PROCEDURE COVER SHEET

PENNSYLVANIA POWER & LIGHT CO. SUSQUEHANNA STEAM ELECTRIC STATION	TP-ISI-332 Revision 0 Page 1 of 13
MEASURING AND RECORDING SEARCH UNIT LOCATION AND MAXIMUM SIGNAL AMPLITUDE DATA DURING ULTRASONIC WELD EXAMINATION	

Effective Date 11-1-84 Expiration Date 11-1-86

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PROCEDURE TYPE: PORC ____, NON-PORC ____, Alternate Review ____

PORC MTG. NO. _____ (If applicable)

Prepared by Ed Coppoll Date 10/17/84

Reviewed by Marcia Strenk Date 10/18/84

Recommended: R. A. Breslin Date 10/19/84
Section Head/Manager

N Kerrigan Date 10-26-84
Superintendent of Plant

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NUCLEAR PROJECTS
OPERATING PROCEDURE

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MEASURING AND RECORDING SEARCH UNIT LOCATION AND MAXIMUM SIGNAL AMPLITUDE DATA DURING ULTRASONIC WELD EXAMINATIONS

1.0 PURPOSE

This procedure specifies the methods and techniques for measuring and recording search unit location and maximum signal amplitude data during manual ultrasonic examinations.

2.0 SCOPE AND APPLICATION

Recording search unit location and maximum signal amplitude data for straight- and angle-beam ultrasonic examinations of welds, heat affected zones, and adjacent base material using manual, contact, and pulse-echo techniques shall be in accordance with this procedure.

2.1 Applicable Documents

The following documents form a part of this procedure as applicable:

(1) Southwest Research Institute Nuclear Quality Assurance Program Manual (NQAPM).

(2) The SwRI Operating Procedures for the ultrasonic examinations being conducted.

3.0 RESPONSIBILITY

(1) The Director of the Department of Engineering Services, Quality Assurance Systems and Engineering Division, shall be responsible for the preparation, review, approval, and control of this procedure.

(2) The Manager of the Nuclear Field Services Section, Department of Engineering Services, shall be responsible for the implementation of this procedure in accordance with the SwRI NQAPM in effect on the date this procedure is approved.

APPROVED
Nuclear Support
Date: 10/18/84

Title: SON - Nuclear Maint Support
Signature: R. A. Breslin

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(3) The examiner shall be responsible for implementing the requirements of this procedure.

(4) The Manager of Support Services, Quality Assurance Systems and Engineering Division, shall be responsible for storage of records generated in accordance with this procedure.

4.0 PROCEDURE REQUIREMENTS

(1) Personnel utilizing this procedure shall be certified in accordance with SwRI NQAP 11-1, Special Process Control.

(2) Examinations shall be conducted as required by the applicable SwRI Operating Procedures.

5.0 PROCEDURE

Nontransverse "L" and transverse "W" measurements for circumferential welds shall start at Lo. Measurements for components with a flow direction shall be made clockwise, looking in the direction of flow. Measurements for components without a flow direction shall be made clockwise as viewed from above the vertical component or clockwise as viewed from an identified end of a horizontal component. The end of a horizontal component referenced to determine clockwise shall be recorded in the "REMARKS" section of the applicable SwRI Examination Record.

Nontransverse "L" and transverse "W" measurements for longitudinal welds shall be made along the weld centerline from Lo.

Nontransverse "L" and transverse "W" measurements for fillet-type attachment and branch connection welds shall start at Lo and shall be made clockwise. Clockwise shall be determined by viewing the weld perpendicular to the component to which the branch connection or fillet-type attachment is welded.

5.1 Weld Length

Weld lengths shall be measured with a steel measuring tape recording distances in inches and common fractions to the nearest 1/16 inch.

5.1.1 Circumferential Welds

Circumferential weld lengths shall be measured along the centerline of the weld bead.

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5.1.2 Longitudinal Welds

(1) Longitudinal weld lengths shall be measured along the centerline of the weld bead from Lo.

(2) When only 12 inches of a longitudinal weld is examined, e.g. in piping, the weld length shall be 12 inches.

5.1.3 Branch Connection Welds

Branch connection weld lengths shall be measured on the examination surface at the junction of the weld and the examination surface.

5.1.4 Lugs, Supports, and Other Similar Welded Attachments with Fillet Type Weld Surfaces

Fillet type weld lengths shall be measured on the examination surface at the junction of the weld and examination surface.

5.2 Amplitude Movements

(1) Signal amplitude shall be recorded as a percent of distance amplitude correction (DAC) at the primary reference level. The percent of DAC shall be determined from Sketch 1.

(2) Maximum signal amplitude shall be attained by search unit manipulation.

(3) Amplitudes of signals shall be measured in decibels (dB) above or below DAC by adjusting the gain control until the peak indication amplitude coincides with the DAC line.

5.3 "L" Measurements, Nontransverse Scans for Angle Beam

(1) "L" measurements shall be recorded in inches and common fractions, to the nearest 1/16 inch.

(2) Measurements shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and the maximum amplitude point for each recordable indication.

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5.3.1 Circumferential and Longitudinal Welds

Datum = Lo to axial center of the search unit. Measurement will be made along the weld centerline using one of the following methods:

(1) Measurements shall be made directly from Lo using a steel measuring tape.

(2) Marks shall be made and labeled every 5 inches from Lo using a steel measuring tape. Measurements shall be made from these marks using a 6-inch steel rule or a steel measuring tape.

(3) The steel measuring tape shall be affixed to the weld centerline with zero at Lo. Measurements shall then be made directly.

5.3.2 Branch Connection Welds

Datum = Lo to axial center of search unit. Measurement shall be made on the examination surface with a 6-inch steel rule or a steel measuring tape from Lo along the weld and examination surface junction.

5.3.3 Lugs, Supports, and Other Similar Welded Attachments with Fillet Type Weld Surfaces

Datum = Lo to axial center of search unit. Measurement shall be made on the examination surface with a 6-inch steel rule or steel measuring tape from Lo along the weld and examination surface junction.

5.4 "L" Measurements, Transverse Scans for Angle Beam

"L" measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

(1) Measurements shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and the maximum amplitude point for each recordable indication.

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5.4.1 Circumferential and Longitudinal Welds

Datum = weld centerline to axial center of search unit. "L" measurements shall be made perpendicular to the weld centerline using a 6-inch steel rule or steel measuring tape.

5.4.2 Branch Connection Welds

Datum = junction of the examination surface and the weld to the axial center of the search unit. "L" measurements shall be made perpendicular to the weld fusion line using a 6-inch steel rule or steel measuring tape.

5.4.3 Supports and Other Similarly Welded Attachments with Fillet Type Weld Surfaces

Datum = junction of the examination surface and weld to the axial center of the search unit. "L" measurements shall be made perpendicular to the weld fusion line using a 6-inch steel rule or steel measuring tape.

5.5 "L" Measurements for Straight Beam

(1) Datum = Lo to the axial center of the search unit. "L" measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

5.5.1 Straight Beam DAC

(1) "L" measurements shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and at the maximum amplitude point for each recordable indication.

(2) Measurements shall be made as described in 5.3.1, 5.3.2, and 5.3.3, as applicable.

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5.5.2 Straight Beam Lamination

(1) "L" measurements shall be made within 1/4 inch of each edge of the laminar type reflector as specified by the applicable SwRI Operating Procedure along with measurements taken from successive scans across the reflector in increments no greater than 1 inch. A laminar reflector may require measurements for two areas as required by the applicable SwRI Operating Procedure.

(2) Measurements shall be made as described in 5.3.1, 5.3.2, and 5.3.3. as applicable.

5.6 "W" Measurements, Nontransverse Indications for Angle Beam

(1) "W" measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

(2) Measurement shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and at the maximum amplitude point for each recordable indication.

5.6.1 Circumferential and Longitudinal Welds

Datum = weld centerline to the incident point of the search unit. "W" measurements shall be made perpendicular to the weld centerline using a 6-inch steel rule or steel measuring tape.

5.6.2 Branch Connection Welds

Datum = junction of examination surface and weld to the incident point of the search unit. "W" measurements shall be made perpendicular to the weld fusion line using a 6-inch steel rule or steel measuring tape.

5.6.3 Supports and Other Similarly Welded Attachments with Fillet Type Weld Surfaces

Datum = junction of examination surface and weld to the incident point of the search unit. "W" measurements shall be made perpendicular to the weld fusion line using a 6-inch steel rule or steel measuring tape.

5.7 "W" Measurements, Transverse Indications, for Angle Beam

(1) "W" measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

(2) Measurements shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and at the maximum amplitude point for each recordable indication.

5.7.1 Circumferential and Longitudinal Welds

Datum = Lo to the incident point of the search unit. Measurements shall be made along the weld centerline using one of the following methods:

(1) Measurements shall be made directly from Lo using a steel measuring tape.

(2) The steel measuring tape shall be affixed to the weld centerline with zero at Lo. Measurements shall then be made directly.

(3) Marks shall be made and labeled every 5 inches from Lo using a steel measuring tape. Measurements shall be made from these marks using a 6-inch steel rule or steel measuring tape.

5.7.2 Branch Connection Welds

Datum = Lo to the incident point of the search unit. Measurements shall be made from Lo along the junction of the examination surface and weld with a 6-inch steel rule or steel measuring tape.

5.7.3 Supports and Other Similarly Welded Attachments With Fillet Type Weld Surfaces

Datum = Lo to the incident point of the search unit. Measurements shall be made from Lo along the junction of the examination surface and weld with a 6-inch steel rule or steel measuring tape.

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5.8 "W" Measurements for Straight Beam

Datum = W_0 to the axial center of the search unit. "W" measurements shall be recorded in inches and common fractions to the nearest 1/16 inch.

5.8.1 Straight Beam DAC

(1) Measurements shall be made to the percentages of DAC required by the applicable SwRI Operating Procedure and at the maximum amplitude point for each recordable indication.

(2) Measurements shall be made with a 6-inch steel rule or steel measuring tape.

5.8.2 Straight Beam Lamination

(1) "W" measurements shall be made to the edges of the laminar type reflector as specified by the applicable SwRI Operating Procedure. A laminar reflector may require measurements for two areas as required by the applicable SwRI Operating Procedure.

(2) Measurements shall be made with a 6-inch steel rule or steel measuring tape.

5.9 Metal Path Measurements

5.9.1 Angle Beam

(1) Metal path measurements shall be recorded in inches and decimal fractions.

(2) Metal path measurements shall be made at the maximum amplitude point and at each "L" location where "W" measurements are made.

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5.9.2 Straight Beam

5.9.2.1 Straight Beam DAC

(1) Metal path measurements shall be recorded in inches and decimal fractions.

(2) Metal path measurements shall be made at the maximum amplitude point and at each "L" location where "W" measurements are made.

5.9.2.2 Straight Beam Lamination

(1) Metal path measurements shall be recorded in inches and decimal fractions.

(2) Each point requiring "L" measurements shall require metal path measurements. These shall be made at the points where the amplitude of the intermediate indication equals 50% of the initial back reflection and is accompanied by a 50% loss of back reflection. Measurements shall also be made at any area of total loss of back reflection as specified in the procedure.

5.10 Crown Width and Height for Fillet Welds

The crown height and width for fillet welds shall be measured as shown in Sketch 2.

5.11 Abbreviations

Appropriate abbreviations (listed below) which describe the search unit location with respect to the weld centerline or edge shall be entered on the applicable SwRI Examination Record with the measurements.

(1) Up - U

(2) Down - D

(3) Clockwise - CW

(4) Counterclockwise - CCW

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(5) Vessel side - V

(6) Lug or support side - L or S

(7) Pipe Side - P

(8) Other symbols with descriptions entered in the "Remarks" section may be used as approved by the Team Leader.

6.0 RECORDS

Required records shall be specified in the applicable SwRI Operating Procedure.

Permanent documents generated in accordance with this procedure shall be stored and retained as a portion of the examination report. The examination report shall be stored by the Manager of Support Services, Quality Assurance Systems and Engineering Division, in the Data Storage Facility for the period specified by the contractual agreement with the customer.

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[illegible signature]	3/31/78	[illegible signature]	3/29	[illegible signature]	5-26	[illegible signature]	[illegible]	[illegible]

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DAC vs. dB Conversion Chart

%DAC	dB	%DAC
100	0	100
90	1	112
80	2	126
70	3	141
63	4	159
56	5	178
50	6	200
45	7	224
40	8	251
36	9	282
31	10	316
28	11	355
25	12	400
22	13	447
20	14	501
18	15	562
16	16	631
14	17	708
13	18	794
11	19	891
10	20	1000

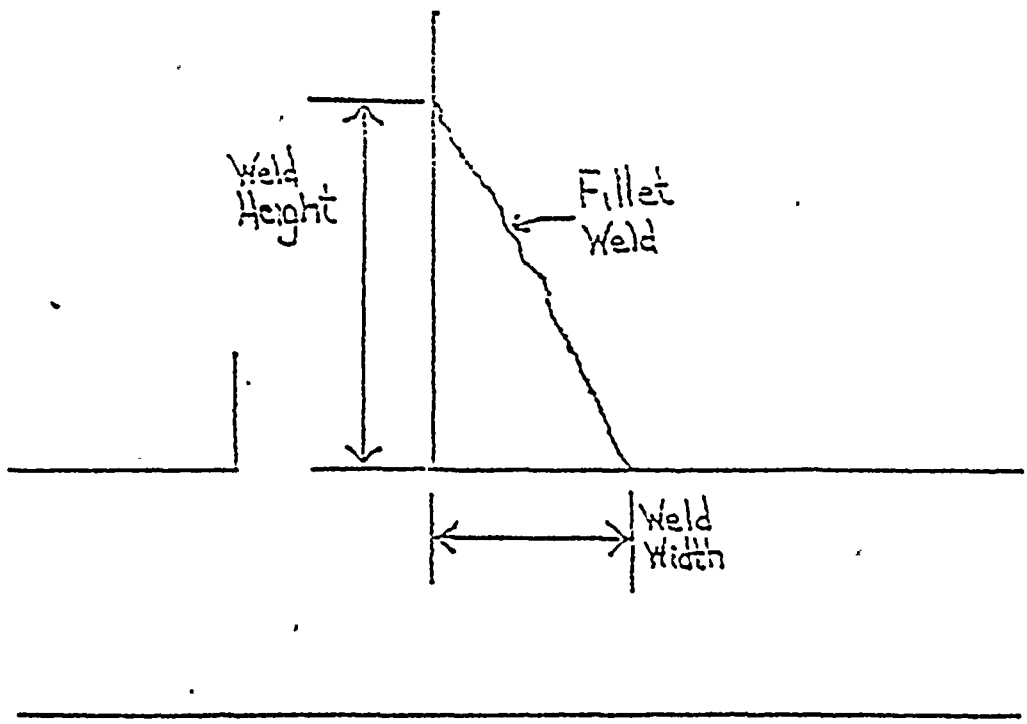
Percent DAC of an amplitude below DAC, which must be increased in amplitude by the dB number change to equal DAC, is read in the column on the left.

For example, an indication is increased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 22 percent of DAC.

Percent DAC of an amplitude above DAC, which must be decreased in amplitude by the dB number change to equal DAC, is read in the column on the right.

For example, an indication is decreased in amplitude by 13 dB to equal the DAC curve; therefore, the indication is 447 percent of DAC.

SKETCH 1



SKETCH 2