

Calibration Sheets: C-001, C-004

Supporting Data: Examination Data Sheets E-16-00 thru E-16-12, Indication Data Sheets 16-001 thru 16-094, Indication Evaluation Sheets, Screen Prints, Exam Patch Location Map, Exam Coverage Plots and GERIS 2000 Setup Records.

Examination Summary

The ultrasonic examination of weld C-4-5 resulted in two (2) recorded indications that exceed the allowable standards of IWB-3500, ASME Section XI, 1986 Edition, No Addenda.

The ASME Section XI required examination volume was examined with the GERIS 2000 System from the RPV inside surface utilizing Procedure No. GE-UT-700, Rev. 2. This examination was limited due to the Guide Rods at 0° and 180°*. The total examination coverage was calculated to be 93%.

The GERIS 2000 utilizes an array of search units arranged to effectively examine the weld and adjacent base material parallel and perpendicular to the weld axis in two directions. The transducer package consisted of 0° longitudinal, 45° and 60° shear wave, and 70° refracted longitudinal (RL) wave search units.

The two (2) unacceptable indications were recorded and sized in accordance with GE-UT-700, Rev. 2 and GE-UT-701, Rev. 2 with the results tabulated below:

Ind. No.	Oriented	Type	X Pos	Y Pos	Z Pos	"S"	T wall	Length	T Meas	a/l	% a/t Calculated	% a/t Allowed
16-075	circ.	subsurface	603.30"	574.70"	3.17"	2.83"	.30"	2.75"	6.6"	.055	2.27	2.23
16-076	circ.	subsurface	617.50"	574.05"	3.85"	2.53"	.44"	1.50"	6.6"	.147	3.33	2.87

9.
10.

Indication 16-075 was sized with 60° shear wave channel 13 utilizing the SPOT technique. This indication was also recorded with 45° shear wave channel 9 as 16-072 .

Indication 16-076 was sized with 60° shear wave channel 13 utilizing the SPOT technique. This indication was also recorded with 45° shear wave channel 9 as 16-074 .

The GERIS 2000 also recorded indications with the 0° weld metal scans, 70° RL, 45° and 60° shear wave scans that were evaluated and found to be acceptable per the referencing Code section. Geometric indications from the stabilizer brackets were recorded with the 0° weld metal, 45° and 60° shear wave scans. Geometric indications from the OD surface were recorded with the 45° shear wave scans.

No manual supplemental examination was performed from the RPV outside surface due to access restrictions.

Fabrication records and previous examination results were reviewed prior to the completion of this examination summary.

GERIS Analyst: C.Q. Mc LEVEL: II DATE: 12/20/93	GE Reviewer: R.O. Forman LEVEL: II DATE: 12-20-93
UTILITY Review: TITLE: DATE:	ANII Review: TITLE: DATE:

GE Nuclear Energy

GERIS 2000 Examination Summary Sheet

Project: TVA, Browns Ferry Nuclear Plant, Unit 3

System: Reactor Pressure Vessel

Weld ID: C-5-FLG *ASME Code Category:* B-A

Calibration Sheets: C-001, C-104, C-107, C-108 and C-109

Supporting Data: Examination Data Sheets E-20-00 and E-20-12, Indication Data Sheets 20-001 thru 20-110, G-115 and G-116, Indication Evaluation Sheets, Screen Prints, Exam Patch Location Map, Exam Coverage Plots, GERIS 2000 Setup Records and Manual Examination Data Sheets D-001, D-002, D-007 ,D-008, D-009 and D-010.

Examination Summary

The ultrasonic examination of weld C-5-FLG resulted in five (5) recorded indications that exceed the allowable standards of IWB-3500, ASME Section XI, 1986 Edition, No Addenda.

The ASME Section XI required examination volume was examined with the GERIS 2000 System from the RPV inside surface utilizing Procedure No. GE-UT-700, Rev. 2. This examination was limited due to a clad patch at 30°, the Guide Rods at 0° and 180° and four (4) Main Steam plug lines at 74°, 110°, 250°, and 286°. Areas that could not be examined using the GERIS 2000 and accessible from the outside were examined with the manual technique utilizing Procedure No. GE-UT-300 Rev. 6, FRR-004. The total examination coverage was calculated to be 82%.

The GERIS 2000 utilizes an array of search units arranged to effectively examine the weld and adjacent base material parallel and perpendicular to the weld axis in two directions. The transducer package consisted of 0° longitudinal, 45° and 60° shear wave, and 70° refracted longitudinal (RL) wave search units.

The five (5) unacceptable indications were recorded and sized in accordance with GE-UT-700, Rev. 2 and GE-UT-701, Rev. 2 with the results tabulated below:

Ind. No.	Oriented	Type	X Pos	Y Pos	Z Pos	"S"	T wall	Length	T Meas	a/l	% a/t Calculated	% a/t Allowed
20-007	circ.	subsurface	83.90"	706.42"	1.01"	.82"	.40"	3.25"	6.54"	.061	3.05	2.27
20-008	circ.	subsurface	88.40"	706.44"	1.02"	.83"	.39"	1.50"	6.55"	.130	2.98	2.74
20-009	circ.	subsurface	95.90"	706.44"	1.03"	.84"	.38"	2.25'	6.59"	.085	2.91	2.41
20-011	circ.	subsurface	100.90"	706.37"	1.23"	1.04"	.39"	1.75"	6.62"	.111	2.92	2.58
20-012	circ.	subsurface	116.90"	706.40"	1.14"	.95"	.48"	1.50"	6.87"	.159	3.47	2.97

11. 12. 13. 14. 15.

Indication 20-007 was sized with the 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 70°RL channel 5 as 20-016.

Indication 20-008 was sized with the 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 45° shear wave channel 7 as 20-022.

Indication 20-009 was sized with the 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 70°RL channel 5 as 20-017, 45° shear wave channels 7 as 20-023 and 9 as 20-027.

Indication 20-011 was sized with the 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 70°RL channel 5 as 20-018

GERIS Analyst: Teresa Kimball LEVEL: III DATE: 12-21-93	GE Reviewer: C. M. LEVEL: III DATE: 12/21/93
UTILITY Review: TITLE: DATE:	ANII Review: TITLE: DATE:

GERIS 2000 Examination Summary
(Continuation)

Indication 20-012 was sized with the 70°RL channel 3 utilizing the PATT technique. This indication was also recorded with 45° shear wave channel 7 as 20-024.

The GERIS 2000 also recorded indications with the 0° weld metal scans, 70°RL, 45° and 60° shear wave scans that were evaluated and found to be acceptable per the referencing Code section. Geometric indications from the flange radius were recorded with the 45° and 60° shear wave scans.

The manual technique utilized 0° longitudinal, 45° and 60° shear wave search units both parallel and perpendicular to the weld axis in two directions to effectively examine the weld and adjacent base materials.

No indications were recorded with the manual technique.

Fabrication records and previous examination results were reviewed prior to the completion of this examination summary.

ACCEPTANCE CRITERIA

GENE-523-120-0992

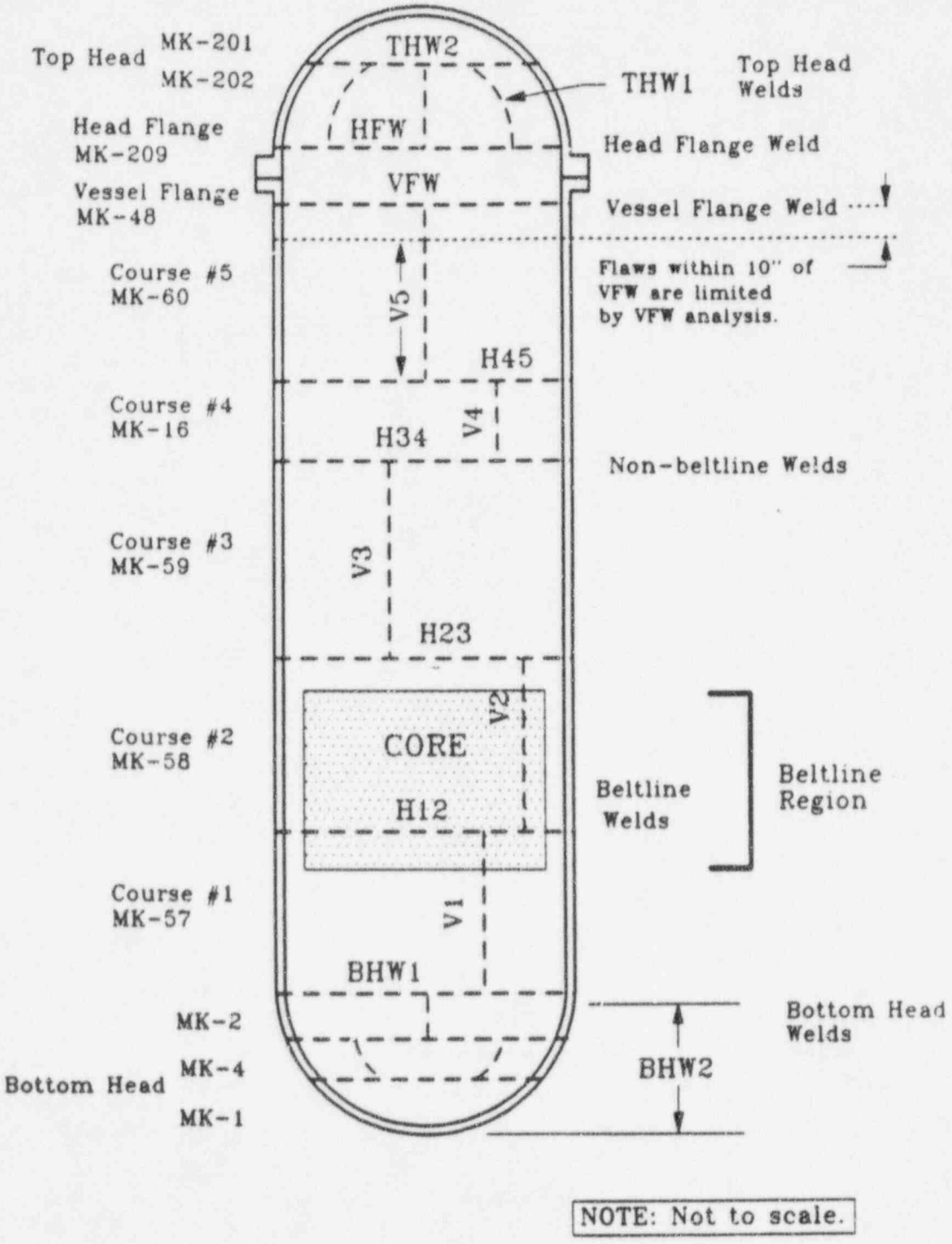

FIGURE I

Browns Ferry III weld regions selected for flaw evaluation.

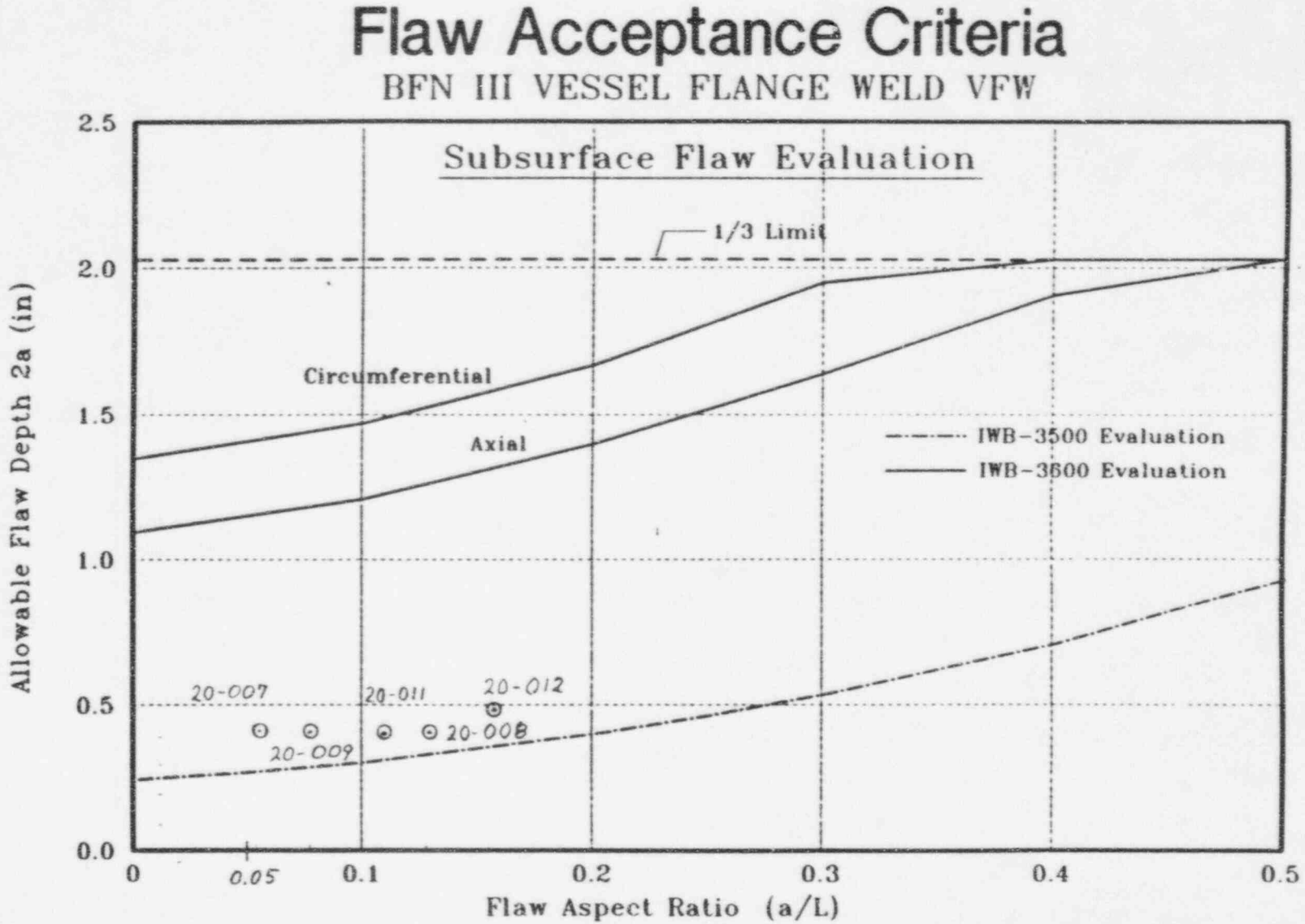

FIGURE 3-10. Allowable subsurface flaw sizes for vessel flange weld.

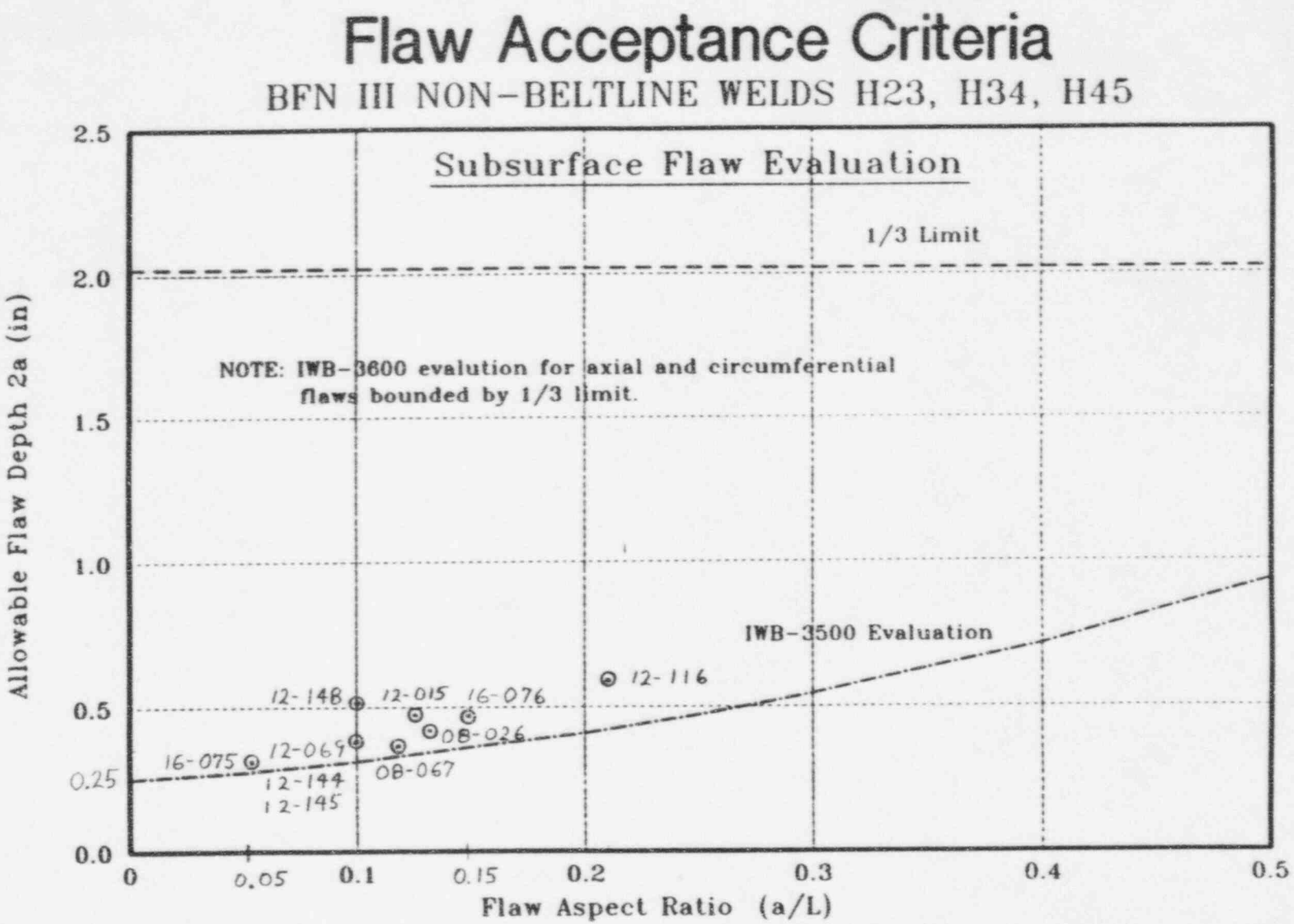

FIGURE 3-14. Allowable subsurface flaw sizes for non-beltline horizontal welds.

Summary

An analysis was performed in accordance with ASME Code Section XI IWB-3600 for all axial and circumferential weld flaws identified in GE NCR No. 1C7LA-05. Fifteen (15) subsurface weld flaws were found during the BFN Unit 3 RPV examination that did not meet IWB-3500 acceptance criteria. Flaw depth (Twall or 2a) versus aspect ratio (a/l) was plotted for each flaw on the Ge Nuclear flaw allowable diagrams. Each diagram consists of allowable flaw curves based on IWB-3500, IWB-3600 & 1/3 thru wall thickness limit for membrane stress for selected weld regions and flaw orientations. Each curve is reduced to account for fatigue crack growth and irradiation embrittlement for up to 12 EFPY.(See figures 3-10 & 3-14)

Conclusion

The weld flaws identified during the Unit-3 RPV examination and documented in NCR No. 1C7LA-05 were evaluated and found to be acceptable per IWB-3600 criteria. The margin of safety, based of the maximum IWB-3600 allowable, is greater than 5:1. Continued unit operation is justified up to 12 EFPY. Reinspection is required at the regular 10 year interval.

Attachment 1

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Nonconformance Report

Project	BFN UNIT 3 RPV EXAMINATION	Project No.	C0387	NCR No.	1C7LA-05

Reference Documents: WO# 92-65636-01, ASME SECTION XI, 1986 EDITION, NO ADDENDA

Description of Nonconformance: (State Cause) NCR Code O45 Cause Code C04

ULTRASONIC EXAMINATION THE RPV, HAS REVEALED INDICATIONS EXCEEDING THE ALLOWABLE STANDARDS OF IWB-3510.1 OF THE REFERENCED ASME CODE. SEE ATTACHED SUMMARY SHEETS AND TVA INSPECTION REPORT (IR)

Initiated By: R. [signature] Date 12-21-93 QC Supervisor [signature] Date 12-21-93

10CFR21 Review: Is (X) Is Not ( ) Reportable Signature: [signature] Date 12-21-93

Proposed Disposition and Technical Justification: (Attach Extra Sheets, Sketches, Etc. as Necessary)

Accept-As-Is ( ) Repair ( ) Rework ( ) Reject ( ) Other If Not Mat. Or Items ( )

TVA NUCLEAR ENGINEERING TO DISPOSITION PER TVA IR BF-T930110

Project Manager R. [signature] Date 12-21-93 QC Supervisor [signature] Date 12-21-93

Final Disposition

Accept-As-Is & Repair Dispositions, Design Verification Is Provided Per:

FINAL DISPOSITION SHALL BE EVALUATED AND INITIATED PER TVA IR BF-T930110

* Client [signature] Date 12/21/93 * ANII Review Albert Tedd Date 12-22-93

(* Required)

Project Manager R. [signature] Date 12-21-93 QC Supervisor [signature] Date 12-21-93

Preventative Action:

NONE REQUIRED

QC Approval [signature] Date 12-21-93

Disposition Completed And Nonconformance Closed QC Supervisor _____ Date _____

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APPENDIX C
FORM SSP-59
(Page 1 of 4)
QUALITY CONTROL INSPECTION REPORT

SHEET 1 of ____ IR No. BFN-T930110

WORK DOC/REV 92-65636-01 ECN/DCN N/A UNIT 3 SYSTEM(s) 1 RPV

FOREMAN R. Seals DURATION N/A RESP SECTION BBO GEE INSPECTOR C. Minor / R. Seals

PART A

ITEM	TYPE INSP	IVP NO	PROCEDURE/REV	DRAWING/REV	UNID/DESCRIPTION	M&TE NO./DATE	S/G/C/U	QC INSPECTOR/LEVEL/DATE
1	NUST	IT. 11	GE-UT-700/2	ISI-0220-C/1	Weld C-5-FIG	N/A	U	C. Minor III 12/4/92
2	NUST	IT. 11	GE-UT-700/2	ISI-0220-C/1	Weld C-4-5	N/A	U	C. Minor III 12/4/92
3	NUST	IT. 11	GE-UT-700/2	ISI-0220-C/1	Weld V-4-B	N/A	U	C. Minor III 12/4/92
4	NUST	IT. 11	GE-UT-700/2	ISI-0220-C/1	Weld C-2-3	N/A	U	C. Minor III 12/4/92
5	NUST	IT. 11	GE-UT-700/2	ISI-0220-C/1	Weld C-3-4	N/A	U	C. Minor III 12/4/92
6								
7								

PART B UNSATISFACTORY CONDITION/CORRECTIVE ACTION | DURATION FOR INSPECTION | PARTIAL INSPECTION Y (N)

ITEM	ATTR No(s) PROC No	UNSAT CONDITION DESCRIPTION	CORRECTIVE ACTION DESCRIPTION	RESP ENGR/DATE RESP FRMN/DATE	M&TE No. DUE DATE	CAUSE CODE	S/U/C	C/A CODE	QC INSP/LVL/DATE
1-5	GE-UT-700 Rev. 2	See Attached Summary Sheets	TVA Engineering To disposition	C. Minor 12/4/92 R. Seals 12-21-93	N/A	H			

C/CODES C=SCAR/ACP D=DOCUMENTATION F=DESIGN CHANGE W=REWORK P=REPLACE R=REPAIR A=ACCEPT-AS-IS O=OTHER/DESCRIBE:

REMARKS:
GE NCR-1C7LA-05

NOTE: ACCEPT-AS-IS/REPAIR - SE MANAGER OR DESIGNEE MUST PROVIDE JUSTIFICATION IN THE REMARKS SECTION.

SE MANAGER OR DESIGNEE SIGNATURE / DATE

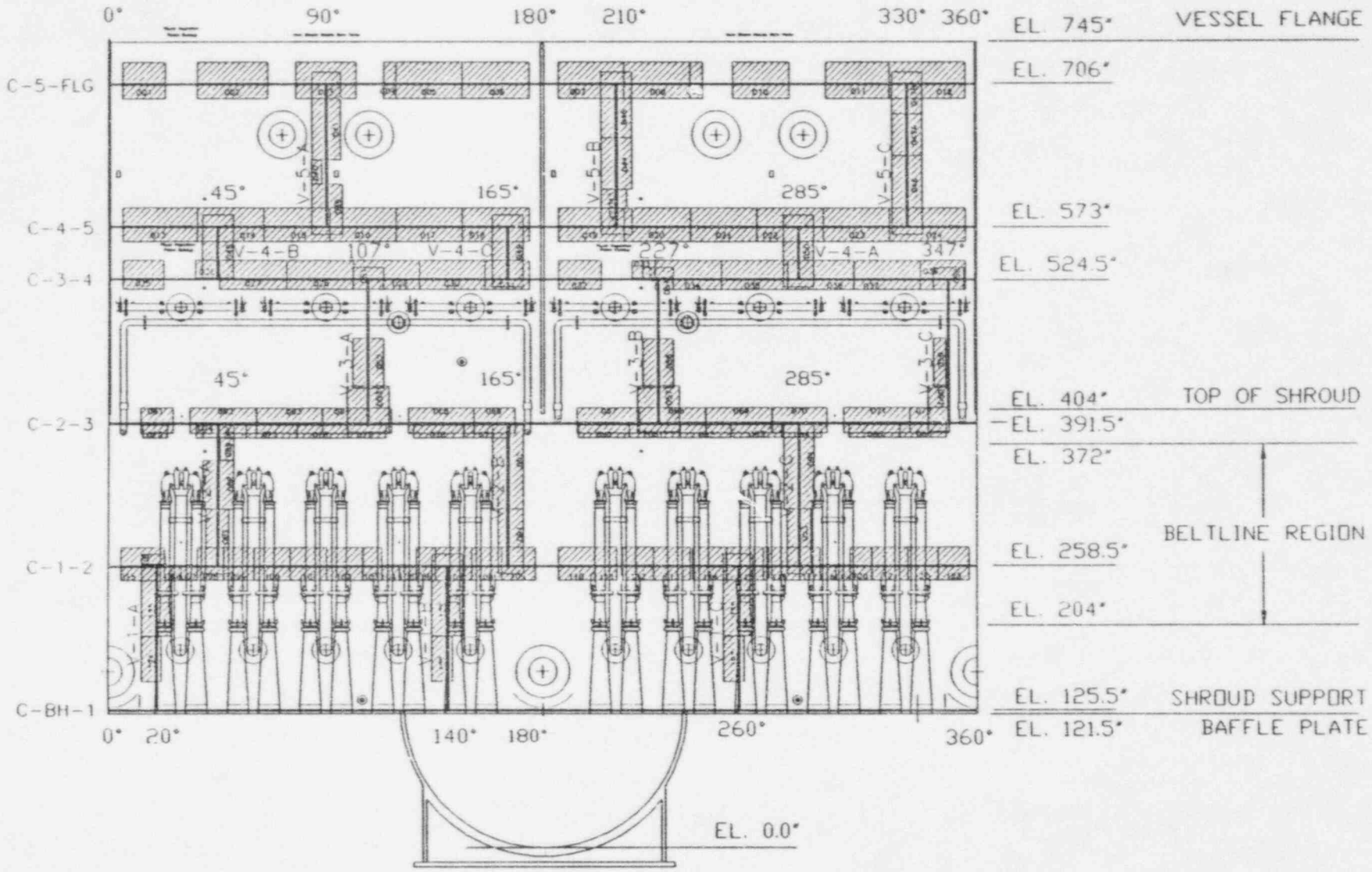
NOTE: ACCEPT-AS-IS/REPAIR - ASME SECTION XI RELATED ACTIVITY.

ANII REVIEW / DATE

REJECTED IR RECEIVED BY/DATE | REVIEWED BY (QC SUPERVISOR)/DATE | ADDED TO DATABASE (DATE)

RETENTION PERIOD: LIFETIME RESPONSIBILITY: RECORDS MANAGEMENT

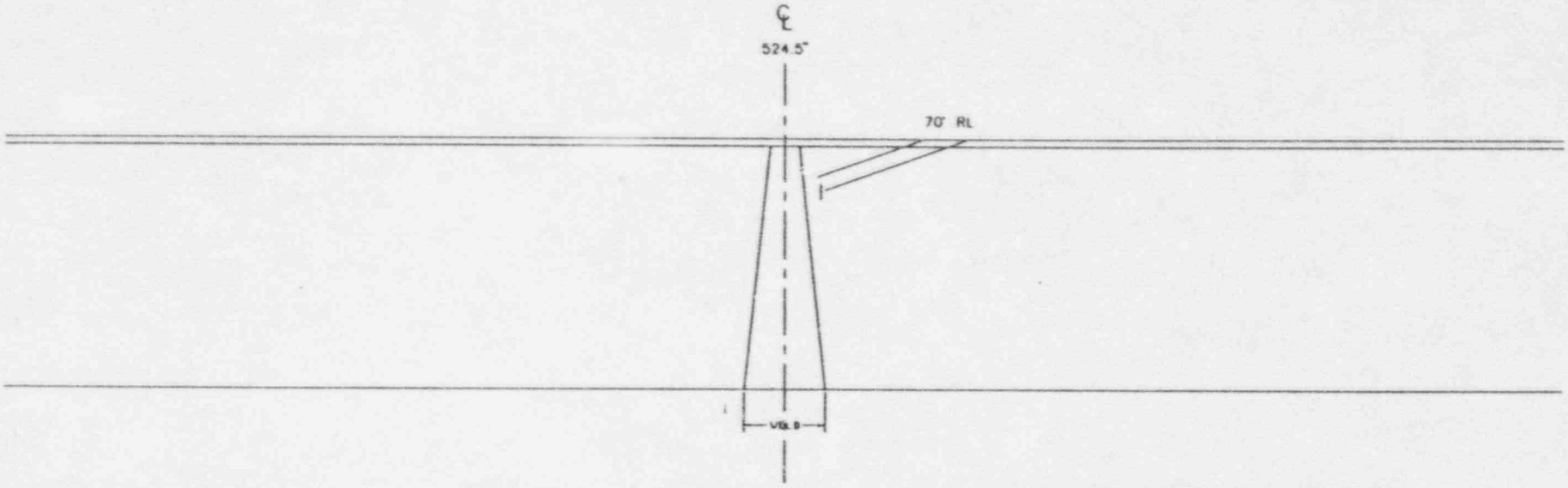
BROWNS FERRY UNIT-3 WELD LOCATIONS



GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	VESSEL ROLLOUT & AS SCANNED PATCH LOCATIONS	BF-3-VMA	REV 0

V-4-B

~~S 4 5~~ ~~RH~~ 1/12/94



Indication 12-015	
Flaw "X" location	94.35"
Flaw "Y" location	525.43"
Flaw Thruwall	.444"
Flaw Length	1.75"
"T" Measured	6.53"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-015	SCALE: NONE	DWG. BFC34IND	REV. 0

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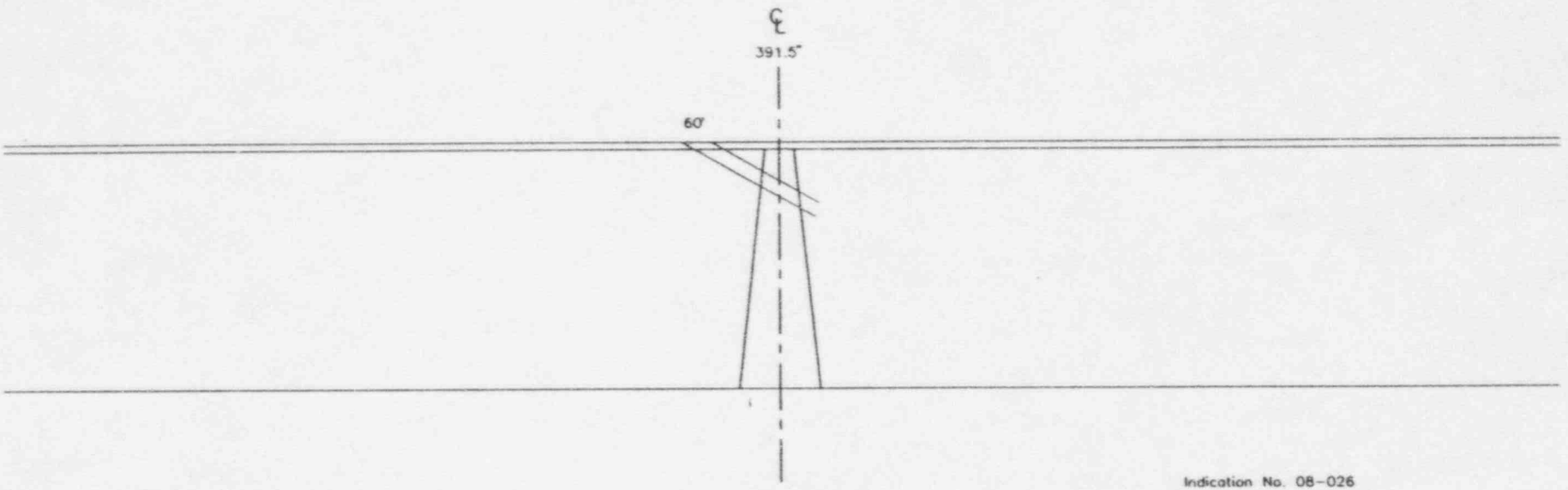


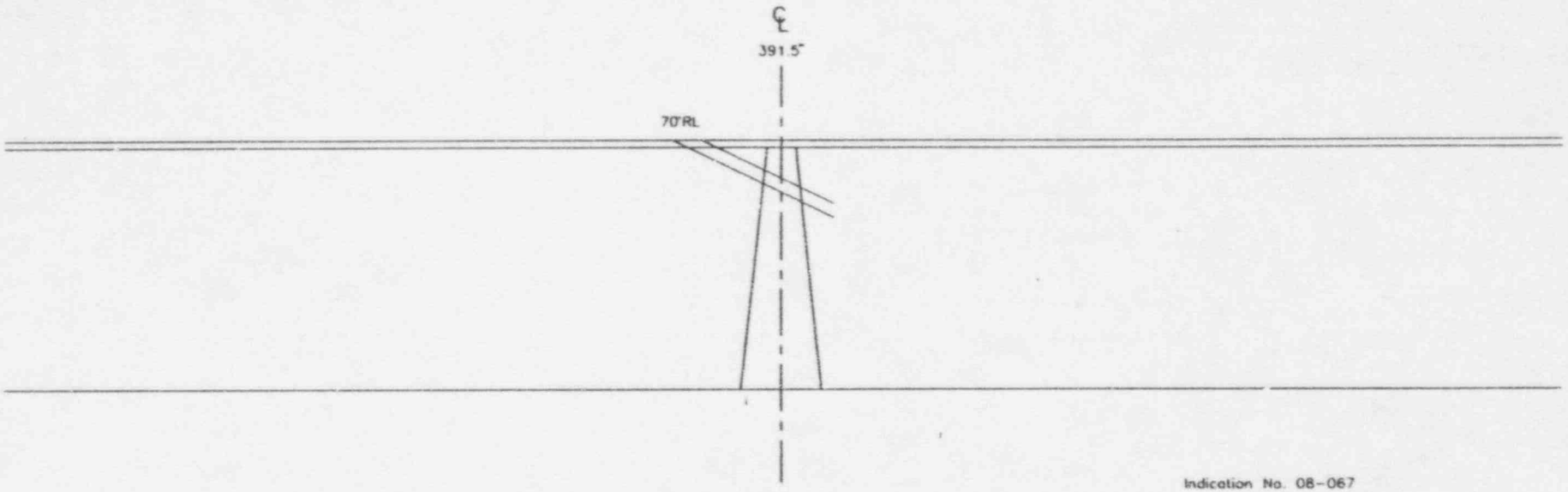
Indication No. 08-026

Flaw "X" location	198.50"
Flaw "Y" location	392.42"
Flaw Thruwall	.41"
Flaw Length	1.50"
"T" Measured	6.60"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

This indication confirmed with channels 3 and 7

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-2-3 Ind. 08-026	SCALE: NONE	DWG. BF3C231	REV. 0



Indication No. 08-067

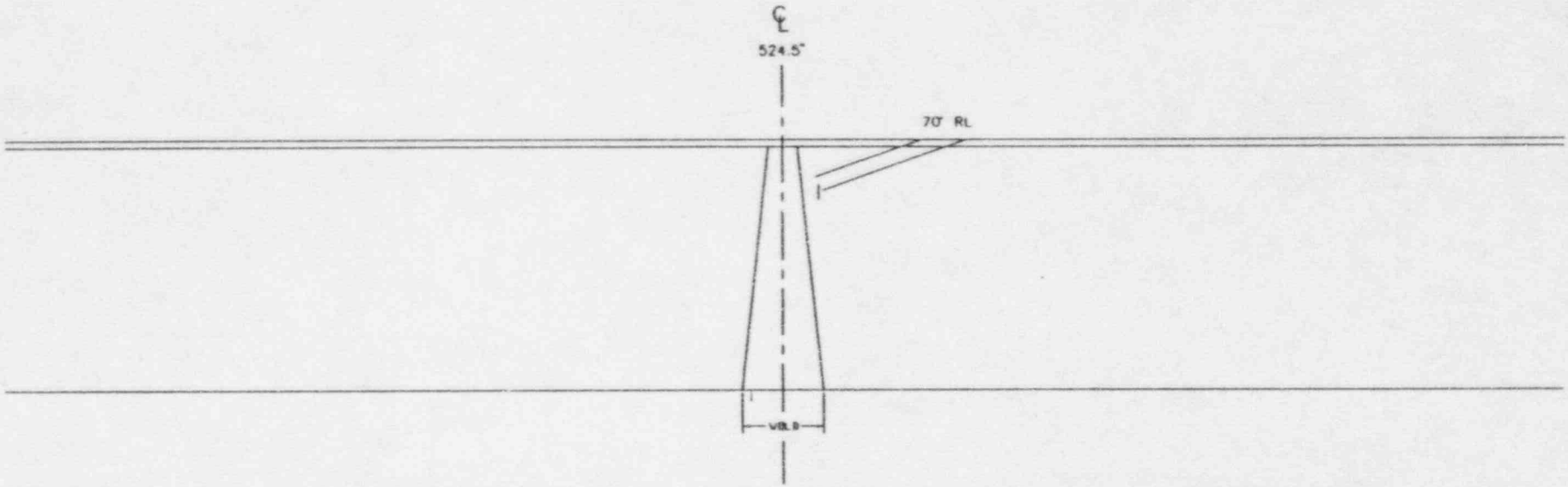
Flaw "X" location	558.25"
Flaw "Y" location	392.85"
Flaw Thruwall	.37"
Flaw Length	1.50"
"I" Measured	6.55"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

This indication confirmed with channels 7 and 11

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-2-3 Ind. 08-067	SCALE: NONE	DWG. BF3C231	REV. 0

C-3-4

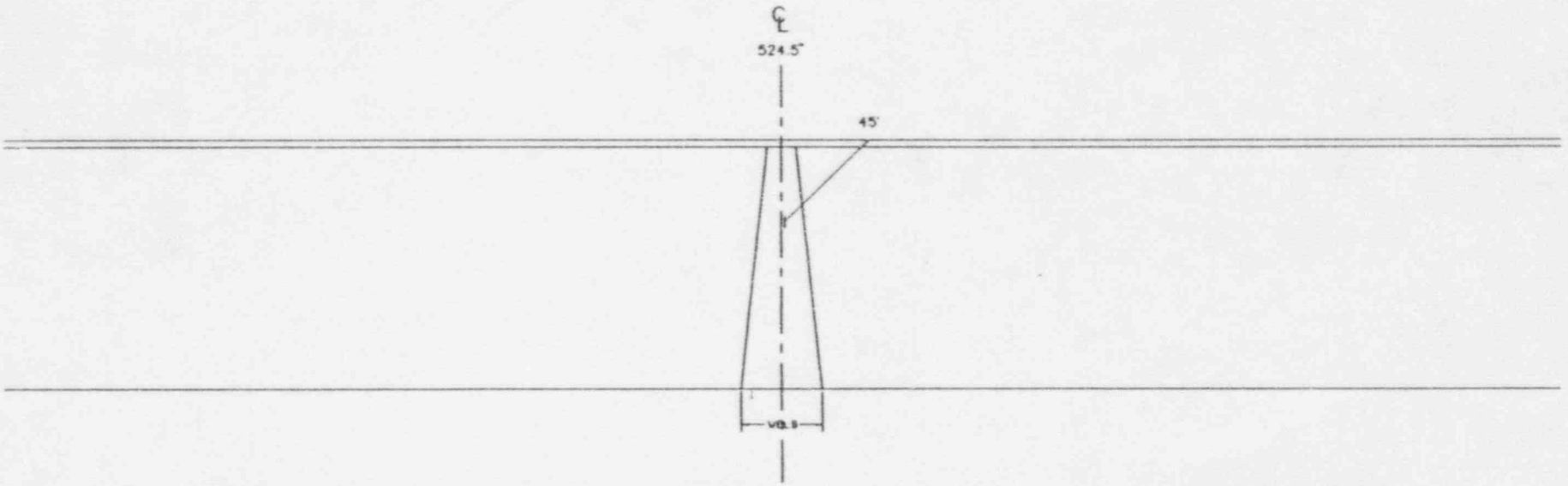


Indication 12-015	
Flaw "X" location	94.35"
Flaw "Y" location	525.43"
Flaw Thruwall	.444"
Flaw Length	1.75"
"T" Measured	6.53"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-015	SCALE: NONE	DWG. BFC34IND	REV. 0

C-3--4



Indication 12-069

Flaw "X" location	424.65"
Flaw "Y" location	524.58"
Flaw Thruwall	.34"
Flaw Length	1.75"
"T" Measured	6.51"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-069	SCALE: NONE	DWG. BFC34IND	REV. 0

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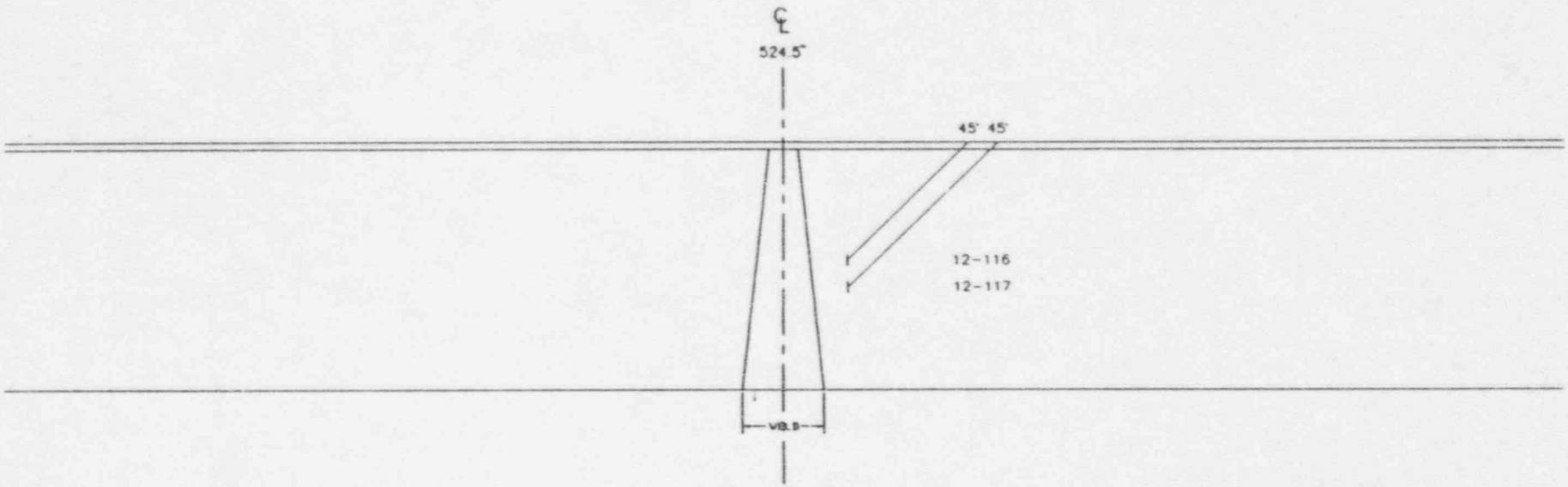
C-3-4



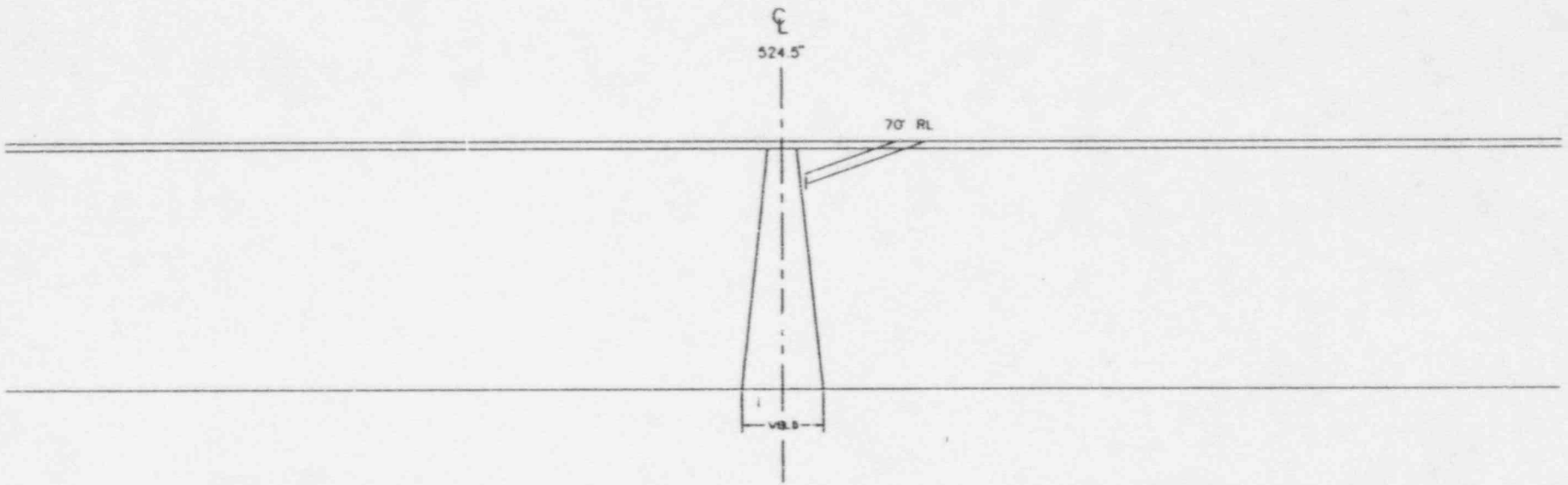
Indication 12-116 Combined

Flaw "X" location	617.15"
Flaw "Y" location	526.14"
Flaw Thruwall	.62"
Flaw Length	.75"
"I" Measured	6.49"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-116	SCALE: NONE	DWG. BFC34IND	REV. 0

C-3-4



Indication 12-144

Flaw "X" location	760.10"
Flaw "Y" location	525.11"
Flaw Thruwall	.325"
Flaw Length	2.00"
"I" Measured	6.44"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

C-3-4

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD ~~C-4-5~~ IND. 12-144	SCALE: NONE	DWG. BFC34IND	REV. 0

RH 1/12/94

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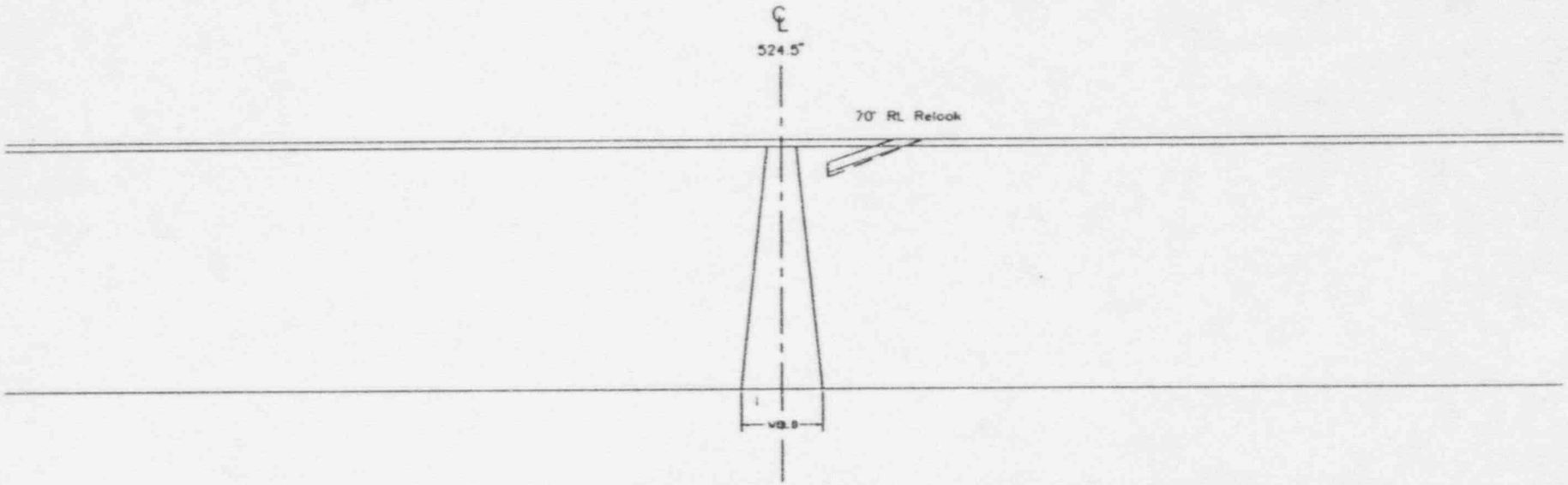
C-3-4



Indication 12-145

Flaw "X" location	763.85"
Flaw "Y" location	525.68"
Flaw Thruwall	.39"
Flaw Length	2.40"
"T" Measured	6.44"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-145	SCALE: NONE	DWG. BFC34IND	REV. 0

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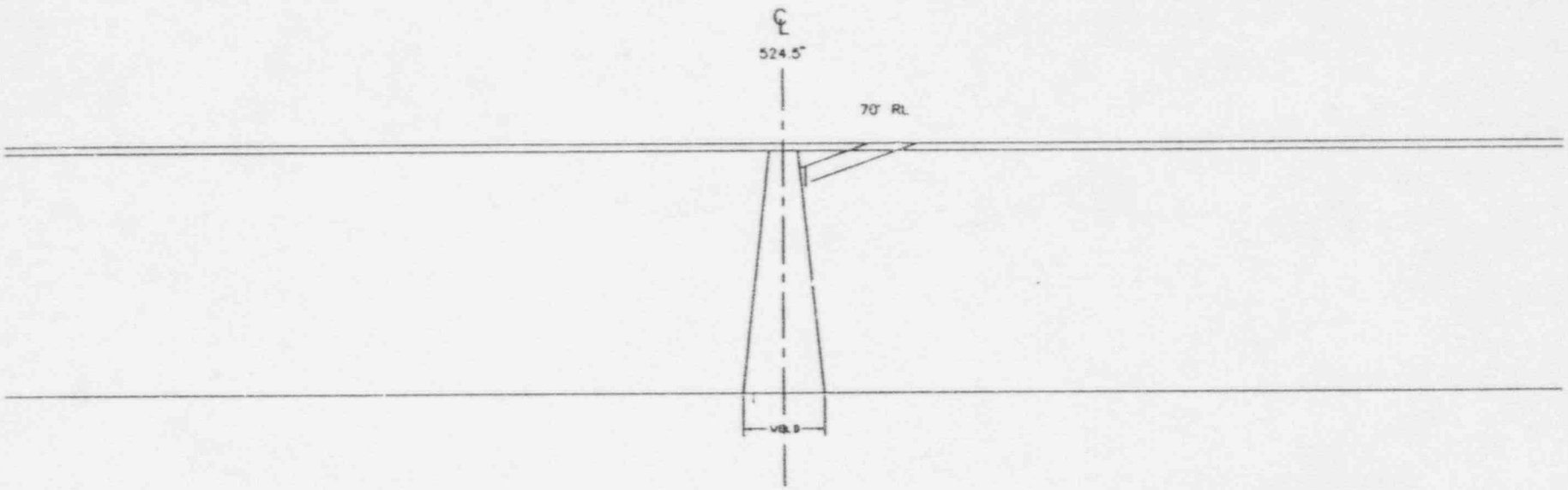
C-3-4



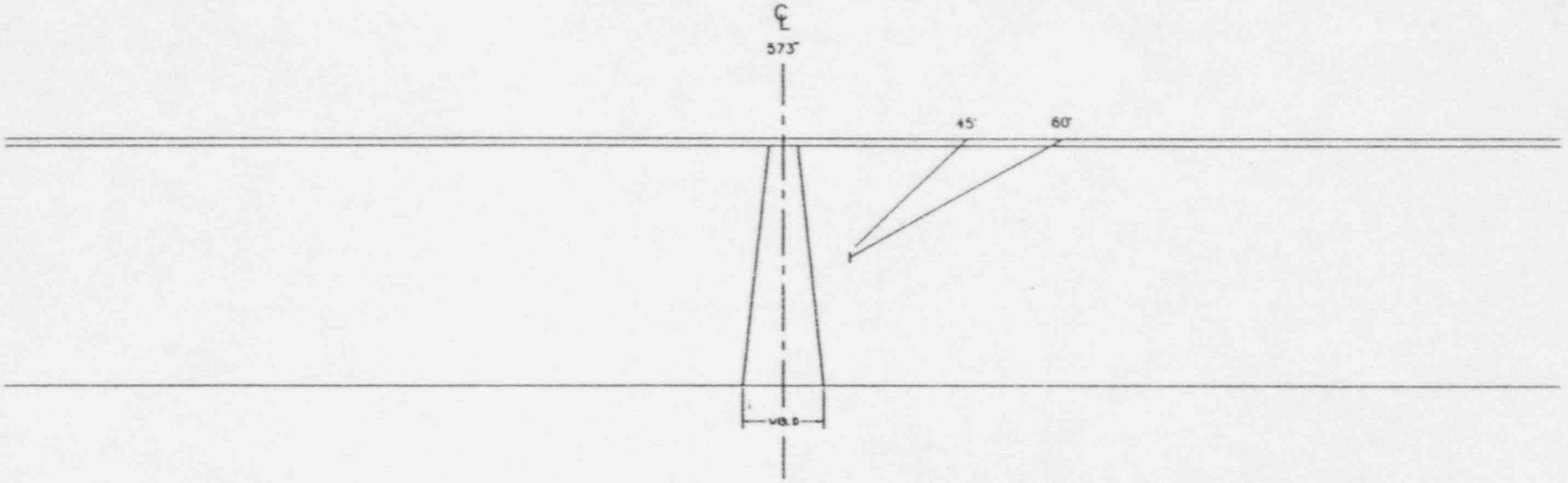
Indication 12-148

Flaw "X" location	771.35"
Flaw "Y" location	525.07"
Flaw Thruwall	.511"
Flaw Length	2.75"
"I" Measured	6.44"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-3-4 IND. 12-148	SCALE: NONE	DWG. BFC34IND	REV. 0

C-4-5



Indication 16-075
Flaw "X" location is 603.30"
Flaw "Y" location is 574.70"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-4-5 IND. 16-075	SCALE: NONE	DWG. BFC45IND	REV. 0

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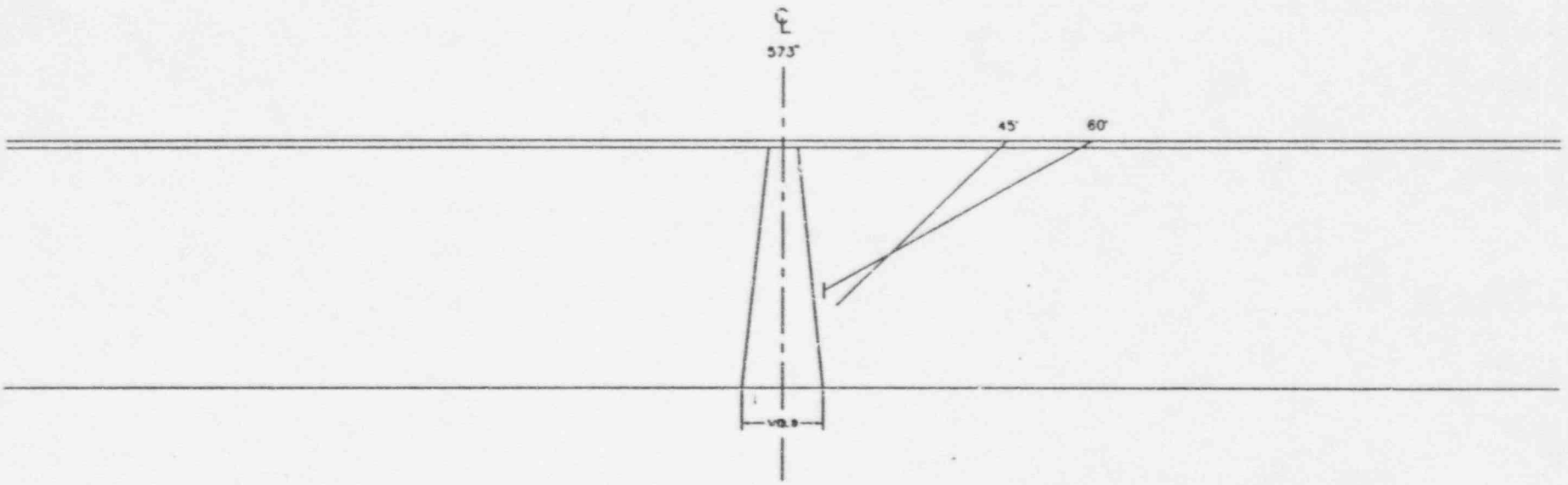
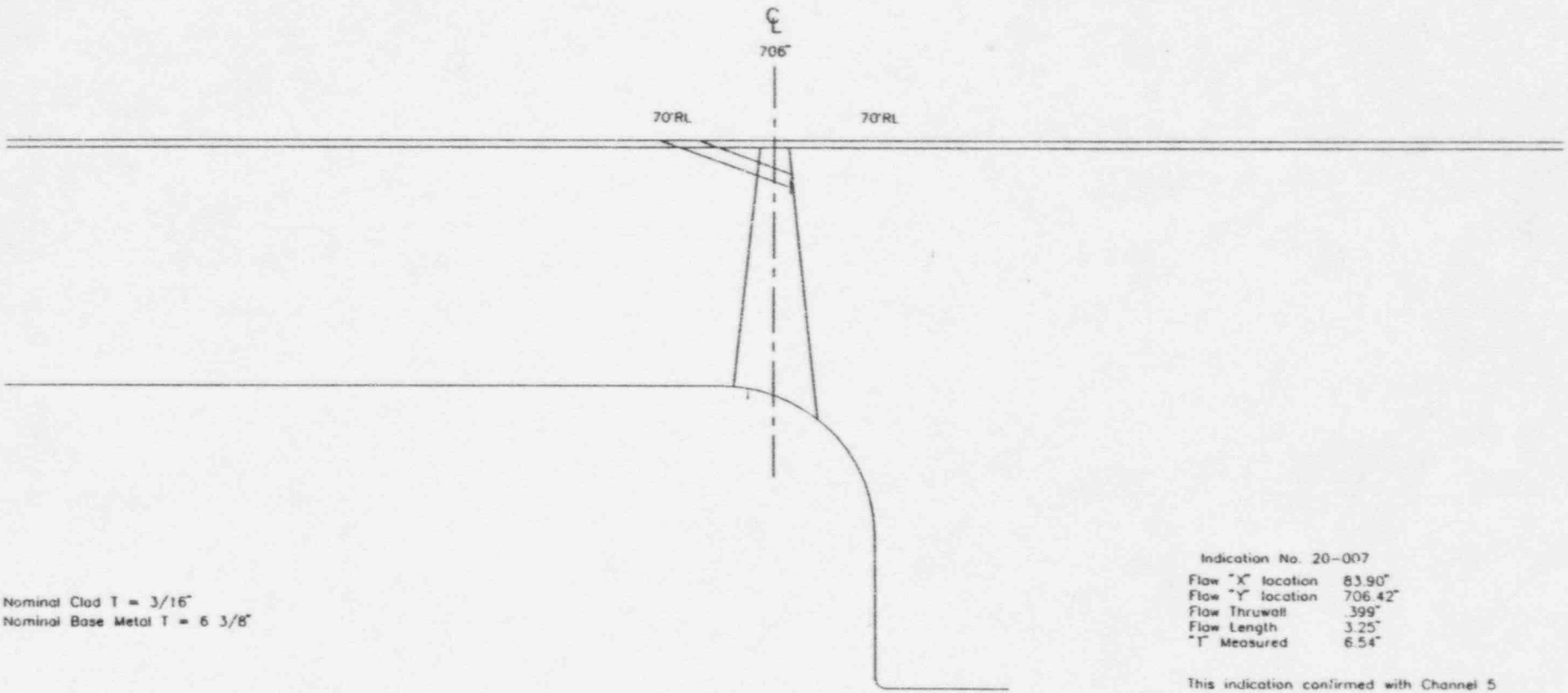
C-4-5



Indication 16-076
Flaw "X" location is 617.50"
Flaw "Y" location is 574.05"
Tw - 0.44"
LENGTH 1.50"
T MEASURED 6.60"

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-4-5 IND. 16-076	SCALE: NONE	DWG. BFC45IND	REV. 0



Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

Indication No. 20-007

Flaw "X" location	83.90"
Flaw "Y" location	706.42"
Flaw Thruwall	.399"
Flaw Length	3.25"
"T" Measured	6.54"

This indication confirmed with Channel 5

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-5-FLG INDICATION 20-007	SCALE: NONE	DWG. BF3C5FI	REV. 0

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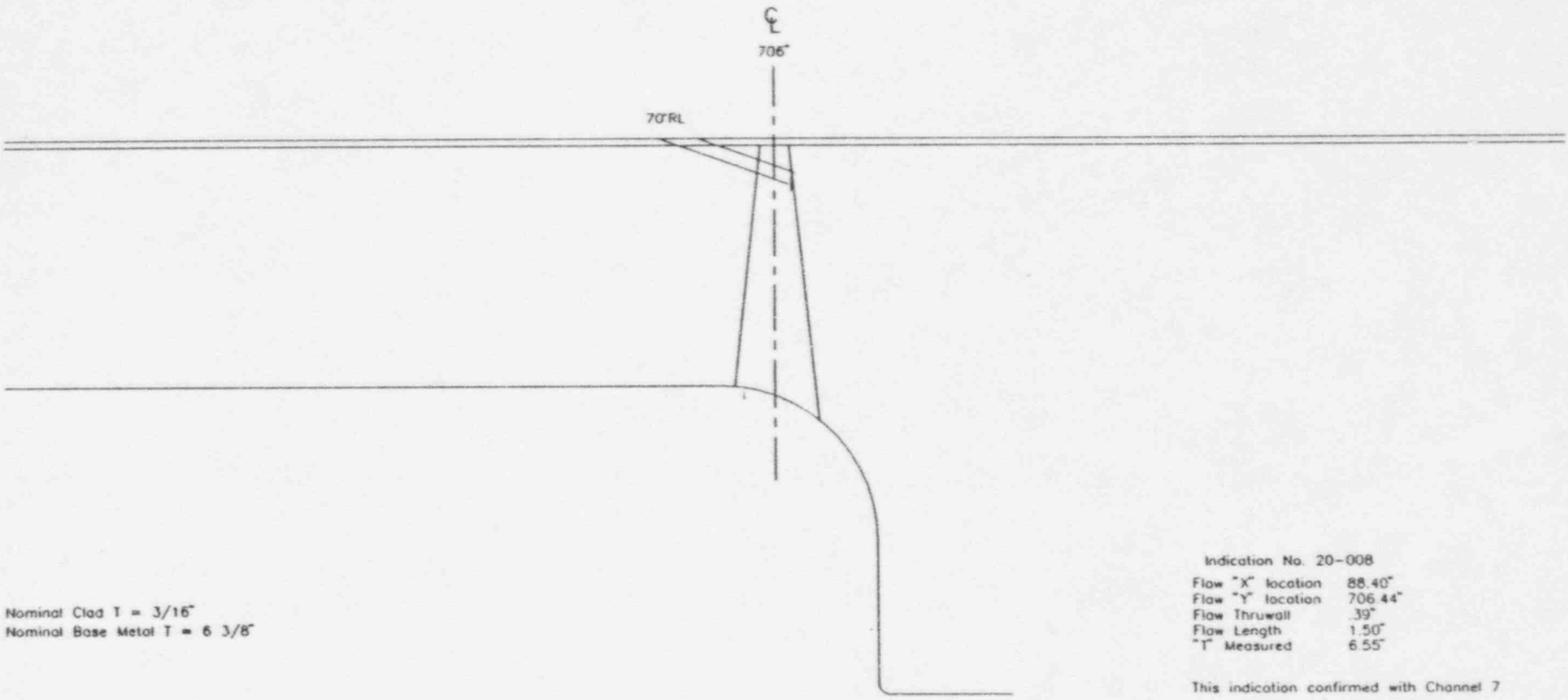

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

Indication No. 20-008

Flaw "X" location	88.40"
Flaw "Y" location	706.44"
Flaw Thruwall	.39"
Flaw Length	1.50"
"T" Measured	6.55"

This indication confirmed with Channel 7

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-5-FLG INDICATION 20-008	SCALE: NONE	DWG. BF3C5FI	REV. 0

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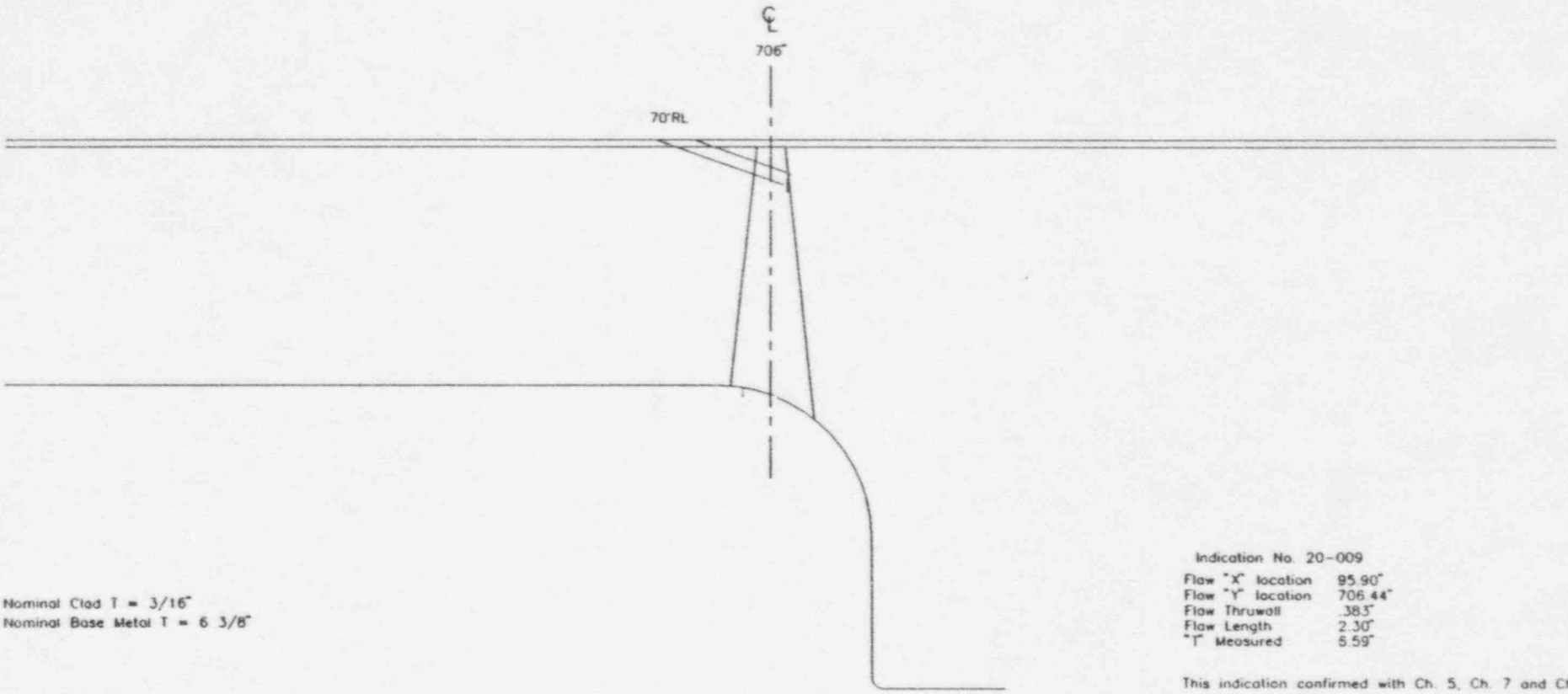


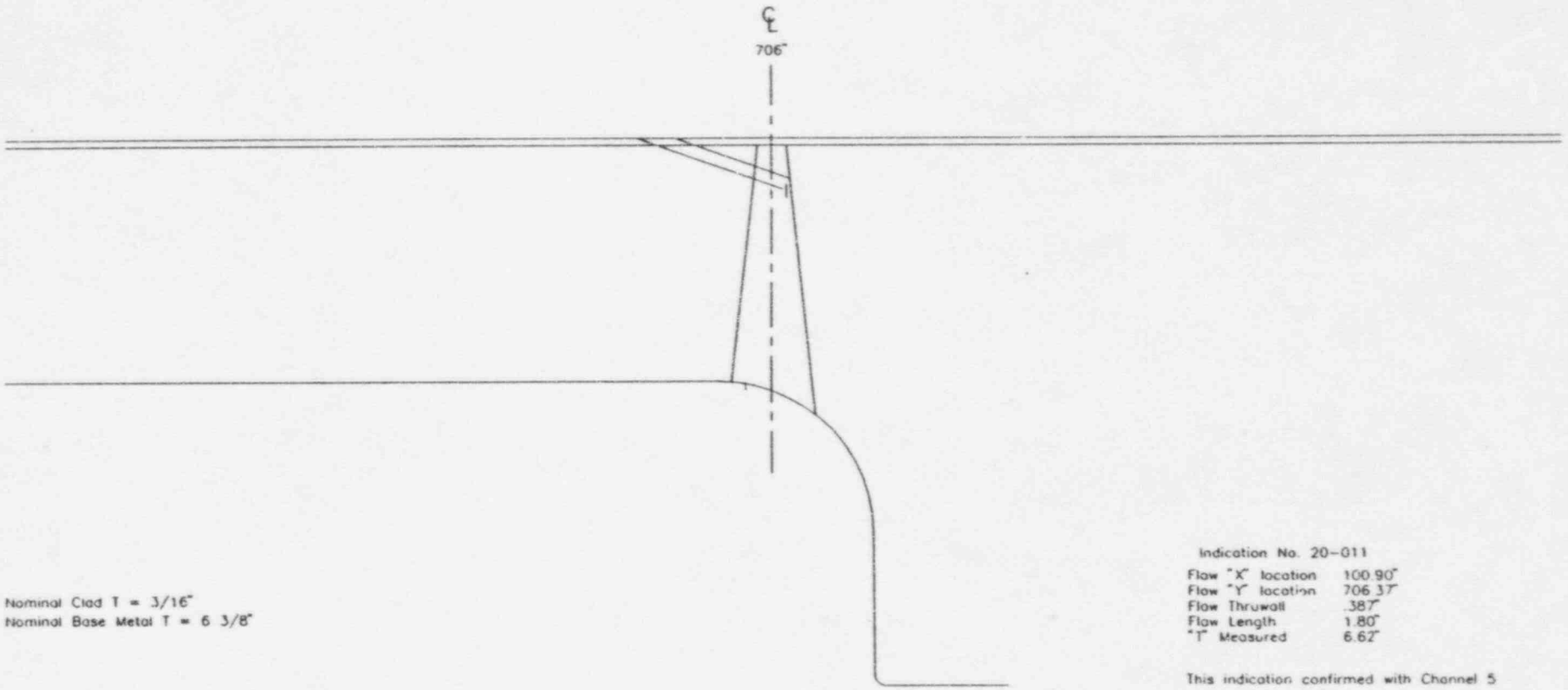
Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

Indication No. 20-009

Flaw "X" location	95.90"
Flaw "Y" location	706.44"
Flaw Thruwall	.385"
Flaw Length	2.30"
"T" Measured	6.59"

This indication confirmed with Ch. 5, Ch. 7 and Ch. 9

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-5-FLG INDICATION 20-009	SCALE: NONE	DWG. BF3C5FI	REV. 0



Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

Indication No. 20-011

Flaw "X" location	100.90"
Flaw "Y" location	706.37"
Flaw Thruwall	.387"
Flaw Length	1.80"
"T" Measured	6.62"

This indication confirmed with Channel 5

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-5-FLG INDICATION 20-011	SCALE: NONE	DWG. BF3C5F1	REV. 0

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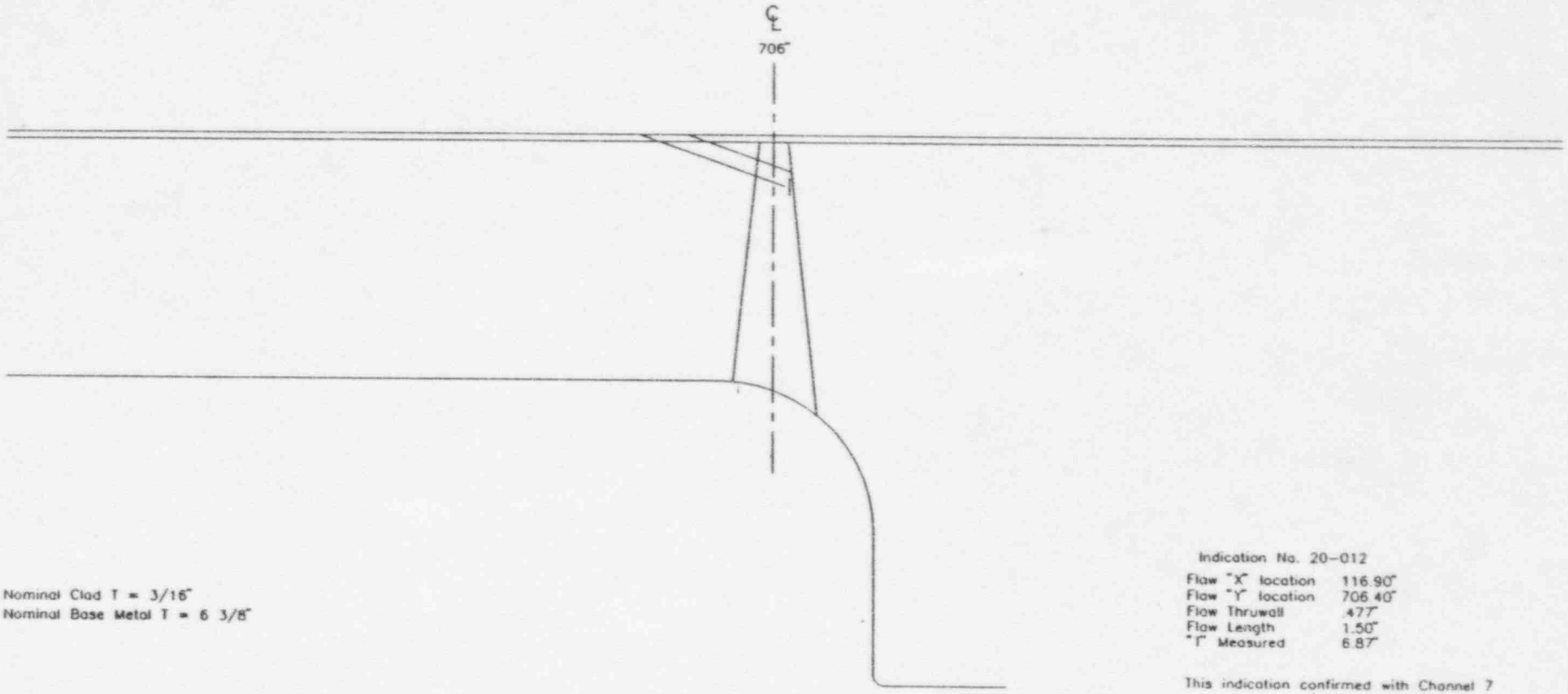

Nominal Clad T = 3/16"
Nominal Base Metal T = 6 3/8"

Indication No. 20-012

Flaw "X" location	116.90"
Flaw "Y" location	706.40"
Flaw Thruwall	.477"
Flaw Length	1.50"
"I" Measured	6.87"

This indication confirmed with Channel 7

GE NUCLEAR ENERGY	BROWNS FERRY UNIT 3	WELD C-5-FLG INDICATION 20-012	SCALE: NONE	DWG. BF3C5FI	REV. 0