•	NUCLEAR FIELD SERVICES DEPARTMENT	SUBJECT SUPPLEMENT FOR ULTRASONIC EXAMINATION OF WELD OVERLAYED AUSTENITIC TIPING		
		NO. UT-AUSTENITIC-M SUPPLEMENT 1 REV. 1 PAGE 1 of 9		
•	LIMERICK UNIT 2	PREPARED BY/DATE Dava Edgel # / 5.16-3?		
		APPROVED BY DATE Node Fr. Miller 5/16/87		
		QA APPROVED BY /DATE Frank J. O'Dornell 5-18-5.		
X	some for 2 s	2 PriFCRLP-1181 To SALC		
-		P-505		

STATEMENT OF INTENDED USE

8808240072

88083

PDR ADOCK 05000353

THIS DOCUMENT CONTAINS INFORMATION PREPARED BY THE GENERAL ELECTRIC COMPANY FOR THE PHILADELPHIA ELECTRIC COMPANY UPON THE CONDITION THAT IT WILL BE USED IN THE CONDUCT OF PHILADELPHIA ELECTRIC COMPANY INTERNAL TECHNICAL WORK AND WILL NOT BE RELEASED BY THE PHILADELPHIA ELECTRIC COMPANY TO COMPETITORS OF THE GENERAL ELECTRIC COMPANY, WILL NOT BE DISTRIBUTED FOR GENERAL INDUSTRY AND WILL NOT BE USED DIRECTLY OR INDIRECTLY IN AN UNFAIR COMPETITIVE MANNER TO THE INTERESTS OF THE GENERAL ELECTRIC COMAPNY.

GENERLI SAR FLECTRIC

RECEIVED

JUN 11 1987

BECHTEL

uned to lise at Limerick

D.L. Schmidt DECo LevelIII s/18/87

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 2 of 9

8

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
1.0	SCOPE	3
2.^	REFERENCES	3
3.0	SEARCH UNITS	4
4.0	CALIBRATION BLOCKS	4
5.0	GENERAL EXAMINATION REQUIPEMENTS	4
6.0	CALIBRATION	A
7.0	EXAMINATION	5
8.0	DATA RECORDING	7
9.0	REPORTS AND RECORDS	7

FIGURE 1 EXAMINATION ZONES AND VOLUME

Procedure:	UT-AUSTENITIC-N			
	SUPPLEMENT 1			
Revision:	1			
Date:	5/6/87			
Page:	3 of 9			
Date: Page:	5/6/87 3 of 9			

- 1.0 SCOPE
 - 1.1 This supplement describes the methods, equipment and requirements for ultrasonic examination (UT) of weld overlayed austenitic piping welds. The examination is applicable to both the weld overlay deposit and the full thickness of weld and base material beneath the overlay.
 - 1.2 Application of this procedure is limited to weld overlayed full penetration butt welds and adjacent base metal having a nominal base material wall thickness of 0.20" to 2.5" and a overlay material thickness of 0.15" to 0.60", for a total * of 0.35" to 3.10" of combined metal.

For overlay thickness greater than 0.60", a successful calibration demonstrating complete compliance with the intent of this procedure must be performed and approved by the cognizant Level III.

- 1.3 Examination techniques utilized include 0° longitudinal wave and refracted longitudinal wave scanning.
- 1.4 The examinations shall be performed from the outside surface of the applicable weld overlayed component.
- 1.5 The techniques described herein are to be used in conjunction with and as a supplement to the basic procedure UT-AUSTENITIC-M. Any need for deviation from the criteria of this supplement shall be reported to the cognizant Level III for disposition and approval prior to implementation. Approval may be documented during data evaluation.

2.0 REFERENCES

- 2.1 The following documents have been referenced in the preparation of this supplement and are considered a part of this supplement to the extent specified herein.
- 2.1.1 American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1980 Edition, including Addenda through Winter 1981.
- 2.1.2 American Society for Mechanical Engineers (ASME) Boiler and Pressure Code, Section V, "Nondestructive Examinations", Article 5, 1980 Edition, including addenda through Winter 1981.
- 2.1.3 General Electric's NDE Personnel Qualification Procedures AP-GQUA-277 and QC-2, which meet the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice, SNT-TC-1A, 1975 and 1980 Editions.
- 2.1.4 Weld overlay workshop, developed by EPRI NDE Center.

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 4 of 9

.O SEARCH UNITS

3.1 For examination of the overlay and base/weld material beneath the overlay refracted longitudinal wave search units shall be used. Minimum transducer element size shall be .2". Maximum size will be dictated by the ability of the transducer to maintain proper contact and coupling on the pipe being examined. Transducers in the frequency range from .75 to 5 MHz are recommended. The transducer angles should be in accordance with paragraphs 5.1 and 5.2.

4.0 Calibration Blocks

4.1 Basic calibration blocks shall be made of material (pipe) of the same nominal composition, diameter, and wall thickness or pipe schedule as the piping to be examined. A block of the same nominal thickness of base material overlayed with weld material in the thickness range expected on the parts to be examined, shall be used. The surface finish of the block shall be representative of the surface finish of the overlayed welds to examined.

5.0 General Examination Requirements

- 5.1 Angle beam examination of weld overlayed circumferential or longitudinal welds and associated base material shall be performed using a two-zone exam technique. The zones and beam angles are defined as:
 - Zone 1: From the O.D. surface to include the outer 1/2 of the material thickness. The recommended beam angle for Zone 1 is 70°.
 - Zone 2: From the 1/2t point to include the inner 1/2t of material thickness. The recommended beam angle for zone 2 is 45°. Alternate beam angles may be used with the approval of the cognizant Level III.
- 5.2 A O° longitudinal wave examination shall be performed, to the extent practical, on the overlay material and the weld and base material beneath the overlay.
- 5.3 It is recommended that the surface finish on the examination area be 125 RMS or better with a waviness (out of flatness) tolerance of .031 in/in max. Smooth search unit movement over the examination surface shall be ensured.
- 5.4 Surface preparation and cleaning operations are not within the scope of this supplement.

6.0 Calibration

6.1 Sweep Range Calibration - A suitable calibration block shall be used to calibrate the UT instrument search unit combination for sweep range over the metal path or depth to be used.

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 5 of 9

6.2 O° Calibration

6.2.1 Calibration for the O` examination shall be established as follows. Position the search unit on the applicable overlay calibration block and obtain a peaked signal amplitude from the 1/4t hole. Adjust the instrument gain to provide a signal amplitude of 80% FSH. This establishes primary reference sonsitivity. Mark the amplitude and sweep position on the CRT and record the data on the Calibration Data Shest.

▲ 6.3 Ar.gle Beam Calibration

- 6.3.1 Calibration for Zone 1 shall be established as follows. Position the search unit on the applicable overlay calibration block. Using the 1/4 and 1/2t SDH extend the CRT sweep to display a minimum of 1t. Obtain a peaked signal amplitude from the applicable 1/4t hole. Set the response to 80% FSH. This establishes primary reference sensitivity for zone 1. Mark the amplitude and sweep position on the CRT and record the data on the Calibration Data Sheet.
- 6.3.2 Calibration for Zone 2 shall be established as follows. Position the search unit on the applicable overlay calibration block. Using the 1/4t,1/2t,3/4t SDH and I.D. notch position the CRT sweep to display a minimum of 5/4t. Obtain a peaked signal amplitude from the applicable 3/4t hole. Set the response to 80% FSH. This establishes primary reference sensitivity for Zone 2. Mark the amplitude and sweep positions on the CRT and record the data on the Calibration Data Sheet.

7.0 Examination

7.1 Scanning Sensitivity

- 7.1.1 <u>0° Technique- Scanning sonsitivity shall be conducted at a minimum of (2x) two times the reference sensitivity when possible. At no time shall scanning be performed at less than the reference sensitivity established during calibration without the approval of the cognizant Level III. Approval may be documented during data review. It is intended that scanning sensitivity be sufficient to maintain an average 80% FSH back reflection wherever possible.</u>
- 7.1.2 Angle Beam Technique- Scanning sensitivity shall be conducted with a gain setting that provides an average ID noise level between 5% and 25% in the part to be examined. At no time will the scanning sensitivity be less than the reference sensitivity established during calibration without the approval of the cognizant Level III. Approval may be documented during data review.

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 6 of 9

7.2 O° Examination

7.2.1 The 0° examination shall be performed on the overlay and the weld and base material beneath the overlay to the extent possible. This examination is performed to verify the integrity of the overlay to base material bonding and to detect laminar reflectors in the base material beneath the overlay that could interfere with angle beam examinations.

7.3 Angle Beam Examinations

7.3.1 Examination for Zone 1.

- 7.3.1.1 Reflectors Oriented Parallel to the Weld The search unit shall be placed on the weld overlay surface with the sound beam directed perpendicular to the weld beneath the overlay deposit, oscillating approximately ±10° and manipulated laterally and longitudinally so that the sound bc passes through the examination zone as shown in Figure 1. The search unit shall then be turned 180°, and the scans repeated.
- 7.3.1.2 Reflectors Oriented Transverse to the Weld

The search unit shall be placed on the weld overlay surface with the sound beam directed parallel to the weld beneath the " overlay deposit, oscillated approximately \div 10° and manipluated laterally and longitudinally so that the sound beam passes through the Examination zone as shown in Figure 1. The search unit shall then be turned 180° and the scans repeated.

7.3.1.3 Scans shall be identified as shown in the base procedure.

7.3.2 Examination for Zone 2

7.3.2.1 Reflectors Oriented Parallel to the weld

The search unit shall be placed on the weld overlay surface with the sound beam directed perpendicular to the weld beneath the overlay deposit, oscillated approximately + 10° and manipulated laterally and longitudinally so that the sound beam passes through the examination zone as shown in Figure 1. The examination shall be performed from both sides of the weld beneath the overlay deposit where configuration permits.

7.3.2.2 Reflectors Oriented Transverse to the Weld

To detect discontinuities which are essentially transverse to the weld, the skew angles for various pipe wall thicknesses are as shown in the base procedure. The examination shall be performed on the required volume in 2 directions as shown in Figure 1. Other skew angles may be used if in the opinion of the Level III more meaningful data can be obtained.

7.3.2.3 Scans shall be identified as shown in the base procedure.

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 7 of 9

Data Recording



8.1.1 Base Material Indications

Record on the data sheet all areas of case material which exhibit a total loss of back reflection. In addition, record all areas where intermediate reflectors appear. If numerous overlapping indications of lesser amplitudes exist which in the opinion of the Level II could prevent a meaningful angle beam examination they shall be documented. These indications shall be recorded using the back reflection sensitivity established.

8.1.2 Indications Within the weld and Required Volume

- 8.1.2.1 The search unit position (W), search unit location (L) the sweep reading to the reflector (SW) at the peak amplitude point and reflector end points shall be recorded to 20% of DAC,or 20% of DAC and 100% of DAC for reflectors that equal or exceed 100% of DAC.
- 8.1.2.2 Any indication suspected to be a crack, lock of fusion or lack of penetration shall be recorded regardless of amplitude. All indications recorded per the above requirements shall be investigated to the extent necessary to determine the shape, identity, and location of the reflector. Measurements shall be recorded in inches to the nearest .1".

8.2 Angle Beam Indications

- 8.2.1 All angle beam indications exceeding 20% FSH above the average noise level shall be recorded on the examination data sheets. Any indications considered to be a crack, lack of fusion, or lack of penetration shall be recorded regardless of amplitude.
- 8.2.2 Refer to the base procedure for relationship between transducer movements (postions W1,Wm,W2), weld centerline (W0), weld reference point (L0), and location and length of indications (L1 and L2).
- 8.2.3 Each indication, which is considered to be a defect, shall be recorded as follows:
 - 8.2.3.1 Record the peak amplitude, and the search unit position, the search unit location, the sound beam direction (1 thur 10), and the sweep reading to the reflector, at the peak amplitude point. End points shall be at the points where the signal cannot be discerned from noise.
 - 8.2.3.2 L and W measurements shall be recorded in inches to the nearest 1".

Procedure: UT-AUSTENITIC-M SUPPLEMENT 1 Revision: 1 Date: 5/6/87 Page: 8 of 9

8.2.4 GEOMETRIC CONDITIONS

8.2.4.1 Indications from ID root and counterbore may be recorded once per paragraph 8.2.3.1 provided the examiner periodically checks the transducer position and sweep readings at the peak amplitudes. The examiner shall record on the Examination Data Sheet the extent to which the indications occur (i.e. Inermittent 360°, or "Intermittent 0" to 32").

8.3 Basis for Reflector Determination

The initial determination of geometric or defect conditions shall be based on plotting of the recorded data, review of radiographs or additional examinations. The basis for determination shall be documented in the examination reports.

8.4 Final evaluation and dispositioning of indications is the responsibility of PECO.

.O REPORTS AND RECORDS

9.1 Reports and records shall be in accordance with the base procedure.



Procedure:	UT-AUSTENITIC-M SUPPLEMENT 1			
Revision:	1			
Date:	5/6/87			
Page:	9	of	9	

-

Ţ

.

E

2



1 · ·

-

10

8

1

NOT TO SCALE



EXAMINATION ZONES AND VOLUME

GENERAL S ELECIHIC