



Westinghouse
Electric Corporation

Energy Systems

Nuclear Services Division

PO Box 855
Pittsburgh Pennsylvania 15230-0855

November 1, 1996

AW-96-1029

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. Frank J. Miraglia

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Transmittal of Proprietary & Non-Proprietary Presentation Materials From 10/10/96, WPSC/NRC/W Meeting Regarding Laser Welded Repair of Degraded HEJ Sleeved Tube Assemblies

Reference: Westinghouse Letter NSD-NRC-96-4837, "Laser Welded Repair of Degraded Hybrid Expansion Joint (HEJ) Tube Assemblies at Kewaunee," Presentation Materials

Dear Mr. Miraglia:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.790, Affidavit AW-96-1029 accompanies this application for withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

NSD499L:October 31, 1996

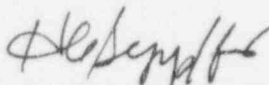
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PDR TOPRP EMVWEST
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AW-96-1029
November 1, 1996

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-96-1029 and should be addressed to the undersigned.

Very truly yours,



N.J. Liparulo, Manager
Regulatory and Engineering Networks

Enclosure

cc: Kevin Bohrer/NRC(12H5)

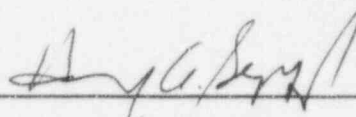
AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Henry A. Sepp, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



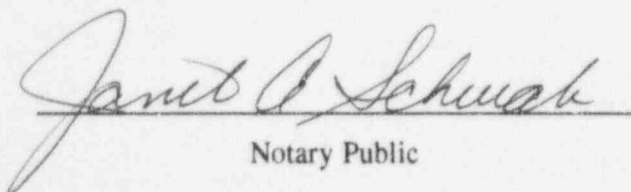
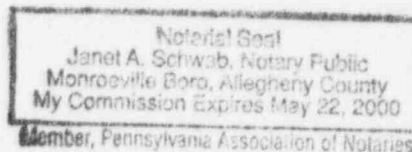
Henry A. Sepp, Manager

Regulatory and Licensing Initiatives

Sworn to and subscribed

before me this 1st day

of November, 1996


Notary Public

- (1) I am Manager, Regulatory and Licensing Initiatives, in the Nuclear Services Division, of the Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.
- (2) I am making this Affidavit in conformance with the provisions of 10CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Energy Systems Business Unit in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

- (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.
- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10CFR Section 2.790, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in Westinghouse letter report NSD-REN-RLI-96-268 entitled: "October 10, 1996 WPSC/NRC/Westinghouse Meeting Presentation Materials, Laser Welded Repair of HEJ Sleeved Tubes, Proprietary Class 2," (Proprietary), being transmitted by the Westinghouse Electric Corporation letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk, Attention Mr. Frank J. Miraglia. The proprietary information as submitted for use by the Westinghouse Electric Corporation is expected to be applicable in other licensee submittals in response to certain NRC requirements for

justification of the use of laser welded repair of hybrid expansion joint sleeves in steam generator tubes.

This information is part of that which will enable Westinghouse to:

- (a) Provide documentation of the methods for laser welded repair of hybrid expansion joint sleeving of steam generator tubes.
- (b) Establish applicable testing methods.
- (c) Establish applicable codes and standards which are to be applied to the process.
- (d) Assist the customer to obtain NRC approval.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for licensing documentation.
- (b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar sleeving services and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing testing and analytical methods and performing tests.

Further the deponent sayeth not.

Westinghouse Proprietary Class 3

Letter Report: NSD-REN-RLI-96-269

Title: October 10, 1996 WPSC/NRC/WESTINGHOUSE meeting presentation materials "Laser
Welded Repair of HEJ Sleeved Tubes"

LASER WELDED REPAIR OF HEJ SLEEVED TUBES

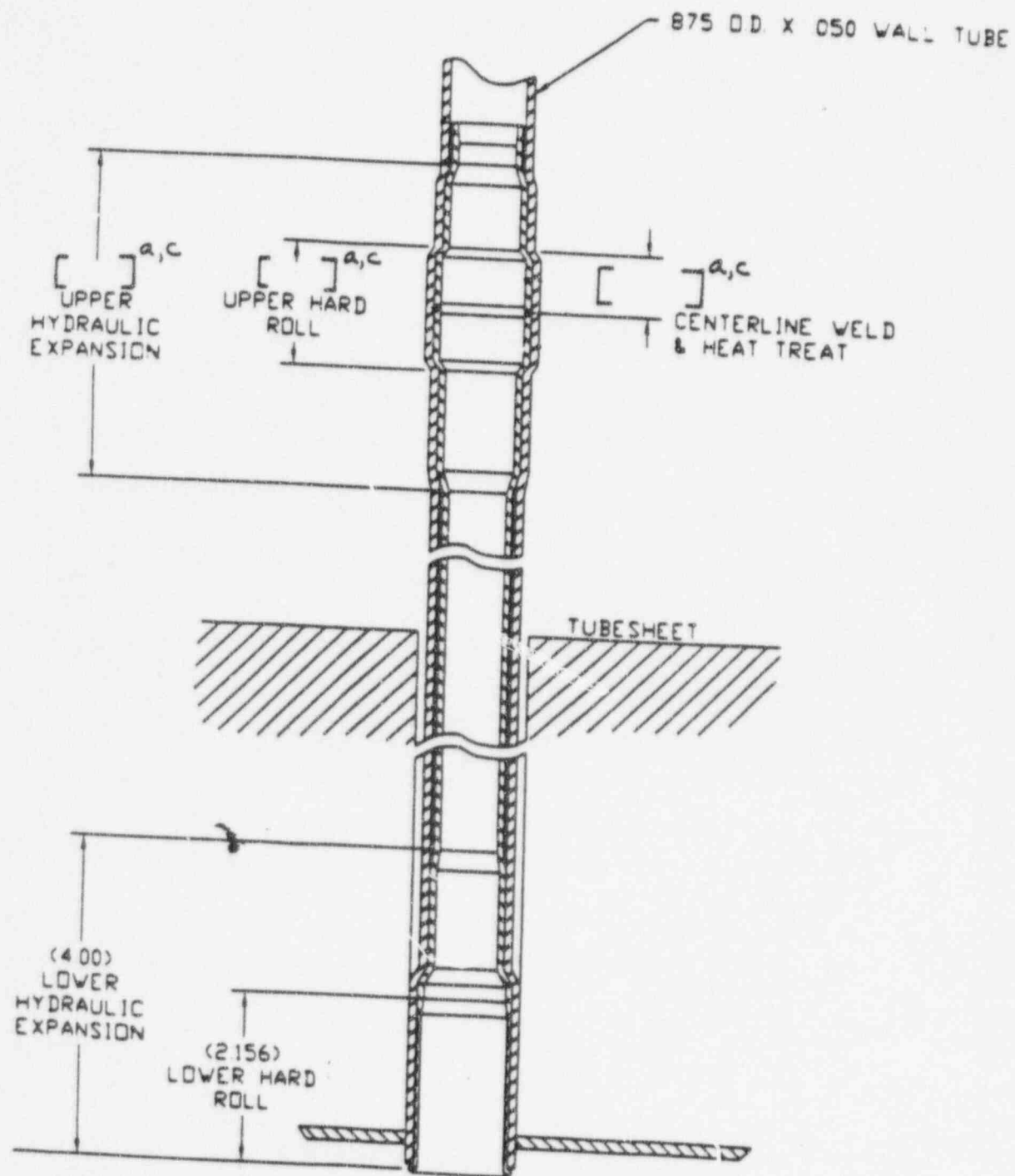
WPSC/NRC/WESTINGHOUSE MEETING

October 10, 1996

LASER WELDED REPAIR OF DEGRADED HEJ SLEEVES UTILIZES THE SAME TOOLING & PROCESSES AS FOR LASER WELDED SLEEVES

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- a,c

LASER WELDED REPAIR LOCATION IN HEJ SLEEVE



LASER WELD LOCATION IN HARD ROLLED SECTION MAXIMIZES SUCCESS OF REPAIR CAMPAIGN

- METAL-TO-METAL FIT BETWEEN SLEEVE & TUBE IN HARD ROLLED AREA

- []^{a,c}
- []

- ACCURATE WELD LOCATION WITH RESPECT TO UPPER HARD ROLL TRANSITION

Sleeved Tubes with Indications above Proposed Weld Location will be Removed from Service

CONTAMINANTS USED FOR HEJ SLEEVED TUBE WELD REPAIR PROCESS TESTING

Anions or Cations Compounds Used	Test Simulant Initial Cation Concentration ($\mu\text{g/ml}$)	Test Simulant Initial Anion Concentration ($\mu\text{g/ml}$)	Pulled HEJ Cation Conc (Note 1) ($\mu\text{g/ml}$)	Pulled HEJ Cation Conc (Note 1) ($\mu\text{g/ml}$)
K as K_2CO_3		a,c	21	
Ca as CaCO_3			21	
Na as Na_2CO_3			97	
Na and SO_4 as Na_2SO_4				10
Mg as $\text{Mg}(\text{OH})_2$			25	
Li as LiOH			10	
Oxalate as Oxalic Acid				10
Acetate as Acetic Acid				37
Formate as Formic Acid				70
Cl as HCl				28
SO_4 as H_2SO_4				171
B as H_3BO_3				
pH of Solution				

Note 1 Concentration estimated from leachate of pulled Kewaunee HEJs, per Reference 1-6

WELD PROCESS TESTING WAS PERFORMED WITH
[]^{a,c} SLEEVE & TUBE

- **SLEEVE ID CLEANED TO REMOVE SURFACE CONTAMINANTS**
- **[]^{a,c}**
- **22 SAMPLES EXAMINED NON-DESTRUCTIVELY BY UT & EC, THEN SECTIONED FOR METALLOGRAPHIC EXAMINATION**
 - **NO EVIDENCE OF ANY LACK OF FUSION OR WELD ZONE INDICATIONS**
 - **ADEQUATE WELD WIDTH**
- **CONFIRMATORY TESTING SHOWED LASER WELDING PARAMETERS WITHIN RANGE OF ASME CODE QUALIFIED WELD PROCESS SPECIFICATION FOR 7/8 INCH LASER WELDED SLEEVES**
 - **REQUALIFICATION NOT REQUIRED**

HEAT TREATMENT PROCESS PARAMETERS HAVE BEEN OPTIMIZED TO REDUCE FAR FIELD RESIDUAL STRESSES WHILE PROVIDING EFFECTIVE STRESS RELIEF

- QUALIFIED HEAT TREATMENT RANGE OF 1250°F TO 1600°F

- -
 -
- a, c

LONGEVITY OF LASER WELDED REPAIR HAS BEEN ESTABLISHED BY ACCELERATED DOPED STEAM CORROSION TESTING

- **FAR FIELD RESIDUAL STRESSES DETERMINED UNDER SIMULATED LOCKED TUBE CONDITIONS**
- **BOTH STRESS RELIEVED & NON-STRESS RELIEVED SAMPLES TESTED IN 750⁰F DOPED STEAM ALONG WITH ROLL TRANSITION CONTROL SAMPLES UNDER TENSILE PRELOADS DERIVED FROM FAR FIELD TESTING**
- **8 STRESS RELIEVED SAMPLES TESTED**
 - **4 SAMPLES SHOWED NO CRACKING AFTER 600 HRS. EXPOSURE**
 - []^{a,c}

TEST RIG FOR DETERMINING FAR FIELD RESIDUAL STRESSES UNDER LOCKED TUBE CONDITIONS

a, c

LONGEVITY OF LASER WELDED REPAIR HAS BEEN ESTABLISHED BY ACCELERATED DOPED STEAM CORROSION TESTING

- 6 NON-STRESS RELIEVED SAMPLES TESTED

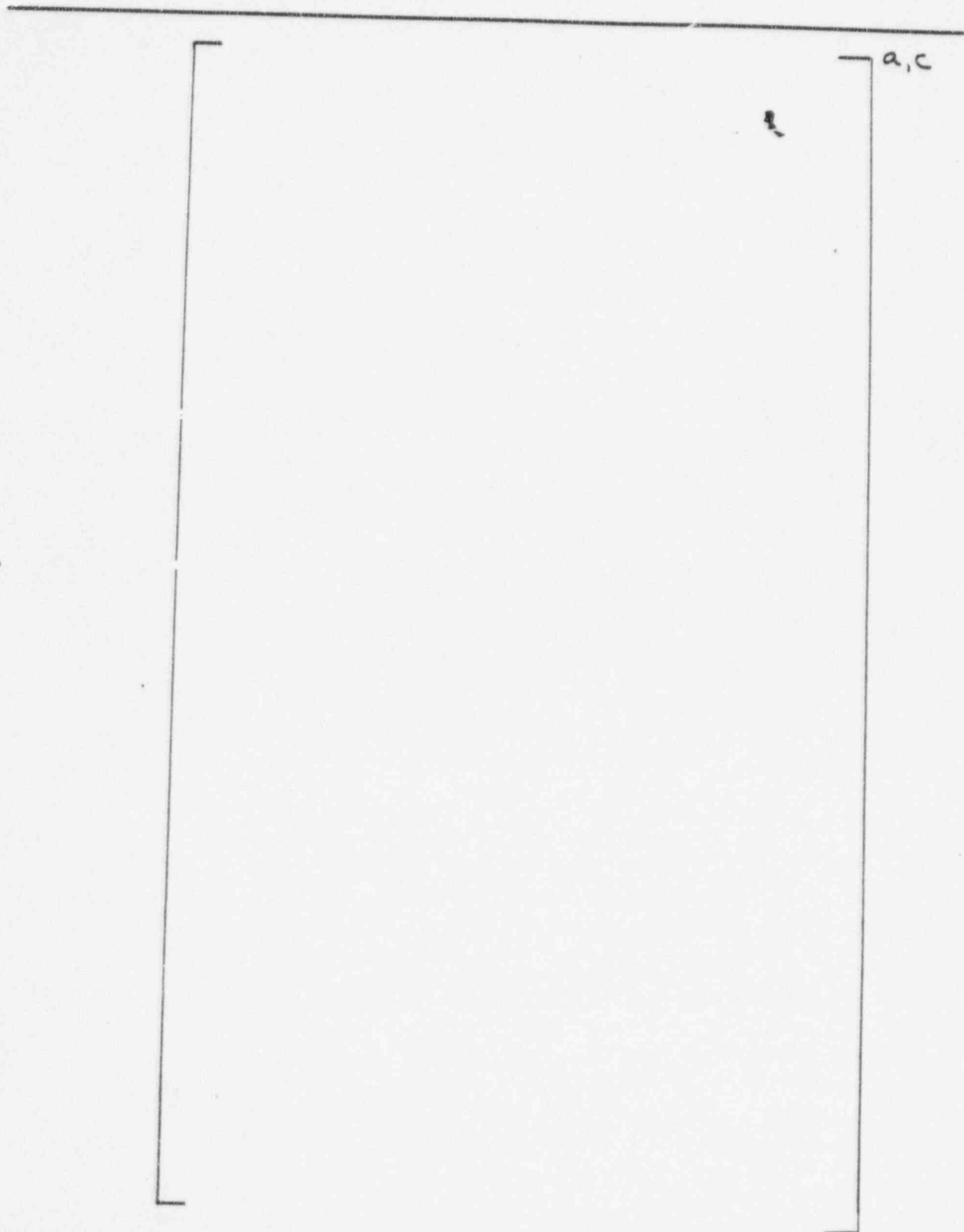
- [

] ^{a,c}

- ROLL TRANSITION CONTROL SAMPLES HAD MEAN TIME TO FAILURE OF 52 HRS.

Estimated Service Life of Laser Weld Repaired HEI Sleeved Tubes
is over 30 EFPY

TENSILE PRELOADING ARRANGEMENT FOR ACCELERATED CORROSION TESTING



STRUCTURAL EVALUATION RESULTS

- **ANALYTICAL VERIFICATION:**
 - **LASER WELDED REPAIR SATISFIES ALL PRIMARY STRESS LIMITS & MAXIMUM RANGE OF STRESS INTENSITY LIMITS WITH POSITIVE STRUCTURAL MARGIN FOR ALL SPECIFIED NORMAL, UPSET, & TEST LOADS**
 - **LASER WELDED REPAIR SATISFIES ASME CODE FATIGUE LIMIT WITH LARGE POSITIVE MARGIN**
 - **PLUGGING LIMIT FOR THE SLEEVE, AS PERCENTAGE OF UNDEGRADED WALL IS 24%**

STRUCTURAL EVALUATION RESULTS

- **MECHANICAL TEST RESULTS:**
 - **LOAD CARRYING CAPABILITY OF LASER WELDED REPAIR EXCEEDS MOST LIMITING RG 1.121 END CAP PRESSURE LOADING**
 - **LOWER HEJ INTEGRITY IS UNAFFECTED BY THE LASER WELDED REPAIR PROCESS**

IN SUMMARY

- LASER WELDED REPAIR IS A VIABLE APPROACH FOR ADDRESSING HEI SLEEVED TUBE DEGRADATION
- LASER WELDING PROVIDES FOR HIGH QUALITY WELDS IN THE PRESENCE OF []^{a,c}
- ACCELERATED CORROSION TESTING & STRUCTURAL EVALUATIONS DEMONSTRATE LONGEVITY OF REPAIR THRU END OF PLANT LIFE
- USE OF INFRA-RED FEEDBACK REAL TIME MONITORING OF WELD QUALITY PROVIDES ADDITIONAL ASSURANCE OF WELD QUALITY, WHILE IMPROVING PRODUCTIVITY

Summary of Results
Of Examinations of LWS-Repaired
HEJ Sleeves at Doel 4

R. E. Gold
Westinghouse Nuclear Services Division
SG Technology & Engineering

Meeting at NRC
Rockville, Md
October 10, 1996

Doel 4 Laser Welded Sleeve Repairs

BACKGROUND

- o In 1993, Approx. 1100 Mechanical Sleeves (HEJ) were Installed in the Doel 4 SGs for ODSCC at the Top of the Tubesheet
- o In 1994, TW or near-TW PWSCC was Confirmed in 2 Tubes at the UHE of HEJ
- o Utility Decision to LW Sleeve Repair All Tubes, including Prior HEJ Sleeves
- o 11,346 TS Sleeves Installed; 1088 HEJ Sleeves also Repaired by Laser Welding
- o Electrabel Agreed with Regulatory Authorities to Inspect All Sleeves in 1995 Outage

Doel 4 - 1994 Laser Welded Sleeving

- o Doel 4 was Chemically Cleaned in 1992, After which Phosphate Treatment was Adopted
- o Assurance Offered that Tubes were Not "Locked" at the Tube Support Plates
- o Both the Welds and UHE Transitions of the Elevated Tubesheet Sleeves (12 inch) and HEJ Repair Sleeves were Given [
Relief with Vertically Oscillating Heater; A Total of
] ^{a,c}
- o Qualification Tests in Doped Steam - Without Axial Load - Indicated Resistance to PWSCC for times >> Remaining Svc. of Doel 4 SGs;
[
] ^{a,c}

Doel 4 - 1995 LWS Experience

- o 100% Eddy Current Inspections of All Sleeves (CECCO 3 and Plus Point Probes)
- o Three Conditions Detected - Led to Ten Tube-Sleeve Pulls for Destructive Examinations:

- [a,c

- o Bulging Clearly Established that Tubes were Locked at the TSPs; Reproduced in W Laboratory
- o Hot Cracking was Detected in 1994, but Lack of Experience with Signals Led to Incorrect Disposition by Analyst (Single Review)

Doel 4 - 1995 Experience (Cont'd.)

o [

](Extremely Conc.

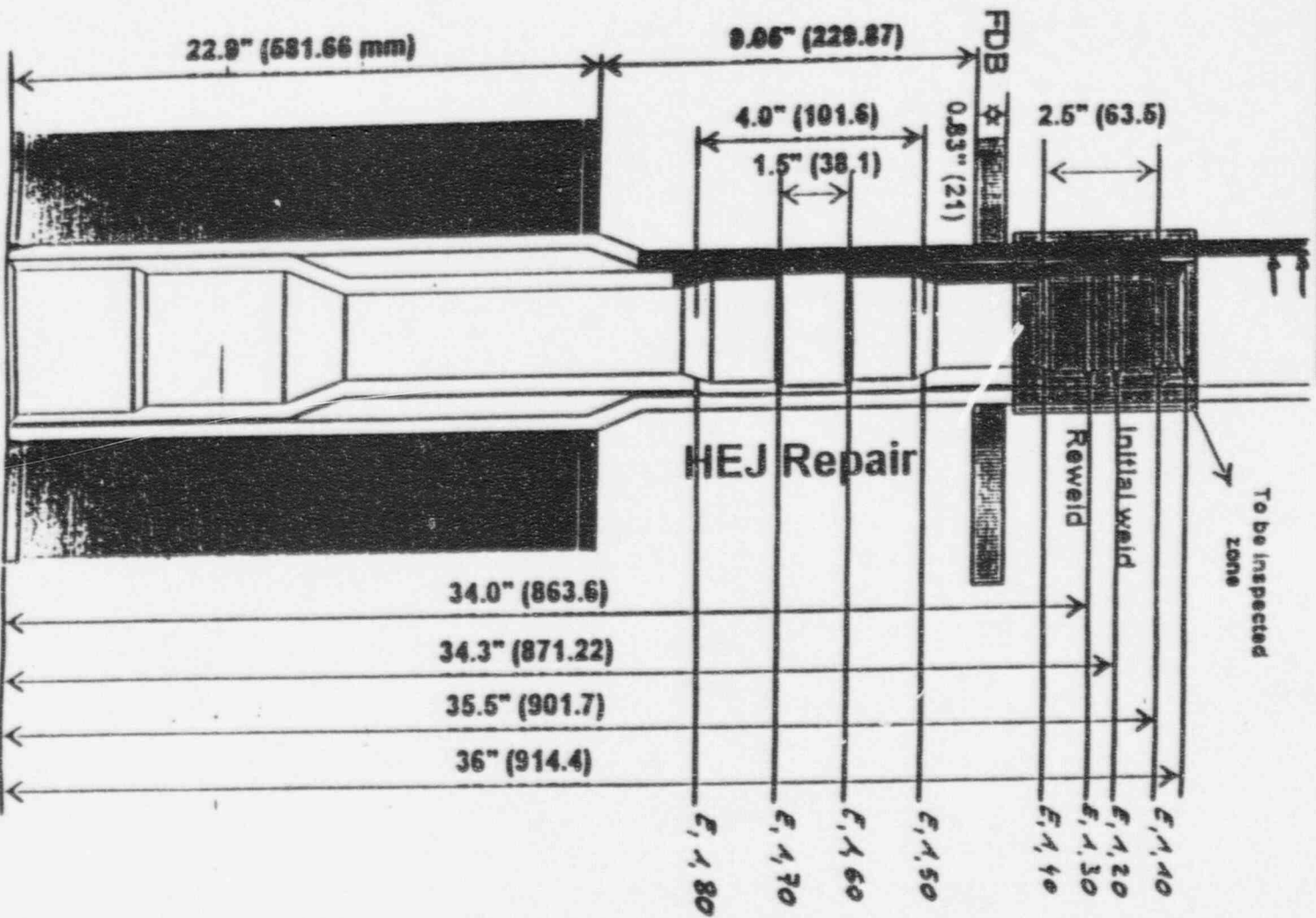
Boric Acid ??)

- o No Environmental Degradation of the Laser Welds or HEJ Repair Welds was Detected
- o Two Actions Defined to Permit Return to Power
 - Testing of Mockups Prepared and Corrosion Tested Under Axial Restraint Conditions
 - Plugging of All Sleeves with [

] ^{a,c}

GENERAL GEOMETRY OF REPAIRED HELI-SLEEVED TUBE

Doel 4 : 36" Sleeve



NDE of Laser Welded Repair of HEJ Sleeves

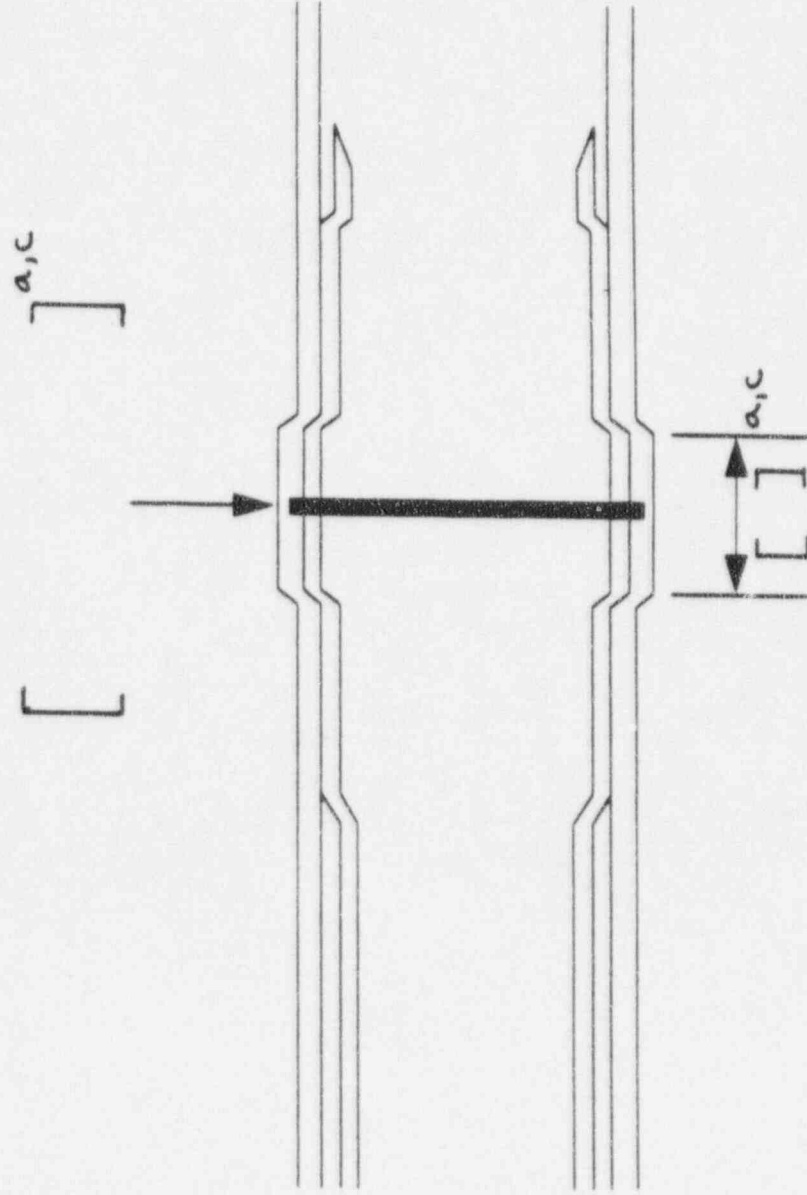
Presentation to the NRC

10 October 1996

Outline

- ❖ Repair Configuration
- ❖ Inspectability
- ❖ Inspection Processes
- ❖ Acceptance Criteria

Repair Configuration



Inspectability

- ❖ Similar to Conventional Laser Welded Sleeve
 - Weld Located in a Flat Expansion
 - Same Weld and Heat Treat Processes Used
- ❖ Same NDE Techniques Applicable

Inspection Processes

❖ Ultrasonic

- Verification of minimum Required Weld Width
- Identification of ID Surface Anomalies
- Detection of Lack of Fusion in Weld

❖ Eddy Current

- Verify the Location of the Weld Within the Hard Roll
- Verify the Presence of the Post-Weld Heat Treatment
- Record Baseline Volumetric Inspection of the Sleeve/Tube Joint
- Verify the Distance From the Weld Centerline to the Tube Indication

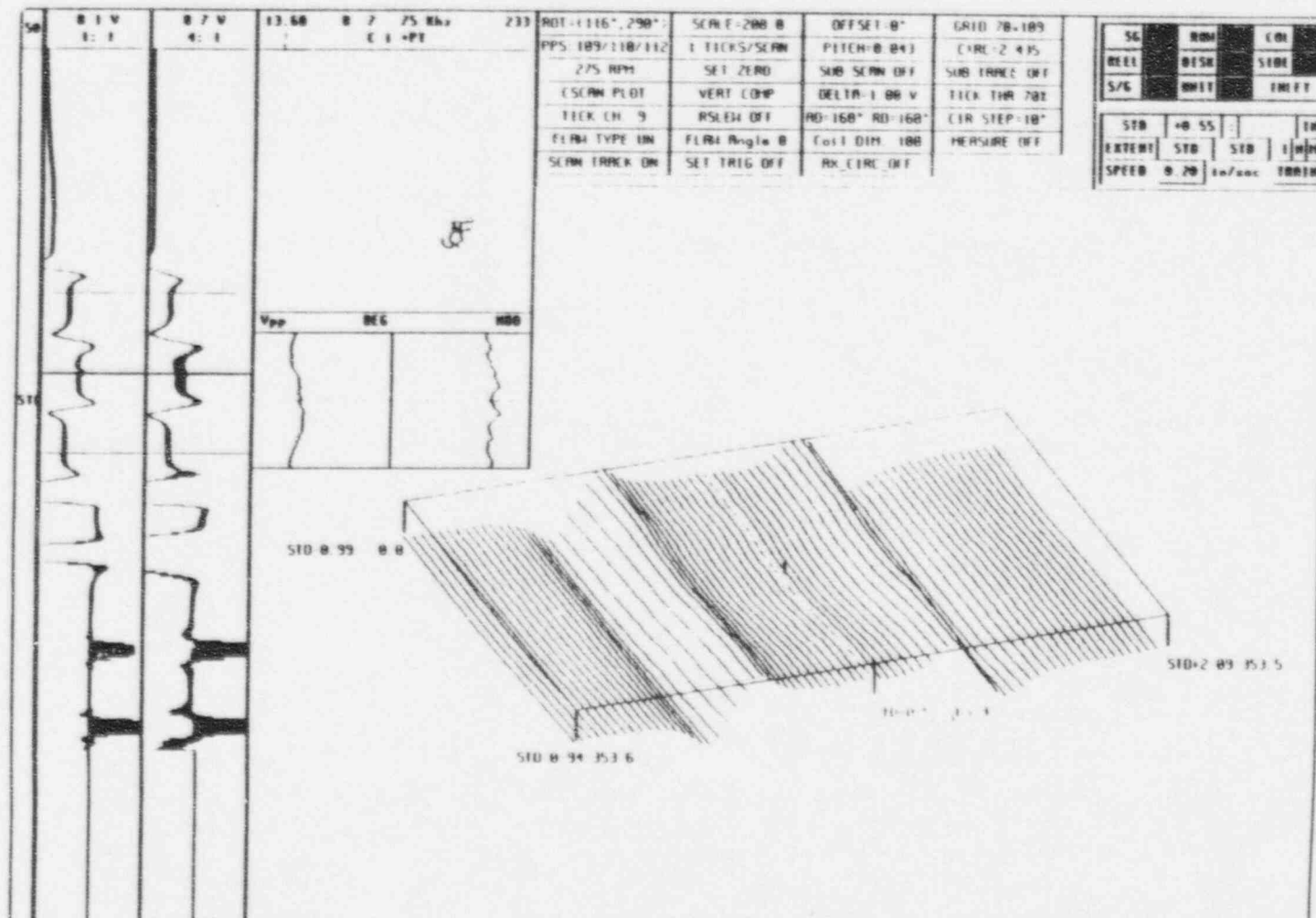
Inspection Processes (cont.)

❖ Eddy Current Techniques

- Bobbin
 - ◆ Location of Weld Within Expansion
 - ◆ Verification of Heat Treatment
- Magnetically Biased + Point Rotating Probe
 - ◆ Magnetic Biasing to Reduce Effects of Permeability
 - ◆ Pre-Service Baseline of Weld Region
 - ◆ Verification of Weld Centerline to Indication Distance

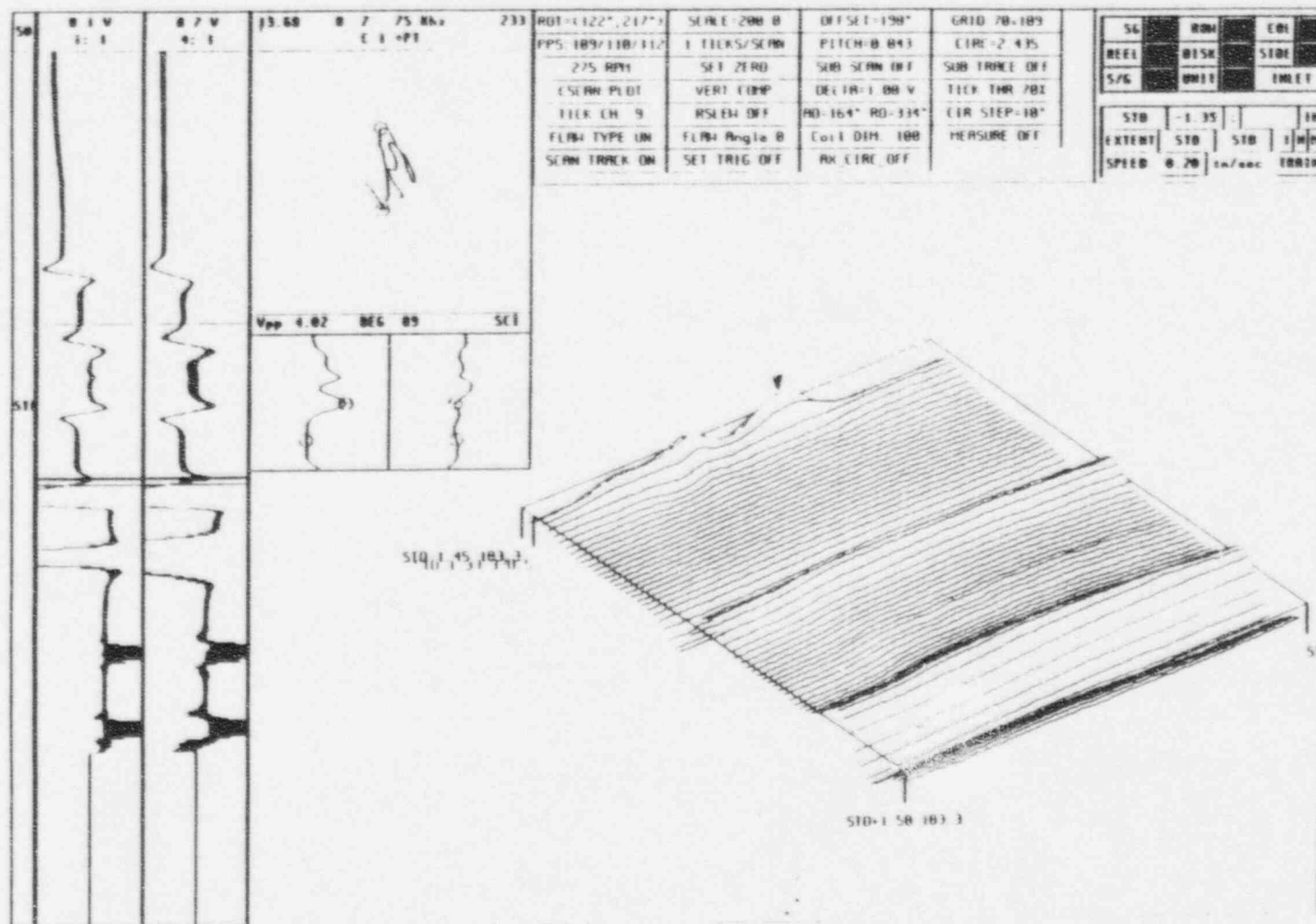
Inspection Processes (cont.)

Hard roll with weld at 75 kHz.



Inspection Processes (cont.)

Parent tube indication in hydraulic transition at 75 klz.



Acceptance Criteria

- ❖ Minimum Weld Width Verified by UT
- ❖ No Undesirable ID Surface Anomalies (UT)
- ❖ Heat Treatment Performed (Bobbin ED)
- ❖ Weld Located in Hard Roll (Bobbin and +Point EC)
- ❖ Acceptable Baseline +Point EC Examination (No Indications of Degradation in the Pressure Boundary)