T.C
50-302

Florida Power
CORPORATION

August 27, 1979

File: 3-0-3-a-3

Mr. J. P. O'Reilly
Director
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Suite 3100
101 Marietta Street
Atlanta, Ga 30303

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
I.E. Bulletin 79-17

Dear Mr. O'Reilly:

Enclosed is our response to Item 1 of I.E. Bulletin 79-17.

Please contact this office if you require any additional discussion concerning our response.

Very truly yours,

FLORIDA POWER CORPORATION

W. P. Stewart

W. P. Stewart
Manager, Nuclear Operations

WPSemhD77

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cc: Director
Division of Operating Reactors
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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IE BULLETIN 79-17 RESPONSE

For All Pressurized Water Reactor Facilities with an Operating License:

1. Conduct a review of safety related stainless steel piping systems within 20 days which contain stagnant oxygenated borated water. These systems typically include ECCS, decay/residual heat removal, spent fuel pool cooling, containment spray and borated water storage tank (BWST-RWST) piping.

RESPONSE:

Stagnant systems are those which do not normally function during routine plant operation.

At Florida Power's Crystal River Unit 3, the systems (or portions of systems) which contain stagnant oxygenated borated water are the following:

(1) Makeup and Purification (High Pressure Injection) MU

(2) Decay Heat (Low Pressure Injection) DH

(3) Spent Fuel SF

(4) Building Spray BS

Flow diagrams of each system are attached:

MU: FD-302-661
DH: FD-302-641
SF: FD-302-621
BS: FD-302-711

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MU

FD-302-661

MAKEUP & PUBLICATION

Fee Display

POOR ORIGINAL

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1(a) Provide the extent and dates of the hydrotests, visual and volumetric examinations performed per 10 CFR 50.55a(g) (Re: IE Circular 76-06 enclosed) of identified systems. Include a description of the non-destructive examination procedures, procedure qualifications and acceptance criteria, the sampling plan, results of the examinations and any related corrective actions taken.

RESPONSE:

Florida Power performed examinations per IE Circular 76-06 as outlined in our 28 February 1977 letter, attached.

During January 1977, FPC discovered two through-wall cracks in the Building Spray system, 8" TP 304 Stainless Steel, Schedule 40 pipe. See LER 77-1 and 77-6. Cracked sections were removed and replaced with TP 304 SS, same size.

Volumetric examinations per IE Circular 76-06 were performed in 27% of the Building Spray welds and 11% of the Decay Heat welds.

NDE procedures used were Babcock and Wilcox Procedures ISI-101 (Revision 11) and ISI-102 (Revision 7), attached. No procedure qualifications are available since Florida is not a code state, but the procedures are certified by B&W's Level III examiner as meeting or exceeding requirements of Section XI (1971 edition through Winter 1972 addenda). Random selection of welds was made per MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes.

Results of the examinations, as summarized in the FPC 28 February 1977 letter: no findings indicative of chloride stress corrosion cracking.

Corrective action taken by FPC:

(a) Monthly hydrostatic test of Building Spray, Makeup and Decay Heat systems (by SP-340, ECCS Pump Operability).

(b) Monthly draining of Building Spray system, prior to and after monthly operability tests.

(c) Volumetric examination of area of Building Spray cracks in addition to Section XI requirements during 23 April 1979 refueling outage. Indications were acceptable.

(d) Volumetric examination of area of Building Spray cracks during next refueling outage.

FPC letter of 5 April 1979, attached, modifies the earlier 28 February 1977 letter to eliminate tests of Building Spray and Decay Heat welds other than scheduled ISI examinations.

LER 77-1/6
60 DAY LTR
2-28-77

Florida Power
CORPORATION

28 February 1977
3-0-3-a-1
CS-77-33

POOR ORIGINAL

Mr. Norman C. Moseley, Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
230 Peachtree St., N.W., Suite 818
Atlanta, Georgia 30303

Crystal River Unit 3
Docket No. 50-302
License #DPR-72
Ref: LER's 77-1 and 77-6

Dear Mr. Moseley:

The purpose of this letter is to summarize the results of our study precipitated by finding two (2) through wall cracks in eight-inch, Type 304, stainless steel, Schedule 40 pipe in the Building Spray System as reported in Licensee Event Reports 77-1 and 77-6.

Upon discovery of the through wall cracks, the sections including the welds were removed for replacement and metallurgical examination to determine cause of failure. A pipe segment was sent to a metallurgical laboratory for examination. The report received concluded the failure was due to chloride stress corrosion. The point of entry of the chlorides cannot be satisfactorily accounted for but may have been BSV-26 which was disassembled during the test program. The report suggests chloride contamination by storage and erection of the Building Spray System in the marine environment of the Gulf Coast. We do not concur with this speculation.

Figure 1 (enclosed) shows the area of concern. Stagnation of water is likely to have occurred between closed BSV-4 outside the Reactor Building and the upward bend in the pipe inside the building. High chloride content isolated to this area is strongly suggested by the configuration and the fact that both failures occurred nearly simultaneously, in similar weld heat affected zones in Schedule 40 pipe. Both failures occurred in areas of welds which had undergone at least four (4) weld repairs which amplifies the problem of sensitization in the heat affected zone of thin wall stainless pipe and induces high stress, both conditions being necessary for chloride stress corrosion. We suspect that chloride entry occurred during the Building Spray Pump Runout Test program when BSV-26 was disassembled to provide a temporary flow path.

A similar piping configuration exists on the "B" Building Spray Train, but Ultrasonic Examination, which effectively identified the cracks in the "A" Train, demonstrated the integrity of similar zones in "B". We believe, therefore, that these two (2) failures really constitute one event and that it is an isolated instance.

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Volumetric examinations were performed in weld zones in areas where stagnant liquid was probable as suggested in IE Circular 76-06. Twenty-seven (27%) percent of the total welds in the Building Spray System and eleven (11%) percent of the total welds in the Decay Heat System were examined with no findings indicative of chloride stress corrosion cracking.

Upon receipt of IE Circular No. 76-06, it did not pertain to our facility as we had not received our Operating License. However, due to the cracking we have experienced, we are making preparations to meet the "Actions to be taken by Licensee" listed on pages 2 and 3 of IE Circular 76-06. These are as follows:

1. Florida Power Corporation will hydrostatically test, code class 2 and 3 systems, in accordance with the ASME Code Section XI, 1974 through Summer 1975 Addenda, with exceptions noted in the waiver for which we are applying. Specifically, it is our interpretation of Section XI, Subsection IWC-5000 that Florida Power is meeting hydrostatic test parameters monthly in operability verification of both the Building Spray System and the Decay Heat System. The procedure for operability checks for any system leak during this test. However, both failures in the Building Spray System have occurred in areas of the line downstream of the shut-off valve for pressure tests. These areas shall be drained monthly prior to and after system operability checks to prevent accumulation of non-flowing water.

2. As previously stated, Florida Power has already completed volumetric examinations on randomly selected welds in twenty-seven (27%) percent of the Building Spray System and eleven (11%) percent of the Decay Heat System on 3-inch and larger thin walled stainless steel pipe with no adverse finds. In the future, we shall volumetrically examine five (5%) percent of the total welds in the Building Spray and Decay Heat Systems at each refueling outage, in addition to our required commitment in Section XI, 1974 through Summer 1975 Addenda of the ASME Codes.

3. During the course of the hydrostatic or volumetric examinations, should any adverse findings occur, your office will be notified within twenty-four (24) hours.

Very truly yours,

FLORIDA POWER CORPORATION

W. P. Stewart
Director, Power Production

DWP/feh

Enclosure

Nuclear Plant Manager

LICENSEE EVENT REPORT

CONTROL BLOCK: [ ] (1–8)

UPDATE REPORT - PREVIOUS REPORT DATE: 1/3/77 & 2/7/77

LICENSEE NAME: [L][G][E][P][3] (14)

LICENSE NUMBER: [0][0-0][0][0][0][0-0][0] (15–25)

LICENSE TYPE: [4][1] (26)

CATEGORY: [-][-] (57–58)

REPORT TYPE: [0] (59)

REPORT SOURCE: [L] (60)

DOCKET NUMBER: [0][5][0-0][3][0][2] (61–68)

EVENT DATE: [0][1][0][1][7][7] (69–74)

REPORT DATE: [0][2][2][7] (75–78)

EVENT DESCRIPTION

Discovery of two (2) through wall cracks in a section of eight inch Schedule 40-304 stainless steel building spray pipe. Redundant Building Spray Train available. Taken as a single occurrence, these cracks are the first failure of this type. Piping sections have been replaced.

(77-1 & 77-6)

SYSTEM CODE: [S][A] (9–10)

CAUSE CODE: [E] (11)

COMPONENT CODE: [P][J][P][P][X][X] (12–17)

FUTURE COMPONENT SUPPLIER: [A] (43)

COMPONENT MANUFACTURER: [K][0][3][5] (44–47)

VIOLATION: [B] (48)

CAUSE DESCRIPTION

Isolated case of chloride stress corrosion. Initial investigation complete. No other cases found. Inservice Inspection Program will provide continued follow-

FACILITY STATUS: [N] (9)

% POWER: [0][0][0] (10–12)

OTHER STATUS: Mode 5 (13–44)

METHOD OF DISCOVERY: [E] (45)

DISCOVERY DESCRIPTION: Observed leakage (46)

FORM OF ACTIVITY RELEASED: [Z] (9)

CONTENT OF RELEASE: [Z] (10)

AMOUNT OF ACTIVITY: N/A (11–44)

LOCATION OF RELEASE: N/A (45)

PERSONNEL EXPOSURES

NUMBER: [0][0][0] (9–11)

TYPE: [Z] (12)

DESCRIPTION: N/A (13)

PERSONNEL INJURIES

NUMBER: [0][0][0] (9–11)

DESCRIPTION: N/A (12)

OFFSITE CONSEQUENCES

N/A

LOSS OR DAMAGE TO FACILITY

TYPE: [ ] (9)

DESCRIPTION: N/A (10)

PUBLICITY

N/A

ADDITIONAL FACTORS

N/A

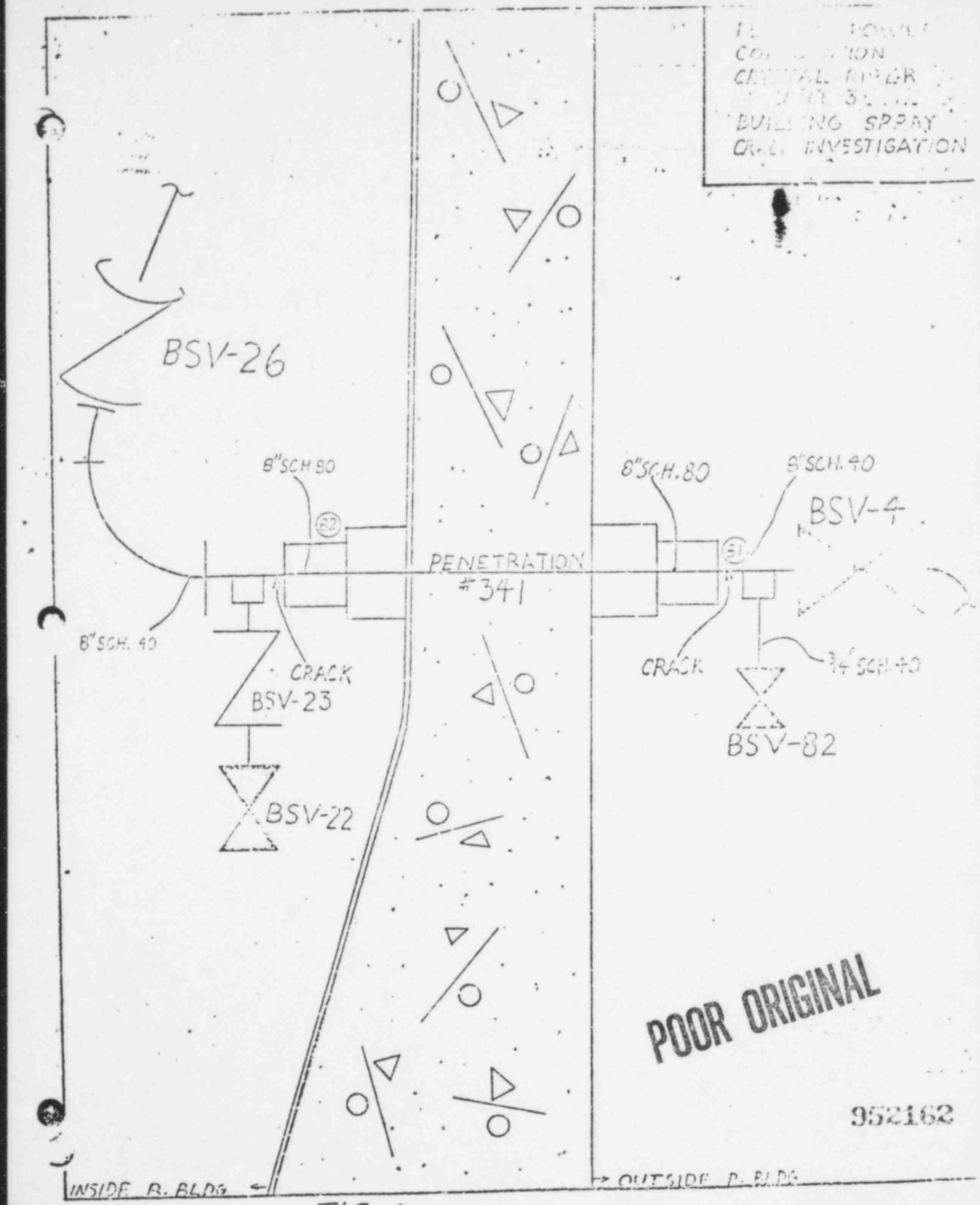

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FIG. 1

SUBJECT ULTRASONIC EXAMINATION OF SIMILAR METAL WELD SEAMS AND ATTACHMENT WELDS	ISI-101, REV. 11

1. SCOPE: This procedure shall govern the manual ultrasonic examination of similar weld seams and attachment welds for inservice inspection in accordance with ASME Boiler and Pressure Vessel Code, Sections III and XI. Circle, longitudinal and attachment weld seams in piping and vessel welds up to 15 inches thick are covered by this procedure. The timing of the examination shall be in accordance with Section XI requirements.

2. EQUIPMENT: Ultrasonic examination equipment shall consist of an electronic apparatus capable of producing, receiving and displaying high frequency electrical pulses at the required frequencies and energy levels.

3. OPERATOR QUALIFICATION: The operator performing the examination shall be qualified to Level II in accordance with B&W Construction Company Quality Control Administrative Procedure 9A-169. The assistant shall be qualified to at least Level I in accordance with B&W Construction Company Quality Control Administrative Procedure 9A-169.

4. SURFACE PREPARATION: The examination surface shall be free of dirt, loose scale, machining or grinding particles, weld spatter, or other loose foreign matter. The surface finish shall be sufficiently smooth to maintain acoustical bond and minimize surface noise. A mill finish may be adequate for testing. Whenever necessary, surface conditioning shall be accomplished by available mechanical processes such as machining, grinding, sand blasting, or belt sanding to provide a suitable surface finish. Surface preparation shall be performed on an area which includes the weld and the area for a 2T (2 times thickness)on both sides of the weld. The ultrasonic testing operator shall inspect the surface for suitability for performing the examination. Surfaces shall be prepared in accordance with ISI-50.

5. COUPLANT: A suitable liquid, semi-liquid, or paste couplant medium, such as water, oil, glycerin, grease or Hamikleer shall be applied to the examination surface.

Each batch of materials used on stainless steels or nickel based alloys shall have been tested for residual amounts of total halogen and total sulfur in accordance with ISI-60. The total residual amount of halogens and sulfur shall not exceed the requirements of ISI-60. The couplant batch number shall be recorded on the report data form.

6. AREA OF INTEREST: The examination shall include the weld, weld fusion line and one plate thickness on both sides of the weld beyond the fusion line in the case of welds in pressure boundaries and two plate thicknesses beyond the fusion line in the case of attachment or support welds.

7. CALIBRATION BLOCK:

7.1 Material: The calibration block material shall be of an equivalent thickness and P-Number to the material being examined. P-Numbers 1, 3, 4, and 5 materials as listed in Table Q-11.1 of Section IX of the ASME Boiler and Pressure Vessel Code are considered to be equivalent.

7.2 Cladding: When an examination is to be performed from the cladded side of a component, the block shall contain cladding of the same nominal thickness and type as the compo

7.3 Configuration: The calibration block shall meet the minimum requirements of the basic calibration block as shown in Figure 1.

7.3.1 Flat Blocks: For examination of circumferential or longitudinal welds on vessels or piping with contact curvatures equal to or greater than 20 inch diameter, a flat block or blocks of essentially the same curvature as the part to be examined shall be used.

7.3.2 Curved Blocks: The calibration block contact surface shall be curved for vessel or piping contact surface curvatures less than 20 inch diameter. A single curved basic calibration block may be used to calibrate the examination on vessel or piping contact

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surfaces in the range of curvature from 9/10 to 1-1/2 times the basic calibration block diameter. For example, the 8 inch diameter curved block may be used to calibrate the examination on vessel or piping contact surfaces in the range of curvature from 7.2 to 12 inch diameter. The curvature range from 0.94 inch to 20 inch diameter requires six block curvatures as indicated in Figure 2. Curved vessel or piping blocks may contain the basic reference holes in a piece of vessel or piping of the same nominal thickness or pipe schedule.

7.4 Size: The length and width of the calibration block shall meet at least the minimum requirements of Figure 1. The thickness of the block shall be as allowed in Figure 1 for the material thickness examined. Where two (2) or more component thicknesses are joined, the block shall be selected to cover the largest thickness.

7.5 Hole(s): The calibration holes shall be drilled parallel to the contact surface for flat blocks and for longitudinal holes in curved blocks and tangent to the surface in curved blocks for circumferential holes when used. The diameter of these holes shall conform to those stated in Figure 1 for the block thickness. The holes may be drilled to greater depths than the 1½ inch stated in Figure 1.

8. SEARCH UNITS:

8.1 Straight Beam: Either ceramic, lithium sulfate or barium titanate 2.25 or 5.0 MHz dual element or 2.25 MHz single element search units, having an effective area of 0.049 to 1.0 square inch inclusive, shall be used for the straight beam longitudinal wave weld examination. If grain structure is such that 2.25 MHz cannot penetrate, a 1.0 MHz search unit of the types listed above may be substituted. Other search units may be used upon approval of the B&W Construction Company Level III Examiner.

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8.2 Angle Beam:

8.2.1 Type: Either ceramic, lithium sulfate or barium titanate 2.25 or 5.0 MHz, 45 and 60 degree (± 2 degrees) angle beam, single or dual element search units shall be used as stated below. The effective area of the transducer shall be 0.049 to 1.0 square inch inclusive. A wedge shall be used to give the

desired angle in the material to be examined. If grain structure is such that 2.25 MHz cannot penetrate, a 1.0 MHz search unit of the types listed above may be substituted. Other search units may be used upon approval of the B&W Construction Company's Level III Examiner.

8.2.1.1 Shear Wave: On materials two (2) inches and over in thickness, both 45 and 60 degr beams shall be used. On materials less th two (2) inches, only a 45 degree beam is required.

8.2.1.2 Longitudinal Wave: On austenitic materials where adequate penetration and sensitivity cannot be achieved with a shear wave beam, an angle longitudinal wave beam (s) shall be used.

8.2.2 Exit Point: A standard steel IIW block will be used before examinations are performed each day to verify or correct the exit point on the transducer shoe.

8.2.3 Beam Angle: After the exit point has been determined the beam angle shall be checked with the IIW block to confirm that the transducer meets the angle ranges specified in 8.2.1.

8.2.4 Wedge Rework: Any transducer wedge not providing the angle tolerances specified in 8.2.1 shall be reworked and the measurements specified in 8.2.2 and 8.2.3 repeated until the unit is satisfactory.

9. CALIBRATION: When the examination is to be performed from the clad or unclad side of the component, the calibration shall be performed through either the clad or base material in the same manner. Calibration blocks may have one side partially or fully clad depending upon the application and/or design of the block. The intent of the calibration is to duplicate the materials that the ultrasonic beam will encounter as near as possible.

9.1 Straight Beam:

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9.1.1 Sweep Range Calibration: The sweep range calibration may be performed using an IIW block to calibrate the sweep range or by using the calibration block itself. The back reflection should appear on the screen at

9.1.1.1 IIW Block Method:

9.1.1.1.1 Select the range desired on the depth control, to include the thickness being examined. i.e., 2, 5, 10, 50 inches or etc.

9.1.1.1.2 Connecting the Search Unit to the instrument should result in an initial pulse being displayed on the CRT; if not, it may be found by adjusting the sweep delay control.

9.1.1.1.3 Place the point when the initial pulse first breaks the time base-line, on the division labeled 0 on the CRT face.

9.1.1.1.4 Place the Search Unit on the 1 inch (25mm) thickness of the IIW block using sufficient couplant to ensure sound transmission into the piece. Other unclad ASME blocks of known thickness may be used.

9.1.1.1.5 To determine where the first back reflection should appear, find the value of each increment, engraved on the CRT face, for the thickness range you have selected. To do thi use the following formula:

$I = R/100$ for screens divided int 100 increments

$I = R/50$ for screens divided int 50 increments

Where I = the value of each increm

Where R = the range you have selec

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9.1.1.1.6 For example: To inspect a piece 8 inches thick, select a screen range that will include the thickness, 10 inch range, and divide the screen into 100 increments:

$I = \frac{10}{100} = 0.1$" the value of each increment

When placing the Search Unit on the 1 inch (25mm) thickness of the IIW block, the first back reflection should break the baseline at 1 inch (10 increments) and 2 inches (20 increments) etc., thru 10 inches (100 increments). This is accomplished using the material calibration and sweep delay controls alternately. Next place the Search Unit on the 8 inch piece you are examining. The first back reflecti should appear at 8 inches (80 increments) on the CRT face.

9.1.1.2 Calibration Block Method:

9.1.1.2.1 Position the search unit for the maximum first indication from the 3/4 T side drilled hole. Adjust the left edge of this indication to line 2 on the screen with the delay control.

9.1.1.2.2 Position the search unit for the maximum indication from the 3/4 T ho Adjust the left edge of this indication to line 6 on the screen with the range control.

9.1.1.2.3 Repeat delay and range control adjustments until the 1/4 T and 3/4 T hole reflections start at sweep lines 2 and 6.

9.1.1.2.4 All measurements of depth should be made where the signal first breaks the baseline on the CRT Scre

9.1.2 Distance-Amplitude Correction:

9.1.2.1 Position for maximum response from the hole which gives the highest amplitude. Adjust the sensitivity control to provide and 80% of full screen indication from the hole. Mark the peak of the indication on the screen with a grease pencil or other suitable marker.

9.1.2.2 Position the search unit for maximum response from another hole (if available) indication. Mark the peak of the indication on the screen

9.1.2.3 Position the search unit for maximum amplitude from the third and other (if available) hole indications and mark the peaks on the screen.

9.1.2.4 Connect the screen marks and extend through the thickness to provide the distance amplitude curve for the side drilled holes. If only one (1) hole is available, this is the primary reference level for the thickness range.

9.2 Angle Beam:

9.2.1 Sweep Range Calibration: The sweep range calibration may be performed using an IIW block to calibrate the sweep range or by using the calibration block itself. The sweep range should be set to cover the range of thickness to be examined for a maximum of 80 percent of the full screen sweep. The use of half, full or multiples of full range will determine the desired thickness to be covered. For examinations from a convex surface where the curvature perpendicular to the vessel or pipe axis, the examination distance must be calculated if curved calibration blocks are not used. The following formula should be used to calibrate the necessary sweep range:

$$SR = (R-T) \sin \left(\theta - \sin^{-1} \left(\frac{R \sin \theta}{R - T}\right)\right) \cot \theta$$

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SR = Sweep Range (Inches)
R = Radius of Curvature for Outside Surface (Inches)
θ = Refracted Beam Angle from Normal to Surface
T = Wall Thickness (Inches)

Several sweep ranges have been calculated for various component radii and thicknesses in Figure 3. Note, some beam angles can not cover the full depth at smaller radii.

9.2.1.1 IIW Block Method:

9.2.1.1.1 Select the range desired, on the depth control, to include the thickness being examined. i. e. 2, 5, 10, 50 inches and etc., and the wave node.

9.2.1.1.2 Connecting the angle beam search unit to the UT instrument should result in an initial pulse being displayed on the CRT, if not it may be found by adjusting the sweep delay control.

9.2.1.1.3 Place the point where the front face reflection first breaks the time baseline on the division labeled 0 on the CRT face.

9.2.1.1.4 Place the search unit on the 1 inch (25mm) thickness, just below the 2 inch diameter hole, perpendicular to the 4 inch side of the IIW block. Using enough couplant to ensure good sound coupling, slowly move the search unit away from the edge until a back reflection shows on the CRT. Maximize the signal by oscillating the transducer and moving it slightly back and forth.

9.2.1.1.5 To determine where the first back reflection should appear, find the value of each increment, engraved on the CRT face, for the thickness range you have selected. To do this, use the following formula:

I = R/100 for screens divided int 100 increments

I = R/50 for screens divided int 50 increments

where I = the value of each increm

where R = the range you have selec

9.2.1.1.6 For example: To examine a plate 3 inches thick, select a screen rang that will include that thickness; 5 inch range.

The screen is divided into 100 increments.

$I = \frac{5}{100} = 0.05"$ = the value of each increment.

Then, using sufficient couplant, place the search unit on the 1 inch (25mm) thick side of the IIW block, perpendicular to the corner as stated in 9.2.1.1.4. Alternate using the material calibration and sweep delay controls bring the pip to correspond with 1 inch in depth on the CRT (20 increments). Since no multiple back echoes will be displayed ove the search unit away from the corner until another pip occurs which represents the to corner of the IIW block, (2 inches After maximizing the signal, alter nately adjust the material calibra tion and sweep delay controls to bring the signal to correspond wit 2 inches in depth on the CRT.

(40 increments). Alternating between this full node and the previous 1/2 node position, bring the signals to their corresponding positions on the screen using the material calibration and sweep delay controls. Once this is accomplished move the search unit still farther to another half or full node position and make fine adjustments using this (N) node position and the first half node position.

Check the result on the curved IIW block end; the first signal should occur at 2.8 inches for a 45 degree angle beam and at 2.0 inches for a 60 degree angle beam whe placing the crystal index mark over the 4 inch (100mm) position. All measurements of depth should be made where the signal first breaks the baseli on the CRT screen.

9.2.1.2 Calibration Block Method:

9.2.1.2.1 Position the search unit for the maximum first indication from the 1/4 T side drilled hole. Adjust the left edge of this indication to line 2 on the screen with the delay control.

9.2.1.2.2 Position the search unit for the maximum indication from the 3/4 T hole. Adjust the left edge of this indication to line 6 on the screen with the range control.

9.2.1.2.3 Repeat delay and range control adjustments until the 1/4 T and 3/4 T hole reflections start at sweep lines 2 and 6.

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9.2.1.2.4 Position the search unit for maximum response from a corner of the block on the opposite surface. The indication will appear near sweep line 8. Two divisons on the sweep equals 1/4T.

9.2.2 Distance-Amplitude Correction:

9.2.2.1 Calibration From the Clad Side:

9.2.2.1.1 Position the search unit for maximum response from the hole which gives the highest amplitude.

9.2.2.1.2 Adjust the sensitivity control to provide an 80% of full screen indication from the hole. Mark the peak of the indication on the screen.

9.2.2.1.3 Position the search unit for the maximum amplitude from any remaining holes and mark the peaks on the screen.

9.2.2.1.4 Position the search unit for the maximum amplitude of additional nodal indications from the hole(s) such that the DAC Curve can be defined beyond the full range to be examined. Mark the indication peaks on the screen.

9.2.2.1.5 Connect the screen marks to provide the distance amplitude curve. If only one (1) hole is available, this amplitude is the primary reference level for the thickness range.

9.2.2.2 Calibration from the Unclad Side of Full Clad Block:

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9.2.2.2.1 From the clad side of the block, determine the dB change in ampli-

tude between the 3/4 T and 5/4T positions (Step A).

9.2.2.2.2 From the unclad side, perform calibrations as noted in 9.2.2.1.1 thru 9.2.2.1.4.

9.2.2.2.3 To determine the amplitude for the 5/4 T hole, position the transducer for maximum amplitude from the 3/4 T hole. Decrease the signal amplitude by the number of dB determined in Step A. Mark the height of this signal amplitude at sweep line 10 (5/4T). (Performed only if 9.2.2.1 is possible.)

9.2.2.2.4 Connect the screen marks to provide the distance - amplitude curve. This will permit evaluation of indications down to the clad surface (near sweep line 8).

9.2.2.3 Calibration from Unclad or Half Clad Blocks: Perform calibrations as noted in 9.2.2.1.1 thru 9.2.2.1.5.

9.3 Change in Equipment: Any change in search units, shoes, couplants, cables, ultrasonic instruments, or any other parts of the examination system shall be cause for recalibration.

9.4 Calibration Confirmation: Sweep range and DAC shall be verified:

A. At the beginning of each day of examination.
B. At least every four hours of examination.
C. With every change of examination personnel.
D. At the finish of examinations for each thickness range.
E. If the operator suspects any malfunction of the UT system.
F. In the event of any power loss.

The original and final calibration must be performed on the basic calibration block. Intermediate calibration checks may be performed on a calibration block simulator. If a calibration block simulator is used, it shall be able to produce known amplitude and sweep readings. The simulator produced amplitude and sweep readings shall be recorded on the calibration sheet at initial calibration and each calibration check. If multiple DAC curves are used for different types of examinations, the calibration block simulator shall be used for each type.

9.5 Calibration Changes: If any point on the distance amplitude correction (DAC) curve has changed by more than 20% (2dB) of its amplitude, all data sheets since the previously successful calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination areas shall be reexamined.

10. SCANNING REQUIREMENTS:

10.1 Movement Rate: The rate of search unit movement shall not exceed 6 in./sec. unless calibration is verified at scanning speed.

10.2 Search Unit Coverage: Each pass of the search unit shall overlap a minimum of 10% of the transducer piezoelectric element dimension perpendicular to the direction of scan.

10.3 Application: The welds and heat-affected zones shall be examined from both sides of the weld by a straight beam and two angle beams where practical and where required. The beams shall pass through all of the weld material on each of the scans where practicable. The beams need not pass through all of the adjacent base material. Direct the angle beams normal to the weld from both sides of the weld and parallel to the weld in both directions. The volume of base material through which the beam will travel in angle beam examination shall be examined with a straight beam search unit in accordance with ISI-102.

10.4. Scanning Sensitivity: Scanning may be performed at a gain setting 2 times the reference level (6dB increase in amplitude) using the 100%, 50% and 20% DAC curves drawn on the screen. The recording of indications shall be carried out with the gain control at the reference level.

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As an alternate method, scanning may be performed after increa the gain 14dB above the reference level. This increases signa amplitude by a factor of five, making the primary reference cu a 20% DAC curve. The recording of the peak indications, using this method, requires that the signal amplitude be adjusted to the 100% DAC curve using the dB control. True signal amplitud shall be obtained from the following chart using the observed in the dB control.

dB	%DAC	%DAC	dB
0	100	100	0
-1	112	90	+1
-2	125	80	+2
-3	141	70	+3
-4	159	63	+4
-5	178	56	+5
-6	200	50	+6
-7	224	45	+7
-8	251	40	+8
-9	282	36	+9
-10	316	32	+10
-11	355	28	+11
-12	400	25	+12
-13	447	22	+13
-14	501	20	+14
-15	562	18	+15
-16	631	16	+16
-17	708	14	+17
-18	794	13	+18
-19	891	11	+19
-20	1000	10	+20

For recording 20% to 20% lengths the dB control will be set at higher gain than the reference level. For 50% to 50% lengths, dB control will be set 6dB higher gain than the reference leve for 100% to 100% lengths, the dB control will be at the refere level.

10.5 Penetration Verification: Penetration shall be verified by ob ing a reflection from an opposite parallel surface of the material when available in straight beam scanning.

10.6 Deviations: Where the configuration of the weld being examine or surrounding structures do not permit scanning as required i Section 10, the examination deviations shall be recorded on the data sheets.

11. RECORDING STANDARDS: All indications which produce a response greater than 20 percent of the DAC reference level shall be investigated to the extent that the operator can determine the shape, identity and location of all such reflectors and evaluate them in accordance with the following:

11.1 The search unit shall be placed in a position which produces the maximum amplitude. If the maximum amplitude equals or exceeds 50 percent of the DAC reference calibration curve, the amplitude and its position shall be recorded. The length of the transducer travel between 50 to 50 and 100 to 100 percent of the DAC reference level shall be recorded. The through thickness dimension shall be determined by measuring the 50 to 50 percent of DAC signal locations on the CRT face. These measurements for the thickness shall be repeated at one-half (½) the transducer active dimension or one-half (½) inch increments on either side of the maximum signal position, starting toward position A or surface one, until the signal drops below 50 percent DAC.

11.1.1 Multiple indications, related in depth and distance from surfaces one or two, which can be damped at the examination surface, having amplitudes from 50 to 100% of DAC shall be recorded in one data entry as intermittent or continuous. Such data entry shall show the amplitude and depth ranges, and the distance from the appropriate surface. Such indications shall state "DAMPS".

11.1.2 Multiple indications as in paragraph 11.1.1 which cannot be damped from the examination surface shall also be recorded as in paragraph 11.1.1, except that the data entry shall state "DOES NOT DAMP".

11.1.3 For indications having peak amplitudes exceeding the DAC reference calibration curve, the thru wall dimension corresponding to the peak amplitude shall be underlined.

11.2 All indications detected in the area of interest which produce signal amplitudes greater than the DAC reference calibration curve and that have a linear dimension equal to or exceeding that given in Table 1 shall be recorded and reported individually and an evaluation made to the acceptance standards involved in the original construction.

TABLE 1

MATERIAL THICKNESS RANGE (INCHES)	LINEAR DIMENSION
0 thru 3/4	1/4 inch
Over 3/4 thru 2-1/4	1/3 of thickness
Over 2-1/4	3/4 inch

11.2.1 An indication in a weld or weld fusion zone shall be evaluated using the fabrication radiographs, whereas an indication in base material shall be evaluated to the radiographic or ultrasonic acceptance standards for the base material. The separation between the weld/weld fusion zone and the base material shall be based on the parameters of the fabrication welding procedure.

11.2.2 If there is any doubt regarding the proper interpretation of ultrasonic indications in the area of interest, such doubt may be resolved by radiography.

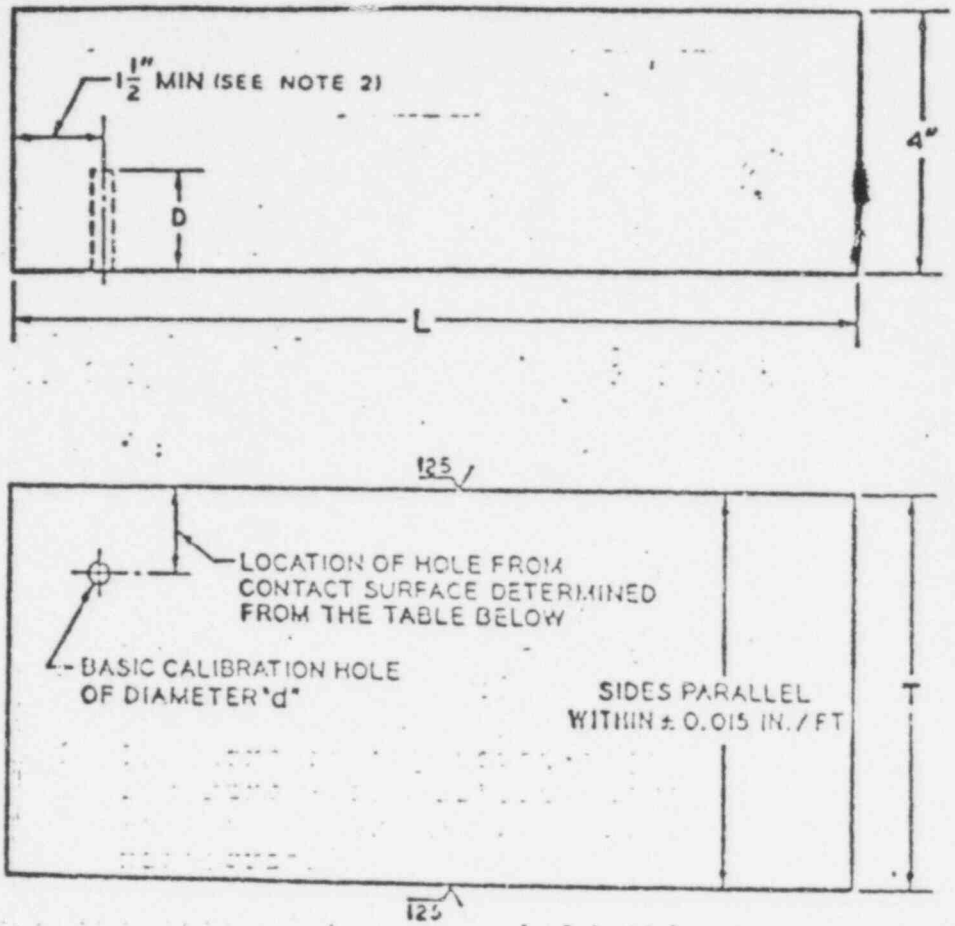
11.3 The examination data shall show the location, size, and depth of indications. The amplitude of discontinuity indications shall be recorded to the nearest 10 percent increment.

11.4 Any area where best effort inspection was performed due to configuration shall be recorded and reported.

12. RECORD OF EXAMINATION RESULTS: A copy of the examination data (Fig. 4) shall be provided to the customer with the following information:

A. Contract Number
B. Examination Personnel
C. Instrument
D. Method of Test
E. Couplant
F. Calibration Sheets
G. Weld Identification and Location
H. Type, Size, and Frequency Search Unit
I. Ultrasonic Wave Mode
J. Calibration Block Number
K. Chart of Results
L. Procedure
M. Date(s) of Examination
N. Examination Surface
O. Layout of weld seams as detailed in ISI-360, ISI-361, or ISI-362.

952178



L = Length of block determined by the angle of search unit and the vee-path used
T = Thickness of basic calibration block (see table below)
D = Depth of side-drilled hole (see table below)
d = Diameter of side-drilled hole (see table below)
t = Nominal production material thickness

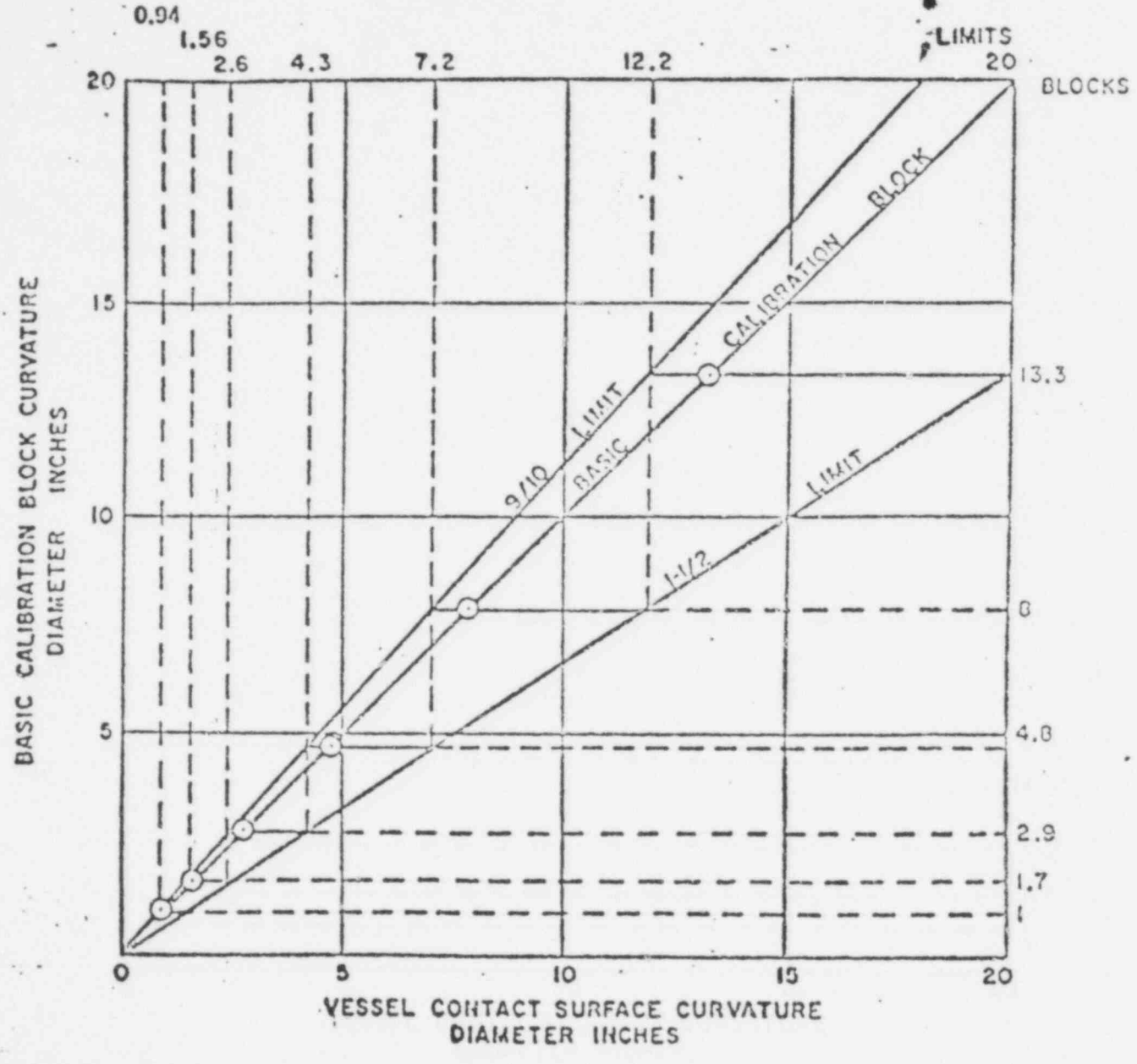
Nominal Production Material Thickness (*t*) in.	Basic Calibration Block Thickness (*T*), in.	Hole Location	Hole Diameter (*d*), in.	Minimum Hole Depth (*D*), in.
Up to 1 incl.	¾ or *t*	1/2 *T*	3/32	1½
Over 1 thru 2	1½ or *t*	1/4 *T*	1/8	1½
Over 2 thru 4	3 or *t*	1/4 *T*	3/16	1½
Over 4 thru 6	5 or *t*	1/4 *T*	1/4	1½
Over 6 thru 8	7 or *t*	1/4 *T*	5/16	1½
Over 8 thru 10	9 or *t*	1/4 *T*	3/8	1½
Over 10	*t*	1/4 *T*	See Note 1	1½

Note 1–For each increase in thickness of 2 in., or a fraction thereof, the hole diameter shall increase 1/16 in.

Note 2–For block sizes over 3 in. in thickness (*T*), the distance from the hole to the end of the block shall be ½*T* min. to prevent coincident reflections from the hole and the corner in the 1/4 th vee-path position. Blocks fabricated with a 1½-in. minimum dimension need not be modified if the corner and hole indications can be easily resolved.

Figure 1 BASIC CALIBRATION BLOCK 952179

SUBJECT	
ULTRASONIC EXAMINATION OF SIMILAR METAL WELD SEAMS AND ATTACHMENT WELDS	ISI-101, REV.11



1. Plot curvature of basic calibration block on diagonal (45°) line.
2. Draw horizontal line through that point from the $^{9}/_{10}$ to the $1^{1}/_{2}$ limit line.
3. The ends of this line read on the horizontal scale gives the range of vessel contact surface curvatures which may be examined with a system calibrated on this block.

Note: thickness range requirements shall also be satisfied.

Figure 2 RATIO LIMITS FOR CURVED SURFACES

The following data have been calculated for use in setting the swee range on the ultrasonic CRT screen when using angle beam examination.

$$SR = (R-T) \sin\left(\theta - \sin^{-1}\left(\frac{R \sin\theta}{R-T}\right)\right) \cot\theta$$

SR=Sweep Range (Inches)
R=Radius of Curvature for Outside Surface (Inches)
θ=Refracted Beam Angle from Normal to Surface
T=Wall Thickness (Inches)

177 Fuel Assembly Units

COMPONENT	RADIUS OF CURVATURE (Inches)	THICKNESS (Inches)	Calibration Based on Dep 1/2 Node Minimum Full Sc SWEEP RANGE (Inches) 45°	60°	SWEEP 1 (Inches) 45°
Reactor Vessel:					
Closure Head	94.25	7.0	7.3	8.2	10
Nozzle Belt	96.125	12.0	13.0	18.0	20
Core Belt	94.25	9.0	9.5	11.3	20
Lower Head	92.675	5.375	5.6	6.0	10
Steam Generator:					
Upper & Lower Heads	68.5	9.0	9.8	14.8	20
Shell	76.6	6.625	7.0	8.0	10
Pressurizer:					
Upper & Lower Heads	50	5.0	5.3	6.4	10
Shell Region	48.5	6.5	7.1	12.0	10
Heater Belt Region	55.0	13.0	16.3	*27.5	20
Main Loop Piping:					
Inlet Piping	15.0	4.0	5.5	* 8.0	10
Outlet Piping	19.0	4.0	4.8	*10.0	10
Inlet Piping	14.0	3.0	3.6	* 7.0	5
Outlet Piping	18.0	3.0	3.4	* 9.0	5

*Beam does not reach internal surface because of curvature.

The last two (2) columns provide even sweep ranges for full screen calibration which are convenient to use.

Figure 3 SWEEP RANGE SETTINGS FOR VARIOUS CURVATURE AND THICKNESS VESSELS.

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SUBJECT: ULTRASONIC EXAMINATION OF SIMILAR METAL WELD SEAMS AND ATTACHMENT WELDS	ISI-101, REV. 11

VOLUMETRIC TEST DATA: | CONTRACT:

STRUCTURE:

MARK: | TO MARK: | PROCEDURE: | I.S.I. ITEM NO.:

COMPONENT:

MATERIAL:

THICKNESS:

TEST SURFACE:

REMARKS:

POSITION A	POSITION B	LENGTH	DEPTH	MAX. SIGNAL	BEAM DIRECTION	ANGLE	CRYSTAL DISTANCE FROM A	CRYSTAL DISTANCE FROM B	CRYSTAL DISTANCE FROM 1	CRYSTAL DISTANCE FROM 2	SURFACE

NOTES:

INSTRUMENT: | CAL-BLOCK:

CRYSTALS:

ANGLES: | NODE:

BEAM DIRECTION:

NO. POSITION: | DISTANCE

#1 REF. POINT:

DRAWING: | DATE:

PAGE 1 OF | PERFORMED BY: | FIGURE NO.:

SKETCH

Figure 4 Typical Data Sheet

SUBJECT	
ULTRASONIC EXAMINATION OF THE BASE METAL AREAS BORDERING WELDED SEAMS AND BASE METAL REPAIRS	ISI-102, REV. 7

1. SCOPE: This procedure shall govern the ultrasonic examination of the base metal areas bordering welded seams and base metal repairs for inservice inspection as required by ASME Boiler and Pressure Vessel Code, Sections III and XI. Materials up to 15 inches thick are covered by this procedure.

2. EQUIPMENT: Ultrasonic examination equipment shall consist of an electronic apparatus capable of producing, receiving and displaying high frequency electrical pulses at the required frequencies and energy levels.

3. OPERATOR QUALIFICATION: The operator performing the inspection shall be qualified to Level II in accordance with B&W Construction Company Quality Control Administrative Procedure 9A-169. The assistant shall be qualified to at least Level I in accordance with B&W Construction Company Quality Control Administrative Procedure 9A-169.

4. SURFACE PREPARATION: The examination surface shall be free to dirt, loose scale, machining or grinding particles, weld spatter, or other loose foreign matter. The surface finish shall be sufficiently smooth to maintain acoustical bond and minimize surface noise. A mill finish may be adequate for testing. Whenever necessary, surface conditioning shall be accomplished by available mechanical processes, such as machining, grinding, sand blasting, or belt sanding to provide a suitable surface finish. Surface preparation shall be performed on an area which includes the weld and the area for 2T (2 times thickness) plus 2 inches on both sides of the weld. The ultrasonic testing operator shall inspect the surface for suitability for performing the examination. Surfaces shall be prepared in accordance with ISI-50.

5. COUPLANT: A suitable liquid, semi-liquid, or paste couplant medium, such as water, oil, glycerin, grease or Hamikleer shall be applied to the examination surface.

Each batch of materials used on stainless steels or nickel based alloys shall have been tested for residual amounts of

total halogen and total sulfur in accordance with ISI-60. The total residual amount of halogens and sulfur shall not exceed the requirements of ISI-60. The couplant batch number shall be recorded on the report data form.

6. AREA OF INTEREST: The examination shall include the weld fusion line and all of the area on both sides of the weld beyond the fusion line through which angle beams will pass. This includes 1.5 times the thickness for 45 degree, and 1.8 times the thickness for 60 degree angle beams.

7. STRAIGHT BEAM SEARCH UNITS: Either ceramic, lithium sulfate or barium titanate 2.25 or 5.0 MHz dual element or 2.25 MHz single element search units, having an effective area of 0.049 to 1.0 square inch inclusive, shall be used for the straight beam longitudinal wave examination. If the grain structure is such that 2.25 MHz cannot penetrate, a 1.0 MHz search unit of the types listed above may be substituted. Other search units may be used upon approval of the B&W Construction Company Level III Examiner.

8. CALIBRATION:

8.1 Instrument Calibration: When the examination is to be performed from the clad or unclad side of the component, the calibration shall be performed through either the clad or base material in the same manner. The search unit shall be coupled to the examination material to produce a minimum 50 percent to a maximum 75 percent full scale signal response from the opposite side of a defect free area of the plate.

If cladding conditions, nonparallel surfaces or other material properties cause calibration from the opposite side (back reflection) of the component to be unreliable or impossible, the opposite side calibration shall be established using a basic calibration block as defined in ISI-1 ISI-106, or ISI-109.

8.2 Change in Equipment: Any change in search units, shoes, couplants, cables, ultrasonic instruments, or any other parts of the examination system shall be cause for recalibration.

8.3 Calibration Confirmation: The back reflection shall be verified.:

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A. At the beginning of each day of examination.
B. At least every four hours of examination.

C. With every change of examination personnel.
D. At the finish of examinations for each thickness range.
E. If the operator suspects any malfunction of the UT syste
F. In the event of any power loss.

The original and final calibration must be performed on the component or the basic calibration block. Intermediate calibration checks may be performed on a calibration block simulator. If a calibration block simulator is used, it shall be able to produce known amplitude and sweep readings. The simulator produced amplitude and sweep readings shall be recorded on the calibration sheet at initial calibration and each calibration check.

8.4 Calibration Changes: If calibration amplitude has changed by more than 20% (2dB) of its original amplitude, all data sheets since the previous calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination areas shall be reexamined.

9. SCANNING REQUIREMENTS:

9.1 Movement Rate: The rate of search unit movement shall not exceed 6 in./sec. unless calibration is verified at scanning speed.

9.2 Search Unit Coverage: Each pass of the search unit shall overlap a minimum of 10% of the transducer piezoelectric element dimension perpendicular to the direction of scan.

9.3 Scanning Sensitivity: Scanning shall be performed with an instrument adjustment that will produce a back reflection from the opposite side of the base metal of from 50% to 90% of full scale. Minor sensitivity adjustments may be made to accomodate for surface roughness.

9.4 Penetration Verification: Verification of sound penetration through the base metal shall be accomplished by maintaining a 50% back reflection from the opposite parallel surface during scanning. It may not be possible to maintain a back reflection due to the clad interface conditions. In these cases, the sensitivity shall not be adjusted.

9.5 Deviations: Where the configuration of the weld being examined or surrounding structures do not permit scanning as required in Section 9, the examination deviations shall be recorded on the data sheets.

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10. RECORDING STANDARDS:

SUBJECT	
ULTRASONIC EXAMINATION OF THE BASE METAL AREAS BORDERING WELDED SEAMS AND BASE METAL REPAIRS	ISI-102 REV. 7

10.1 Plate:

10.1.1 Any area, where a discontinuity produces a total loss of back reflection accompanied by a continuous indication on the same plane that cannot be contained within a 3 inch diameter circle or 1/2 the plate thickness, whichever is greater, shall be reported.

10.1.2 Single discontinuities that do not exceed the requirements of 10.1 but are separated from a similar discontinuity by a distance less than the diameter of the larger shall be reported unless both can be contained within a 3 inch diameter circle or 1/2 plate thickness, whichever is greater.

10.1.3 All areas deemed acceptable to the above requirements but that cannot be contained in a 2 inch diameter circle shall be recorded.

10.2 Forgings:

10.2.1 All areas which exceed 50 percent of the resultant back reflection shall be investigated with the search unit in a position which produces the maximum amplitude. If the maximum amplitude equals or exceeds 100 percent of the resultant back reflection, it shall be recorded to those levels.

10.3 Areas which contain nonparallel surfaces shall be examined by establishing a minimum of 50 percent to a maximum of 75 percent back reflection from a calibration block which is of the nominal thickness and acoustically similar to the part being examined. Indications which exceed 100 percent of the original back reflection and cannot be contained in a 2 inch diameter circle shall be recorded to those levels.

10.4 The record shall show location, depth, size and amplitude of the discontinuity. Discontinuity amplitude shall be in 1 percent increments.

10.5 If a base material condition exists which exceeds the limits of Sections 10.1.1 and 10.1.2 or 10.2.1 the shear wave inspections as required by subsequent ISI specifications shall be performed from both inside and outside surfaces wherever possible. If the opposite side is not accessible, these areas shall be charted and the inspection performed on a best effort basis.

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11. RECORD OF EXAMINATION RESULTS: A copy of the examination data (Fig. 1) shall be provided to the customer with the following information:

A. Contract Number
B. Examination Personnel
C. Instrument
D. Method of Test
E. Couplant
F. Calibration Sheets
G. Item Identification and Location
H. Type, Size, and Frequency Search Unit
I. Ultrasonic Wave Mode
J. Calibration Block Number or Back Reflection (BR)
K. Chart of Results
L. Procedure
M. Date(s) of Examination
N. Examination Surface
O. Layout of Item as detailed in ISI-360, ISI-361 or ISI-362.

952187

B&W Construction Company

INSERVICE INSPECTION PROCEDURE

SY CT ULTRASONIC EXAMINATION OF THE BASE METAL AREAS BORDERING WELDED SEAMS AND BASE METAL REPAIRS	ISI-102, REV.7

CONTRACT:

VOLUMETRIC TEST DATA:

STRUCTURE: | PROCEDURE: | I.S.I. ITEM NO.:

MARK: TO MARK: | COMPONENT:

MATERIAL:

THICKNESS:

TEST SURFACE:

REMARKS:

POSITION A	POSITION B	LENGTH	DEPTH	MAX. SIGNAL	BEAM DIRECTION	ANGLE	CRYSTAL DISTANCE FROM A	CRYSTAL DISTANCE FROM B	CRYSTAL DISTANCE FROM 1	CRYSTAL DISTANCE FROM 2	SURFACE

NOTES:

INSTRUMENT: | CAL-BLOCK:

CRYSTALS:

ANGLES: | NODE:

BEAM DIRECTION:

NO. POSITION: | DISTANCE

#1 REF. POINT:

DRAWING: | DATE:

PAGE 1 OF | PERFORMED BY:

SKETCH

FIGURE NO.:

PAGE NO. 6 OF 6

Figure 1 Typical Data Sheet

Florida Power
CORPORATION

W. P. STEWART, DIRECTOR
POWER PRODUCTION

April 5, 1979

Mr. Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Crystal River Unit No. 3
Docket No. 50-302
Operating License No. DPR-72

Dear Mr. Reid:

The purpose of this letter is to update Florida Power Corporation's letter dated February 28, 1977, regarding inspections of stagnant, low pressure stainless piping containing boric acid solutions. The February 28, 1977, letter described the actions we took as a result of two cases of intergranular stress corrosion cracking (IGSCC) in the Crystal River Unit 3 building spray piping, and in response to IE Circular No. 76-06. In summary, the actions we took were as follows:

1. Ultrasonic examinations were performed of 27% of the building spray system welds and 11% of the decay heat system welds. No defects were found.

2. Procedures were initiated to perform periodic system operability/leak tests as required by our in-service inspection test program. No leaks have been found during these tests. We intend to continue these tests as required by our in-service inspection and test program.

3. Procedures were revised to require the building spray piping where the two cracks occurred to be drained following each test. This ensures that the stagnant water conditions which led to the cracking will not recur.

The February 28, 1977 letter also indicated we would volumetrically examine 5% of the total welds in the building spray and decay heat systems at each refueling outage. However, we have performed a reevaluation to determine the extent of inspections which are justified. Experience at CR-3 and other PWRs indicates that cracks in the subject piping may occasionally occur. However, in no cases have these cracks threatened the system operability — in all cases, small leaks have resulted in detection prior to the

cracks propagating completely around the circumference of the pipe. In this regard, it is noted that the NRC has indicated that "failure of austenitic stainless steel pipes in nuclear plants, without prior leakage, is considered to be extremely unlikely". (See Page 7 of NUREG-75/067, Investigation and Evaluation of Cracking in Austenitic Stainless Steel Piping of Boiling Water Reactors Plants, October, 1975.) Based on the above experience and NRC position, we consider it suitable to rely on periodic pressure tests and leak detection to monitor the condition of the subject piping for detection of intergranular chloride stress corrosion cracking.

Therefore, in lieu of the volumetric inspections of 5% of the welds, in the decay heat and building spray systems we proposed to perform:

1. Volumetric inspections and pressure tests in accordance with Section XI of the ASME Boiler and Pressure Vessels Code, 1974 Edition through Summer 1975 Addenda. This inspection program is defined by Florida Power Corporation's submittals dated April 14, 1977, November 21, 1977, August 17, 1978, and March 28, 1979.

2. At the forthcoming refueling outage we will ultrasonically inspect the building spray system welds at either side of the Reactor Building penetrations to insure that there has been no recurrence of cracking. The area to be examined will cover a distance of approximately six times the pipe wall thickness (not less than 2 inches) on each side of the welds.

If you require any further discussion concerning our proposal, please contact this office.

Very truly yours,

FLORIDA POWER CORPORATION

W. P. Stewart

W. P. Stewart

ECSekcR05
D24

File: 3-0-3-a-3

STATE OF FLORIDA

COUNTY OF PINELLAS

W.P. Stewart states that he is the Director, Power Production, of Florida Power Corporation; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W.P. Stewart

Subscribed and sworn to before me, a Notary Public in and for the State and County above named, this 5th day of April, 1979.

Notary Public

Notary Public, State of Florida at Large,
My Commission Expires: July 25, 1980
(Notary 1 D12)

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1(b) Provide a description of water chemistry controls, summary of chemistry data, any design changes and/or actions taken, such as periodic flushing of recirculation procedures to maintain required water chemistry with respect to pH, B, CL, F, O_2.

RESPONSE:

Crystal River Unit 3 water chemistry controls are covered by procedures SP-710 and SP-713, attached.

In general, the following water chemistry limits are maintained:

System	Building Spray	Spent Fuel	Decay Heat
pH	See Note 1	4.8 - 8.5	4.8 - 8.5
B ppm	"	0 - 2300	0 - 2300
Cl^- ppb	"	<50 - 200	<50 - 200
F^- ppb	"	<50	<50
O_2 ppm	"	6 - 8	10 ppb-8 ppm

NOTE 1: Some parts of Building Spray are operated on water from BWST which is maintained in range of Spent Fuel water chemistry limits.

SURVEILLANCE PROCEDURE

SP-710

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

RC, DECAY HEAT REMOVAL, AND RC MAKEUP SYSTEMS' CHEMISTRY SURVEILLANCE PROGRAM

REVIEWED BY: Plant Review Committee

Date 6/29/78

Meeting No. 78-26

APPROVED BY: Nuclear Plant Manager

Date 7/27/78

1.0 SURVEILLANCE REQUIREMENTS

1.1 The reactor coolant (RC), decay heat (DH) removal, and makeup systems shall be determined to be within the limits described on Enclosure 1 (Surveillance Table).

NOTE: Requirements listed on Enclosure 1 may include, but are not limited to, Standard Technical Specifications (STS), Environmental Technical Specifications (ETS), and FSAR specifications.

1.2 DEFINITIONS

1.2.1 Surveillance Table

Compiled information needed to schedule, implement, accept, and document surveillance activities.

1.2.2 Specified

Criteria as outlined by STS, ETS, FSAR, B & W, etc. in publications.

1.2.3 Administrative

Criteria as outlined by the ChemRad Section.

1.2.4 Action References

References to action required when "Specified Acceptance Criteria" cannot be met.

1.2.5 Implementation References

References needed to perform surveillance task.

1.2.6 Documentation

Florida Power Corporation (FPC) form on which surveillance results are to be recorded for review and transmittal to plant files.

1.2.7 LLD (Lower Limit of Detection)

1.2.8 FUR (Form 912915, ChemRad Follow-Up Report)

2.0 ACCEPTANCE CRITERIA

See Enclosure 1 (Surveillance Table).

3.0 REFERENCES NEEDED TO COMPLETE PROCEDURE

See "Completion" column of Enclosure 1 (Surveillance Table).

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

None

5.0 EQUIPMENT REQUIRED

Per "Implementation Reference" column of Enclosure 1 (Surveillance Table).

6.0 PROCEDURE

6.1 Consider special conditions or requirements per Section 4.0 of this procedure.

6.2 Perform "Surveillance Requirements" as outlined on Enclosure 1 (Surveillance Table).

6.2.1 Form 912915, ChemRad Follow-Up Report, shall be initiated describing deficiencies that prevent the scheduled completion of a surveillance task; ChemRad supervision and/or the Shift Supervisor shall be notified per "Documentation" form; and the applicable "Action Reference" shall be reviewed for required action.

6.3 Restore the affected system or component per the "Implementation Reference".

6.4 Record surveillance results on the form designated in the "Documentation" column of Enclosure 1 (Surveillance Table).

6.5 Circle in red on the "Documentation" form each result outside the limits on the form.

6.6 Notify ChemRad supervision and/or the Shift Supervisor per the "Documentation" form of all items circled.

6.6.1 Refer to the applicable "Action Reference" for required action when "Specified Acceptance Criteria" on Enclosure 1 (Surveillance Table) are exceeded.

6.6.2 When the Shift Supervisor must be notified of unsatisfactory surveillance results or when restorative and/or corrective actions require follow-up on a later date, a ChemRad Follow-Up Report (Form 912915) shall be initiated and referenced in the "Remarks" section of the "Documentation" form.

6.7 Route the completed "Documentation" form(s) per Section 5.6 of AI-400, Plant Operating Quality Assurance Manual Control Document.

6.7.1 A copy of Form 912915 (initiated above) shall be transmitted in the documentation package wherein the Follow-Up Report referenced.

SURVEILLANCE TABLE

SYSTEM (8) BC, Decay Heat Removal, BC Makeup — MODES 1, 2, 3, 4

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1		ADMINISTRATIVE			EQUIPMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REQUIRED (1
	BC LETDOWN								CH-301/302/ CH-303/308		
01	pH @ 25°C	5X/7D	BAW 1385 Part 1 Sec. 2.1, 2.7			4.8	8.5		CH-109/114	BC-D1/1-4	
02	Sp. Cond. @ 25°C	5X/7D	BAW 1385 Part 1 Sec. 2.1, 2.7a			0.056	20	μmho cm	CH-107/126	BC-D1/1-4	
03	Chloride(1	5X/7D(2	STS 4.4.7; BAW 1385 Part 1, Sec. 2.1, 2.9		.15	LLD	.10	ppm	CH-105	BC-D1/1-4	STS 3.4.7, 6.9
04	Fluoride(1	5X/7D(2	STS 4.4.7; BAW 1385 Part 1, Sec. 2.1,2.10		.15	LLD	.10	ppm	CH-104/142	BC-D1/1-4	STS 3.4.7, 6.9
05	Dissolved Oxygen(1	5X/7D(2	STS 4.4.7; BAW 1385 Part 1, Sec. 2.1,2.8		100(3	LLD	50(3	ppb	CH-110/125	BC-D1/1-4	STS 3.4.7, 6.9
06	Boron	5X/7D	BAW 1385 Part 1 Sec. 2.1, 2.5	(4	(4	(4	(4	ppm	CH-101/102	BC-D1/1-4	
07	Turbidity	5X/7D	Admin.			LLD	1.0	NTU	CH-125	BC-D1/1-4	
08	Lithium	1X/7D(5	BAW 1385 Part 1 Sec. 2.1, 2.6	0.2	2.0	0.5(5	1.2	ppm	CH-153	BC-M1/1-4	
09	Hydrogen	1X/7D	BAW 1385 Part 1 Sec. 2.1, 2.11	15	40	15	40	cc/kg	CH-112 302 only	BC-M1/1-4	
10	Total Gas	1X/7D	BAW 1385 Part 1 Sec. 2.1, 2.12		100	LLD	100	cc/kg	CH-112 302 only	BC-M1/1-4	
11	Filt. Fe Oxides	1X/14D	Admin.			LLD	50	ppb	CH-136	BC-BW1/1-4	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATIONS QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Maximum Interval: 72 hrs.
(3 Limit does not apply at an RC temperature of T(ave) ≤ 250°F.
(4 Record results as required herein and immediately inform the Control Center Operator of the value obtained.
(5 Frequency is 1X/8H when a lithium unsaturated demineralizer is on-line and/or
1X/D when lithium concentration is less than 0.5 ppm.

SURVEILLANCE TABLE

SYSTEM (5) RC, Decay Heat Removal, RC Makeup — MODES 1, 2, 3, 4

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	PRESSURIZER WATER SPACE								CH-304		
20	pH @ 25°C	1X/7D(3	Admin.; BAW 1385 Part 1, Sec. 2.15.4			4.8	8.5	---	CH-109/114	RC-M1/1-4	
21	Sp. Cond. @ 25°C	1X/7D(3	Admin.; BAW 1385 Part 1, Sec. 2.15.4			0.056	20	μmho CM	CH-107/126	RC-M1/1-4	
22	Chloride(1	1X/7D(3	STS 4.4.7; BAW 1385 Part 1, Sec. 2.15.3		0.15	LLD	0.10	ppm	CH-105	RC-M1/1-4	STS 3.4.7, 6.9
23	Fluoride(1	1X/7D(3	STS 4.4.7; BAW 1385 Part 1, Sec. 2.15.3		0.15	LLD	0.10	ppm	CH-104/142	RC-M1/1-4	STS 3.4.7, 6.9
24	Dissolved Oxygen(1	1X/7D(3	STS 4.4.7; BAW 1385 Part 1, Sec. 2.15.2		100(2	LLD	50(2	ppb	CH-110/111	RC-M1/1-4	STS 3.4.7, 6.9
25	Boron	1X/7D(3	BAW 1385 Part 1 Sec. 2.15.4	-20 of Bulk	+20 of Bulk	-20 of Bulk	+20 of Bulk	ppm	CH-101/102	RC-M1/1-4	
	PRESSURIZER STEAM SPACE								CH-307		
30	Non-Condensable Gases	1X/M(3,4	BAW 1385 Part 1 Sec. 2.15.5		10	LLD	5	psia	CH-112	RC-M3/1-4	
31	Vent Steam Space to Makeup Tank	1X/D(4	Admin.			0.3	1.0	gpm	CH-307	RC-M3/1-4	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Limit does not apply at T(ave) ≤ 250°F.

(3 Surveillance initiated during plant heatup by OP-202.

(4 When the daily venting of the pressurizer steam space is not possible, determine non-condensable gases and repeat 1X/7D until daily venting is resumed.

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POOR ORIGINAL

EXCLOSURE 1
PAGE 3 OF 7

SURVEILLANCE TABLE

SYSTEM (S) RC, Decay Heat Removal, RC Makeup MODES 1, 2, 3, 4

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED (1		ADMINISTRATIVE					
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	IMPLEMENT REFERENCE	DOCUMENT REFERENCE	ACTION REFERENCES (1
	MAKEUP AND PURIFICATION (2 DEMINERALIZER OUTLET								CH-309		
35	Chloride	1X/7D	BAW 1385 Part 2 Sec. 2.2.2		.10	LLD	.07	ppm	CH-105	RC-W1/1-4	
36	Fluoride	1X/7D	BAW 1385 Part 2 Sec. 2.2.3		.10	LLD	.07	ppm	CH-104/142	RC-W1/1-4	
37	Lithium	1X/7D	BAW 1385 Part 2 Sec. 2.2.4		2.0	LLD	2.0	ppm	CH-153	RC-W1/1-4	
38	Boron	1X/7D	BAW 1385 Part 2 Sec. 2.2.5			LLD	3,000	ppm	CH-101/102	RC-W1/1-4	
	MAKEUP TANK WATER SPACE								CH-310		
40	Turbidity	1X/7D	BAW 1385 Part 2 Sec. 2.4.2			LLD	0.2	NTU	CH-125	RC-W1/1-4	
41	Boron	(3	BAW 1385 Part 2 Sec. 2.4.1			LLD	3,000	ppm	CH-101/102	RC-W1/1-4	
	MAKEUP TANK GAS SPACE								CH-34x		
44	Pressure	1X/D	Admin.			3(4	22(5	psig	----	RC-W1/1-4	
45	Hydrogen	1X/7D	BAW 1385 Part 2 Sec. 2.3.2			80	100	Vol. %	CH-112	RC-W1/1-4	
46	Oxygen	1X/7D	BAW 1385 Part 2 Sec. 2.3.3		2	LLD	2	Vol. %	CH-112	RC-W1/1-4	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Required for unit(s) in service only.

(3 As required during bleed and feed operations.

(4 When pressure is less than 3 psig, dissolved hydrogen analysis is required and repeated at a frequency of 1X/D. (See task 710-09.)

(5 Pressures greater than 22 psig area acceptable during non-equilibrium/startup conditions.

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SURVEILLANCE TABLE

SYSTEM (8) RC, Decay Heat Removal, RC Makeup MODES 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPEC FIXED(1)		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCE (1
DECAY HEAT COOLER OUTLET									CH-314		
60	pH @ 25°C(5)	5X/7D	E/W 1385 Part 1 Sec. 2.2, 2.7			4.8	8.5	---	CH-109/114	RC-D1/5-6	
61	Sp. Cond. @ 25°C	5X/7D	BAW 1385 Part 1 Sec. 2.2, 2.7a			0.056	20	μmho CM	CH-107/126	RC-D1/5-6	
62	Chloride(1	5X/7D(2	STS 4.4.7		.15	LLD	0.10	ppm	CH-105	RC-D1/5-6	STS 3.4.7, 6.9
63	Fluoride(1	5X/7D(2	STS 4.4.7		.15	LLD	0.10	ppm	CH-104/142	RC-D1/5-6	STS 3.4.7, 6.9
64	Boron(1,3	5X/7D(2	STS 4.9.1(3	(3	(3	(3	(3	ppm	CH-101/102	RC-D1/5-6	STS 3.9.1(3, 6.9(3
65	Turbidity	1X/D	BAW 1385 Part 1 Sec. 3.0			LLD	0.2	NTU	CH-125	RC-D1/5-6	
66	Lithium(5	(8	BAW 1385 Part 1 Sec. 2.2, 2.6	0.2	2.0	0.5	1.2	ppm	CH-153	RC-D1/5-6	
67	Hydrazine(4,5	(5	BAW 1385 Part 1 Sec. 2.13			0.1	1.0	ppm	CH-113	RC-D1/5-6	
68	Filt. Fe Oxides	1X/14D	BAW 1385 Part 1 Sec. 2.4.2			LLD	50	ppb	CH-136	RC-D1/5-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Maximum Interval: 72 hrs.

(3 In Mode 6, surveillance requirements (including limits) are controlled by SP-406, Refueling Operations Daily Data Requirements. Record results as required herein and immediately inform the Control Center Operator of the value obtained.

(4 Hydrazine added only when required for oxygen control at less than 400°F and must not be added during power operation. Analysis required only when hydrazine is present.

(5 Required in Mode 5 only on startup prior to entry into Mode 4.

SURVEILLANCE TABLE

SYSTEM (S) RC, Decay Heat Removal, RC Makeup MODES 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
MAKEUP AND PURIFICATION(2 DEMINERALIZER OUTLET									CH-309		
70	Chloride	1X/7D	RAW 1385 Part 2 Sec. 2.2.2		.10	LLD	.07	ppm	CH-105	RC-W1/5-6	
71	Fluoride	1X/7D	RAW 1385 Part 2 Sec. 2.2.3		.10	LLD	.07	ppm	CH-104/142	RC-W1/5-6	
72	Lithium(4	1X/7D	RAW 1385 Part 2 Sec. 2.2.4		2.0	LLD	2.0	ppm	CH-153	RC-W1/5-6	
73	Boron	1X/7D	RAW 1385 Part 2 Sec. 2.2.5			LLD	3,000	ppm	CH-101/102	RC-W1/5-6	
PRESSURIZER WATER SPACE(4									CH-304		
75	Dissolved Oxygen	(3	STS 4.4.7		100	LLD	50	ppb	CH-110/111	RC-W1/5-6	
76	Chloride	(3	STS 4.4.7		.15	LLD	.10	ppm	CH-105	RC-W1/5-6	STS 3.4.7, 6.9
77	Fluoride	(3	STS 4.4.7		.15	LLD	.10	ppm	CH-104/142	RC-W1/5-6	STS 3.4.7, 6.9

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Required for unit(s) in service only.

(3 Surveillance initiated during plant heatup by OP-202.

(4 Required in Mode 5 only.

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SURVEILLANCE TABLE

SYSTEM (S) RC, Decay Heat Removal, RC Makeup MODES 5, 6

SURVEILLANCE REQUIREMENTS			ACCEPTANCE CRITERIA					COMPLETION		
SURVEILLANCE			SPECIFIED[1]		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TEST	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	PRESSURIZER STEAM SPACE								CH-307		
80	Hydrogen	(2	Admin.				LLD(2	psia	CH-112	RC-M1/5-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT
(2 Required prior to entry into Mode 6 only.

SURVEILLANCE TABLE

SYSTEM (8) RC, Decay Heat Removal, RC Makeup MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
				SPECIFIED[1]		ADMINISTRATIVE					
NO.	TEST	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	IMPLEMENT REFERENCE	DOCUMENT REFERENCE	ACTION REFERENCES (1
	AUXILIARY BLDG. DEMIN. WATER STG. TANK								CH-334		
89	Dissolved Oxygen	1X/7D(4	BAW 1385 Part 1 Sec. 4.3		100(4	LLD	100(4	ppb	CH-110/111	RC-D3/1-6	
90	Sp. Cond. at 25°C	1X/D	BAW 1385 Part Sec. 4.2		1	LLD	0.8(2	μmhos cm	CH-135	RC-D3/1-6	
91	Chloride	1X/7D(2	BAW 1385 Part 1 Sec. 4.5		.10	LLD	.07	ppm	CH-105	RC-W1/5-6 RC-W1/1-4	
92	Fluoride	1X/7D(2	BAW 1385 Part 1 Sec. 4.6		.10	LLD	.07	ppm	CH-104/142	RC-W1/5-6 RC-W1/1-4	
93	Silica	(2	Admin.			LLD	20	ppb	CH-130	RC-D3/1-6	
94	Sodium	(2	Admin.			LLD	10	ppb	CH-152	RC-D3/1-6	
95	Turbidity	1X/D	Admin.			LLD	0.5	NTU	CH-125	RC-D3/1-6	
96	pH at 25°C	1X/D	BAW 1385 Part 1 Sec. 4.4			6.0	8.0(3	---	CH-109/114	RC-D3/1-6	
97	Hydrazine	(3	Admin.			LLD	100	ppb	CH-113	RC-D3/1-6	
98	Ammonia	(3	Admin.			LLD	0.7	ppm	CH-124/129	RC-D3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT
(2 Chloride, fluoride, silica, and sodium analyses required if specific conductivity is greater than 0.8 μmho/cm.
(3 Hydrazine and ammonia analyses required if pH is greater than 8.0 at 25°C.
(4 Frequency is 1X/D and upper limit applies only if water is to be used directly as primary plant makeup.

ENCLOSURE 1 (Page 7 of 7)

SURVEILLANCE PROCEDURE

SP-713

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

RC SUPPORT SYSTEMS' CHEMISTRY SURVEILLANCE PROGRAM

952205

REVIEWED BY: Plant Review Committee

Date 7/12/79

Meeting No. 79-28

APPROVED BY: Nuclear Plant Manager

952204 Date 7/24/79

1.0 SURVEILLANCE REQUIREMENTS

1.1 The reactor coolant (RC) support systems' chemistry shall be determined to be within or equal to the administrative acceptance criteria as described on Enclosure 1 (Surveillance Table).

NOTE: Requirements listed on Enclosure 1 may include, but are not limited to, Standard Technical Specifications (STS), Environmental Technical Specifications (ETS), and FSAR specifications.

1.2 DEFINITIONS

1.2.1 Surveillance Table

Compiled information needed to schedule, implement, accept, and document surveillance activities.

1.2.2 Specified

Criteria as outlined by STS, ETS, FSAR, B & W, etc. in publications.

1.2.3 Administrative

Criteria as outlined by the ChemRad Section.

1.2.4 Action References

References to action required when "Specified Acceptance Criteria" cannot be met.

1.2.5 Implementation References

References needed to perform surveillance task.

1.2.6 Documentation

Florida Power Corporation (FPC) form on which surveillance results are to be recorded for review and transmittal to plant files.

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1.2.7 LLD (Lower Limit of Detection)

1.2.8 FUR (Form 912915, ChemRad Follow-Up Report)

2.0 ACCEPTANCE CRITERIA

See Enclosu' (Surveillance Table).

3.0 REFERENCES NEEDED TO COMPLETE PROCEDURE

See "Completion" column of Enclosure 1 (Surveillance Table).

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

None

5.0 EQUIPMENT REQUIRED

See "Implementation Reference" column of Enclosure 1 (Surveillance Table).

6.0 PROCEDURE

6.1 Consider special conditions or requirements per Section 4.0 of this procedure.

6.2 Perform "Surveillance Requirements" as outlined on Enclosure 1 (Surveillance Table).

6.2.1 Form 912915, ChemRad Follow-Up Report, shall be initiated describing deficiencies that prevent the scheduled completion of a surveillance task; ChemRad supervision and/or the Shift Supervisor shall be notified promptly per "Documentation" form; and the applicable "Action Reference" shall be reviewed for required action.

6.3 Restore the affected system or component per the "Implementation Reference".

6.4 Record surveillance results on the form designated in the "Documentation" column of Enclosure 1 (Surveillance Table).

6.4.1 Circle in red on the "Documentation" form each result outside the limits on the form.

6.4.2 Promptly notify ChemRad supervision and/or the Shift Supervisor per the "Documentation" form of all items circled.

6.4.3 Refer to the applicable "Action Reference" for required action when "Specified Acceptance Criteria" on Enclosure 1 (Surveillance Table) are exceeded.

6.4.4 When the Shift Supervisor must be notified of unsatisfactory surveillance results or when restorative and/or corrective actions require follow-up on a later date, a ChemRad Follow-Up Report (Form 912915) shall be initiated and referenced in the "Remarks" section of the "Documentation" form.

6.5 Route the completed "Documentation" form(s) per Section 5.6 of AI-400, Plant Operating Quality Assurance Manual Control Document.

6.5.1 A copy of Form 912915 (initiated above) shall be transmitted in the documentation package wherein the Follow-Up Report referenced.

SURVEILLANCE TABLE

SYSTEM (8) Emergency Core Cooling MODES 1, 2, 3

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
	SAMPLE/COMPONENT			SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REMARKS (1
	CF TANK 3A								CH-355		
01	Boron(1	1X/M(2	STS 4.5.1; BAW 1385 Part 4	2270	3500	2400	3400	ppm	CH-101	RS-M2/1-4	STS 3.5.1, 6.9
02	Fluoride(3	1X/M	Admin.			LLD	0.1	ppm	CH-104/142	RS-M2/1-4	
03	Chloride(3	1X/M	Admin.			LLD	0.1	ppm	CH-105	RS-M2/1-4	
04	Turbidity	1X/M	Admin.			LLD	1	NTU	CH-125	RS-M2/1-4	
05	Sp. Cond. at 25°C	1X/M	Admin.			0.056	20	μmho/cm	CH-107/126	RS-M2/1-4	
	CF TANK 3B								CH-355		
07	Boron(1	1X/M(2	STS 4.5.1; BAW 1385 Part 4	2270	3500	2400	3400	ppm	CH-101	RS-M2/1-4	STS 3.5.1, 6.9
08	Fluoride(3	1X/M	Admin.			LLD	0.1	ppm	CH-104/142	RS-M2/1-4	
09	Chloride(3	1X/M	Admin.			LLD	0.1	ppm	CH-105	RS-M2/1-4	
10	Turbidity	1X/M	Admin.			LLD	1	NTU	CH-125	RS-M2/1-4	
11	Sp. Cond. at 25°C	1X/M	Admin.			0.056	20	μmho/cm	CH-107/126	RS-M2/1-4	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Within six hours of volume increase ≥ 80 gals. and 1X/D until ΔB ≤ 100 ppmB. Special frequency initiated by SP-300, Operating Daily Surveillance Log, and OP-401, Core Flooding System, Section 7.0.

(3 Limits are established since dissolved oxygen in tanks is a function of cover gas and makeup solution composition and is not controlled readily.

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SURVEILLANCE TABLE

SYSTEM (S) Emergency Core Cooling

MODES 1, 2, 3, 4

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
	SAMPLE/COMPONENT			SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	BWST								CH-312		
12	Boron(1	1X/7D(2	STS 4.5.4	2270	2450	2300	2425	ppm	CH-101	RS-W2/1-6	STS 3.5.4, 6.9
13	Chloride	1X/Q	Admin.			LLD	0.1	ppm	CH-105	RS-Q2/1-4	
14	Fluoride	1X/Q	Admin.			LLD	0.1	ppm	CH-104/142	RS-Q2/1-4	
15	Turbidity	1X/Q	Admin.			LLD	0.5	NTU	CH-125	RS-Q2/1-4	
16	Sodium	1X/M	Admin.			LLD	0.1	ppm	CH-157	RS-M2/1-4	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Surveillance initiated by SP-320, Weekly Operability Verification of Boron Injection Sources, Pumps, and Flow Paths.

SURVEILLANCE TABLE

SYSTEM (S) Chemical Addition

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	BAST 3A								CH-318		
17	Boron(1	1X/7D(2	STS 4.1.2.8/4.1.2.9	12250	14000	12500	13800	ppm	CH-101	RS-W2/1-6	STS 3.1.2.8, 6.9/3.1.2.9
18	Turbidity	1X/M	Admin.			LLD	1	NTU	CH-125	RS-M2/1-4 RS-M2/5-6	
19	Chloride	1X/M	Admin.			LLD	1	ppm	CH-105	RS-M2/1-4 RS-M2/5-6	
20	Fluoride	1X/M	Admin.			LLD	1	ppm	CH-104 CH-142	RS-M2/1-4 RS-M2/5-6	
21	Sodium	1X/M	Admin.			LLD	1	ppm	CH-157	RS-M2/1-4 RS-M2/5-6	
	BAST 3B								CH-318		
22	Boron(1	1X/7D(2	STS 4.1.2.8/4.1.2.9	12250	14000	12500	13800	ppm	CH-101	RS-W2/1-6	STS 3.1.2.8, 6.9/3.1.2.9
23	Turbidity	1X/M	Admin.			LLD	1	NTU	CH-125	RS-M2/1-4 RS-M2/5-6	
24	Chloride	1X/M	Admin.			LLD	1	ppm	CH-105	RS-M2/1-4 RS-M2/5-6	
25	Fluoride	1X/M	Admin.			LLD	1	ppm	CH-104/142	RS-M2/1-4 RS-M2/5-6	
26	Sodium	1X/M	Admin.			LLD	1	ppm	CH-157	RS-M2/1-4 RS-M2/5-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Surveillance initiated by SP-320, Weekly Operability Verification of Boron Injection Sources, Pumps, and Flow Paths.

SURVEILLANCE TABLE

SYSTEM (S) Spent Fuel Cooling MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE COMPONENT				SPECIFIED		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
SF COOLING DEMINERALIZER INLET									CH-313		
27	Boron	1X/7D	BAW 1385 Part 5 Sec. 2.2	1700	----	1700	3000	ppm	CH-101/102	RS-W2/1-6	
28	Chloride	1X/7D	BAW 1385 Part 5 Sec. 2.4			LLD	.10	ppm	CH-105	RS-W2/1-6	
29	Fluoride	1X/7D	BAW 1385 Part 5 Sec. 2.5			LLD	.10	ppm	CH-104/142	RS-W2/1-6	
30	Turbidity	1X/7D	BAW 1385 Part 5 Sec. 2.3			LLD	.2	NTU	CH-125	RS-W2/1-6	
31	pH at 25°C	1X/7D	BAW 1385 Part 5 Sec. 2.6	4	5	4	5	----	CH-109/114	RS-W2/1-6	
SF COOLING DEMINERALIZER OUTLET (2									CH-313		
33	Chloride	1X/7D	Admin.			LLD	.07	ppm	CH-105	RS-W2/1-6	
34	Fluoride	1X/7D	Admin.			LLD	.07	ppm	CH-104/142	RS-W2/1-6	
35	Turbidity	1X/7D	Admin.			LLD	.1	NTU	CH-125	RS-W2/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Required for unit in service only.

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SURVEILLANCE TABLE

SYSTEM (5) Reactor Building Spray Additive

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED (1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	SODIUM THIOSULFATE STORAGE TANK (2								CH-354		
37	$Na_2S_2O_3$ (1	1X/6M	STS 4.6.2.2	257000	310000	265000	300000	ppm	CH-132	RS-SA3/1-6	STS 3.6.2.2, 6.9
38	NaOH (1	1X/6M	STS 4.6.2.2	5500	7500	6000	7000	ppm	CH-134	RS-SA3/1-6	STS 3.6.2.2, 6.9
39	Boron (1	1X/6M	STS 4.6.2.2	1640	2452	1800	2300	ppm	CH-101	RS-SA3/1-6	STS 3.6.2.2, 6.9
40	pH at 25°C	1X/6M	BAW 1385 Part B Sec. 3	7.5	10.0	9.0	10.0	---		RS-SA3/1-6	
41	Turbidity	1X/6M	Admin.			LLD	5	NTU	CH-125	RS-SA3/1-6	
	SODIUM HYDROXIDE STORAGE TANK (2								CH-354		
43	NaOH (1	1X/6M	STS 4.6.2.2	105,000	120,000	110,000	115,000	ppm	CH-134	RS-SA3/1-6	STS 3.6.2.2, 6.9
44	Turbidity	1X/6M	Admin.			LLD	5	NTU	CH-125	RS-SA3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Analyses shall be verified at one week after initial fill or at one month after any replenishment.

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SURVEILLANCE TABLE

SYSTEM (S) Industrial Cooling MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
	SAMPLE/COMPONENT			SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT REFERENCE	DOCUMENT REFERENCE	ACTION REFERENCES (1
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS			
	INDUSTRIAL COOLER CLOSED CYCLE								CH-371		
46	pH at 25°C	1X/7D	Admin.			8.5	9.5	----	CH-109/114	RS-W3/1-6	
47	Cat. Cond. at 25°C	1X/7D	Admin.			LLD	10	μmho cm	CH-135	RS-W3/1-6	
48	Dissolved Oxygen	1X/M(2	Admin.			LLD	100	ppb	CH-110/111	RS-W3/1-6	
49	Morpholine	1X/7D	Admin.			2	6	ppm	CH-151	RS-W3/1-6	
50	Hydrazine	1X/7D	Admin.			15(2	25	ppm	CH-113	RS-W3/1-6	
51	Turbidity	1X/7D	Admin.			LLD	2	NTU	CH-125	RS-W3/1-6	
	INDUSTRIAL COOLER TOWER SUMP								CH-371		
53	pH at 25°C	1X/7D	Admin.			6.5	9.0	----	CH-109/114	RS-W3/1-6	
54	Sp. Cond. at 25°C	1X/7D	Admin.			0.056	200	μmho cm	CH-107/126	RS-W3/1-6	
55	Continuous Bloudown Rate	1X/7D	Admin.			Fully Closed	Fully Open	Valve Turns	CH-371	RS-W3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Dissolved oxygen analysis required if N_2H_4 is less than 15 ppm.

SURVEILLANCE TABLE

SYSTEM (E) Emergency Core Cooling

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1)		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
DIESEL GENERATOR CCC 3A									CH-370		
57	CS Inhibitor	1X/M	Admin.			2500	3500	----	CH-137	RS-M3/1-6	
58	pH at 25°C	1X/M	Admin.			8.5	9.5	----	CH-109/114	RS-M3/1-6	
59	Turbidity	1X/M	Admin.			LLD	300	NTU	CH-125	RS-M3/1-6	
DIESEL GENERATOR CCC 3B									CH-370		
61	CS Inhibitor	1X/M	Admin.			2500	3500	----	CH-137	RS-M3/1-6	
62	pH at 25°C	1X/M	Admin.			8.5	9.5	----	CH-109/114	RS-M3/1-6	
63	Turbidity	1X/M	Admin.			LLD	300	NTU	CH-125	RS-M3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

SURVEILLANCE TABLE

SYSTEM (5) DHCCC

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
	SAMPLE/COMPONENT			SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REQUIRED (1
	DHCCC 3A								CH-316		
65	pH at 25°C	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	8.5	9.5	8.5	9.5	----	CH-109/114	RS-W3/1-6	
66	Cat. Cond.	1X/7D	BAW 1385 Part 6 Sec. 2.3.3		25	LLD	5(4	μmho cm	CH-135	RS-W3/1-6	
67	Dissolved Oxygen	1X/M(3	BAW 1385 Part 6 Sec. 2.3.4		100	LLD	100	ppb	CH-110/111	RS-W3/1-6	
68	Chloride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-105	RS-W3/1-6	
69	Fluoride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-104/142	RS-W3/1-6	
70	Morpholine	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	2	6	2	6	ppm	CH-151	RS-W3/1-6	
71	Hydrazine	1X/7D	BAW 1385 Part 6 Sec. 2.3.4	10	15	15(3	25	ppm	CH-113	RS-W3/1-6	
72	Filt. Fe Oxides	1X/7D	Admin.			LLD	500	ppb	CH-125	RS-W3/1-6	
73	Total Copper	1X/Q(2	BAW 1385 Part 6 Sec. 2.3.6		100	LLD	50	ppb	CH-156	RS-W3/1-6	
74	Ammonia	1X/7D	BAW 1385 Part 6 Sec. 2.3.7			LLD	0.5(2	ppm	CH-124/129	RS-W3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Total copper analyses are required if ammonia is greater than 0.5 ppm.
(3 Dissolved oxygen analysis required if N_2H_4 is less than 15 ppm.
(4 Chloride and fluoride analyses required if cation conductivity is greater than 5 μmho/cm.

SURVEILLANCE TABLE

SYSTEM (S) DHCCC

UNITS 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1)		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	DHCCC 3B								CH-316		
75	pH at 25°C	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	8.5	9.5	8.5	9.5	----	CH-109/114	RS-W3/1-6	
76	Cat. Cond.	1X/7D	BAW 1385 Part 6 Sec. 2.3.3		25	LLD	5(4	μmho cm	CH-135	RS-W3/1-6	
77	Dissolved Oxygen	1X/M(3	BAW 1385 Part 6 Sec. 2.3.4		100	LLD	100	ppb	CH-110/111	RS-W3/1-6	
78	Chloride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-105	RS-W3/1-6	
79	Fluoride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-104/142	RS-W3/1-6	
80	Morpholine	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	2	6	2	6	ppm	CH-151	RS-W3/1-6	
81	Hydrazine	1X/7D	BAW 1385 Part 6 Sec. 2.3.4	10	15	15(3	25	ppm	CH-113	RS-W3/1-6	
82	Filt. Fe Oxides	1X/7D	Admin.			LLD	500	ppb	CH-136	RS-W3/1-6	
83	Total Copper	1X/Q(2	BAW 1385 Part 6 Sec. 2.3.6		100	LLD	50	ppb	CH-156	RS-Q3/1-6	
84	Ammonia	1X/7D	BAW 1385 Part 6 Sec. 2.3.2			LLD	0.5(2	ppm	CH-124/129	RS-W3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Total copper analyses are required if ammonia is greater than 0.5 ppm.
(3 Dissolved oxygen analysis required if N_2H_4 is less than 15 ppm.
(4 Chloride and fluoride analyses required if cation conductivity is greater than 5 μmho/cm.

SURVEILLANCE TABLE

SYSTEM (S) NSCCC

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
SAMPLE/COMPONENT				SPECIFIED(1		ADMINISTRATIVE			IMPLEMENT REFERENCE	DOCUMENT REFERENCE	ACTION REQUIRED (1
NO.	TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS			
	NSCCC								CH-316		
86	pH at 25°C	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	8.5	9.5	8.5	9.5	----	CH-109/114	RS-W3/1-6	
87	Cat. Cond.	1X/7D	BAW 1385 Part 6 Sec. 2.3.3		25	LLD	5(4	µmho cm	CH-135	RS-W3/	
88	Dissolved Oxygen	1X/M(3	BAW 1385 Part 6 Sec. 2.3.4		100	LLD	100	ppb	CH-110/111	RS-W3/1-6	
89	Chloride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-105	RS-W3/1-6	
90	Fluoride	1X/M(4	BAW 1385 Part 6 Sec. 2.2.6		1	LLD	0.5	ppm	CH-104/142	RS-W3/1-6	
91	Morpholine	1X/7D	BAW 1385 Part 6 Sec. 2.3.2	2	6	2	6	ppm	CH-151	RS-W3/1-6	
92	Hydrazine	1X/7D	BAW 1385 Part 6 Sec. 2.3.4	10	15	15(3	25	ppm	CH-113	RS-W3/1-6	
93	Turbidity	1X/7D	Admin.			LLD	2	NTU	CH-125	RS-W3/1-6	
94	Total Copper	1X/Q(2	BAW 1385 Part 6 Sec. 2.3.6		100	LLD	50	ppb	CH-156	RS-Q3/1-6	
95	Ammonia	1X/7D	BAW 1385 Part 6 Sec. 2.3.7			LLD	0.5(2	ppm	CH-124/129	RS-W3/1-6	

(1 Requirement shall not be administratively relaxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.

(2 Total copper analyses are required if ammonia is greater than 0.5 ppm.

(3 Dissolved oxygen analysis required if N_2H_4 is less than 15 ppm.

(4 Chloride and fluoride analyses required if cation conductivity is greater than 5 µmho/cm.

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SURVEILLANCE TABLE

SYSTEM (6) MSCCC

MODES 1, 2, 3, 4, 5, 6

SURVEILLANCE REQUIREMENTS				ACCEPTANCE CRITERIA					COMPLETION		
				SPECIFIED[1]		ADMINISTRATIVE			IMPLEMENT	DOCUMENT	ACTION
NO.	SAMPLE/COMPONENT TASK	FREQUENCY	REFERENCES	LL	UL	LL	UL	UNITS	REFERENCE	REFERENCE	REFERENCES (1
	CRD FILTER OUTLET								CH-363		
97	Turbidity	1X/2W	Admin.			LLD	0.2	NTU	CH-125	MS-BW1/1-6	

(1 Requirement shall not be administratively laxed as per AI-400 - PLANT OPERATING QUALITY ASSURANCE MANUAL CONTROL DOCUMENT.
(2 Required for unit(s) in service only.

1(c) Describe the preservice NDE performed on the weld joints of identified systems. The description is to include the applicable ASME Code sections and supplements (addenda) that were followed, and the acceptance criterion.

RESPONSE:

Preservice inspection at Crystal River Unit 3 was performed per ASME Section XI (1971 edition through Winter 1972 addenda). Inspection was conducted for FPC by B&W. Acceptance criteria are listed in the attached Summary Report.

In general, PSI included these examinations:

Class 1 Piping:

60 Decay Heat welds examined by UT (0°/45°) and VT
310 Makeup welds examined by UT (0°/45°) and VT

Class 2 Piping:

354 Decay Heat welds examined by UT (0°/45°) and VT
88 Makeup welds examined by UT (0°/45°) and VT

All PSI data was reviewed by B&W and FPC Level III examiners and found acceptable.

1.0 SUMMARY REPORT INTRODUCTION

This report describes the 1975-76 Preoperational Inspection of the Class 1 and 2 portions of the Nuclear Steam Supply System for Florida Power Corporation, Crystal River Unit #3, located near Crystal River Florida. This Inspection was performed in conformance with the 1971 Edition (through the Winter 1972 Addenda) of Section XI "Rules for Inservice Inspection of Nuclear Reactor Coolant Systems" of the ASME B&PV Code. All pressure boundary welds and adjacent base metal were examined to the extent that the system design and non-destructive testing technology permitted. This report describes the areas examined, the type of examinations, the examination standards and procedures, and the test data accumulated for comparison in future Inservice Inspections. Manual and remote ultrasonic examination techniques were used in conjunction with visual, liquid penetrant and magnetic particle examinations.

The technical data and examination results summarized in Volume 1 of this report are documented in detail in Volumes 3 through 8. It may be noted that the data forms used are not exact duplicates of those shown in the procedures contained in the Preoperational Inspection Manual. Those shown in the procedures are intended only as examples, and the forms used in this report comply with the recording requirements of said procedures.

1.1 EXAMINATION METHODS

All nondestructive examinations were performed in accordance with the detailed procedures contained in the Preoperational Inspection Manual. For easy reference, a list of these procedures is presented in Section 2 of Volume 1.

The development of examination methods, the preparation of examination methods, the preparation of examination procedures, the performance of examinations, and the interpretation and evaluation of examination results were performed by qualified personnel.

The examination procedures were written by personnel qualified to at least the requirements of SNT-TC-1A (1968 Edition) Level II and were reviewed and approved by personnel qualified to Level III. These procedures conform to the requirements of the 1971 Editions, (through Winter 1972 Addenda) of ASME B&PC Code Sections XI, V and III where applicable.

The preoperational inspection examinations were performed by technicians qualified to SNT-TC-1A (1968 Edition) Level II, assisted by technicians qualified to at least Level I. Each of the examination data figures in Volume 3 through 8 lists the specific equipment, materials and procedures that were used. All pieces of equipment were calibrated in accordance with the specific procedures and ISI-80, Revision 4, "Administrative Procedure for Preventive Maintenance of NDE Equipment", and were standard production models having no changes or modifications. In like manner, the materials used for the examinations were those required in the procedures and were recorded in the data figures.

1.2 DATA REVIEW AND EVALUATION

The Class 1 and Class 2 systems preoperational inspection examination data, except for the Class 2 piping, were reviewed and evaluated at B&W Construction Company, Copley, Ohio by personnel qualified to SNT-TC-1A (1968 Edition) Levels II or III. The criteria used during the evaluations are as follows:

1.2.1 Recordable Indications: Any visual, magnetic particle, or liquid penetrant indications with size or number exceeding the amount allowed by Paragraph NB5342 and NB5352 of the ASME B&PV Code Section III, 1971 Edition, through Winter 1972 Addenda. Ultrasonic indications with signal amplitude exceeding 20 or 50 percent (depending on the specific procedure) of the calibration reference level.

1.2.2 Reportable Indication: Visual, magnetic particle, liquid penetrant and ultrasonic indications with shape, size, number, or signal amplitude exceeding the amount allowed by ASME B&PV Code Section XI, 1971 Edition, through Winter 1972 Addenda.

The results of all Class 1 and Class 2 system nondestructive examinations, except for the Class 2 piping examinations, were reviewed and certified by personnel qualified to SNT-TC-1A (1968 Edition) Levels II and III. Indications were evaluated and/or correlated to the original fabrication acceptance standards or the acceptance standards in ASME B&PV Code Section XI.

The results of all Class 2 piping nondestructive examinations were reviewed and certified by Mr. J. C. Hicks, the Level III examiner for Florida Power Corporation.

Frank J. Sattler

Frank J. Sattler
B&W Construction Company
Level III Examiner

6.0 CLASS 1 PIPING SUMMARY

For clarity, the results are summarized in groups of similar welds or components. No reportable indications were found by ultrasonics. Several reportable indications were found by visual and liquid penetrant. These areas were repaired, re-examined and found to be clear.

6.1 Reactor Vessel Core Flood Nozzle to Safe End Welds

The core flood nozzle to safe end welds joining MK89 to 17 were examined with ultrasonics and liquid penetrants. Several low amplitude recordable indications were found as documented on the various data sheets.

6.2 Surge Nozzle to Safe End Weld

The surge nozzle to safe end weld joining MK8 to MK37 was examined visually and with liquid penetrants and ultrasonics. One low amplitude recordable signal was found as documented on the data sheet This indication resulted from the ID geometry of the nozzle.

6.3 Pressurizer Relief Nozzle to Safe End Welds

The pressurizer relief nozzle to safe end welds were examined visually and with liquid penetrants and ultrasonics. However, some low amplitude recordable indications were found as noted on the data sheet. These signals were due to nozzle geometry.

6.4 Flow Meter RTE-Mounting Boss-Vent Connection Pressurizer Tap, Decay Heat and Drain Nozzle to Safe End Welds

These nozzle welds were examined visually and with liquid penetrants and ultrasonics. No recordable indications were found.

6.5 Reactor Vessel Inlet and Outlet Nozzle to Pipe Welds

The inlet and outlet nozzles to primary piping welds were examined and two low amplitude recordable indications were found as documented on the data sheets.

6.6 Circumferential and Longitudinal Welds

The circumferential and longitudinal weld seams were examined visually and with ultrasonics.

Three hundred and twelve recordable indications were found.

6.7 Branch Connection Welds Exceeding 4 inches Nominal Pipe Size

The branch connection welds were examined visually and with ultrasonics. No recordable indications were found by ultrasonics. Recordable indications were found by visual examinations in four areas on the MK51 to MK49 pressurizer spray nozzle to pipe weld.

6.8 Socket Welds

The socket welds were examined visually and with liquid penetrants Numerous recordable indications were found as noted on the data sheets.

6.9 Branch Connection Welds, 4 Inches Nominal Pipe Size and Less

The branch connection welds were examined visually and with liquid penetrants and ultrasonics. Several recordable indications were found visually and with liquid penetrants, as documented on the data sheets. No recordable indications were found by ultrasonics.

6.10 Circumferential and Longitudinal Welds and Branch Connection Welds

The welds were examined visually. Florida Power personnel performed this examination. No recordable indications were found.

6.11 Integrally Welded Piping Supports

Twenty-six integrally welded piping supports were examined visually and with either liquid penetrants or ultrasonics. No reportable indications were found. For nineteen of the supports, the geometric structure prohibited the effective use of ultrasonics for the examinations. Liquid penetrant examinations were performed

on these supports as an alternative. The remaining seven supports were examined with ultrasonics. Several recordable indications were found, as documented on the data figures.

10.0 CLASS 2 PIPING WELDS

For clarity, the results are summarized in groups of similar welds or components.

10.1 Circumferential and Longitudinal Welds

The circumferential and longitudinal welds were examined with ultrasonics. Numerous indications were found. These indications were evaluated by Mr. J. C. Hicks Florida Power Corporation Level III examiner. Mr. Hicks' evaluation follows this summary.

10.2 Support and Hangers

The piping supports and hangers were examined visually and with magnetic particles and liquid penetrants. No reportable or recordable indications were found.

10.3 Bolts and Nuts

The bolts and nuts were examined visually and with ultrasonics. No reportable or recordable indications were found.

10.4 Valves

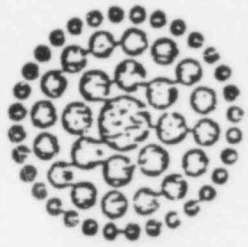
The valves were examined visually. No reportable indications were found. Four recordable indications were found.

10.5 Valve Bolts

The valve bolts were examined visually and with ultrasonics. No reportable or recordable indications were found.

10.6 Penetration Welds

The penetration welds were examined with either liquid penetrant or magnetic particle. No reportable indications were found.



Florida
Power
CORPORATION

EVALUATION OF CLASS II ULTRASONIC TEST RESULTS DURING PRESERVICE INSPECTION

Prepared by:

J. C. Hicks
FPC - Level III
Quality Programs Department

PROBLEM

Extensive ultrasonic indications were identified during preservice inspection of mainsteam (MS), feedwater (FW), and emergency feedwater (EF) welds.

The subject indications appear on a large portion of the MS, FW and EF welds; both shop and field, which were examined as part of preservice inspection. They consist of circumferential linear indications which equal or exceed the magnitude of the reference curves and have lengths greater than those acceptable under the applicable inspection procedures conducted under Plant Surveillance Procedure SP-304.

A determination of the physical cause of the indications was needed to evaluate the possible effect the cause of the indications might have on the integrity of the welds.

BACKGROUND

The Crystal River Unit #3 Main Steam, Feedwater, and Emergency Feedwater systems consist primarily of SA-106 GrB and SA-182 piping materials which were designed and fabricated to ANSI B31.1 - 1969 as modified by Requirement Outline, RO-2891. These documents do not recognize the conduct of ultrasonic examinations; and further, were promulgated prior to the existence of any requirements for the conduct of inservice examinations of pressure containing equipment.

Because of the foregoing no clearly defined basis existed upon which to evaluate the ultrasonic (UT) indications.

Additional background is as follows:

1. Main steam line 24 inch diameter by 0.94 inch nominal wall SA-106 GrB.
2. Feedwater line 18 inch diameter by 0.937 inch nominal wall SA-106 GrB.
3. Shop welds were made by M. W. Kellogg to weld procedure P1-K1-F6-SAW-14-1G (copy attached).
4. Field welds were made by J. A. Jones to weld procedure CS-1-TIG-SMA and CS-2-BR-SMA (attached).
5. Welds were visually inspected and radiographed to a nominally 2-2T sensitivity after post weld heat treatment (PWHT).
6. Preservice inspection was conducted under procedure SP-304 (attached).
7. Ultrasonic inspections were in accordance with procedures ISI-101 and 102.

INVESTIGATION

The first step of the investigation was an attempt to ascertain the location of the UT reflectors by making full-scale layouts of them on plan views of some of the subject welds.

Similar layouts were made for UT data taken as follows:

1. MS-17 weld A prior to hydrotest
2. MS-17 weld A after hydrotest
3. MS-4 weld A prior to hydrotest
4. MS-4 weld A after hydrotest
5. MS-18 prior to hydrotest
6. Partial MS-18 after hydrotest
7. FW-347 prior to hydrotest

Examples of the layouts from MS-17A are attached.

All of the layouts exhibited certain characteristics as follows:

1. Indications were linear and circumferential in nature.
2. Many indications had apparent through wall distances of 0.10 to 0.30 inches.
3. Most indications were at or very near the weld I.D. surface.
4. The indications were 1/8 to 3/16 inches off the root centerline.
5. Many indications were not detectable from both sides of the weld.

In an attempt to characterize the cause of the UT indications, Pittsburg Testing Lab (PTL) radiographed MS-17A both prior and subsequent to hydrotest with a technique which produced radiographs to a 2-1T sensitivity. The indications present were mapped in the same manner as the UT data. UT indications were found to correspond to most of the slight RT indications, but no RT indications correlated with the significant linear root UT indications.

Based on the foregoing, it was decided to conduct an experiment to try to duplicate the indications in a sample weld. Pipe material, which had been cut from the Main Steam lines to permit installation of the isolation valves, was obtained and had weld preps machined in accordance with drawing (attached). From the preservice inspection records and construction records it was determined the weld MS-18 was a field weld with a typical pattern of UT indications. Using the Field Weld Data Sheet, it was determined that a consumable insert of the same heat number as used on MS-18 was available; as was the welder who "pulled" the original insert.

INVESTIGATION (Cont'd)

Using the above information and materials, the sample weld was made as similar to MS-18 as practical. The weld was subject to quality control similar to the field weld and was documented on a Field Weld Data Sheet (attached).

A battery of non-destructive and destructive examinations were conducted on the sample weld, as listed below, in order to provide a maximum data base from which to evaluate the problem.

NDE ON SAMPLE WELD - AS WELDED

1. O. D. Visual
2. I. D. Visual
3. UT from O. D. both 0° and 45° shear.
4. RT to a 2-1T sensitivity on Kodak "M" film

NDE ON SAMPLE WELD - AFTER PWHT

1. O. D. Visual
2. I. D. Visual w/macro-photos
3. UT from O. D. both 0° and 45° shear.
4. RT to a 2-1T sensitivity or better on both Kodak "M" and "R" films.
5. Fluorescent liquid penetrant (LP) of the I. D. of the weld root area.
6. Magnetic Particle (MT) by the dry D. C. yoke method on the I. D. and O. D. weld area.

From this range of tests there appeared to be a series of linear indications coincident with I. D. weld prep machining marks which were visible close-up, confirmed by magnetic particle and liquid penetrant examinations, partially correlated with fine indications in high resolution radiographs and partially corresponding to UT indications greater than 100% DAC showing through wall distances of 0.10 to 0.30 inches.

Based on the NDE results it was then decided to section the sample weld at locations where multiple NDE techniques all showed indications. This was done and the resulting six cross-sections were polished and examined both as-polished and etched. The sample from the location of greatest UT response was sent to Dr. William F. Smith at Florida Technological University for an independent analysis. His resultant report is attached. None of the cross-sections examined showed any macro or micro discontinuities in or near the weld zone which would relate to the UT indications. The machining marks were determined to be less than three mils deep.

Further consideration of the sample weld showed that sharp changes of the I. D. contour, resulting from both the machined weld prep and the root bead configuration, were present that might act as geometric UT reflectors. To demonstrate if this was

INVESTIGATION (Cont'd)

the case a one foot section of the sample weld was re-exami[illegible] by UT, again verifying the indications as present, and then the I. D. was care[illegible]ly handground to produce a smoothly transitioned contour with a minimum meta[illegible]removal. Examination by the same UT technique after contouring showed all appare[illegible] indications had been eliminated.

As a final investigation visual examinations of field welds [illegible]-17A and MS-17L were accomplished using a fiber-optic borescope. Viewing condit[illegible]s were marginal, but it was verified that a similar root bead contour was presen[illegible]ut no weld prep contours could be distinguished.

CONCLUSIONS

From the results of this extensive investigation it has been concluded that:

1. A weld contour is produced which acts as a geometric reflector during ultrasonic examination; causing apparent linear root indications.

2. Removal of the root bead contour eliminates the indications.

3. No radiographic indications are present in the accepted construction radiographs which correlate with the UT indications.

4. Remote visual examination of two main steam welds confirmed the presence of root bead contours comparable to the sample weld.

5. Macro and micro examinations of areas with significant ultrasonic indications showed no related discontinuities.

6. The results and conclusions of this investigation have received the review and concurrence of the architect engineer, Gilbert Associates, Inc. (letter FPC - 13544 attached).

ACTION TO BE TAKEN

Based upon the conclusions of this evaluation and the recommendations of the Florida Power Corporation Level III Examiner, we shall:

1. Make no attempt to eliminate the weld I.D. ultrasonic indications from the mainsteam, feedwater, and emergency feedwater systems.

2. Monitor the structural integrity of the subject systems in service by use of an acceptable radiographic technique.

3. Retain in file all present radiographic and ultrasonic examination records made to date on the subject systems.

4. Perform ultrasonic examinations on the same one quadrant of the following mainsteam welds during three (3) inservice inspections with a minimum of 9 months operation between examinations: MS-17A, MS-4, & MS-18.

   Should no degradation be discovered upon comparison of results to past data, no further examinations will be made other than those committed to in our Standard Technical Specifications.

1(d) Facilities having previously experienced cracking identified systems, Item 1, are requested to identify (list) the new materials utilized in repair or replacement on a system-by-system basis. If a report of this information and that requested above has been previously submitted to the NRC, please reference the specific report(s) in response to this bulletin.

RESPONSE:

Florida Power Corporation experienced through-wall cracking in two areas of Building Spray welds as discussed in our 28 February 1977 letter, attached. In both cases, TP 304 SS piping was replaced with TP 304 SS. The initial crack was repaired and radiographed per Work Request 01876 and Modification Approval Record 77-1-8. The second and final crack was repaired and radiographed per WR 2181, MAR 77-1-31.

Both areas were again volumetrically examined (UT and RT) during the refueling outage commencing 23 April 1979. Indications were acceptable.