VERMONT YANKEE
NUCLEAR POWER CORPORATION

50-271

2.C.2.1
FVY 82-132

RD 5, Box 169, Ferry Road, Brattleboro, VT 05301

December 21, 1982

REPLY TO:
ENGINEERING OFFICE
1671 WORCESTER ROAD
FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Division of Licensing
Domenic B. Vassallo, Chief
Operating Reactors Branch #2

References:
a) License No. DPR-28 (Docket 50-271)
b) USNRC Letter to VYNPC, dated November 8, 1982
c) VYNPC Letter to USNRC, dated July 1, 1981, Response to NRC Generic Letter 81-04
d) VYNPC Letter to USNRC, dated April 8, 1982, Proposed Change No. 77 to Technical Specifications, Supp. 1
e) USNRC Letter to VYNPC, dated February 26, 1981, Implementation of NUREG-0313, Rev. 1 (Generic Letter 81-04)
f) VYNPC Letter to USNRC (FVY 82-121), dated 11/24/82

Dear Sir:

Subject: Additional Information Regarding NUREG-0313, Revision 1

This letter is written in response to Reference (b), which requested that we provide additional information regarding Reference (c). Reference (c) constituted our original response to USNRC Generic Letter 81-04, and was supplemented by Reference (d), which proposed a Technical Specification change to provide for compliance with the intent of NUREG-0313, Rev. 1. Attachments (A), (B), and (C) contain the information requested.

It should be noted that the information provided reflects our position as of April 1982 (consistent with Reference (d)) and may be subject to change. Based on the current situation relative to the Intergranular Stress Corrosion problem, we are carefully monitoring the events taking place at other nuclear stations and reassessing the appropriateness of our position. This reassessment will culminate in revision and resubmittal of our Inservice Inspection Program, prior to the 1983 refueling outage.

We trust that the information provided is responsive to your request. If you need any further information, please do not hesitate to contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Warren P. Murphy
Vice President and
Manager of Operations

WPM/dm

A001

ATTACHMENT A

1. Unidentified Leakage Monitoring (IV.B.1 of NUREG-0313, Rev. 1)

Request 1.a: Identify the methods to detect and monitor unidentified leakage in the pressure boundary piping of your BWR. Some of these methods are enumerated in Regulatory Guide 1.45, Paragraph B.

Response: The major systems available to monitor unidentified leakage are the drywell floor drain sumps and the Containment Air Monitor (CAM). Some of the other sources of information available to the operator to assist him in detecting leaks in the containment include the drywell equipment drain sumps, drywell pressure and temperature, torus level and drywell cooler inlet and outlet water temperatures.

Request 1.b: Please fill out the attached table of information regarding the systems identified in the above paragraph.

Response: See Attachment B.

2. Augmented ISI of Nonconforming Service Sensitive Pipe

Request 2.a: Please identify the methods for augmented ISI of the nonconforming service sensitive pipe (IV.B.3 of NUREG-0313, Rev. 1).

Response: The methods used at Vermont Yankee for augmented ISI of nonconforming service sensitive pipe comply with ASME Sec. XI, 1974 Edition through the Summer 1976 Addenda, including Appendix III. These methods have been modified to limit the selection of ultrsonic transducers to the dual element, focused variety with a frequency of 1.5MHZ. Each transducer is selected to focus on a specific thickness of material. Scanning is performed at a minimum gain of + 12 db from reference. The reference level is set at the response from a 10% notch in pipe of a size, schedule, and material specification which is identical to that of the piping to be examined. Scan motion includes skewing of the search unit $\pm$ 30° from the primary direction. Scan direction is both axial and perpendicular.

When an indication is evaluated as a possible crack, the UT examination is supplemented, as practical, with radiography. The radiography is performed using conventional techniques, optimizing film and processing methods and controlling geometric unsharpness. This procedure is standard ASME Section III/V radiography.

Request 2.b: Provide a copy of the specifications for the augmented ISI method or methods (IV.B.3 of NUREG-0313, Rev. 1).

Response: See Attachment C.

Request 2.c: Identify each of the augmented ISI methods used and the training and certification levels the individuals using those methods received. Indicate if cracked specimens are used in your training (IV.B.3 of NUREG-0313, Rev. 1).

Response: The augmented methods used are those described in paragraph 2.a. The inspection team consists of a Level II and a Level I UT examiner, qualified in accordance with ASNT-TC-1A. The examiners are selected on the basis of experience, and satisfactory completion of a written (general) exam on NDE and a practical test on a cracked sample of 304 stainless steel, 12" Schedule 80 pipe supplied by EPRI. Training is provided prior to selection of the examination personnel. The training varies from 4 to 8 hours depending on the experience level of the contractor personnel. Prior to the first use of the current contractor, EPRI samples from other area BWR's were obtained and the contractor personnel were trained and tested on these samples.

Request 2.d: Identify the proportion of the nonconforming service sensitive pipe that is being inspected (IV.B.2.b of NUREG-0313, Rev. 1).

Response: At the present time, we intend to include in our augmented inspection program all dissimilar metal welds and 25% of the other welds in each system which have a potential for increased susceptibility to IGSCC, unless otherwise limited as discussed in our response to Item 2.e.

Request 2.e: Identify the inspection interval of each system of the nonconforming service sensitive pipe (IV.B.2.b of NUREG-0313, Rev. 1).

Response: With the exception of 304 SS welds in the Core Spray and recirculation riser piping, the required number of welds in each nonconforming service sensitive piping run will be inspected once during each of three consecutive refueling outages. Thereafter, if no rejectable indications are found, the inspection interval will be extended to require that these welds be examined once during each of three consecutive 36-month periods, coincident with scheduled refueling outages. If no IGSCC is detected after three such inspections, the interval will expand further to require inspection of these welds once during each successive 80-month period.

Although NUREG-0313, Rev. 1, states that all Core Spray piping welds in this category must be examined once during each of three consecutive refueling outages, each remaining 304 SS weld in this piping was previously examined three times between 1975 and

1977, and no IGSCC was detected. Therefore, the augmented inspection program will begin with one inspection of each weld in on subsystem or equivalent during each of three consecutive 36-month periods, and will revert to one inspection of each weld in one subsystem or equivalent during successive 80-month periods thereafter if no IGSCC is discovered.

As previously discussed in Reference (d), the examinations to be performed during each refueling outage will be limited to that number which can be completed within the constraints of our established ALARA policy. At the present time a 10 man-Rem limit is being considered.

Due to the excessively high radiation level of the recirculation riser piping, increased volumetric examination of nonconforming welds will not be performed. The existing leakage detection and monitoring system provides adequate assurance that leakage from this piping will be detected in a timely manner. Additional support for this position is provided by the fact that 50% of all riser welds were ultrasonically inspected between 1978 and 1980, and no instances of IGSCC were discovered. Code-required volumetric and hydrostatic inspections will continue to be performed.

Request 2.f: Identify the Stress Rule Index Numbers for the welded joints in the nonconforming service sensitive pipe (IV.B.1.b(6) of NUREG-0313, Rev. 1).

Response: Vermont Yankee does not presently have Stress Rule Index numbers for these welded joints.

3. Augmented ISI of Nonconforming Non-Service Sensitive Piping

Requests 3.a: Please identify the methods for augmented ISI of the nonconforming non-service sensitive piping (IV.B.3 of NUREG-0313, Rev. 1).

3.b: Please provide a copy of the specifications for the augmented ISI method or methods (IV.B.3 of NUREG-0313, Rev. 1).

3.c: Identify each of the augmented ISI methods used and the training and certification levels the individuals using those methods received. Indicate if cracked specimens are used in your training (IV.B.3 of NUREG-0313, Rev. 1).

Response: The inspection methods and personnel qualification requirements used at Vermont Yankee for examination of nonconforming nonsensitive piping are identical to those used for service sensitive piping.

Request 3.d: Identify the proportion of the nonconforming nonservice sensitive piping that is being inspected (IV.B.2.b of NUREG-0313, Rev. 1).

Response: At the present time, we intend to include in our augmented inspection program all dissimilar-metal welds and 25% of other high susceptibility welds in each system, unless otherwise limited as discussed in our response to Item 3.f.

Request 3.e: Identify the Stress Rule Index Numbers for the welded joints in the nonconforming nonservice sensitive piping (IV.B.1.b(6) of NUREG-0313, Rev. 1).

Response: See our response to Item 2.f.

Request 3.f: Identify the proposed inspection interval for each system of nonconforming nonservice sensitive piping (IV.B.1.b of NUREG-0313, Rev. 1).

Response: With the exception of welds in the Standby Liquid Control and Vessel Drain Lines, the required number of welds in each nonconforming nonservice sensitive piping run will be inspected once during an 80-month period. Thereafter, if no rejectable indications are found, the inspection interval will revert to 120 months in accordance with ASME Section XI. The examinations to be performed during each refueling outage will be subject to the ALARA considerations identified in our response to Item 2.e.

Standby Liquid Control Line SLC-11 and Vessel Drain Lines CUW-19 and CUW-400 are constructed entirely of socket-welded joints, with the exception of the nozzle to safe-end weld on SLC-11. Because socket-welded configurations do not permit meaningful volumetric examination, and since surface examination is ineffective in detecting IGSCC, nondestructive inspection of this piping (other than visual inspection during code-required hydrostatic testing) will not be performed. The existing leakage detection and monitoring system provides adequate assurance that any leakage from the piping will be detected in a timely manner. This position is supported further by the fact that socket-welded joints rarely suffer from IGSCC since the sensitized areas are removed from the aggressive coolant environment. The SLC nozzle to vessel butt weld joins two conforming materials and is therefore exempt from augmented inspection.

The Head Spray Line, which was identified as nonconforming in Reference (c), has since been removed. The two remaining welded joints at the nozzle will be volumetrically examined as stated above.

4. Coolant Leakage (IV.B.1.b(2) of NUREG-0313, Rev. 1)

Request: NUREG-0313, Rev. 1, states that:

Plant shutdown should be initiated for inspection and corrective action when any leakage detection system indicates, within a period of 24 hours or less, an increase in rate of unidentified leakage in excess of 2 gallons per minute or its equivalent, or when the total unidentified leakage attains a rate of 5 gallons per minute or its equivalent, whichever occurs first. For sump level monitoring systems with fixed-measurement interval method, the level should be monitored at 4-hour intervals or less.

Please provide technical justification for not including this in your Technical Specifications. This justification should include data or operating experience.

Response: Your letter requests that we commit to monitor sump level every 4 hours. We intend to maintain our current once per 8-hour shift determination of unidentified leakage because a more frequent determination would cause an unjustified departure from our current practice of monitoring certain key plant parameters on a shift basis. As we stated in Reference (e), there is no technical justification in NUREG-0313, Rev. 1, or in industry experience which indicates that the bases of our existing Technical Specifications is deficient. There is no data that we know of which indicates that a critical crack is more likely to propoagate faster and that more frequent checks of leakage rate are necessary. Industry experience continues to confirm that IGSCC results in slowly propagating cracks. In addition, the sump fill and pump out timers provide alarms to the operators to indicate when leakage is rapidly increasing. The operators may then calculate leakage rate from the flow integrators and take whatever action is required.

Throughout our operating history we have had excellent success in detecting and acting upon leakages as low as less than 1 gpm increase over normal. We are confident that the performance of our detection systems meets their intended design.

Your letter also requests that we commit to limiting leakage rate increase to less than 2 gpm. The lack of evidence to indicate that IGSCC rapidly increases crack growth rate confirms that the 5 gpm leakage limit is still valid. The 5 gpm limit conservatively assumes that all the leakage is coming from a single crack in the worst case line (a 4" line which no longer exists in the containment). There is no justification for adding a more restrictive Technical Specification requirement. Please note that Vermont Yankee currently has an administrative limit which requires the Shift Supervisor to take action to determine the cause of any 2 gpm increase above normal of unidentified leakage in any 8-hour period. This administrative limit, along with the operational flexibility requested in Reference (f) to deinert the containment for shortterm inspections and maintenance, will result in rapid response to unidentified leakage.

ATTACHMENT B

INFORMATION REQUESTED ON LEAK DETECTION SYSTEM

Type of System	(1) Is System Operable (Yes/No)	(2) Leak Rate Sensitivity (gpm)	(3) Time Required To Achieve Sensitivity (hours)	(4) Is System Functional After SSE (Yes/No)*	(5) Control Room Indications (alarms) (recorders)	(6) Calibration of Testing During Operation (Yes/No)	(7) Documentation Reference For (1) Thru (6)
Drywell floor drain sumps	Yes	0.25 gpm	3-4	No	Integrated flow indicator Flow recorder Pump running lights Sump pump operating too frequently alarm Sump pump operating for too long a duration alarm Sump high level alarm Sump fill and pump out timer indicators	Calibrated during each refuel outage but could be calibrated during operation	FSAR Control wiring diagrams
CAM	Yes	Variable, depending on activity level of leak, leak location, amount of fuel failures, percent of leak which flashes to steam, etc.		No	Elec. pwr. loss, high rad., low rad., and flow fault alarms Radiogas and particulate activity, recorders and indicators.	Yes	FSAR Control wiring diagram

*Note that several of the secondary systems available to monitor leakage (as specified in our response to request 1.a) are seismically qualified.

Attachment (C)

NUCLEAR SERVICES DIVISION INSERVICE INSPECTION	PROCEDURE REVISION PAGE	YA-UT-10 3 1 of 20

PROCEDURE FOR

UNCONTROLLED COPY

YA-UT-10

ULTRASONIC EXAMINATION OF PIPING

AUSTENITIC WELDS INCLUDING

APPENDIX A FOR DETECTION OF IGSCC

REV.	PREPARED BY	DATE	VERIFIED BY	DATE	QAD REVIEW	DATE	APPROVED BY	DATE
0								
1								
2								
3	Thomas Linnell	5/26/82	T. Linnell for G. Perkins	9/8/82	[illegible]	9/9/82	[illegible]	9/27/82
4								
5								

REV.	PREPARED BY	DATE	VERIFIED BY	DATE	QAD REVIEW	DATE	APPROVED BY	DATE
2	[illegible]	Aug 29 79	[illegible]	Aug 29 79	[illegible]	9/28/79	[illegible] for D. Moody	8/29/79	[illegible]	Aug 29 79
3		12								
4										
5										

*These revisions (0 and 1) are on file in the Mechanical Engineering Group.

YANKEE ATOMIC ELECTRIC COMPANY
1671 Worcester Road Framingham, Ma. 01701

1.0 SCOPE

1.1 This procedure is for the ultrasonic examination of similar metal groove and/or fillet welds in austenitic piping (cast, forged or plate) having a nominal wall thickness of 0.20 to 6 inches by the contact method in accordance with below referenced codes and addendas.

1.2 This procedure shall be used in conjunction with YA-UT-1 unless otherwise specified. YA-UT-1 contains all the general requirements applicable to this examination procedure. This procedure contains all the specific application requirements for the examinations of 1.1.

1.3 Appendix A to this procedure shall be used when detection of intergranular stress corrosion cracking is required. This Appendix shall be used only with permission of the NSD ISI coordinator or his designate.

2.0 REFERENCES

2.1 Section XI, 1977 Edition through Summer of 1978 Addenda.

3.0 CALIBRATION BLOCKS

3.1 Material - The material from which the block is fabricated shall be from one of the following:

a) Nozzle drop out from the component;
b) A component prolongation; or
c) Material of the same material specification, product form, and heat treatment as one of the materials being joined.

If material of the same specification is not available, material of similar chemical analysis, tensile properties, and metallurgical structure may be used. When the examination is to be performed from only one side of the joint, the calibration block material shall be of the same specification as the material on that side of the joint. The finish on the surfaces of the block shall be representative of the surface finishes of the piping.

3.2 Design - Basic calibration blocks shall contain circumferential and longitudinal notches whose sides are perpendicular to the surface, at least 1.0 inch long, on the OD and ID surfaces. Allowable notch configurations are shown in Figure 1. Notch width shall be no greater than 1/4 inches. Notch depth shall be 10% of the nominal wall thickness. The blocks shall generally conform to the design shown in Figure 1. Alternate block design and layout may be used provided similar beam paths are utilized.

4.0 SEARCH UNITS

4.1 A shear wave search unit with a nominal 45° beam angle ±2° shall be used for the examination. Alternate angles may be used with Owner approval in order to completely scan the required examination volume. Search units may contain either single or dua transducer elements. Search units with contoured contact wedges may be used to aid ultrasonic coupling. Calibration must be done with the contact wedges used during the examination.

4.2 Transducer nominal frequency shall be 2.25 MHz unless variables such as material grain structure require the use of other frequencies to assure adequate penetration.

4.3 Physical interference between the transducer shoe and the weld crown may preclude half-vee examination of the weld root as shown in Figure 8. If these variables are such that the Dimension A on Figure 8 is greater than:

0.93t = 43° to 45°
1.6t = 58° to 60°
2.5t = 68° to 70°

The beam path shall be increased at least one-half vee.

If the search unit wedge dimensions cannot be met, the interfering conditions may be eliminated by:

a) using a full "V" technique;
b) using a smaller search unit;
c) increasing the beam angle.

5.0 CALIBRATION

5.1 Position the search unit for maximum response from the notch on opposite sides of the calibration standard, which corresponds to a thickness of T; (4/8 th's V-path). Adjust the sweep control to display the indications from the notch at a convenient interval on the sweep range, provided the sweep is used to the maximum extent practical. Mark the indication location on the screen and record it on the calibration data sheet.

5.2 Position the search unit for maximum response from the notch on the same side of the calibration standard, which corresponds to a thickness of 2T (8/8 th's V-path). Mark the indication location on the screen and record it on the calibration sheet.

5.3 Additional thicknesses may be added in a similar manner as required to fully examine the volume required by 5.0.

5.4 Sensitivity levels shall be established using the notch and shall be applicable to that region of the calibrated sweep length providing complete examination of the weld and HAZ. To establish

calibration, maximize the signal amplitude from the notch with the highest amplitude and set gain to 80% of full screen height (FSH). Without changing the gain control, determine the peak indication amplitudes from the remaining points in the examination region and construct a distance amplitude curve (DAC). This curve shall be the primary reference level.

5.5 When the examination technique is limited to a thickness of T (4/8 V path), side drilled holes shall be used to obtain the slope and shape of the DAC. A minimum of two holes, each of the same diameter, located at 1/4T and 3/4T, shall be placed in the end surfaces of the calibration standard. The minimum hole length shall be 1-1/2 inches. Calibration shall be accomplished by constructing a DAC from the side drilled holes so that the maximum amplitude point is at 80% FSH. Once the shape and slope are determined and marked on the screen, the curve shall be extrapolated 1/4T to cover the full examination thickness. Next, establish the sensitivity from the ID surface notches by setting the indication amplitude at the level of the DAC curve.

6.0 EXAMINATION

6.1 Reflectors Parallel to the Weld Seam - The angle beam examination of the weld and HAZ shall be done by at least a full V-path from two sides of the weld, where practicable. The direction of scanning shall be perpendicular to the weld centerline. When examination is limited to one side of the weld, this shall be clearly noted on the data sheet, since the weld and 1/2 inch base material on each side of the weld will have to be examined by a surface method. (See Sections 5.5, 4.3.)

6.2 Reflectors Transverse to the Weld Seam

a) For preservice examination, or if no previous UT exam data exists, angle beam examination of reflectors transverse to the weld shall be done on the weld crown parallel to the weld centerline on a single scan path to examine the weld root by one-half V-path in two directions along the weld, where practical.

b) For inservice examination, only those welds showing reportable preservice indications need be examined for transverse reflectors.

6.3 Extent of Scanning

a) Pipe Butt Welds - For Safety Class 1, the area to be examined shall include circumferential pipe welds and at least 12 inches of each longitudinal weld intersecting the circumferential weld selected for examination. The examination volume shall include the weld and the adjoining base material, as shown in (Figure 2). For Safety Class 2 Components, the areas shall include circumferential welds, branch connection welds, and at least a 2-1/2t length of

each longitudinal weld intersecting a circumferential weld (Figure 3).

b) Pipe Branch Connections - Pipe branch connections on branch runs exceeding 6 inches NPS shall be examined according to the following criteria:

1) The main run adjacent to the branch connection shall be examined for one pipe wall thickness (main run thickness).

2) The weld metal shall be examined.

3) Two inches of base metal shall be examined adjacent to the weld on the branch run.

4) A minimum of a full "V" examination shall be used.

5) When a full "V" exam is not possible, a half vee exam shall be performed and the above exam area shall be examined using a liquid penetrant or magnetic particle techniques as appropriate.

6) For Safety Class 1, refer to Figures 4, 5, and 6 for exam areas and volumes, and Figure 7 for Safety Class 2.

6.4 Reflectors $<$100% DAC - Report all indications that equal or exceed 50% of DAC, by recording peak indication amplitude as a percent of DAC, the sweep distance, and the search unit location and orientation.

6.5 Reflectors $\geq$100% DAC - For each indication that equals or exceeds 100% of DAC, the following information shall be recorded:

a) Peak amplitude as either dB from the reference level, or as a percent of DAC, sweep reading to reflector; search unit position; search unit location; sound beam direction perpendicular or parallel to weld centerline;

b) Minimum sweep reading to reflector and position of search unit at reference level amplitude;

c) Maximum sweep reading to reflector and position of search unit at the reference level amplitude;

d) Search unit positions or locations parallel to the reflector at the end points where the reflector amplitude equals the reference level (length of reflector);

e) Obtain data from successive scans at increments no greater than 9/10 of the transducer dimension measured parallel to the scan increment change (25% overlap);

f) Record all dimensions to the nearest 1/10 of an inch.

6.6 Ultrasonic Reflectors of Geometric Origin - Ultrasonic indications that can be identified as reflectors due to piping surface configuration, such as weld root, crown or variations in metallurgical structure of materials at interfaces, such as weld-to-base metal interface, may be classified as geometric responses. Such reflectors need not be characterized as indications provided the following requirements are met:

a) The presence of geometric reflectors shall be confirmed by comparison with the fabrication drawings of pipe weld edge preparation, radiographs, or visual examination.

b) Supplemental examination methods shall be used, if necessary, to confirm the presence of geometric reflectors.

7.0 ACCEPTANCE CRITERIA

7.1 The indications recorded in 6.5 shall be compared to the acceptance standards of IWB-3514 1977 Edition, ASME Section XI up to and including Summer of 1978 Addenda.

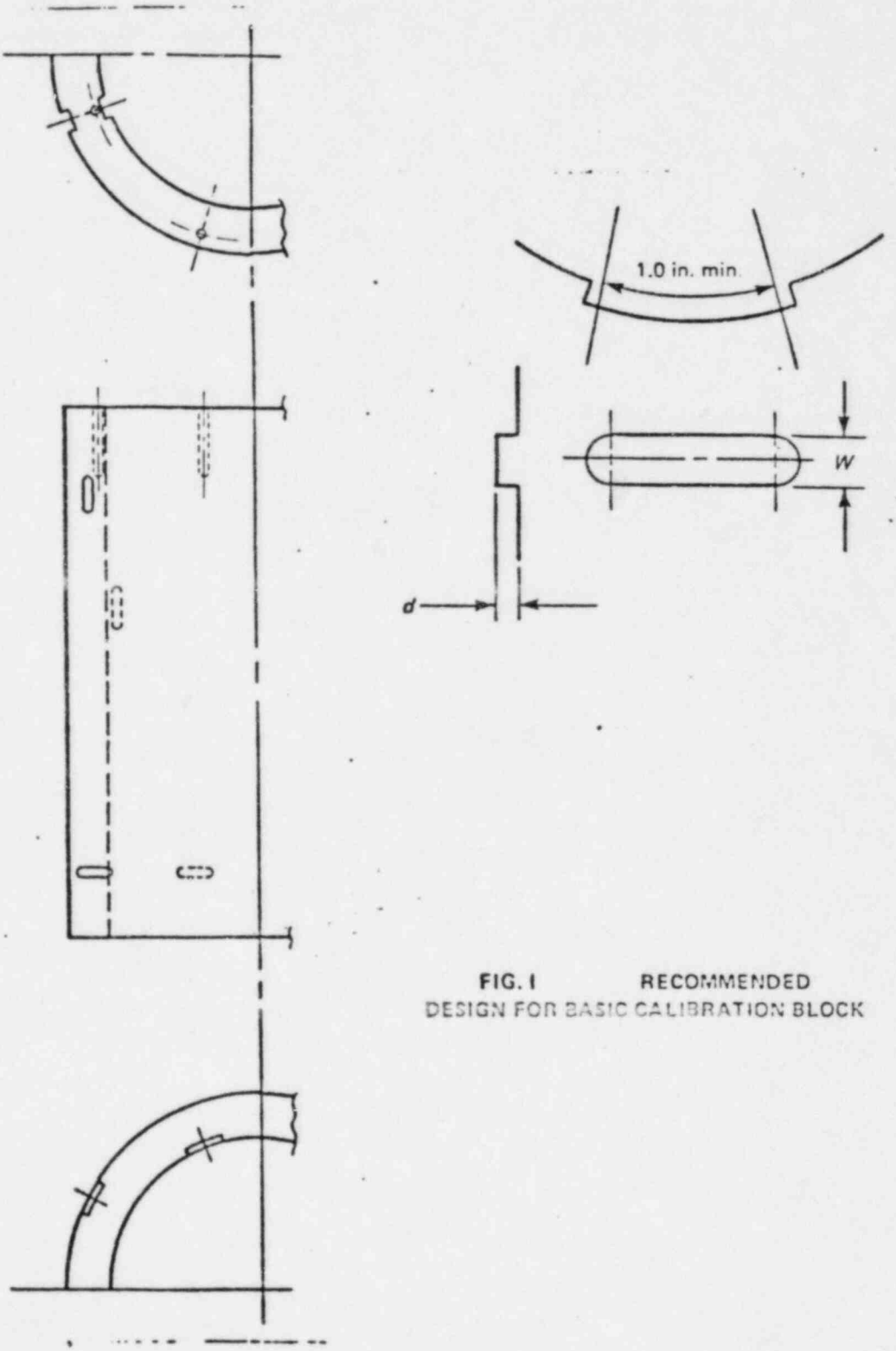
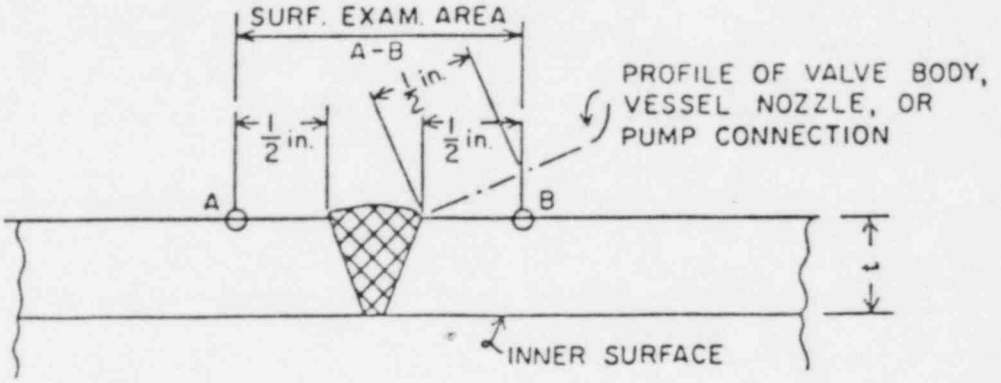


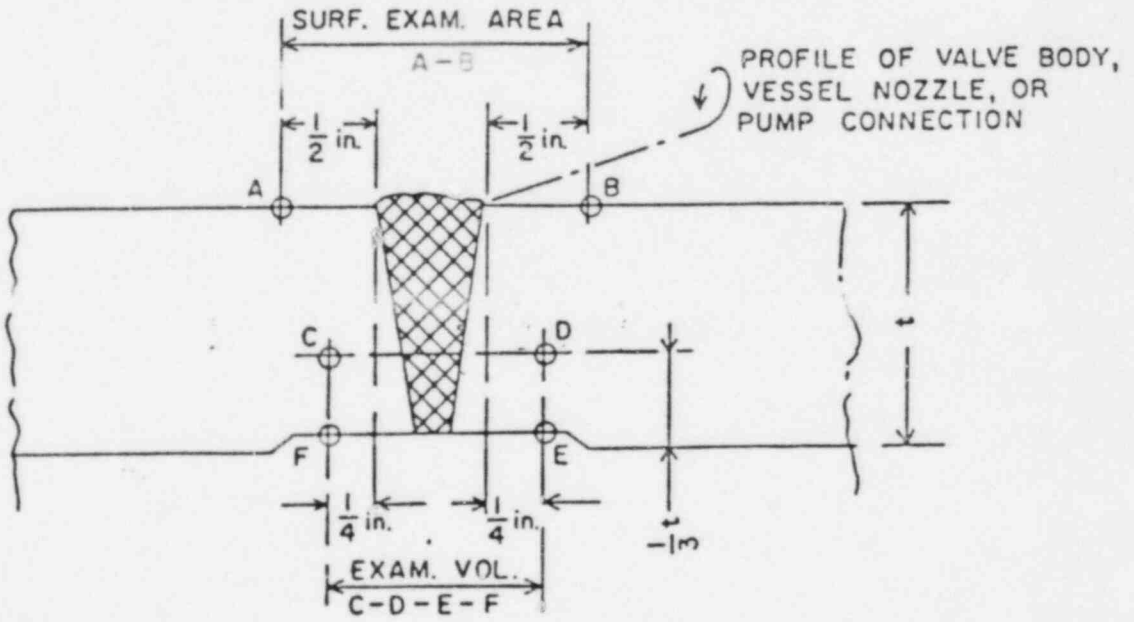
FIG. 1 RECOMMENDED
DESIGN FOR BASIC CALIBRATION BLOCK

Pressure Retaining Weld in Piping
Safety Class 1

FIGURE 2



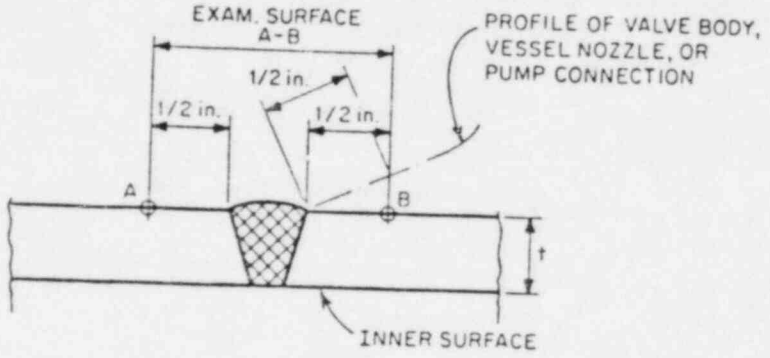
NOM. PIPE SIZE LESS THAN 4 IN.



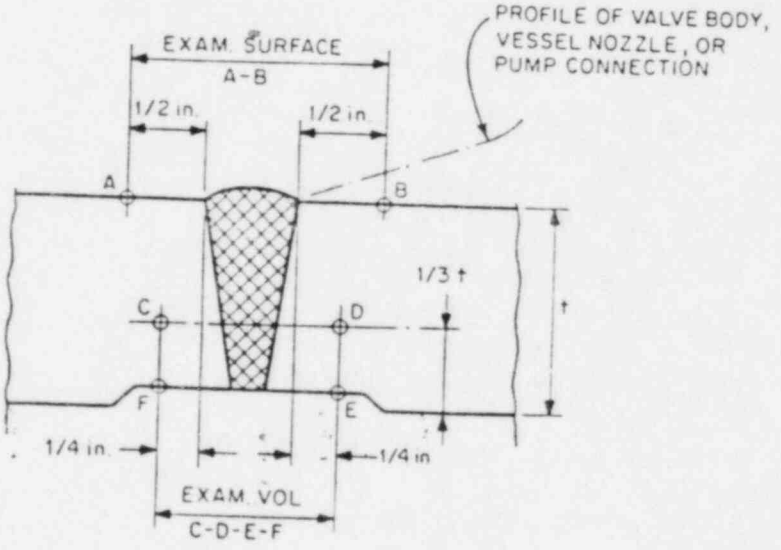
NOM. PIPE SIZE 4 IN. AND GREATER

NOTE: Alternate to examination volume CDEF can be ABEF without surface exam

Figure 3



NOM. PIPE WALL THICKNESS, t = 1/2 in. OR LESS



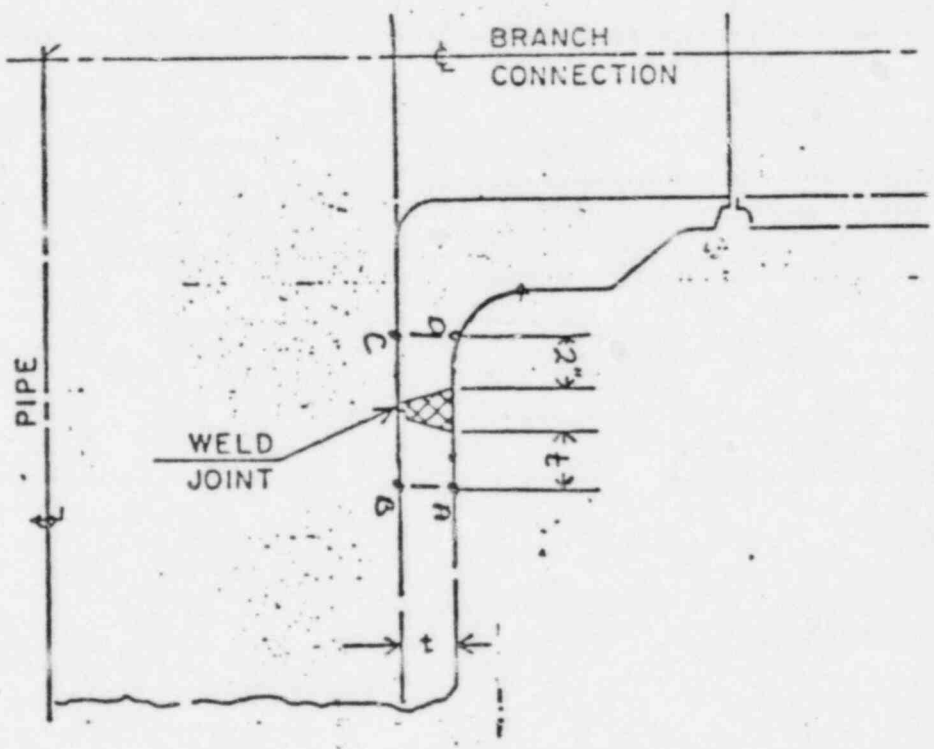
NOM. PIPE WALL THICKNESS t OVER 1/2 in.

Pressure Retaining Welds in Piping
Safety Class 2

Figure 4

Branch Connections

Safety Class 1

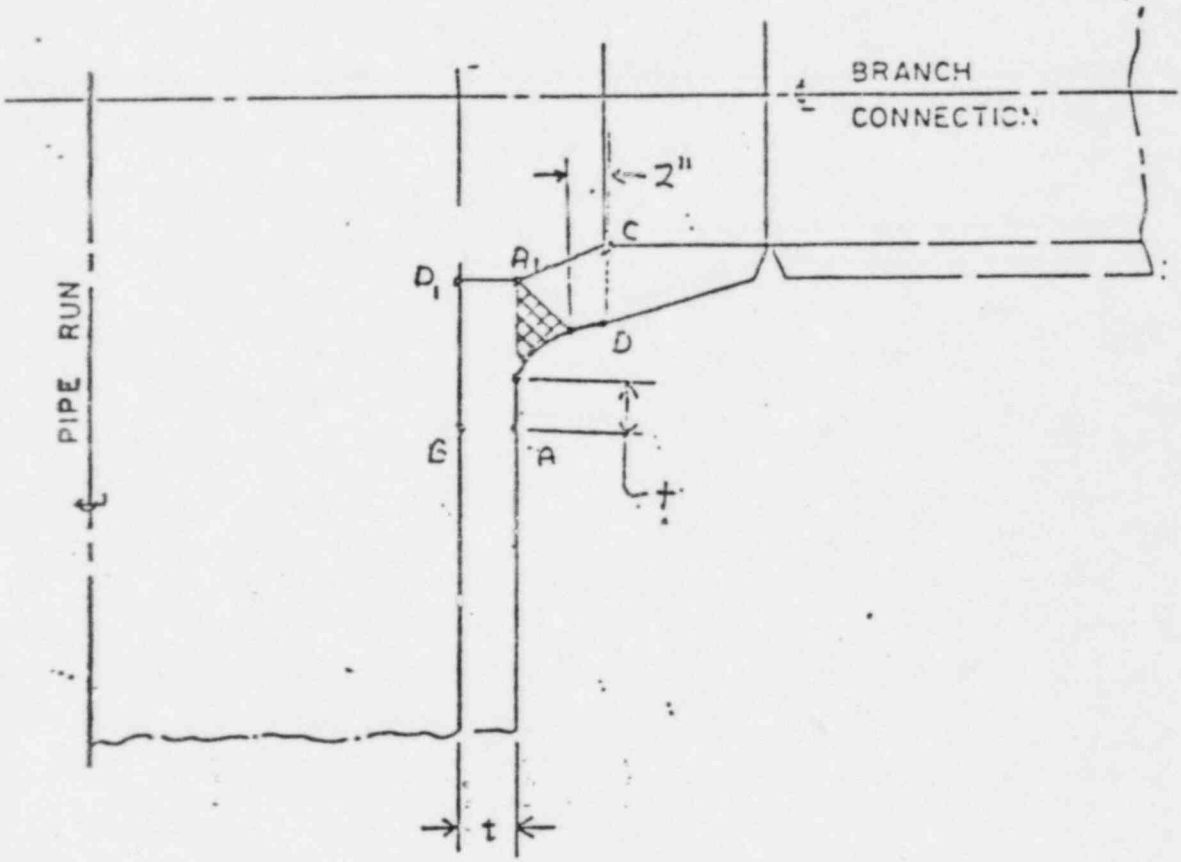


Vol. Exam (UT) A-B-C-D as practical. Scan limits to be noted.
Surface Area (PT or MT) A-D.

Figure 5

Branch Connections

Safety Class 1

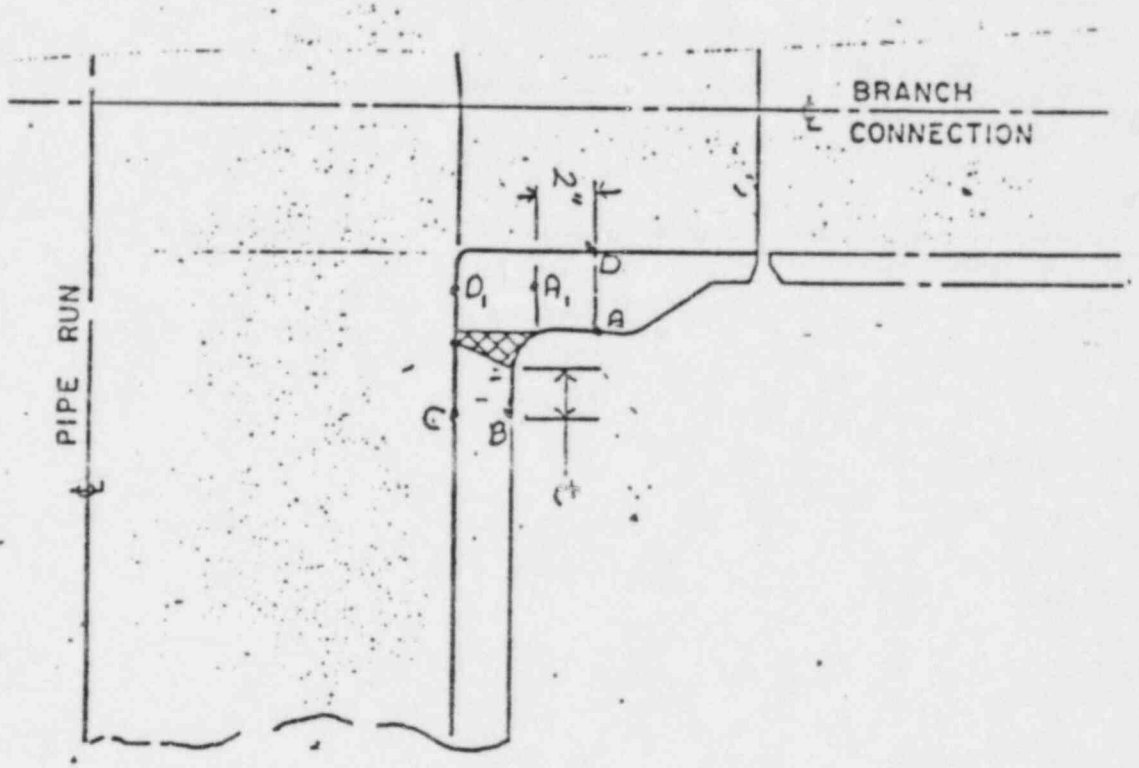


Vol. Exam (UT) A-B-D_1-A_1 as practical. Scan limits to be noted.
Surface Area (PT or MT) A-D.

Figure 6

Branch Connections

Safety Class 1

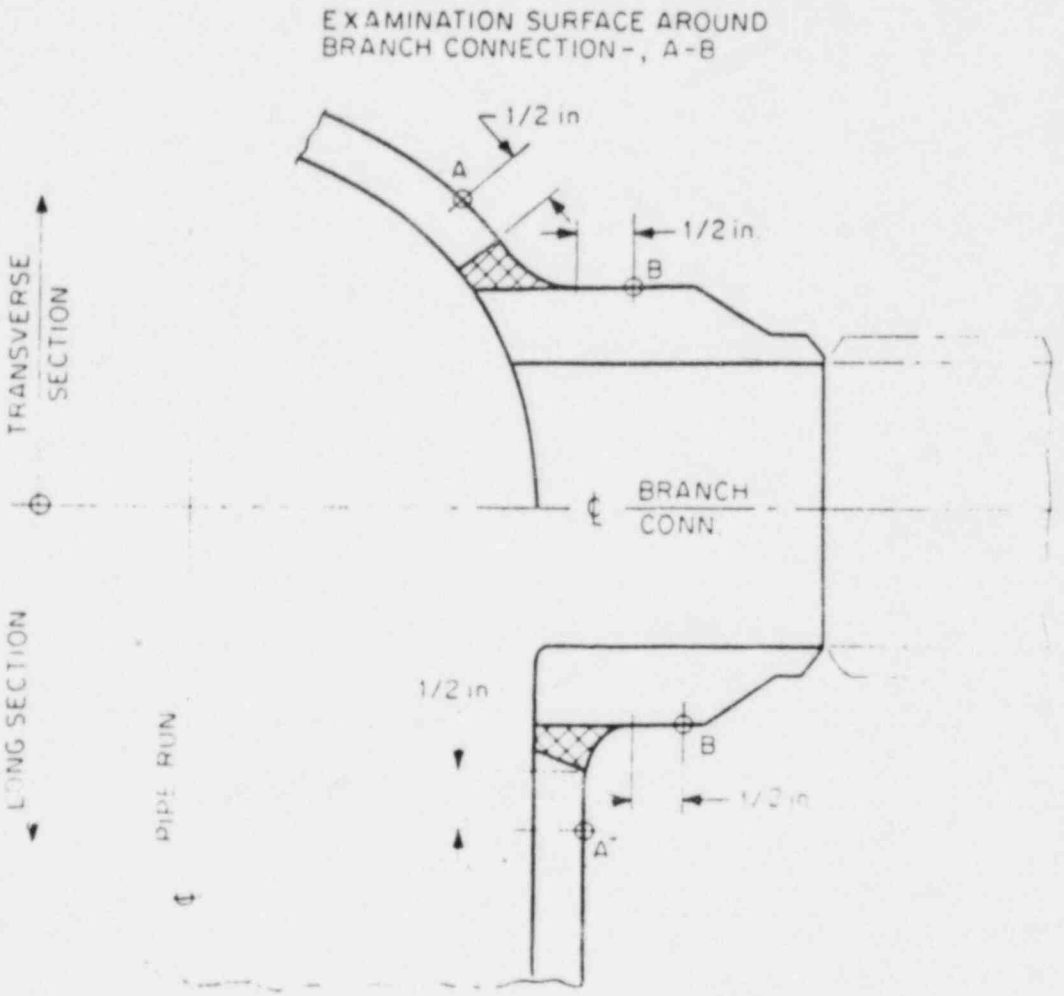


Vol. Exam (UT) B-C-D_1-A_1 as practical. Scan limits to be noted.
Surface Area (PT or MPG) A-B

Figure 7

Branch Connections

Safety Class 2



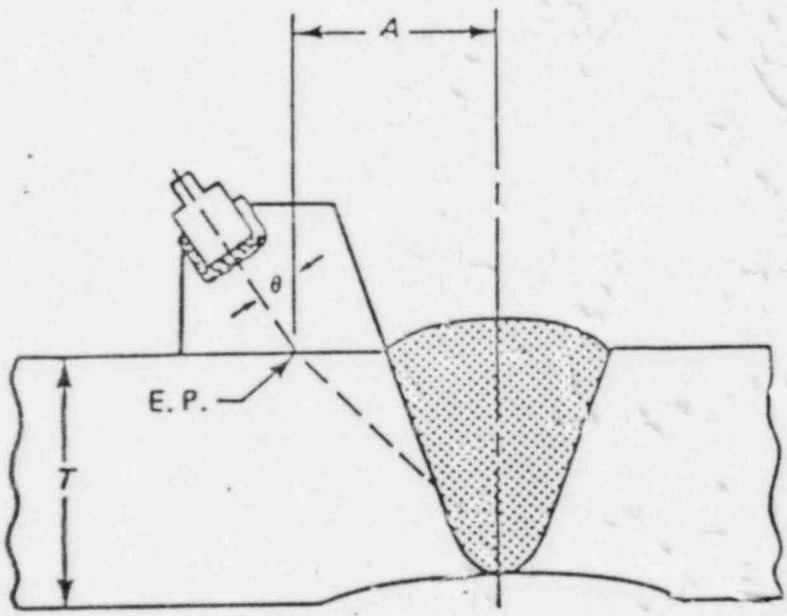


FIGURE 8

Physical Restrictions To The Weld Examination

PROCEDURE FOR ULTRASONIC EXAMINATION OF AUSTENITIC PIPING WELDS FOR INTERGRANULAR STRESS CORROSION CRACKING

A1.0 SCOPE

A1.1 This procedure is for the ultrasonic examination of similar metal full penetration butt and branch connection welds and adjacent base material having a nominal wall thickness of 0.2 to 3.5 inches by the contact method in accordance with Section XI, Appendix III.

The techniques and equipment described in this procedure have been optimized for the detection of innergranular stress corrosion cracking.

A1.2 This procedure shall be used in conjunction with YA-UT-1 unless otherwise specified. YA-UT-1 contains all the general requirements applicable to this examination procedure. This procedure contains all the specific application requirements for the examination of 1.1.

A2.0 CALIBRATION BLOCKS

A2.1 Material - The basic calibration blocks shall be made from material (pipe) of the same nominal diameter and nominal wall thickness or pipe schedule as those to be examined. The calibration blocks shall be fabricated from one of the materials specified for the piping being joined by the weld. If material of the same specification is not available, material of similar chemical analysis, tensile properties, and metallurgical structure may be used. When the examination is to be performed from only one side of the joint, the calibration block material shall be of the same specification as the material on that side of the joint. The finish on the surfaces of the block shall be representative of the surface finishes of the piping.

A2.2 Design - Basic calibration blocks shall contain circumferential and longitudinal notches whose sides are perpendicular to the surface, at least 1.0 inch long, on the OD and ID surfaces. Allowable notch configurations are shown in Figure 1 of this procedure. Notch width shall be no greater than 1/4 inch. Notch depth shall be 10% of the nominal wall thickness. The blocks shall generally conform to the design shown in Figure 1 of this procedure. Alternate block design and layout may be used provided similar beam paths are utilized.

A2.3 Angle Beam Calibration Block - For examination of austenitic piping welds (specifically 304S.S). The following blocks (FigureA-1) shall be used to determine beam index point and refracted beam angle.

a) SUS 237-1

b) SUS 237-2

A3.0 SEARCH UNITS

A3.1 The search units used for the examination shall be dual element, zone isolation 45° beam angle ± 2°, with a nominal operating frequency of 1.5 MHz, Search Unit Systems, Inc., model numbers SUS 11, SUS 10, SUS 16, SUS 39 or equivalent.

A3.2 For examination of a specific pipe wall size, the search unit shall be selected according to the following table:

PIPE WALL	SEARCH UNIT MODEL NO.	DESCRIPTION
0.2 to 0.5 inches	SUS 11	1.5 MHz, 45° shear wave, receiver element 1/4" x 3/16", transmitter element 1/4" x 3/16".
0.5 to 1.0 inches	SUS 10	1.5 MHz, 45° shear wave, receiver element 3/8" x 3/8", transmitter element 3/8" x 3/8".
1.0 to 1.5 inches	SUS 16	1.5 MHz, 45° shear wave, receiver element 3/8" x 3/8", transmitter element 3/8" x 3/8".
1.5 to 3.5 inches	SUS 39	1.5 MHz, 45° shear wave, receiver element 1/2" x 1/2", transmitter element 1/2" x 1/2".

A3.3 Physical interfer nce between the search unit shoe and the weld crown may preclude half - V examination of the weld root, if this condition exists, a one and one half - V technique will be used.

A4.0 INSTRUMENT

A4.1 The instrument used for the examination shall be Sonic Instruments, Inc., model number Mark 1 or an equivalent approved by MEG Level III and shall be calibrated in accordance with YA-UT-1, 4.0.

A5.0 CALIBRATION

A5.1 Position the search unit for maximum response from the notch on opposite side of the calibration standard, which corresponds to a thickness of T; (4/8 th's V-path). Adjust the sweep control to display the indications from the notch at a convenient interval on the sweep range, provided the sweep is used to the maximum extent practical. Mark the indication location on the screen and record it on the calibration data sheet.

A5.2 Position the search unit for maximum response from the notch on the same side of the calibration standard, which corresponds to a thickness of 2T (8/8 th's V-path). Mark the indication location on the screen and record it on the calibration sheet.

A5.3 Additional thicknesses may be added in a similar manner as required to fully examine the volume required by A8.0.

A5.4 Sensitivity levels shall be established using the notch and shall be applicable to that region of the calibrated sweep length providing complete examination of the weld and HAZ. To establish calibration, maximize the signal amplitude from the notch with the highest amplitude and set gain to 80% of full screen height (FSH). Without changing the gain control, determine the peak indication amplitudes from the remaining points in the examination region and construct a distanceamplitude curve (DAC). This curve shall be the primary reference level.

A5.5 When the examination technique is limited to a thickness of T (4/8 V-path), side drilled holes shall be used to obtain the slope and shape of the DAC. A minimum of two holes, each of the same diameter, located at 1/4T, shall be placed in the end surfaces of the calibration standard. The minimum hole length shall be 1-1/2 in. Calibration shall be accomplished by constructing a DAC from the side drilled holes so that the maximum amplitude point is at 80% FSH. Once the shape and slope are determined and marked on the screen, the curve shall be extrapolated 1/4T to cover the full examination thickness. Next, establish the sensitivity from the ID surface notches by setting the indication amplitude at the level of the DAC curve.

A6.0 SECONDARY DAC CALIBRATIONS

A6.1 If any points on the DAC curve do not appear at 20% FSH or greater, a secondary DAC curve shall be constructed as follows:

(1) All secondary DAC curves shall contain at least 2 points.

(2) The DAC point at 20% FSH or greater in amplitude and adjacent to a DAC point that falls below 20% FSH shall be brought to the primary reference level by manipulating the gain controls of the instrument. This point shall then be marked on the instrument screen. The adjacent point, previously at less than 20% FSH, shall then be marked on the screen and the two points connected with a smooth curved line. The instrument gain settings for this secondary DAC curve shall then be recorded on the appropriate Instrument Calibration Record.

EXCEPTION

When the first DAC point is the only point above 20% FSH, then the next highest point shall be brought to the primary reference level. This point shall then be marked on the instrument screen. The adjacent point, previously at less than 20% FSH, shall then be marked on the screen and the two points connected with a smooth curved line. The instrument gain settings for this secondary DAC curve shall then be recorded on the appropriate Instrument Calibration Record.

A7.0 CALIBRATION VERIFICATION and reverification shall be conducted in accordance with 5.0 of YA-UT-1.

A8.0 EXAMINATION

A8.1 Scan Sensitivity shall be adjusted to primary sensitivity reference level, as established in paragraph 5.4, plus a minimum of 12 dB gain.

A8.2 Scan Motion - During all scanning operations, the search unit shall be skewed at least 30 degrees in both the clockwise and counter clockwise directions.

A8.3 The Examination Volume shall include the weld and the adjoining base material within one wall thickness beyond the edge of the weld as shown in Figure 2 of YA-UT-10 and Figures 3, 4 and 5 o. YA-UT-10 for branch connections. All welds shall be scanned from both sides. If obstructions preclude access for scanning the position and a description of the obstructions shall be clearly noted on the data sheet.

A8.4 Scan Directions - All welds shall be scanned with a one half to one and one half V-path with the beam directed perpendicular to the weld centerline. The beam shall also be scanned in a circumferential direction, using a one half to one and one half V-path, in both clockwise and counter clockwise directions.

When a full V-path is not possible, due to crown or other obstructions, the examination area shall be examined using a liquid penetrant technique as appropriate.

A8.5 Scan Speed shall not exceed 6 inches per second.

A8.6 Scanning Overlap shall be a minimum of 25% of the search unit transmitter piezoelectric element dimension perpendicular to the direction of scan.

A9.0 RECORDING CRITERIA

A9.1 Reflectors Less than 100% DAC - Report all indications that equal or exceed 50% of DAC, by recording peak indication amplitude as a percent of DAC, the sweep distance, and the search unit location and orientation.

Any indications producing a response 20% or greater of the reference level and suspected by the examiner to be other than geometrical in nature shall be recorded and investigated to the extent necessary to determine the shape, identity and location of the reflector.

A9.2 Reflectors $\geq$ 100% DAC - For each indication that equals or exceeds 100% of DAC, the following information shall be recorded:

a) peak amplitude as either dB from the reference level, or as a percent of DAC, sweep reading to reflector; search unit position; search unit location; sound beam direction perpendicular or parallel to weld centerline.

b) minimum sweep reading to reflector and position of search unit at reference level amplitude.

c) maximum sweep reading to reflector and position of search unit at the reference level amplitude.

d) search unit positions or locations parallel to the reflector at the end points where the reflector amplitude equals the reference level (length of reflector).

e) obtain data from successive scans at increments no greater than 9/10 of the transducer dimension measured parallel to the scan increment change (25% overlap).

f) record all dimensions to the nearest 1/10 of an inch.

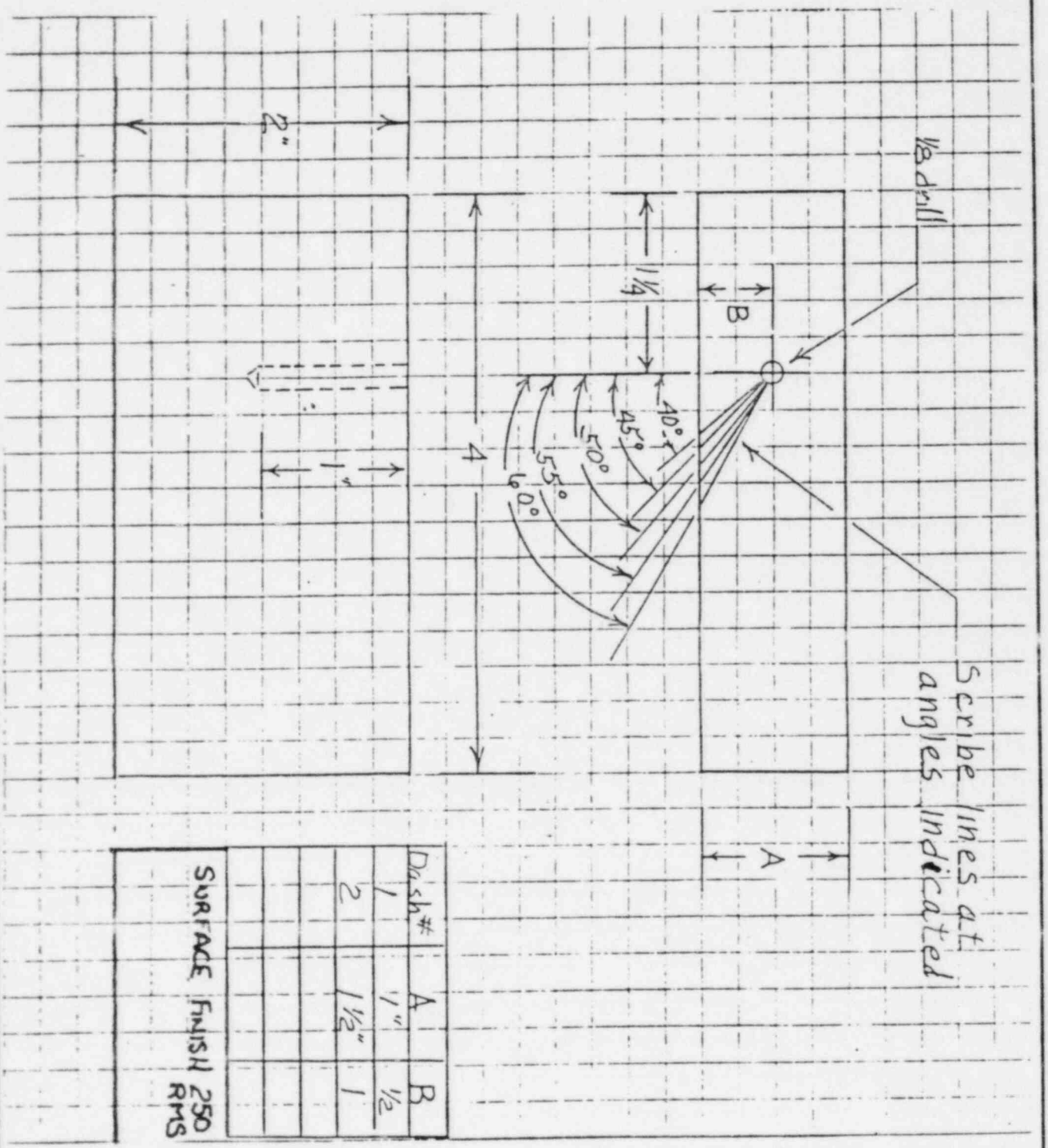
A9.3 Ultrasonic Reflectors of Geometric Origin - Ultrasonic indications that can be identified as reflectors due to piping surface configuration, such as weld root, crown or counterbore geometry, or variations in metallurgical structure of materials at interfaces, such as weld-to-base metal interface, may be classified as geometric responses. Such reflectors need not be characterized as indications provided the following requirements are met:

a) the presence of geometric reflectors shall be confirmed by comparison with the fabrication drawings of pipe weld edge preparation, radiographs, or visual examination.

b) supplemental examination methods shall be used, if necessary to confirm the presence of geometric reflectors.

A10.0 ACCEPTANCE CRITERIA

A10.1 The indications recorded in 9.2 shall be compared to the acceptance standards of IWB-3514, 1977 Edition ASME, Section XI up to and including Summer of 1978 Addenda.



Dash #	A	B
1	1"	½
2	1½"	1

FIGURE A-1

Angle Beam Calibration Block

NDE ENGINEERING CONSULTANTS, INC.

P. O. Box 535 Storrs, Connecticut 06268

August 30, 1982

Mr. Jack Lance
Mechanical Services Group, Manager
Yankee Atomic Electric Company
1671 Worcester Road
Framingham, MA 01701

Subject: NDE Procedure Review

Dear Jack:

I have completed my review of the subject procedures listed in "Attachment A". All of my comments submitted to you on July 30, 1982, have either been incorporated or mutually resolved between Tom Rennell and myself.

Based on this final review I am satisfied that these procedures meet the requirements of Yankee Atomic Engineering Instruction WE-106, Rev. 3 and the 1977 Edition of Section XI through the Summer 1978 Addenda .

If you have any questions please call me.

Very truly yours,

Glenn R. Perkins

Glenn R. Perkins
President

Attachment A

Procedure No.	Rev. No.	Title
YA-PE-2	(3)	Liquid Penetrant Examination
YA-UT-1	(2)	Ultrasonic Examination-General Requirements
YA-UT-3	(2)	Ultrasonic Examination of Vessels - Flange to Shell Weld from Flange Face
YA-UT-6	(1)	Ultrasonic Examination of Flange Ligaments
YA-UT-7	(2)	Ultrasonic Examination of Bolting
YA-UT-8	(1)	Ultrasonic Examination of Reactor Closure Nuts
YA-UT-9	(2)	Ultrasonic Examination of Piping Ferretic Welds
YA-UT-10	(3)	Ultrasonic Examination of Piping Austenitic Welds Including Appendix A for Detection of IGSCC
YA-UT-11	(2)	Ultrasonic Examination of Piping Dissimilar Metal Welds
YA-UT-14	(2)	Ultrasonic Examination of Piping Base Materials and WHAZ
YA-UT-15	(2)	Ultrasonic Examination of Piping Straight Beam Method When Used for Weld and HAZ Exams
YA-UT-22	(0)	Ultrasonic Examination of Vessels - Circumferential, Longitudinal, Meridional, and Flange Welds
YA-UT-44	(0)	Ultrasonic Examination of Vessels Nozzle to Vessel Welds
YA-UT-55	(0)	Ultrasonic Examination of Vessels Integral Support Attachment Welds
YA-UT-112	(0)	Thickness Measurement by UT

MEMORANDUM

To R. Wanczyk — Vermont Yankee (LOCATION) — December 21, 1982 (DATE)

From L. E. Mullins — (LOCATION) — I.M.S. No.

Subject PROCEDURE FOR ULTRASONIC EXAMINATION OF PIPING AUSTENITIC WELDS INCLUDING APPENDIX A FOR DETECTION OF IGSCC YA-UT-10 REV. 3 — R.T. No. [redacted]

A review of the subject procedure has been made and the procedure found to be compatable with the 1974 Edition of Section XI with Addenda thru Summer 1976. Use of this procedure will not violate the Vermont Yankee Technical Specification requirements.

L. E. Mollins
Mechanical Services Group

J. J. Lance, Manager
Mechanical Services Group

LEM/mjc

cc: J. D. Haseltine