U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-443/84-12
50-444/84-06

Docket No. 50-443
50-444

License No. CPPR-135
CPPR-136 Priority -- Category B

Licensee: Public Service Company of New Hampshire
1000 Elm Street
Manchester, New Hampshire 03105

Facility Name: Seabrook Station, Unit 1 and 2

Inspection At: Seabrook, NH

Inspection Conducted: August 13-17 and 27-31, 1984

Inspectors:	H. Gray, Lead Reactor Engineer	10/5/84 date
	J. Raval, Reactor Engineer	10/5/84 date
	A. A. Varela, Lead Reactor Engineer	10/5/84 date
	S. D. Ebneter, Chief, Engineering Programs Branch	10/5/84 date
	R. Harris, NDE Technician	10/5/84 date
Approved by:	S. D. Ebneter, Chief, Engineering Programs Branch	10/5/84 date

Inspection Summary: Inspection on August 13-17 and 27-31, 1984 (Inspection Report 50-443/84-12 and 50-444/84-06)

Areas Inspected: Special, unannounced inspection by a region-based team of inspectors of procedures, specifications, work activities, and quality records related to concrete walls, steam generators, welding, piping, valves, storage, and NCR control as a result of an allegation statement submitted by an anonymous alleger. The inspection involved 349 hours on site by one Branch Chief, three reactor engineers, one NDE technician and two NRC contractors.

Results: In two areas the staff substantiated the allegation, but found that the licensee had taken appropriate corrective actions.

In the remainder of the areas, the staff could not substantiate the allegations. No violations were identified related to the allegations. In one area unrelated to the allegations, the staff identified a violation for failure to implement adequate corrective action (see para. 16).

Details

1. Persons Contacted

Yankee Atomic Electric Company (YAEC)

*G. McDonald, Jr., QA Manager
J. Azzopardi, QA Engineer
*R. Julian, QA Engineer-Radiographer
*B. Mizzau, QA Engineer
P. Oikle, Level III Radiographer
*J. Singleton, Field QA Manager
*W. Middleton, QA Staff
C. Moynihan, QA Engineer
*D. Groves, Senior QAE
D. Covill, QA Engineer
J. Nay, QA Engineer
*J. Philbrick,Discipline Supervisor

Pullman-Higgins (PH)

R. Boyer, Weld Engineer
W. Becksted, QA Manager
R. Donald, Asst. QA Manager
J. Martin, QC Supervisor
H. Edwards, Weld Supervisor (S.G. Loop Piping)
J. Godfrey, QA Records Manager
B. Steadman, QA NCR Lead Engineer
J. Krommenhoek, Field Engineer
D. Briggs, Lead Piping Engineer
H. Watson, UT Level II Technician
J. West, QA Records
J. Butler, Construction Superintendent

United Engineers & Constructors (UE&C)

H. Baselice, Engineer - (Service Water Piping)
F. Rose, Construction Supervisor (SW Piping)
R. Kosian, Field Engineer
R. Tancibok, QA Engineer
D. Lambert, QA Engineer
J. Gries, QA Engineer
B. Husleton, Manager, Discipline Engineering
*B. O'Connor, Adminstrative Assistant

2. Background

An anonymous alleger submitted a multiple allegation statement dated July 24, 1984 to Nuclear Regulatory Commission Commissioner James Asselstine, which detailed the alleger's concerns about the quality of work at the Seabrook Station. The alleger wished to remain anonymous but expressed a willingness to speak on the telephone with the NRC staff. The Commissioner transmitted the allegation statement to Region I for followup.

The written statement consisted of four (4) type written pages detailing the alleger's concerns about the quality of piping, welds, steam generator nozzles, concrete walls, and valves installed at the Seabrook plant. The written statement was supplemented by a list of pipe lines on page 5 of his submittal. These pipe lines contained welds which allegedly were defective. The alleger also supplied eleven (11) photographs and two pages (pages 6 and 7) of written narrative which described the allegedly deficient conditions portrayed by the photographs.

On August 24, 1984, members of the Region I technical staff and the Office of Investigation (OI) participated in a telephone conversation with the alleger. The alleger discussed his allegations over the telephone but did not consent to meet with the staff. The alleger clarified many of the technical areas and provided additional information which enabled the staff to pursue the allegations.

The Region I staff partitioned the allegations into those related to hardware deficiencies and those which may have management integrity or criminality facets. The set of allegations related to hardware deficiencies are the subject of this report. The other set of allegations were referred to the Office of Investigation (OI).

3. Allegation - Cracks in Concrete Wall of Waste Processing Building (WPB)

The alleger states on page 2 of his statement:

- "In the Waste Processing Building, cracks have appeared in the two-foot thick concrete walls because of improper concrete pouring. In one instance, a 30-foot long crack was chiseled out and filled with ordinary grouting material to a depth of two inches and a width of six inches.
- The Perini Corp. apparently circumvented standards applying to concrete pours. Those standards limit each pour to a depth of 10 feet liquid. At the plant, they made 30-foot pours. This was done with the use of a vibrator which causes the crushed rock in the concrete to settle to the bottom. I believe this is why cracks and groundwater leaks have developed (see photographs)."

In addition, the alleger provided photographs 1, 2, 3 and 4 with a written description of each on page 6 of the written statement.

- Photo 1:
  Waste Processing Building (WPB)
  Elevation: -25.0
  Description: South exterior wall, with crack extending approximately 30 feet. Ground water is evidently percolating through. Crack was superficially repaired by removing concrete the length of the defect to an approximate depth of one to two inches and a width of 6 inches, and replacing it with mortar.

- Photo 2:
  WPB
  Description: South exterior wall, with crack extending approximately 4 feet. Evidence of ground water percolating through

- Photo 3&4:
  WPB
  Description: West Exterior wall, with crack extending along embed plate. Evidence of ground water and mineral deposits percolating through.

3.1 <u>Scope of Inspection</u>

The inspection effort was directed to the above allegations to ascertain if improper concrete construction placement had been made; determine if the contractor, Perini Corporation, had circumvented standards applying to concrete; and to evaluate the significance of the concrete cracks and of the ground water leakage through the Waste Processing Building (WPB) exterior walls. This effort consisted of the following:

- visual inspection of cracks in the south and west exterior walls
- observations of cracks to determine if leakage occured during this inspection
- review of engineering specifications, drawings and referenced codes and standards on concrete construction
- review of implementing construction and quality control procedures
- discussions with cognizant construction and engineering personnel, and
- performance of independent measurements by the NRC NDE van to check the quality of concrete

3.2 <u>References</u>

- UE&C Specification Number 13-3, Specification for Concrete Work Other than Containment

- UE&C engineering drawing number 101751 and Perini construction drawings and WPB-12 sheets 1 and 2.
- UE&C and Perini construction and quality control procedures and inspection verification reporting on concrete placing, vibratory consolidation and curing
- UE&C Specification for Concrete Crack Repair by Capillary Waterproofing and Perini construction control procedure for crack repair using the proprietary method identified as "Vandex" Capillary Waterproofing.
- Perini Concrete Placing Scheme for WPB exterior wall construction, pour #WPB-12-ABC, dated January 23, 1979, approved by UE&C
- Quality Control records of Pour #WPB-12-ABC involving 230 cubic yards placed January 24, 1979. The records include formal check lists and reports identifying independent sign off and verification by measurement and/or inspector observation.

3.3 Inspection Conduct

a. Review of Nonconformance Report Relating to Waste Process Building Concrete Cracks and Water Leakage Inspection

Perini Corporation's Quality Assurance Department initiated NCR #551 on November 11, 1979 identifying ground water leakage through the waste process building's 2'6" thick exterior walls. The NCR states that a small amount of water is entering the WPB due to incomplete construction of the waterproofing membrane on the exterior walls - this allows rain water to enter between the membrane and exterior surface of the concrete wall. This NCR was traced through five revisions during which studies were coordinated between Perini, UE&C and Yankee Atomic. (NRC inspection reports number 50-443 and 444/82-03 and 82-07 relate to the above). In August 1982 UE&C issued Specification Number 10-4 for Concrete Crack Repair by Capillary Waterproofing. Details of the specified repairs and the quality controls imposed thereon are addressed in the following paragraph.

b. Review of WPB Exterior Concrete Wall Crack Repairs and Observation of Their Present Condition

Perini's NCR #551 identified that UE&C is responsible for the disposition of the nonconformance. The hairline cracks identified in the NCR are noted to be due to concrete shrinkage. Extensive crack surveys, detail crack mapping, water leak monitoring and water chemistry analyses were performed when leakage continued after completion of the waterproofing membrane on the WPB exterior walls. The waterproofing membrane was found not to accomplish its intended purpose. The UE&C studies resulted in UE&C Specification 10-4 for repair of the WPB exterior wall concrete cracks by capillary waterproofing using Vandex Inc. material. This material is a surface applied waterproofing compound consisting of a combination of chemicals, cement, and special treated quartz which waterproofs by crystalline growth through the capillary voids in the concrete. The WPB exterior wall crack repair specification provides detail quality control requirements for dimensional control of crack preparation by chipping out of concrete on the interior surface of the subject walls. Perini implemented these requirements in their Field Civil Construction Procedure No. FCCP-112 and QC procedure QCP10.9. WPB crack repair work was performed by Perini during 1983. The NRC staff observed in the review of NCR #551 and QC documentation of the repairs that the specified details of repair and quality controls conform to the requirements of Specification 10-4.

Observation was performed during this inspection of the WPB exterior south and west wall cracks to identify, among the numerous hairline cracks that had been repaired, those cracks specified in the allegation. See Figure 3-1A. These three cracks were observed to have been repaired and no perceptible leakage was observed during this inspection. Evidence was found that the wall paint had blistered and peeled over many of the repaired cracks. This could have been caused by additional seepage or possible chemical reaction in the repair area. This is not of significance, nor does it jeopardize the functional aspects of the building or the structural integrity of the concrete.

As a result of the recent reorganization of the Seabrook project, UE&C has taken over the responsibility of Perini's NCR #551 which still remains open for final disposition. The NRC staff identified at the exit interview their concerns relating to possible future changes in ground water chemistry. The present non-saline condition of ground water may change and affect the concrete walls' reinforcing steel bars. This might cause rusting of the steel bars and affect the concrete as well as the steel. This is unresolved item number 50-443/84-12-01.

c. Review of Quality Records

The WPB walls in question were constructed in January 1979 to the specifications listed in the References section. The following concrete construction and quality control documentary records were reviewed for conformance to requirements and their referenced codes and standards, governing the safety related concrete construction of the WPB:

- Preparations for concrete construction.

- In-process concrete placement controls of continuous placement from Elev. (-) 31.0' to (-) 5.5'.

- Consolidation of placed concrete - controls verified on use of vibratory equipment to achieve required homogeneity and density of the concrete mix as required by concrete construction standard ACI-309.

- Concrete Post Placement Cold Weather Protection and temperature control in curing for seven days.

- Concrete Form Removal on February 15, 1979 and finishing of formed surfaces.

- Concrete Records of controls in batch plant mixing, truck delivery, pumping into forms and verification testing for concrete slump, temperature, air content, unit weight and compressive strength.

- Concrete strength test records of test cylinders for 7 and 28 day compressive strength.

No violations or uncorrected unsatisfactory items were observed in the above records.

d. Independent Measurements

The NRC NDE van crew performed six Windsor probe measurements on two walls in the WPB as shown in Figure 3-1B. The NRC measurements were taken at different elevations on the walls in an attempt to determine if there was any segregation of aggregate during the pouring of the walls. A summary of the measurements is shown in Table 3-1. The results of the NRC tests were compared with data from previously conducted licensee Windsor probe tests. All data correlated well. The concrete strength was greater than 7000 psi which exceeds specification requirements.

TABLE 3-1

RESULTS OF WINDSOR PROBE TEST

Test	Test Area	Wall	Alleger's Reference	Concrete Compressive Strength(PSI)
1	WPB	S. Exterior Wall	Photo 1	7200
2	WPB	S. Exterior Wall	Photo 1	7200
3	WPB	S. Exterior Wall	Photo 2	7400

A) REPAIR GROUTED CRACK IN WPB BUILDING

B) NRC INSPECTOR USING WINDSOR PROBE TO CHECK QUALITY OF CONCRETE ON WALL WITH CRACKS

CONCRETE WALL CRACKS

FIGURE 3-1

TABLE 3-1 (Cont)

Test	Test Area	Wall	Alleger's Reference	Concrete Compressive Strength(PSI)
4	WPB	S. Exterior Wall	Photo 3	7200
5	WPB	West Exterior Wall	Photo 3&4	7400
6	WPB	West Exterior Wall	Photo 3&4	7400

3.4 Findings

Perini's construction method for placement of concrete was verified to conform with requirements. The QC records generated by qualified engineering inspectors during the construction of the WPB exterior walls, conformed to American Concrete Institute Standard, ACI-309 for consolidation of concrete. UE&C specifications required the use of calibrated vibratory equipment. The controls applied in the concrete placement, and the vibratory equipment used, were documented to satisfy concrete standards. The staff could find no evidence that industry standards were circumvented. The use of industry standards required to achieve homogeneity and adequate density of the concrete were substantiated by the concrete strength tests. The concrete was poured in 2' deep layers, and each layer was vibrated to fill the forms to a total depth of 25.5', (Elev. (-) 31.0' to (-)5.5'). The referenced ACI-301 and ACI-318 standards do not limit each pour depth to 10 feet.

The WPB south exterior wall was found to have many hairline cracks that are documented in Perini NCR #551. Leakage through some wall cracks was expected by UE&C. The WPB exterior walls with the exterior waterproof membrane applied are designed to prevent excess water inflow caused by hydrostatic pressure of considerable head. Apparent defects in the envelope of the waterproofing membrane applied to the exterior walls caused the water leakage through the hairline cracks. The cracks in alleger Photos #1 and #2 were identifed in NCR #551 as cracks #2b and 8b and were noted to show signs of water leakage. These cracks were repaired in mid 1983. The NRC staff observed that the repairs were effective since no perceptible water leakage could be detected although paint peeling across the repairs was observed.

There was a total of 29 hairline cracks in the WPB walls that required repair to prevent ground water leakage and these are shown on Perini Drawing WPB-12 sheets 1 and 2. The controlled method of repair called for chipping out of concrete to enlarge the crack to the required width and depth as specified for application of the special Capillary Waterproofing (CP) mortar, identified as Vandex C.P. compound. This proprietary compound, through crystalline growth and chemical action when combining with water does more than accomplish superficial repairs. The NRC staff inspection conducted one year after repairs, indicated the technique is effective and that the grouting material used was acceptable for its intended purpose.

The crack identified in alleger Photos #3 and #4 is identified in the repair drawings as number 8H, and was repaired as discussed in Section 3.3.b. No evidence of leakage or mineral deposits at this crack location was observed by the NRC staff during this inspection which is approximately one year after repairs.

3.5 Conclusions

The observations identified by the alleger in his letter and in captions to the four photographs were valid prior to completion of repairs to the WPB exterior walls. The walls had hairline cracks that admitted ground water leakage through them. As identified in preceding paragraphs of this report the contractor used approved construction standards, industry practices, and state-of-the-art construction techniques. The alleger's "belief" that concrete cracks and groundwater leaks were the result of circumventing standards applicable to concrete placement was not substantiated. His allegation that repairs to the cracks were "superficial" and used "ordinary grouting material" also was not substantiated. The NRC Windsor probe measurements verified that the concrete was of high quality.

4. Allegation - Cold Spring of Pipe (Tank Farm Area)

The alleger states on page 3 of his written statement:

- "In May, 1983, the company issued a memo forbidding any more "cold springing" of pipes and indicating that anyone found to be engaging in the practice would be disciplined and perhaps terminated. However, following the memo, at least one area supervisor instructed workers to "cold spring" a pipe from the Tank Farm near the Pump Auxiliary Building to a valve."

During a telephone interview with the alleger on August 24, 1984 he supplied the following clarification:

- It was a CBS 4" diameter line off a flange to a valve. They rolled a piece of pipe to get the proper fit-up. There was also a 14" line connected to the tank. Mr. X knew about it.

4.1 Scope of Inspection

The staff identified the 4" CBS line and the 14" line in the Tank Farm area. Both lines and one other 4" line in the vicinity were inspected visually, measured for ovality, ultrasonically measured for wall thickness, and the degree of level of the 4" pipes was measured to detect pipe roll (only visual and ovality measurements were made on the 14" line). Mr. X was interviewed and two of the welder/fitters who fit up the joints in question were also interviewed.

4.2 References

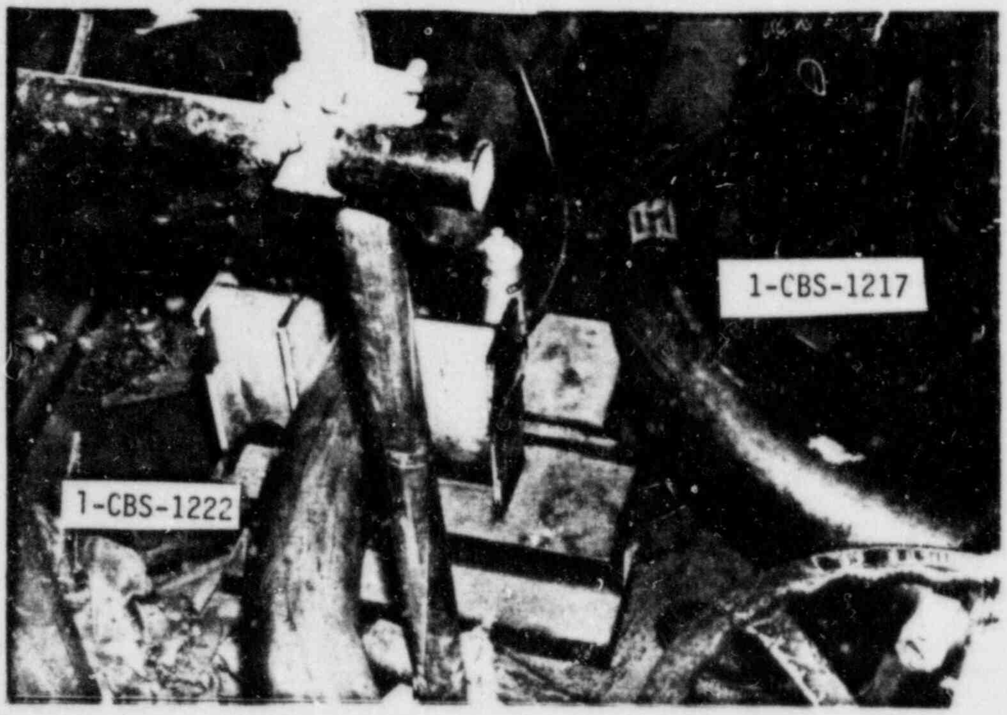
- ASME Code Section III, Subsection NC (Class 2)
- ASME III, NC 4223.2 - Ovality Tolerance
- ANSI B31.1, Power Piping Code
- Piping Data Sheet for ASME III, Class 2, UE&C Class 151
- Isometric Drawings: 1-CBS-1217-4
1-CBS-1202-1
1-CBS-1222-1
- General Arrangement Drawings: 976-F-805661
976-F-805662
- Piping Data Sheet for ANSI B31.1, UE&C Class A7

4.3 Inspection Conduct

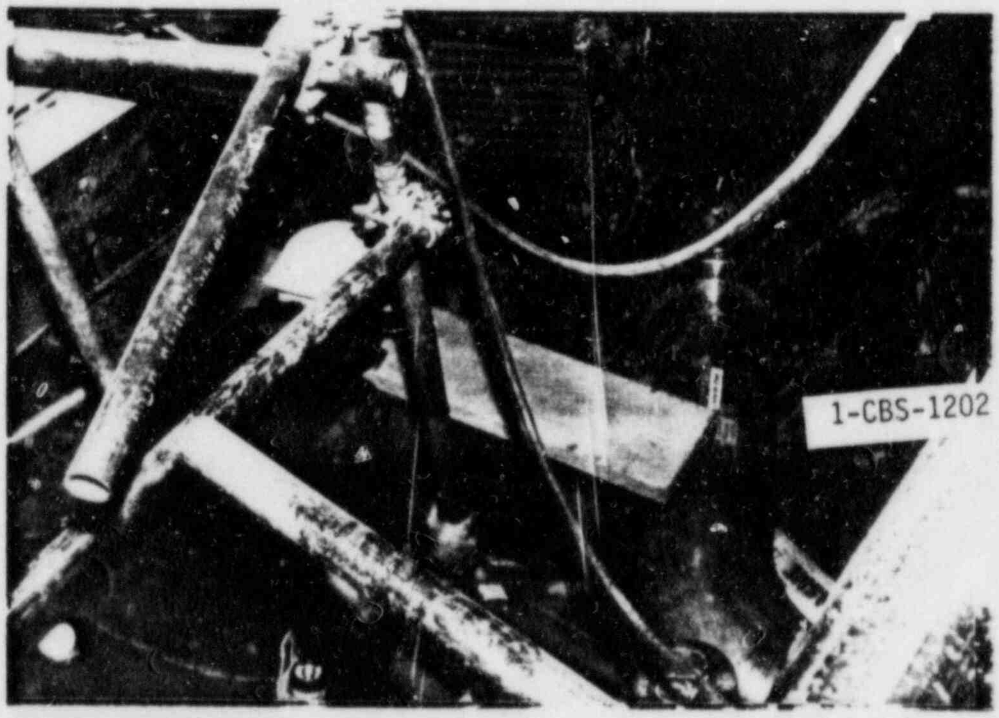
The staff inspected the tank farm area and identified two 4" diameter CBS lines one (*) of which is the line referred to by the alleger. The 14" line referred to by the alleger is in the same general vicinity.

Line Number	Diameter	Description
*1-CBS-1222	4"	Connected from flange on tank to a valve
1-CBS-1217	4"	Fill line-runs to top of tank (not part of allegation)
1-CBS-1202	14"	In vicinity of line 1-CBS-1222 (not part of allegation)

These lines are connected to the Refueling Water Storage Tank (RWST) 1-CBS-TK-8 and are shown in Figure 4-1. The staff visually inspected all of these lines with particular emphasis on the 4" lines since there was a sharp bend in both of these.



A) TWO 4" DIAMETER PIPE LINES



B) LARGE 14" DIAMETER PIPE LINE

PIPE LINES CONNECTED TO RWST 1-CBS-TK8

FIGURE 4-1

The 1-CBS-1222 pipe run from flange-to-valve was measured for ovality at 6 places and wall thickness was measured ultrasonically at 6 places by the NRC staff. The flange weld and pipe-to-valve weld areas were also measured by UT to verify wall thickness. The degree of levelness of this pipe was measured with a three foot spirit level to determine if excess pipe roll had occurred during fitup.

The 1-CBS-1217 pipe is a 4" diameter fill line for 1-CBS-TK-8. As it was in the immediate area the staff also examined this pipe for ovality, wall thickness and degree of levelness. The 14" line, 1-CBS-1202, was inspected visually and for ovality.

The staff interviewed Mr. X who had supervised the crafts during erection of the piping and was actively involved with this system. In addition, two of the welder/fitters who had performed the fitup/welding of these pipes were made available for informal interviews.

4.4 Findings

The pipe the alleger referred to was 1-CBS-1222. It was a 4" line between a flange off tank 1-CBS-TK-8 and an in-line valve. The other 4" line adjacent to 1-CBS-1222 was line 1-CBS-1217.

The staff measured the pipe bends and found them to be five (5) diameter bends as identified on the isometric drawings. The minimum, wall thickness prior to bending was in compliance with the requirements of ASME III, Table NC-3642.1(c)-1 and NC-3644 as verified by staff calculations and field measurements.

The visual inspection of these lines revealed no creases, wrinkles, flat spots or any other defects that would have been induced by improper fitup. The ovality was within specification limits and code requirement of less than 8% (NC 4223.2). At the bend area in both 4" pipes, ultrasonic measurements showed wall thinning at the outer bend radius due to the bending process. There was also slight out of round at the bend area of the two 4" lines but both were within code limits. The code recognizes that pipe wall thinning occurs and some out-of-round will result at bend areas and therefore provides a tolerance for these as specified in NC 4223.1 and Table NC 3642.1(c)-1.

Curved pipe is frequently "rolled" a small amount during fitup to provide the proper alignment. Slight rolling is acceptable if both the fitup alignment and pipe run levelness are maintained within tolerance. The staff measurement of the level of both 4" diameter lines revealed only minor out of level - 1/8" in a three foot length.

Mr. X discussed with the staff the erection of the piping to the RWST. He supervised the job and stated they had had some problems with fitup to the tank flanges because of tank fabrication errors. The tank had been fabricated by a different contractor. The tank problems were documented on NCRs and corrected (Mr. X provided NCRs written on the lines during the erection). One joint on the 14" line could not be fit up properly and the NCR disposition by engineering approved a slight miter condition. However, in the final fitup on the 1-CBS-1222 line no fitup problems were experienced. He stated that pipe can be rolled to effect a good fitup as long as the pipe is essentially level and that too much roll will result in an out of level condition.

Two welder/fitters were also interviewed. Both worked on the lines during erection. Neither knew of any problems during fitup or welding of these lines. Both said the fitups were easy because of the pipe configuration and loose end of the pipe attached to the opposite side of the valve.

4.5 Conclusion

The staff could not identify any defects in the as-built system to substantiate the alleger's concern related to improper fitup of 1-CBS-1222, 1-CBS-1217, or 1-CBS-1202. Independent measurements verified requirements were met for ovality and wall thickness. No evidence of cold spring was detected.

5. Allegation - Cold Spring of Ferro-Cement Pipe

The allegation states on pages 2 and 3:

- "Concrete linings of several sections of ferro-cement pipe which brings service water into the plant have cracked. When the pipes failed to meet properly, a 10-ton Portapower Hydraulic Jack was used to "cold spring" the pipe -- that is to try to bend the pipe to make it fit. When the pipes were cold sprung. I could hear concrete cracking some distance behind the joint in the pipe slot. I am afraid some worker could get hurt if he loosens the phlanges."

During a telephone conference with the alleger on August 24, 1984, the alleger referred to the "pipe slot" area as the area between the Waste Processing Building and the Diesel Generator Building.

5.1 Scope of Inspection

For cement-lined service water (SW) pipe, the staff reviewed records and drawings, interviewed engineering and supervisory personnel and observed cement lining inside piping. The staff entered the 42" pipe and visually inspected approximately 40 linear feet. The SW pipe is classified as safety-related ASME Class 3, Seismic.

5.2 References

- Drawing 9763-F-202499 - Service Water System - Plan

- ASME Code Section III Subsection ND (Class 3)

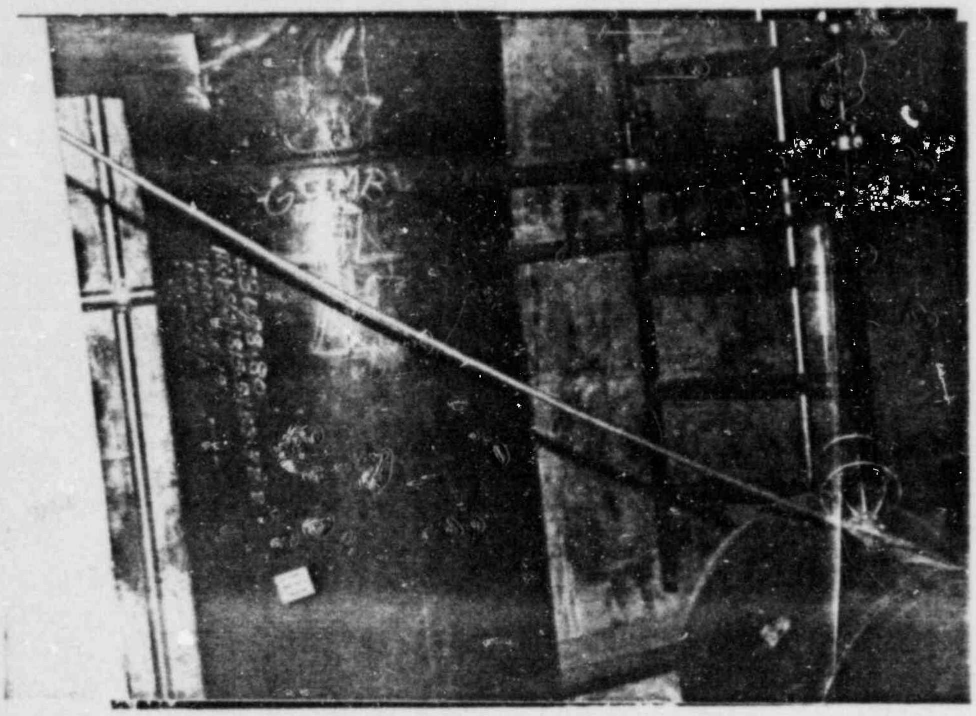
- ANSI B31.1, Power Piping Code
- Piping Data Sheet for ASME III, Class 3, UE&C Class 153.
- NCR punchlist for Service Water Area dated 8/17/84.
- Procedure IX - 30, Application of Sika-Gel to cement lined pipe joints
- Procedure IX-31, Application of X-Pando to cement lined pipe joints (including cracks)
- Centriline Process Booklet, page 18 - Deflection Test
- NRC CAT inspection report 50-443/84-07, page VII-5.
- Report of March 13, 1984 by UE&C to YAEC on Service Water - Cement Lined Pipe.
- NCR numbers 002, 327, 1810, 3820, 4773, 5065 and 5173
- Drawing 9763-D-804998, Pipe End Joint Design for Cement Lined and Non-Ferrous Piping.
- Specification 9763-006-248-2, Fabrication of Cement Lined Pipe and Non-Ferrous Pipe

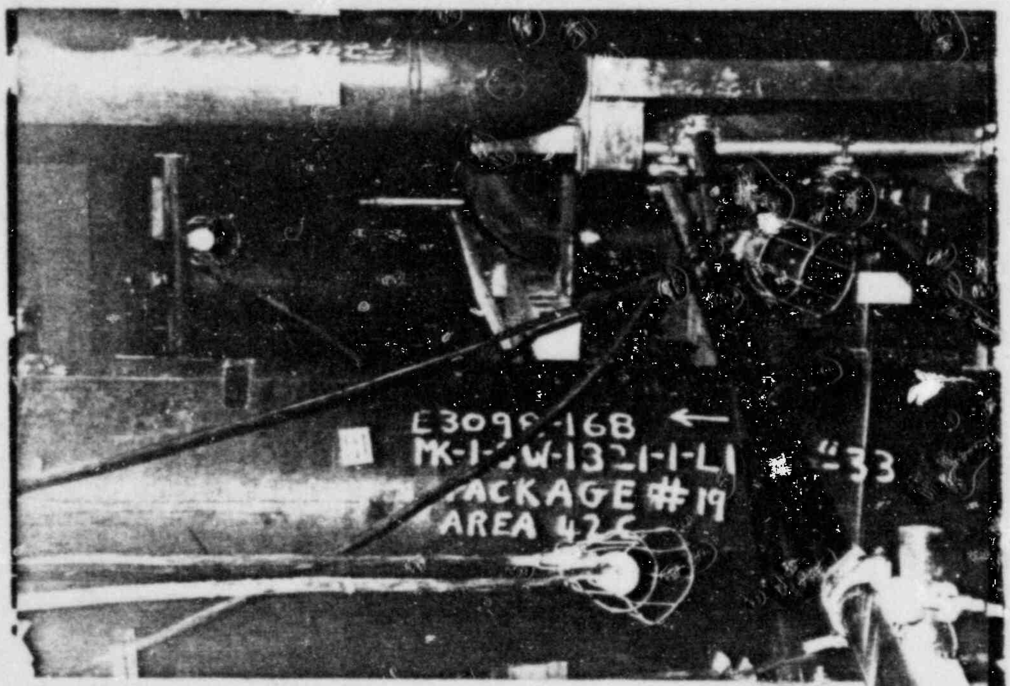
5.3 Inspection Conduct

The inspection was conducted to determine the conditions and controls applicable to pipe cold springing, to establish if the lining cracked during pipe fitup or welding, and how cracking would be identified such that repair could be initiated. Interviews and records review were concentrated toward service water piping in the pipe slot area between the diesel generator building and the waste processing building. The staff visually inspected accessible interior and exterior portions of the SW pipe in several areas. Cement-lined pipes installed as part of the service water system are shown in Figure 5-1.

5.4 Inspection Findings

The construction supervisor detailed the sequence of events from arrival of pipe at the site to final cement installation on the inside of the pipe at welded joints after completion of piping fitup. Cold springing of pipe was limited by both procedure and physical distances between pipes. Movement at the end of a pipe was limited to one inch during fitup, an insignificant dimension for the length of pipe sections (up to 40') being installed. The majority of the service water lined piping is 24 inch diameter or larger (up to 42 inch diameter) which permits internal access after welding for mortaring of fitup joints and inspection of the inside surface of the cement lining. The inspector reviewed records verifying that in the pipe slot area fitup joints were mortared after welding such that any cracked cement lining could be also identified and repaired. The construction supervisor and engineer also stated that this was true during informal interviews with them.





FERRO-CEMENT LINES-SERVICE WATER PIPE

FIGURE 5-1

They also stated that QC inspectors were advised to be alert to identify and report significant cracks in piping while enroute to specific internal pipe mortar inspections. The NRC staff reviewed a sample of NCRs where service water lining cracks exceeding the 1/32" criteria were identified and repaired. The justification for the 1/32" dimension for the maximum width crack is contained in the report submitted under the letter of March 13, 1984 by United Engineers and Constructors, Inc. (UE&C) to Mr. J. DeVincentis, YAEC Project Manager. This report details the result of a study into the corrosion mechanism and barrier breakdown which could occur in the cement lined system and provides the basis for the 1/32" maximum lining crack dimension.

The Centriline Process Booklet on cement lining of pipe lines reports the deflection testing of a 72" x 5/16" pipe section with a ¼" lining. The pipe was deflected 13" without impairment to the lining. The site drawing D-804998, Table 1 details the lining thickness for 42" and 24" pipe to be ½" and 3/8" respectively. While the deflection test result is not directly applicable to the Seabrook 24" and 42" pipe lining sizes, the test does indicate an unexpected resistance of cement lining to cracking or breakage on deformation. It is probable that some "popping" noise could be heard when the pipe is stressed.

The staff found that it is unlikely that cement lining would have been subject to sufficient forces to cause significant cracking by cold springing the pipe during installation. Should cracking by this mechanism have occurred, it would have been identified during work operations including QC inspections conducted in the pipe after welding and those cracks exceeding the 1/32" criteria would be repaired.

The inspector entered the 42 inch diameter line 2-SW-1825 thru the opening for SW valve V-46 and observed the cement lining and junctions at weld seams for approximately 40 feet. The lining did contain hairline cracks although these were of width much less than the 1/32" acceptance criteria in paragraph 3.5.3.10.6 of Specification 248-2. The lining at weld joints was noted to be smooth and merged with the pipe lining.

5.5 Conclusion

The licensee had studied the affect of cracks on the safety of the pipe in service and determined that cracks exceeding 1/32" should be repaired.

The staff concluded that cracking of the service water pipe cement lining although unlikely could occur if excess force was applied to the pipe. In addition it is possible that cracks could occur due to mishandling during transportation.

However, the crack criteria, final internal inspections subsequent to fitup and welding, and repair criteria provide reasonable assurance that cracks exceeding the 1/32" criteria, no matter what the source, would be detected and repaired.

6. Allegation - Low Quality of Reactor Coolant Pipe

The alleger states, on page 1 of his written statement:

- "Faulty welds and mismatches of round pipe with out-of-round pipe in the auxiliary reactor cooling system. In addition to the potential for a loss-of-coolant accident such mismatches could -- if the emergency cooling system was activated -- create turbulence in the water which could lead to the formation of air pockets."

- "The company appeared to be using cheaper pipe as money got tighter at the plant. Often the pipe would be significantly out-of-round."

He further elaborates on the RC line on page 2:

- "On the Reactor Coolant Line, it was also a normal practice to grind down excessive mismatch, center line shrinkage, suck back and unconsumed ring. Look at the RC line from the main steam feed."

In a telephone conference with the alleger on August 24, 1984 the alleger stated that there was a 10" schedule 80 RC line in the MSF penetration area that was of concern. When questioned about "use of cheaper pipe" (see above), he stated that on the RC system the prints called for seamless pipe but that seamed - butt welded pipe was used. He thought the seamed pipe was cheaper.

6.1 Scope of Inspection

The NRC staff walked down all the lines in the Main Steam Feed (MSF) area to identify RC and other piping in the general area. Two RC lines were identified, the piping and associated welds were visually inspected, radiographs were taken, ovality and ultrasonic wall thickness measurements were made and the engineering specifications were reviewed.

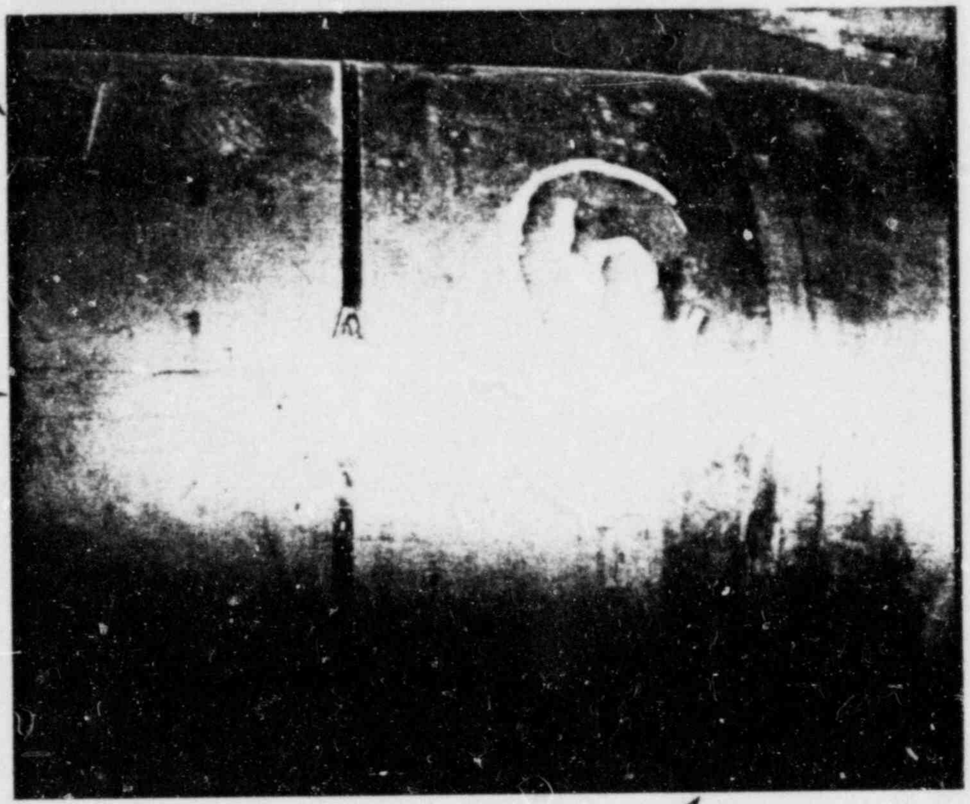
6.2 References

- Sketch E2936-614
- Sketch E2936-598
- Sketch E2936-135
- Specification 9763-006-248-1, Shop Fabrication of Piping

6.3 Inspection Conduct

The staff walked down the MSF penetration area to identify the RC lines. The staff could not identify any 10" RC line but did identify two 12" RC lines in the area, RC-58 and RC-13, the redundant residual heat removal suction lines. The staff inspected these lines.

Both RC lines were visually inspected and ovality measurements were made at numerous points on the lines. Wall thickness measurements to detect excessive grinding and/or mismatch were made at several welds and at pipe spool pieces. In addition, an alloy analyses was performed to provide assurance that the pipe material was SS 304 as specified in the specification.



BUTT WELDED LONGITUDINAL SEAM---RC-58

FIGURE 6-1

NRC radiography of welds on the RC-58 and RC-13 lines was performed which provided additional assurance of proper alignment, wall thickness, mismatch and overall pipe weld quality.

6.4 Findings

Visual inspection revealed the RC-58 and RC-13 line were 12" diameter lines and both utilized seamed butt welded pipe. The spool pieces and welds on these lines, visually were of high quality and had been inspected and accepted by ASME inspectors. Figure 6-1 shows a typical spool piece with both a horizontal seam and circumferential weld. Note the ASME Code acceptance stamp. Seamed pipe refers to the fabrication method of the pipe spool piece in which a longitudinal weld seam joins two edges of a formed plate.

Ovality measurements with calipers at 6 points each on line RC-58 and RC-13 did not reveal any deviations from ASME specification requirements. Wall thickness measurements at 2 field welds, 2 shop welds and at 2 points on the pipe run of RC-58 by NRC staff utilizing ultrasonic techniques did not reveal any violation of minimum wall thickness requirements.

Radiography by the NRC NDE Van staff of weld number F0301 on RC-58 and on weld number F0302 and F0304 on RC-13 did not show any mismatch, significant wall variations, or volumetric defects.

The staff reviewed the appropriate drawings and cross checked the piping material specification. The applicable specification, 9763-006-248-1 was identified on the spool pieces. The RC pipe was classified as UE&C class 601 which specified that pipe of 10" through 12" diameter should be SA312 type 304 Schedule 40 <u>welded or seamless pipe</u> (emphasis added - welded means with longitudinal seam). The NRC NDE van personnel performed an alloy analysis on both the RC lines and verified that the material was type 304s stainless steel.

6.5 Conclusion

The staff could not substantiate the allegation of "cheap pipe". The pipe conformed to specification requirements. The welds met code design requirements as verified by NRC independent measurements.

No out of specification deviations were identified by ovality, ultrasonic wall thickness or radiography measurements. The staff confirmed that there was seamed butt-welded pipe in the RC piping spools, but this was acceptable per the design specification.

7. Allegation - Violation of Pipe Minimum Wall Due to Grinding of Mismatch During Fitup

On page 1 of his written statement, the alleger states:

- "The grinding down of pipes to thicknesses significantly below those mandated by NRC codes. Bombardment from radioactive particles could cause the overly-thin pipe sections to become brittle before engineering projections would anticipate their embrittlement. Such grinding down of pipes to make them fit properly was one thing everyone at the plant knew we were doing. It was as illegal as hell, but everyone did it. See, for example, line E2936-283-1-CBS-1211 -- the Containment Building Spray line from the main steam feed which runs through the Pump Auxiliary Building through the Radioactive tunnel through the Equipment Vault.

I worked on the C'^ system connecting the main steam feed pipes to valve set into the concrete containment hull. Throughout the plant, welding crews frequently found that the pipes didn't match in size or shape the valve or pump they feed. The company appeared to be using cheaper pipe as money got tighter at the plant. Often the pipe would be significantly out-of-round. We would have a ¼" concentric in a large pipe. Under codes of both the NRC and American Society of Mechanical Engineers, only 1/16th" concentric (or 1/32nd" eccentric) is permitted. When a concentric mismatch greater than 1/16th" was found, a welder was sent squirming (sometimes, myself) inside the pipe to grind out the inside base metal diameter. That would, however, reduce the thickness of the pipe form ½" to ¼" concentrically. I am concerned this could affect the metal's ability to withstand radiation. The error is not detectable by X-rays. I understand that ultrasonic tests must be conducted to determine pipe thickness. I know of no ultrasonic tests done on this specific line, except for one weld repair at a different location".

Further, the alleger provided two photographs designated as Photos 6 and 7 with a description of his concerns on page 6 of his statement.

Photos 6 and 7
Area: Main Steam Feed, Penetrations
Elevation: -20.0
Description: Containment Vessel for 16" stainless steel Motorized Gate Valve, on Containment Building Spray (CBS) Line. Also pipe fabrication by Dravo, which extended from the valve through the Radioactive Tunnel and connecting to the Equipment Vault. Upon an attempted "fit-up" of the valve described above, an excessive "mismatch" existed between it and the Containment Penetration connection. With Quality Assurance acquiescence and awareness of a ¼" mismatch, the joint was welded out as is. As an accepted practice by Production Management, Quality Assurance and NDT, I was told by my area supervisor and foreman to grind down the mismatch so that the joint would pass x-ray criterion, thus diminishing the wall thickness by minimum of ¼ inch. Due to the out-of-roundness of all of the Dravo fabricated pipe, from the opposite side of the valve to the Equipment Vault tie in, the practice of grinding the root inside diameter was necessary for it to pass NDT tests because of mismatch and excessive suck back.

7.1 Scope of Inspection

The staff identified the 1-CBS-1211 line in the Main Steam Feed Penetration area. This line, its redundant line 1-CBS-12 12, and associated valves 1-CBS-V-8 and 14 were examined by the staff utilizing independent measurements. The licensee records were also reviewed and compared with the NRC data.

7.2 References

- Drawing CBS-1211-02 - Containment Spray System ISO
- Drawing CBS-1212-02 - Containment Spray System ISO
- ASME III, Division I, Subsections NB and NC
- ANSI B31.1, Power Piping Code
- Piping Data Sheet for ASME Class 3, UE&C Class 301 and 151.
- Pullman Power Products - NDE Records

7.3 Inspection Conduct

The staff reviewed the ASME Code Section III and ANSI B31.1 requirements for fairing of offsets and alignments when component surfaces are inaccessible, evaluated the effect of radiographic sensitivity on detectability of excess internal pipe metal removal, ultrasonically measured the pipe and weld thickness at V14 and V8 and two other pipe welds, and radiographed selected CBS system welds.

7.4 Inspection Findings

All of the pipe fabrication codes have provisions to control fitup and alignment tolerance of pipe weld joints. These are discussed for various pipe classification in the following paragraphs.

The ASME Code Section III Subsection NB for Class 1 components is quoted below to provide a baseline for consideration of weld joint fairing and alignment of inside surfaces.

- NB-4232.1 Fairing of Offsets.

  "Any offset within the allowable tolerance provided above shall be faired to at least a 3 to 1 taper over the width of the finished weld or, if necessary, by adding additional weld metal beyond what would otherwise be the edge of the weld. In addition, offsets greater than those stated in Table NB-4232-1 are acceptable provided the requirements of NB-3200 are met."

- NB-4233 Alignment Requirements When Component Inside Surfaces Are Inaccessible.

  "When the inside surfaces of components are inaccessible for welding or fairing in accordance with NB-4232.1, the inside diameters shall match each other within 1/16 inch. When the components are aligned concentrically, a uniform mismatch of 1/32 inch all around the joint can result as shown in Fig. NB-4233-1(a). However, other variables not associated with the diameter of the component often result in alignments that are offset rather than concentric. In these cases, the maximum misalignment at any one point around the joint shall not exceed 3/32 inch, as shown in Fig. NB-4233-1(b). Should component tolerances on diameter, wall thickness, out-of-roundness, etc., result in inside diameter variations which do not meet these limits, the inside diameters shall be counterbored, sized or ground to produce a bore within these limits." (Emphasis added)

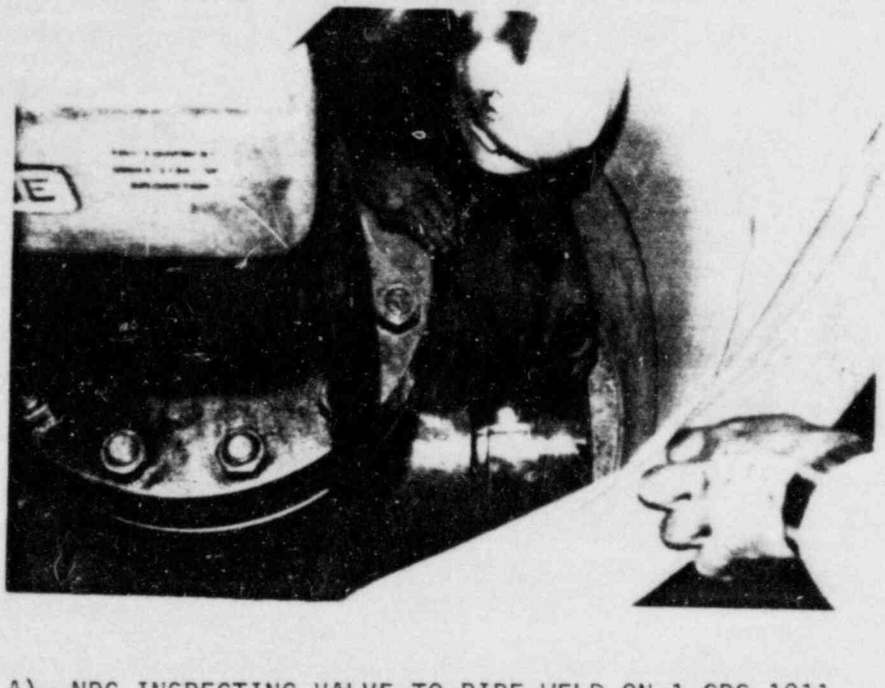
The ASME Code, Section III Subsection NC for class 2 system components is identical to paragraphs NB 4232.1 and 4233 except for references.

The ANSI B31.1 Code Section 127.3 prefers internal trimming (by grinding or machining) where ID mismatch exceeds 1/16".

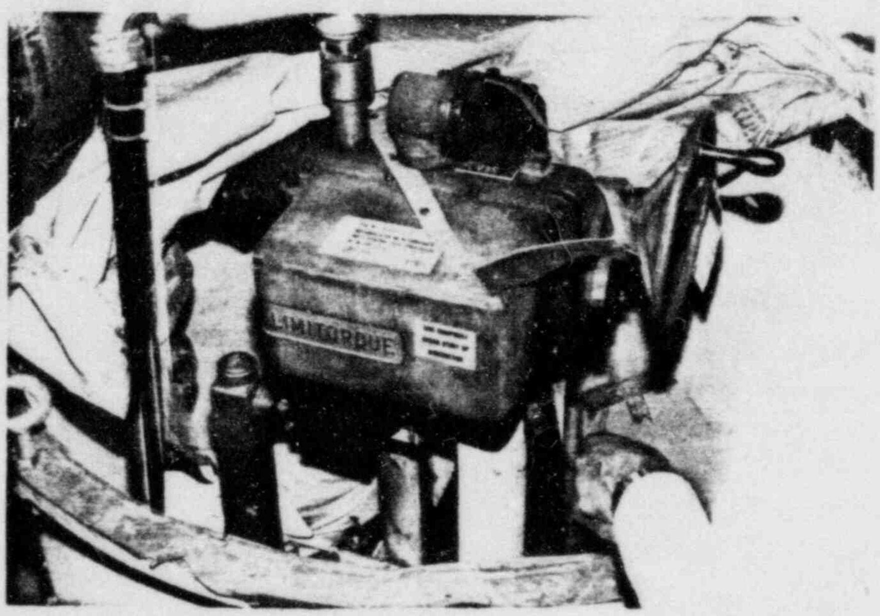
The CBS-1211 and 1212 lines specified in the allegation are ASME Code Class 2 lines which are governed by the requirements of NC-4230. Visual, ultrasonic and radiographic examination of specific welds on the CBS lines did not disclose violations of the NC alignment requirements. See Figure 7-1.

In the case of radiography, the issue is if excess grinding was done on radiographed joints, would this condition be observable on the radiograph? The ASME Code, Section V, Article 2, Tables T262.1 and T262.2 specify the sensitivity of the radiograph to be 3% minimum. In the case of CBS-1211 with a thickness requirement of 3/8 inch, the RT is required to show a local material thickness difference of 3% x 3/8 or 0.012 inches or more. The reduction of wall thickness by ¼" by grinding (or other metal removal method) is many times greater than the minimum RT sensitivity requirement such that metal removal amounts of ½" to ¼" would clearly show on the radiograph of the weldment.

Two CBS welds, F0204 and F0206, on CBS lines 1211 and 1212 respectively were radiographed and interpreted by the NRC inspection team. These welds were found to be acceptable and without evidence of excess local pipe material removal. A sample of licensee radiographs of welds in the CBS lines was reviewed by the staff and found to meet requirements.



A) NRC INSPECTING VALVE-TO-PIPE WELD ON 1-CBS-1211



B) TOP VIEW OF 1-CBS-1211 MOV SHOWING VALVE LOCATION INSIDE ENCAPSULATION TANK

CONTAINMENT BUILDING SPRAY (CBS) LINE VALVE

FIGURE 7-1

Ultrasonic wall thickness measurements made on the CBS pipe-to-valve weld joints on valves V8 and V14 did not show evidence of excess internal weld joint or pipe metal removal. Pipe wall thickness exceeded minimum wall requirements and these measurements correlated with the radiographic interpretations

In addition UT wall thickness measurements were made on one weld each and at least one spool piece for lines 1-CBS-1211 and 1-CBS-1212. All met requirements.

7.5 Conclusion

The staff could not substantiate the alleger's concern of "the grinding down of pipes to thicknesses signficantly below those mandated by NRC Codes". NRC-performed NDE and applicable documentation review provided objective evidence of the acceptability of the CBS lines including ovality, wall thickness, and welds.

8. Allegation - Poor Pipe Welds in Pipe Tunnel

On page 2 of the written statement the alleger states (technical parts abstracted from the paragraph):

- "Working in the pipe tunnel, I saw frequent instances of lack of proper documentation of faulty welds in pipes. Many welds were performed with the use of 2 Diametrics (automatic welding) machines."

- "The Diametrics machine was used to weld beveled pipe ends with a consumable ring. But the ring, which is about 1/16th" thick and the same diameter as the pipes, would shrink by as much as 1/8th". As a result, the inner circle of the ring would shear off or "fingernail." The crew was ordered to cut out 6 such welds. All were found to have up to 75 percent of their root below accepted standards. All these welds resulted in excessive suck back and lack of fusion, center line shrinkage and unconsumed ring."

During this telephone conversation, the alleger identified an individual, Mr. Y who could verify the above. The alleger felt Mr. Y had been intimidated.

During the August 24, 1984 telephone conversation the alleger stated "you could see by looking down the open end of the pipe with a flashlight the unconsumed ring."

The alleger also provided a list of nine (9) specific lines located in the pipe tunnel on page 5 of his statement. These lines are listed below.

Alleger's List of Lines in WPB Pipe Tunnel

Line No. 2 - Vent Gas - 1530 ss/40, 1530
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. 2 Chemical Volume Control ss/40, 522
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. 2 - Spent Fuel Pool Cooling ss/40, 1711
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. Steam Blowdown carbon steel /40, 1711
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class C

Line No. 2 Chemical Volume control ss/40, 388
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. 2 Waste line drain ss/40, 2102
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class C

Line No. 2 resin sluicing ss/40, 2517
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. 2 Boron recovery system ss/40, 2020
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

Line No. 2 vent gas ss/40, 1525
Area: Pipe Tunnel (WPB)
Zone: 37B, 34B
Cleanliness: Class B

8.1 Scope of Inspection

All cf the lines identified by the alleger are non-safety related lines whose requirements are significantly less than safety related lines and therefore are subject to less inspection than safety related lines. The NRC staff inspected the full length of all of the lines in the pipe tunnel identified by alleger. The staff performed independent measurements including pipe ovality, pipe wall thickness, weld penetrant examinations and visual weld inspections with gauges. In addition, the staff viewed the internal condition of accessible welds from the open end of each pipe run. Further, the staff cross-checked the specification requirements for the pipe and verified the proper alloy by independent alloy analysis on the NRC NDE van.

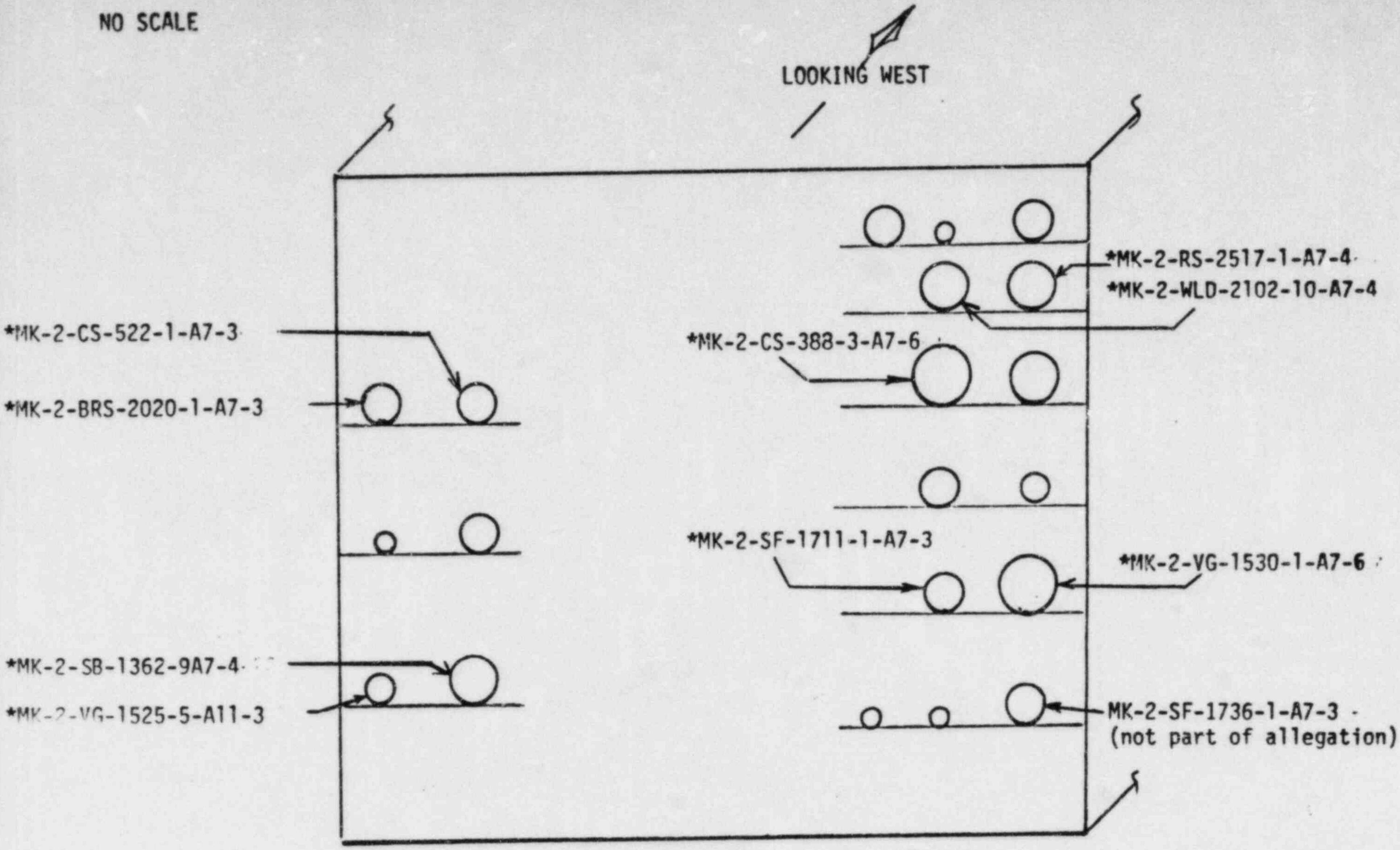
The NRC staff also examined the pipe storage areas and stored pipe in the WPB pipe tunnel including sections of pipe that had been cutout of lines. These cut-out pieces allowed internal inspection of the root area of typical WPB area welds.

8.2 References

- Seabrook FSAR - Section 3.11, Appendix 3B and Table 3.2-1
- ANSI B31.1, Power Piping Code
- Specification 9763-006-248-43, Design Specification for Nuclear Power Plant Piping Systems
- Specification 9763-006-248-51, Field Assembly and Irstallation of Piping and Mechanical Equipment

8.3 Inspection Conduct

The staff identified all but one of the pipe runs listed in the alleger's statement. The pipes were located in the Waste Processing Building (WPB) pipe tunnel. Figure 8-1 is a sketch of the relative location of each line in the tunnel. The steam blowdown line listed as ISO 1711 in the allegers list could not be identified as ISO 1711. Apparently this was listed incorrectly by the alleger. The steam blow down line identified as MK-2-SB-1362-9A7-4"-22 was inspected. Table 8-1 lists each line, system, and relevant specifications.



Cross Section of Tunnel Showing Pipe Runs Identified by Alleger and Inspected by NRC Staff (ALL PIPES ARE NON SAFETY RELATED)

WASTE PROCESSING BUILDING - PIPE TUNNEL

FIGURE 8-1

PIPE SPECIFICATIONS
Table 8-1

ISO No. (Pullman)	Line No.	Pipe Data	MFG STD.	SPEC No. 9763-006-243-43	Seismic Class	System Description
2-VG-1530	2VG-1530-1-A7-6"	A312TP304 SMLS SS SCH. 40.S	ANSI B31.1	UE&C-A7	N/A	Equipment Vent System
2-VG-1525	2-VG-1525-5-A11-3"	Same	Same	UE&C-A11	N/A	Same
2-CS-522	2-CS-522-1-A7-3"	Same	Same	UE&C-A7	N/A	Chemical Volume Control System
2-CS-388	2-CS-388-3-A7-6"	Same	Same	Same	N/A	Same
2-SF-1711	2-SF-1711-1-A7-3"	Same	Same	Same	N/A	Spent Fuel Pool Cooling System
2-WLD-2102	2-WLD-2102-10-A7-4"	Same	Same	Same	N/A	Waste Process Liquid Drain System
2-RS-2517	2-RS-2517-1-A7-4"	Same	Upgraded ANSI B31.1	Same	N/A	Spent Resin Sluicing System
2-BRS-2020	2-BRS-2020-1-A7-3"	Same	Same	Same	N/A	Boron Recovery System
2-SB-1362	2-SB-1362-9A7-4"	Same	ANSI B31.1	UE&C-A7	N/A	Steam Blowdown System
2-SF-1736	2-SF-1736-1-A7-3"	A312TP304	ANSI B31.1	UE&C-A7	N/A	Spent Fuel Pool Cooling System

This part of the inspection was concentrated in the Waste Processing Building (WPB) pipe tunnel, elevation (-) 4 feet. Inspection efforts were expended to verify compliance with code requirements, FSAR commitments, and document requirements, as applicable, in the following areas:

a) Pipe ovality (measurements at welds and in vicinity of the welds)

b) Characteristics of pipes and welds (visual inspection and penetrant exams)

c) Pipe wall thickness (by ultrasonic exams)

d) Weld Process Control Records review

e) Receiving inspection records review

f) Inspection records for Dimetrics welds

Isometric drawings (ISOs) were utilized to inspect the installed piping in WPB pipe tunnel to verify the pipe length, weld configurations and associated details (see Table 8-1).

The pipes identified with an asterisk in Figure 8-1 were inspected. The outside pipe diameters were measured by calipers, to check ovalities at the welds and 3" on either side of the welds. Visual examinations were made of the piping and welds to check for defects or nonconformance with ANSI B31.1 requirements. Weld gauges were used to measure offsets, heights and pipe alignments for concentricities on the welds. Mirrors were used to examine the internal surface of pipe welds where they were accessible from open pipe ends. Confirmatory calculations to verify compliance with code minimum wall thickness requirements were made by the staff and compared with NDE van independent measurements.

Penetrant examinations on 10 welds, which included one weld for each line in question, were performed by the NRC NDE van crew to determine weld quality. The NDE van crew also performed ultrasonic exams of 27 weld joints and adjacent pipe walls to determine if minimum wall thickness violation had occurred due to grinding of pipe mismatch. An alloy analyzer was utilized by the NRC NDE crew to analyze the chemical composition of the stainless steel pipes and verify compliance with material specifications.

The welding records, receipt inspection records and QA records as applicable, were reviewed for compliance with the ANSI B31.1 code and other codes and standards as appropriate. The ISOs were reviewed and compared with the installed piping and weld configuration to verify as-built conditions.

The staff informally interviewed craft persons in the plant during the field inspections. The crafts reported no known quality problems. Mr. Y, an individual the alleger identified by name in a telecon with the NRC on August 24, 1984, was on site and was interviewed by the staff.

8.4 Findings

The pipes in the WPB are non-safety related pipes. Seabrook 1 & 2 FSAR, Volume 6, Section 3.11, Appendix 3B, classifies the above lines as non-seismic, non-ASME class, and non-essential lines. Table 3.2-1 - Seismic Category I structures, systems and components, lists these pipes as non-nuclear, non-safety, and ANSI B31.1 piping. The ISOs identify these piping either ANSI B31.1 or upgraded ANSI B31.1 piping. The quality of the upgraded B31.1 lines exceed that required by licensee commitment. United Engineers & Constructors (UE&C) Specification No. 9763-006-248-51, Field Assembly and Installation of Piping and Mechanical Equipment, paragraph 1.1.1.41 provides additional documentation requirements for the upgraded ANSI B31.1 piping.

The ANSI B31.1 Code, Chapter V, Section 127.3, Paragraph C, specifies the alignment requirement as quoted below:

> "Alignment. The inside diameters of piping components to be joined shall be aligned as accurately as is practicable within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness. Alignment shall be preserved during welding. Where ends are to be joined and the internal misalignment exceeds 1/16 in., it is preferred that the component with the wall extending internally be internally trimmed (see Fig. 127.3.1) so that adjoining internal surfaces are approximately flush. However, this trimming shall not result in a piping component wall thickness less than the minimum design thickness and the change in contour shall not exceed 30 deg (See Fig. 127.3.1)."

The staff did not identify any unacceptable pipe conditions. All pipes met ovality/concentricity requirements and no violations of minimum wall thickness (less than 12½% of nominal wall) were observed. Alloy analysis confirmed that stainless steel pipe met specifications.

A typical Dimetrics weld in the WPB is shown in Figure 8-2B. The Dimetrics machine-made welds were of exceptionally high quality and uniformity (See Figure 8-2A for a comparison with a typical manual weld). Visual and liquid penetrant examinations verified acceptability. Internal examination of welds accessible from the open pipe ends by mirrors and flashlights did not reveal any unconsumed roots. Ultrasonic examination at the weld did not show any significant variation across the weld volume. Normal weld shrinkage occurred at the weld-to-pipe interface. A few welds exhibited some external discoloration but this was of no significance.

A) TYPICAL MANUAL WELD

B) TYPICAL DIMETRICS AUTOMATIC MACHINE WELD
(Note Uniformity)

WELDS INSPECTED IN WPB PIPE TUNNEL

FIGURE 8-2

One manually made field weld, FW F0603 in line 2-SB-1362-5-A7-4"-16 exhibited excess reinforcement at one point on its circumference and was of different surface appearance than the Dimetrics automatic welds. However, the staffs judgement was that the weld was fit for service.

Mr. Y was still employed at Seabrook during this inspection and he was informally interviewed by the staff. Mr. Y stated he had worked in the WPB pipe tunnel during welding operations there. He inspected pipe welds and Tufline valve-to-pipe welds and had worked both day and evening shifts. He knew of no unresolved quality problems and in response to questions about harassment or intimidation he responded he had never been the subject of either.

8.5 Conclusion

The staff could not substantiate the allegation.

9.0 Allegation - Diesel Generator Piping Field Weld NCR

The allegation states on page 3 of the written statement:

- "Two days later, I was assigned to work on Line No. 4417-01-R/1 F0101, NCR No. 2166 to grind and remove block weld stainless metal from weld area. This field weld had sugar deposits (oxidation caused by atmospheric contamination when welding stainless steel) from 10:00 to 2:00 on the interior of the root pass. I pointed this out the welding foreman, but the field weld was completed regardless of this defect. I believe it involved the diesel generator."

9.1 Scope of Inspection

NCR 2166 was written against weld 2DG-4417-F0101 which is located in Seabrook Unit 2. This portion of the inspection was directed toward the Unit 2 Diesel Generator Cooling Water System with emphasis on the specific weld 4417-F0101. The staff reviewed design records, performed an ASME code calculation to confirm wall thickness, and reviewed test records. The inspector also considered the significance of an internal weld oxidation (sugaring) area in the root of weld 4417-F0101.

9.2 References

- FSAR Section 3.11, and Section 9.5.5.
- ASME Section III, Subsection ND
- Drawing 9763-F-202103, Diesel Generator Cooling Water P&I Diagram
- Isometric Drawing 2DG-4417-01 Rev. 5
- Isometric Drawing 2DG-4417-02 Rev. 5

- NCR 2166- Correction of draw due to block welding
- Diesel Generator Test Number Report 2DG-19, 70/150 on 2DG4417, 2-4417-02-151-10"

9.3 Inspection Conduct

The staff reviewed NCR 2166, ISO 2DG-4417-01 Revision 5, the status of installation and testing of line 2DG-4417 in the vicinity of weld F0101, the installation records, and the ASME minimum wall thickness requirements. Weld F0101 could not be visually observed on the outside because the line was buried underground following the hydrostatic test of the line. The staff performed confirmatory calculations to establish minimum wall thickness and compared this with the drawing requirement. In addition, the staff reviewed the worst case condition for "sugaring" of the weld and design features such as redundancy.

9.4 Inspection Findings

The pipe in which F0101 is located is 10 inch, schedule 40S Type 304 stainless steel procured to the SA312 specification and installed to the ASME Code, Section III, Subsection ND Class 3 requirements. By ASME Code calculation (ND-3641) the required pipe wall thickness for the design pressure of 75 psi is 0.021"; the actual specified pipe wall is 0.365".

The installed portion of line 2DG-4417 including F0101 is a buried pipe external to the building. A section of the line passes thru the building wall but weld F0101 was not accessible for internal examination from the open end in the Unit 2 Diesel Fuel Tank Room.

NCR 2166 identified an in-process weld deficiency and provided for removal of a block weld of stainless steel (as stated in the allegation) and provided for hot pass welding to correct the joint dimensionally. Completion of the NCR disposition permitted continuation of the weld joint and inspection per the original weld process sheet. The NCR disposition and weld process sheet showed joint welding, visual inspection and non-destructive examination were completed successfully.

Weld sugar deposit on stainless steel is the internal oxidation resulting from inadequate argon inert gas shielding of the pipe inside diameter during root pass or subsequent hot pass welding. Weld sugar appears as an irregular, granular, generally concave but occasionally convex surface condition. The convex condition, providing it is not excessive, does not significantly detract from the weld quality as the minimum thru wall thickness requirement is not violated. The concave condition is addressed in the ASME Code, paragraph ND 4424(d) for Class 3 piping. This permits root pass concavity of single welded circumferential butt welds when the resulting weld thickness is at least equal to the thickness of the thinner member being joined.

Where ASME Code material required thickness is 0.021" minimum, and the actual material thickness is approximately 0.365", a minor internal oxidation condition (sugar deposit) is not considered to be significant by the staff. The code required hydro static test had been successfully completed on this line and the results demonstrated acceptability of this line to meet requirements.

The construction process controls sheet preparation, installation step identification, NCR preparation and disposition, hold point inspection and final line pressure testing were documented as complete. Site records show satisfactory completion of hydrotest of the now buried portion of the 2DG-4417-01 line including F0101 at 150 psi test pressure.

9.5 Conclusion

The staff concluded that while the presence of internal oxidation from 10:00 to 2:00 could not be proven, if the condition as alleged did exist, it would not have a deleterious effect on the safety function of line 2DG-4417.

10. Allegation - Radioactive Tunnel Welds

The alleger states on page 4 of his written statement:

- "I also observed a number of improper welds on Dravo-made pipe with excessive mismatches in the Radioactive Tunnel -- up to ½" concentric."

10.1 Scope of Inspection

The inspection was in the radioactive tunnel piping area, elevations 8 feet and 10 feet to verify code compliances, FSAR commitments, and document requirements, as applicable, for:

a) Pipe ovality at welds and in vicinity of the welds

b) Quality of pipe and weld fabrication.

c) Pipe wall thickness (ultrasonic exam).

10.2 References

- Seabrook FSAR - Section 3.11, and Table 3.2.1
- ANSI B31.1, Power Piping Code
- ISO WLD-2204
- ISO WLD-2092
- ISO 1-FP-8142

10.3 Inspection Conduct

The Isometric drawings (ISOs) listed in Table 10-1 were utilized to inspect the piping in the radioactive tunnel to verify the as-built weld configurations and associated details.

The staff walked the entire radioactive tunnel and identified all pipe lines routed through it. The staff also examined the temporary piping in the radioactive tunnel area, even though this piping was not related to the installed plant permanent piping.

Ovality checks were made on the permanent lines in the tunnel by measuring the outside pipe diameters with calipers at nine (9) welds and 3" upstream and downstream of each weld. Visual examinations on the welds was performed to detect any nonconformance with requirements. Weld gauges were used to measure the offsets, heights and pipe alignments for concentricities on the welds. Ultrasonic (UT) examinations were performed at three welds and in the vicinity of the welds to check the pipe wall thicknesses.

10.4 Findings

Seabrook 1 & 2 FSAR, Volume 6, Section 3.11, Appendix 3B classifies the above identified lines as non-seismic, non-ASME class and non-essential lines. Seabrook 1 & 2 FSAR, Table 3.2-1 - Seismic Category I structures, systems and components, lists above piping as non-nuclear, non-safety and B31.1 piping. The ISOs identify these piping as ANSI B31.1 piping, as shown above.

The ANSI B31.1 Code, Chapter V - Fabrication, Assembly and Erection specifies the welding requirements. No violations of the code requirements were observed on the installed permanent plant piping inside the radioactive tunnel.

No piping ovalities were identified at the welds. No physical damages were observed on the 300 feet plus of entire installed piping runs. The UT examinations confirmed the pipe thicknesses met the specification requirements.

The inspector observed one-six inch (6") diameter temporary stainless steel pipe where an offset of ¼" was present at the weld of an elbow to pipe joint. Approximately 20 feet from the observed mismatch, this stainless steel temporary pipe was connected to the temporary polyvinyl chloride (PVC) piping and was used for preop testing. The temporary pipe is used for filling and flushing systems during preoperational tests and will be removed after completion of preop tests.

TABLE 10-1

PIPE SPECIFICATIONS TABLE

ISO No. (Pullman)	Line No.	Pipe Data	MFG STD.	SPEC No. 9763-006-243-43	Seismic Class	Cleanliness Class	System Description
WLD-2204	WLD-2204-A7-1½"	A312TP304 SMLS 3.S.Sch.40	ANSI B31.1	UE&C-A7	N/A	C&D	Waste Process Liquid Drain System
WLD-2092	WLD-2092-A7-2"	Same	Same	Same	N/A	D	Same
1-FP-8142	1-FP-8142-1-M3-6"-1	A53GR.B SMLS SCH.40	Same	UE&C-M3	N/A	D	Fire Protection System

10.5 Conclusions

The examinations, physical measurements, and the observations performed on the radioactive tunnel area piping do not substantiate the identified allegation.

Allegation 6 also discusses Dravo-made pipe in the MSF penetration area. There are some references to the "tunnel" in the MSF area. See allegation findings and conclusions in relation to RC (Dravo) pipe in the MSF area.

11. Allegation - Turbine Building Piping Shop Weld Defect

The allegation stated on page three:

- "While working in Turbine Building No. 1, the crew received many prefabricated sections of welded pipe made by Dravo. Many times the joints did not meet ASME codes.

  On May 11, 1982, I was assisting another welder on line EX-4125-01-Rev/1, field weld no. 108, a 10" weld outlet (WOL) off a 24" carbon steel line, when I noticed a Dravo shop weld defect. Informed the Quality Assurance inspector about a one-inch lack of fusion zone on the interior of the root pass. However, I was told, "A Dravo shop weld is not our concern."

11.1 Scope of Inspection

The staff visually examined weld joint FW 108, and the other nearby welds including Shop Weld B; performed an ultrasonic exam on Shop Weld B and reviewed NDE performed by the licensee in response to staff concerns.

11.2 References

- ANSI B31.1, Power Piping Code
- FSAR Section 3.11, Page 220
- Drawing 9763-F202080, P&I Diagram for Extraction Steam
- SA 524, Table A2 - pipe dimensions.
- Sketch E2937-1885 for shop fabrication of 24" diameter extraction steam pipe/elbow assembly and preparation incuding shop weld "B" dated May 14, 1979.
- Isometric Drawing EX-4125-01 Revision 9.
- Field process sheet and weld rod requisitions for field weld FW 108.

- Specification 9763-006-248-1, Shop Fabrication of Piping.

11.3 Inspection Conduct

The staff identified the weld on the steam extraction line in the turbine building. See Figure 11-1. The staff examined the weld joint FW 108 and the other nearby welds on the steam extraction line 1-EX-4125-01. Dravo shop weld "B" is adjacent to FW 108 and is the only shop weld in the Dravo shop fabricated pipe section where the 10" weldolet (WOL) was field attached.

The shop weld in the area of FW 108 is a circle seam joining 24" diameter x 0.375 wall SA106 GrB pipe to an elbow with a design pressure of 100 psi. Visual examination of the shop weld on the outside surface showed this weld to be of adequate but not excessive reinforcement with the edges of the welded material to be in alignment. No surface defects were observed. The weld was ultrasonically examined by the NRC NDE van crew around its circumference. The licensee responded to an NRC question, raised as a result of the UT exam, by performing radiography on the weld.

11.4 Findings

One six (6) inch portion of the shop weld "B" near FW 108 produced a small ultrasonic indication. This area was radiographically examined by the licensee and RT film was reviewed by the NRC staff with the resulting conclusion that the ultrasonic indication was a reflection from the contour of the inside weld bead surface but was not an indication of a welding or material defect. The ANSI Code and design specification for EX-4125-01 do not require radiography or ultrasonic examination of this shop weld. The radiograph taken to supplement the ultrasonic evaluation exhibited one 5/16" long indication which did not correspond to the root pass interior surface.

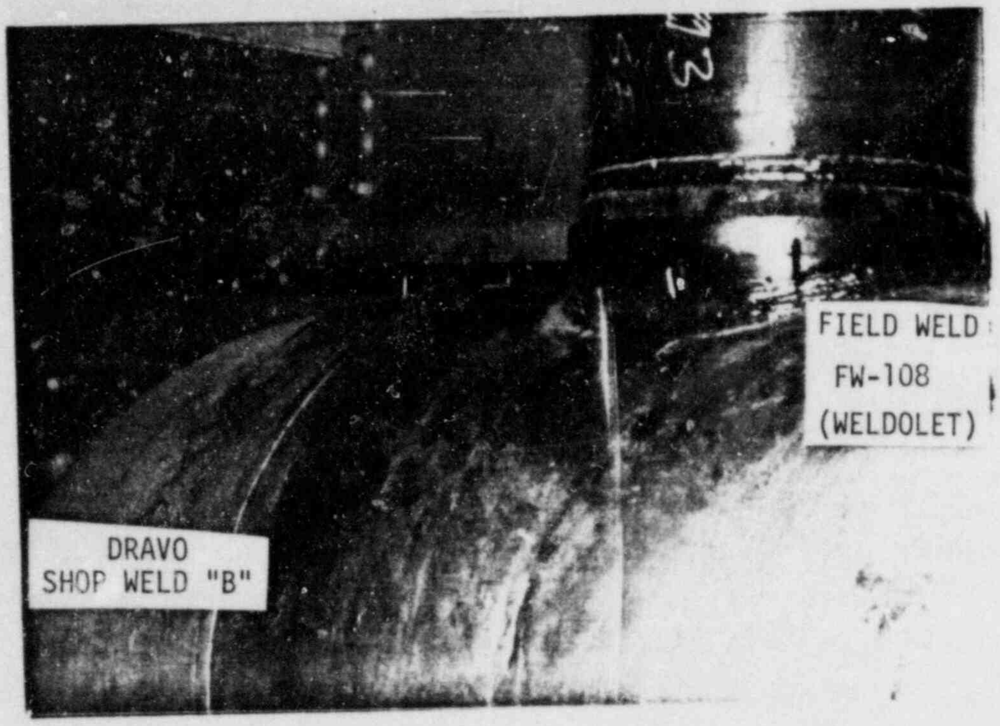
11.5 Conclusion

The conclusion reached by the staff is that the visual indication discussed in the allegation could not be confirmed by volumetric examination of the subject weld area. However, the 5/16" long radiographic indication exceeds the ANSI B31.1 standard allowable linear indication length of ¼" that would apply if radiography was required. The disposition of the 5/16" radiographic indication is an unresolved item pending licensee evaluation (50-443/84-12-2).

12. Allegation - Overheated Teflon Seat Valves

The alleger, on page 3 of his written statement, states:

- "In the Waste Processing Building, I observed several instances of improperly welded pipes to valves. Because the valves are made with teflon seating material, a manufacturer's tag warns never to heat



A) CLOSE UP VIEW FROM ANGLE

B) VIEW STRAIGHT ON OF SHOP WELD "B"

LINE NO. EX-4125-01-REV/1 --- MAIN STEAM EXTRACTION PIPE

FIGURE 11-1

them beyond 250 degrees. A photo of one such valve shows discoloration and rust, an apparent result of exposures far in excess of 250. The welding was apparently so hot it baked the chromium out of the alloy. The valves have been installed but, to my knowledge, they have never been checked for damage to the seating. A company inspector wrote up NCRs on this and several hundred other joints. But the company decided to "Accept As Is" the work in question."

To illustrate his allegation he supplied Photograph number five with the following caption:

- Photo 5:
  Waste Processing Building
  Elevation: 0.0
  Description: 3-inch Teflon valve welded to 3-inch stainless steel nipple. Valve and nipple were obviously overheated. An NCR on this joint and several hundred others was written up by a Pullman Higgins inspector, but the dispositions from the company came back "Accept As Is".

12.1 Scope of Inspection

The staff identified several "teflon seat valves" located in various areas of the WPB. A sample of 14 valves was visually inspected for external appearance, five were inspected for internal damage, and seven were functionally operated. Applicable NCRs were reviewed, craft were interviewed, and in-process weld operations were observed.

12.2 References

- TUFLINE - Maintenance and Repair Instructions
- ISO BRS - 1886-01
- ISO 2VG-1525-04
- ISO 2VG-1529-03
- ISO 2CS-522-03
- Field Instruction ISO FI-77
- Nonconformance Reports (NCR) 1900 and 469

12.3 Inspection Conduct

The staff reviewed the referenced documents and inspected Tufline valves installed in the Waste Processing Building (WPB). Fourteen valves of various sizes were visually inspected at several locations in the WPB. Smaller size valves were socket welded to the pipes and the larger size valves were butt welded to the pipes.

The staff completely disassembled two valves, one horizontally mounted and one vertically mounted, to inspect the teflon sleeve (seat) and the polished plug. One additional valve was partially disassembled to inspect the plastic diaphragm.

Several of these valves were only partially installed, i.e. only one end of the valve had been welded to the pipe run. The valve internals and the weld root areas of these valves were inspected with the aid of flashlights and mirrors by gaining access from the open end. Seven valves from the sample size were manually operated by NRC staff to verify operability.

Two different craft crews working in the WPB were interviewed to determine their knowledge of the limitations on control of welding heat input when welding Tufline valves and the proper precautions to take. Both crews were aware of the temperature limitations and precautions. Several quality control inspectors were interviewed and they also were knowledgeable of the temperature limitation. One Q-C inspector, who had been assigned to the WPB area to inspect welding, including pipe to valve welds on Tufline valves, stated he knew of no unresolved quality problems.

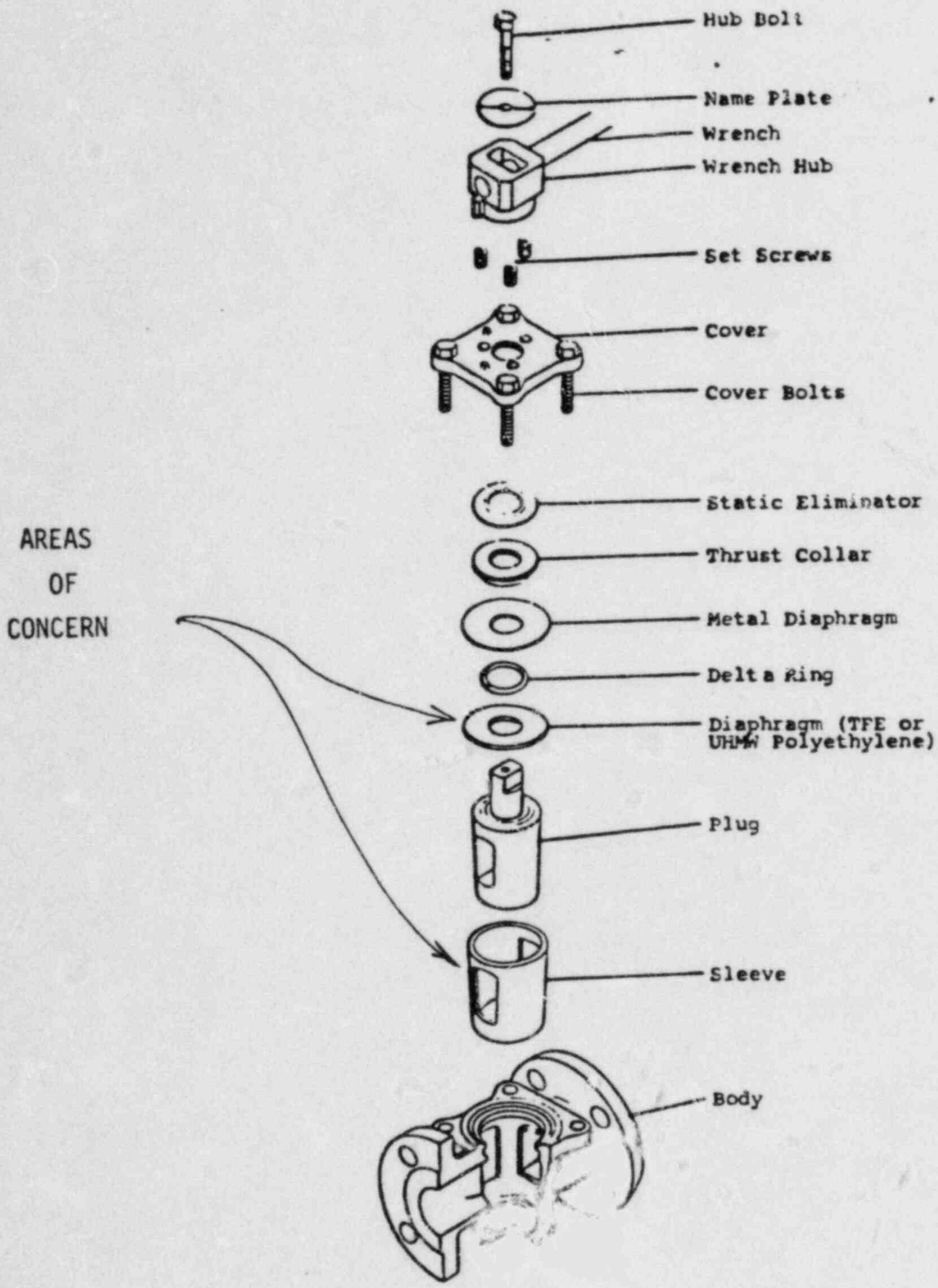
The staff observed one craft crew (welder and fitter) welding the Tufline valves to pipe sections. The welder knew the procedure requirements, had a calibrated pyrometer available, and had sufficient demineralized water to cool the valve body in accordance with FI-77.

12.4 Findings

The teflon seat valves are Tufline valves manufactured by the XOMOX Corporation. The valves have one or more plastic parts which could be affected by excess welding heat input, which are shown on Figure 12-1 an exploded view of a representative Tufline valve. Figure 12-2A shows a typical installed valve. These valves inspected are utilized in non-safety related systems.

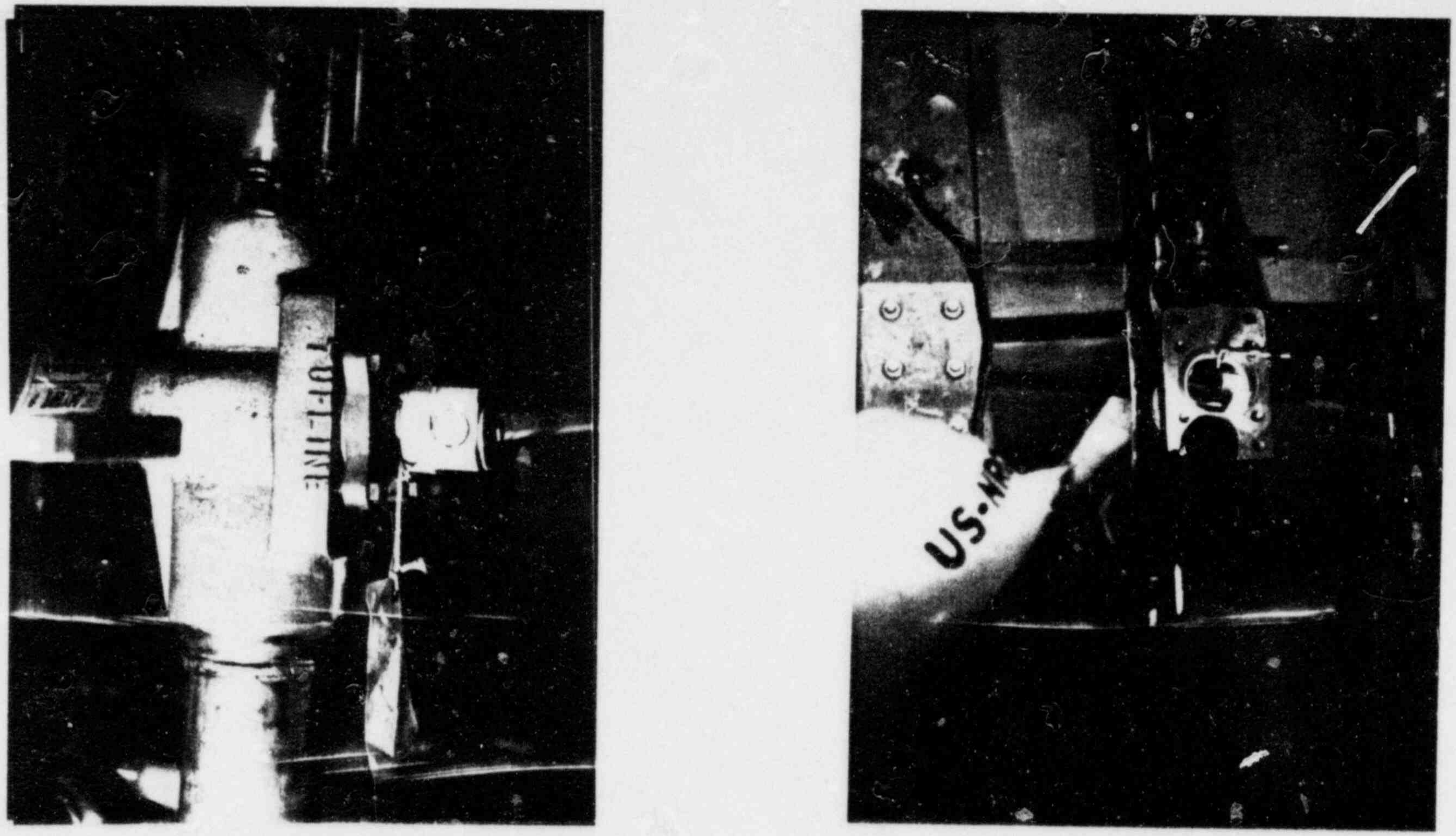
The staff review of the manufacturer's instruction manual found that certain precautions must be observed to minimize weld heat input during welding. The XOMOX manual contains recommended weld techniques and a special technique for cooling the valve body to assure the temperature of the valve body does not exceed 200°F during welding.

The licensee had incorporated these requirements in procedure FI-77 which was issued and approved by QA in January 1981. The weld/fitter crews were aware of the limitations, procedural controls and were actually observed to be adhering to these controls during welding. Observation of welding by NRC confirmed the use of a calibrated pyrometer and the proper cooling technique. In addition, the valves are received with a manufacturer's tag which clearly warns the welder of temperature limitation.



EXPLODED VIEW OF TYPICAL TUFLINE VALVE

FIGURE 12-1



A) TYPICAL TUFLINE VALVE WITH TEFLON SLEEVE INSTALLED IN WPB AREA

B) NRC STAFF TEAR DOWN AND INSPECTION OF TUFLINE VALVE INTERNALS

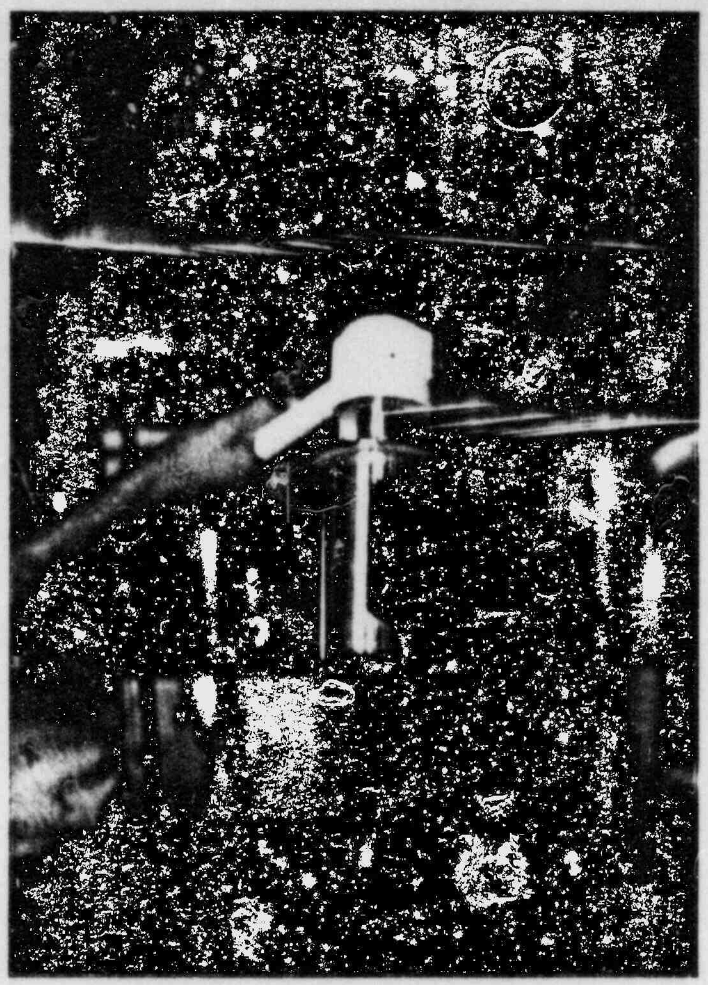
TUFLINE VALVE

FIGURE 12-2

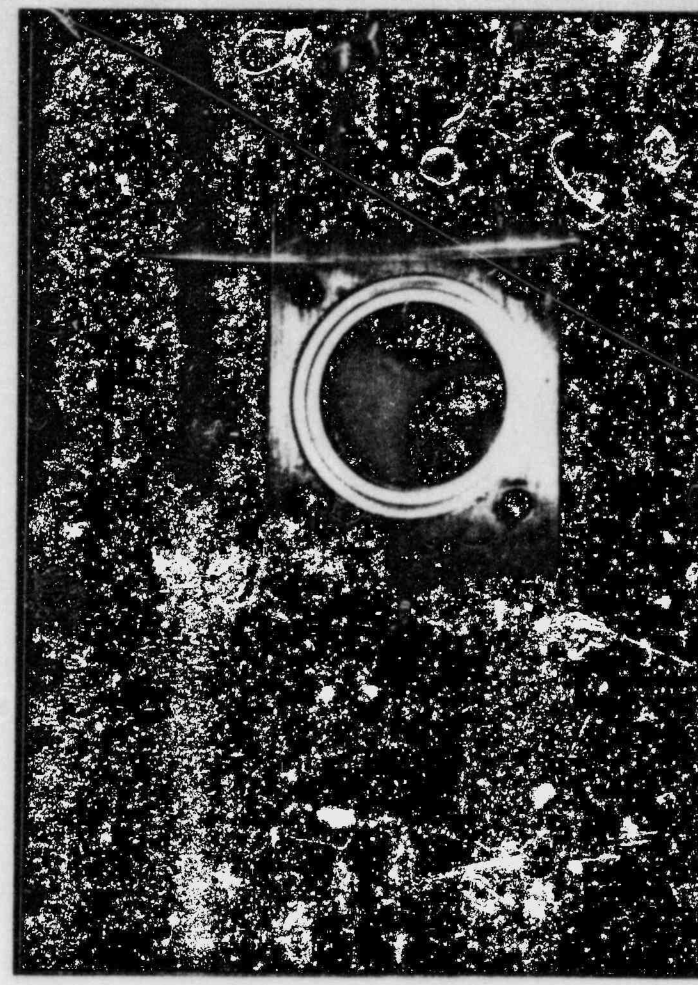
Table 12-1

Tufline Valves - Tear down/internals Inspection

Valve No.	Classification	Location	External Visual	Internal	Functional	Conclusion
2-VG-V-0085 (Vertically mounted)	Non-Safety	WPB	Fully welded slight rust at lower weld no defects observed in weld or valve	Complete Disassembly Valve Plug - No Damage Welds - Excellent	Manual Operation Completely Functional	No damage to valve internals General quality very high
2-CSV-0765 (Horizontally mounted)	Non-Safety	WPB	Fully welded Little discoloration. No defects observed in weld or valve	Complete disassembly Valve Plug - No damage Plastic sleeve - no damage Welds - Very Good	Manual Operation Completely Functional	No damage to valve
1-VG-V-0061 (Horizontally mounted)	Non-Safety	WPB	Fully welded slight rust in weld zone. No defects observed	Partial disassembly No damage to the diaphragm	Manual Operation Functionally OK	No damage to valve
BRS-2-V448 (Horizonally mounted)	Non-Safety	WPB	One end of valve welded to pipe No external defects	Access to valve from open end. No defects observed	Manual Operation Functions OK	No damage to valve
BRS-2-V548 (Horizontally mounted)	Non-Safety	WPB	One end of valve welded to pipe No external defects	Access to valve from open end No defects observed	Manual Operation Functions OK	No damage to valve



A) VALVE PLUG
No Damage



B) VALVE SEAT - TEFLON SLEEVE
No Damage

CLOSE-UP OF TUFLINE VALVE INTERNALS

FIGURE 12-3

The results of the NRC tear down inspection of the valves is shown in Table 12-1 and Figures 12-2B and 12-3 are photographs of the valve internals. The staff tear down of the valve internals inspection did not identify any evidence of overheating, improper weld technique or lack of procedural control. The plastic parts were not discolored, distorted or damaged in any manner. The internal root surfaces of the pipe-to-valve welds were examined with the aid of lights and mirrors and no defects were detected.

Manual operation of seven valves demonstrated functionality. Breakaway torque was very high due to the Teflon sleeve but once started the plug moved smoothly and through full rotation.

NCRs 469 and 1900, which documented deficient weld control applicable to the welding of the Tufline valves, were reviewed by the staff. NCR 469 dated November 11, 1980 identified 23 small bore Tufline valves that were installed without procedural controls and therefore could have been damaged due to excessive weld heat input. The reason for this condition was that the XOMOX Corporation instructions were not incorporated in field procedures. The licensee's corrective action was to functionally operate all valves to verify that the teflon sleeve was not distorted. A distorted sleeve would prevent functional movement. This corrective action was coordinated with the valve manufacturer. All functionally tested valves were found to be acceptable and dispositioned "Use As Is".

To prevent future problems, the licensee issued FI-77 to provide procedural controls and instructions to the crafts with regard to the welding sensitivity of the Tufline valves. NCR 1900 dated January 28, 1982 documents an excessive interpass temperature during welding of a Tufline valve. Valve operability was demonstrated and the valve was dispositioned "Use As Is".

12.5 Conclusion

Tufline valves are susceptible to damage by excessive welding heat. The licensee identified through his QA program the potential for a problem and corrected the potential by issuing detailed process control instructions. To complete the corrective action, they demonstrated functionality of the valves in question by manual operation. Further demonstration of acceptability will occur when the valves are subjected to pre-op tests which will detect any leakage across the valve.

The NRC inspection of disassembled valve internals, welds, and valve external conditions did not identify any deficencies. Interviews with QC and crafts indicated that there were no problems related to this type of valve.

13. Allegations - Improper Storage of Motor Operated Valves (MOVs)

The alleger states on page 4 of the written statement:

- "In January, 1982, near the Waste Process Building, I observed electronically activated valves stored in the rain and showing signs of rust. Such equipment, with its exposed wiring, is covered by Class B cleanliness requirements."

- "No one ever took them apart and looked at them to be sure they weren't damaged. I know because I helped install them. These valves are located in the main steam feed zone and are connected to pipes emerging from the containment."

The written statement on page 7, describes conditions depicted in several photographs supplied by the alleger:

- Photo No. 10:
  Area: Main Steam Feed, Penetrations:
  Elevation: -20.0
  Descriptions: ASME and ANSI pipes and valves being stored in conditions which are flagrant code violations.

- Photo No. 8
  Area: Main Steam Feed, Penetrations:
  Elevation: -20.0
  Description: 4-inch motorized gate valves ss. This valve and many others were left out in the open, exposed to the elements during the winter months of 1981, through February 1982. Note the water drops on the coiled wire in the foreground, attesting to the open roof conditions these ASME Class III Section 1 valves were exposed to. The NRC did cite these valves with obvious storage violations. However, LWAs were issued, the valves installed and accepted as is.

13.1 Scope of Inspection

The technical staff located the motor operated valves (MOVs) in the MSF area and performed independent measurements on the valves, reviewed licensee records and procedures and verified the valves were adequate for service.

13.2 References

- QCP-13, Rev. 14 Handling and Storage Control for Seabrook Station

- FGCP-9, Rev. 8, Preventive Maintenance and Protection of Nuclear or Safety Related Equipment

- FGCP-6, Rev. 3, General Preventive Maintenance and Minimum Storage Requirements for In-Place Storage of Permanent Plant Equipment

- GTE-33, Rev. 10, General Test Procedure, Motor Operated Valves

- ANSI N45.2.6, Qualification of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants

- Limitorque Manual for MOVs

- GT-M-102-F01, Rev. 3, Relubrication of Limitorque Operators

- Nonconformance Reports (NCRs) 562, 1066, 1249, 1815, 1861

13.3 Inspection Conduct

The staff identified several MOVs of the type identified by the alleger located in the Primary Auxiliary Building (PAB) Main Steam Feed Penetration (MSFP) area. In addition several other MOVs of a similar type were identified in the containment building.

The NRC staff visually inspected thirteen (13) MOVs, listed in Table 13-1, removed valve cover plates and inspected the internals of the compartments on five (5) units, and performed megger (insulation resistance) tests on two (2).

The staff verified that the referenced procedures were being implemented by the licensee by reviewing preventive maintenance and storage records for the previous year.

The qualifications of licensee and contractor inspection personnel who perform storage and maintenance inspections were reviewed and certifications verified. The staff reviewed the licensee nonconformance record (NCR) log and the following specific NCRs related to storage and handling of MOVs - NCRs 562, 1066, 1249, 1815 and 1861.

Table 13-1

MOVs Inspected by NRC Staff

Valve	Location	
*1-RH-V-32	PAB	General area of Elevation (-) 15ft Main Steam Feed Penetration Area
*1-RH-V-70	PAB	
*1-RH-V-26	PAB	
1-RH-V-14	PAB	
1-CS-V-166	PAB	
1-CS-V-162	PAB	
*1-SI-V-139		
*1-CS-V-143	PAB	
*1-CS-V-142	PAB	
1-CBS-V-14	PAB	
1-CBS-V-8	PAB	
1-CC-V-428	Containment	Elevation 0 ft
1-CC-V-438	Containment	

* Licensee identified improper storage on NCR 1249

13.4 Findings

The licensee identified improper storage of MOVs on several different occasions during construction at Seabrook. These conditions were documented in accordance with the applicable procedures. Of particular importance is NCR 1249 which was written on January 8, 1982 - the exact time period identified by the alleger.

NCR 1249 identified that Level C storage requirements for eleven safety related MOVs located in the MSF area were not being met. The corrective actions were appropriate for the conditions and included upgrading the storage to Level C, drying the motor, meggering, cleaning and followup inspections to verify corrective actions.

Seven of the valves identified on NCR 1249 were inspected by the NRC staff during this inspection. See Figure 13-1A for a typical MOV. The direct inspection of these MOVs did not reveal any deficient conditions. In addition the staff verified that the preventive maintenance program had been implemented. The P-M program calls for a bimonthly inspection when the valves are under jurisdiction of construction and a semi-annual inspection after they are turned over to the startup organization. For example, MOV 1-CS-V-143 was indexed on Preventive Maintenance Book 214, sheet 83 and included inspection data on a bimonthly basis from the most recent inspection of July 1984 back through May 1983. The records were complete and indicated that the megger values for motor windings were acceptable and storage requirements had been complied with. The significance of the megger readings is that motor insulation degradation is readily revealed in the form of low value megger readings.

The staff reviewed the qualification/certification of four of the quality control inspectors who performed the PM inspections on the valves. All certifications were for Level II and were in accordance with ANSI N45.2.6 and NRC RG 1.58.

The licensee's turnover program requires that all MOVs undergo a re-lubrication and inspection per procedure GT-M-102-F01 prior to turnover from construction to the startup group. This requires a complete re-lubrication of the limit switch gearbox grease, lubrication of the drive sleeve bearing and a complete inspection of wire routing, heaters, gaskets and the torque limit plate. All of the seven MOVs that had been listed on NCR 1249, and which were inspected by the staff, had been relubricated between May and October 1983. Objective evidence of the results of relube and inspection was reviewed and verified.

The staff performed independent measurements on five MOVs as shown in Table 13-2. The staff did a partial tear down of the MOVs, see Figure 13-1B, to observe the condition of heaters, switch contacts, wire terminations, wire routing, gasket integrity, and a check for oil leaks. An insulation measurement (megger test) was made on two of the MOVs. The results of the NRC inspection was cross-checked with licensee data. All

A) TYPICAL MOV IN MSF AREA

B) MOV PARTIALLY DISASSEMBLED FOR NRC INSPECTION

MOTOR OPERATED VALVES (MOVs)

FIGURE 13-1

Table 13-2

Independent Measurements - Limitorque Valves

MOV No.	Location	Type	Size	Inspection				
				Cover Removal	Internal Inspection(1)	Heaters on	Latest P-M done	Motor Megger
1-CC-V-428	Containment 0' El 320 degrees AZ	SMB	0	Yes	OK	Yes	Yes	Yes approx. ∞ (inf)
1-CC-V-438	Containment 0' El 150 AZ	SMB	0	Yes	OK	Yes	Yes	Yes approx. ∞ (inf)
1-CS-V-166	Primary Auxiliary Bldg. (PAB) El (-15)	SMB	00	Yes	OK	Yes	Yes	No
1-CS-V-162	PAB EL(-15)	SMB	00	Yes	OK(3)	Yes(2)	Yes	No
1-SI-V-139 NCR 1249	PAB EL(-15)	SB	00	Yes	OK(3)	Yes	Yes	No

NOTE: (1) With limit switch cover removed NRC Staff verified cleanliness, gasket in place, wire routing, terminations,

(2) For these two MOVs, heater indicating bulb had burned out. Electrician replaced.

(3) These two MOVs exhibited minute weepage of oil in limit switch compartment this is acceptable per manufacturers maintenance manual

the MOVs were found to be in acceptable condition. Two MOVs exhibited very slight oil seepage. The manufacturer's (Limitorque) maintenance manual stated this is acceptable and can be expected after extended periods of idleness.

The staff interviewed several QC inspectors involved in the performance of the MOV inspections (one of these inspectors had written NCR 1249 and was very knowledgeable of the storage problem). They acknowledged problems had been experienced but felt the corrective actions were effective and knew of no other quality problems that were not being addressed.

A Limited Work Authorization (LWAs) is a valid administrative control mechanism which allows work to be performed on a nonconforming item. For example, on MOVs, some LWAs were issued to allow QC to perform P-M functions on the MOVs thus preventing further deterioration. The staff did not identify any misuse of the LWA nor was any situation identified where the deficient condition on the NCR was bypassed by use of an LWA.

13.5 Conclusion

The allegation that MOVs had been inadequately stored in January 1982 is true. However, the licensee's quality assurance system identified the problem and instituted proper remedial corrective action. The preventive maintenance program further assured that the valves did not degrade during the construction phase and a relubrication/inspection prior to turnover provides additional assurance of the quality of the MOVs. The MOVs will also be subjected to functional and performance tests during the preop test program thus proving the operability of the MOVs.

14. Allegation - Unrepaired Defects in Steam Generator Nozzles

The allegation stated on page 2:

- "The failure to check nozzles on three of the plant's four steam generators. In one case, workers found a separation of cladding -- that is, the stainless steel nozzle kept separating from the carbon steel of the steam generator. After much grinding and rewelding, it was discovered that the nozzle was contaminated by large amounts of slag. Representatives of General Electric, which manufactured the nozzles, apparently repaired that particular nozzle. But to my knowledge, none of the other nozzles on the plant's other three steam generators were checked for similar problems."

14.1 Scope of Inspection

Unit 1 and 2 each contain four steam generators (SG) which have two lower head nozzles for a total of sixteen. The staff reviewed records for pre-weld examination of all nozzles and the post-weld examination of those nozzles that are welded to piping. Visual inspections and independent penetrant exams were performed on SG nozzles in Unit 1 by the NRC staff.

14.2 References

- FSAR Sections 5.4.2 and 5.4.3
- Files on Unit #1 Steam Generator Nozzle Welds to RC1, 2, 4, 5, 7, 8, 10 and 11, Field Welds FW0101 and FW0104 including pre-weld PT, post-weld RT, post-weld internal and external inspection.
- ASME Code Section III, Subsection NB.
- ASME Code Section V, Article 2 - Radiography
- NCR numbers 1107, 1476, 3833, 4490, 4789 and 6069.
- Memo-RC Loop Welding - Unit II, dated 8/30/83 file W-1043, from Kountz (UE&C) to Corcoran (P-H).
- Westinghouse concurrence of 9/13/83 to program of file W-1043
- Ultrasonic Test Records for Unit #2 Nozzle Buildups
- Status memo of Reactor Coolant Loop Unit #2 dated 4/11/84 including welds to steam generator nozzles.
- Unit #2 Steam Generator Layout for F420003/4/5/6
- Field Instruction ISO FI-132, Reactor Coolant Loop Piping Installation and Inspection
- Files on Unit #2 Steam Generator Nozzle Welds for Loops RC1, 2, 4, 5, 7, 8, 10 and 11, Field Welds F010 and F011, including Pre-weld RT, UT, & PT, Post Weld RT and post-weld internal and external inspections.
- NCRs, 2364, 5321, 6697, and 7035
- NRC Inspection Report 50-443/83-19

14.3 Inspection Conduct

10 CFR 50.55a(g) defines components which are part of the reactor pressure boundary to be classified as ASME Code Class 1. The steam generator bottom head reactor coolant inlet and outlet nozzles which carry reactor coolant are required to be welded to the reactor coolant loop piping and examined in accordance with ASME Class 1 requirements. The principle construction non-destructive examination (NDE) for these welds is radiography (RT) with the primary inservice inspection examination being Ultrasonic Examination (UT). The inspector reviewed site records

for the eight steam generator to reactor coolant piping welds for both Unit 1 and Unit 2, observed a sample of welding and discussed welding and testing practices with cognizant site personnel. Two completed nozzle welds were penetrant inspected by the NRC NDE van crew. The final radiographic film for the steam generator nozzles were reviewed.

14.4 Findings

The defect referred to by the alleger had been identified by the licensee and on Unit 1 the eight nozzle clad weld preparations were penetrant inspected (PT) to locate surface indications prior to welding the nozzles to reactor coolant loop piping. Subsequently, all eight Unit 1 nozzles were welded to the reactor coolant loop piping. The work was performed under the QA program controls and in-process inspections were performed. Final acceptance inspection consisted of radiography in accordance with the ASME Code. The NRC staff verified that the required radiography (volumetric examination) had been done and was complete by review of individual weld joint records and RT record sheets. The staff reviewed objective evidence that weld defects and defects in clad found by PT or RT by the licensee during fabrication were repaired and re-examined by the required NDE method. Of the two steam generator nozzle to piping welds examined with the liquid penetrant method by the NRC NDE van crew, both met ASME Code requirements and were acceptable.

On Unit 2, in an effort to minimize post weld repair of clad, the licensee established a supplemental UT, PT and RT program of the steam generator clad lower head nozzle weld joint areas. The inspector reviewed the records of this supplemental NDE on the clad of the nozzle weld joint preparation. At the time of this inspection three Unit 2 nozzle-to-reactor coolant pipes were welded and accepted on RT. An additional two welds are presently rejected on final RT due to a total indication length of 6" out of approximately 200" of weld length. One nozzle (2RC-2-1-F011) has not been fit-up to the 40° elbow, and the other two nozzles are fit-up and partially welded.

The staff also reviewed Field Instruction ISO FI-132 for Reactor Coolant Loop Piping Installation and Inspection, the documentation of the ASME Code required RT, and inprocess records of work done on the eight lower head nozzles of the four steam generators on Unit 2. Based on the above, the inspector concludes that all clad lower head steam generator nozzle weld joint preparations were examined to identify and repair defects including "separation of cladding". Subsequent to welding the nozzle clad to reactor coolant loop piping, each weld joint requires ASME Code Radiography for construction acceptance and ultrasonic examination for inservice inspection purposes.

The NRC Region I staff as part of the routine inspection program had previously followed the status of the steam generator nozzles. During NRC inspection 443/83-19, the NRC Regional NDE specialist reviewed the final radiographic film packages for seven of the eight Unit #1 steam generator nozzle welds. Of two radiographs questioned, both were reshot and found to be acceptable. At that time, radiographs of eight Unit #2 reactor vessel safe end nozzles were also reviewed and found to be acceptable.

14.5 Conclusion

The allegation that the nozzles on three of the four plant's steam generators were not checked was not substantiated.

15. Interviews

During the course of the inspection, the staff informally interviewed crafts workers, quality control inspectors, and field supervisors to obtain their views on:

- the quality of work at Seabrook
- effectiveness of the QC interface with crafts, i.e. availability of QC and observance of hold points, and
- harrassment or intimidation of inspectors.

15.1 Welder/Fitter Interviews

Twenty-four (24) welders and fitters were interviewed in the field. None knew of any unresolved quality problems related to piping or welding. Most of the welders/fitters had been employed at Seabrook for time periods from 6 months to over 3 years.

There were no negative comments about the QC inspection interface. One craft worker stated that newly hired inspectors have a tendency to over inspect because of lack of knowledge of requirements. Hold points are observed by the crafts and QC is fairly responsive to the need for timely inspection of the hold points.

The welder/fitters interviewed were knowledgeable of site conditions and work requirements of their trade and stated the quality of workmanship was good or better than average, several commented that it was excellent.

15.2 Quality Control Inspector Interviews

The staff informally interviewed six (6) field quality control inspectors. All QC personnel stated the quality of work is good and there is no harassment or intimidation of QC. QC inspectors were aware of the limitations of welding Tufline valves; one inspector stated the crafts had frequently asked him to check the valve body temperature with a pyrometer.

As envisioned by QC, the craft-QC interface works well. Crafts call for QC at hold points and if a hold point is missed, the work is re-done. The QC staff said there is no harrassment or intimidation. One inspector stated that when he first started (over 3 years ago) a welder whose work was rejected by QC threatened the inspector. The welder was terminated.

Several of the QC inspectors stated there had been some cold springing of pipe. They said everyone was aware of the restriction against it. There was no problem with the "critical stuff". There had been some on other (non-safety) pipe but they felt that it had been caught. They specifically cited the number of "quality holds" placed on pipe where there may have been a problem.

16. Falsification of QC Inspector's Signature

16.1 Background

The staff reviewed the Pullman Higgins (P-H) nonconformance report (NCR) log and selected several NCRs for follow-up. One of the NCRs selected for staff followup and review was P-H NCR 7433 dated 8/16/84. The nonconformance was specified to be "Step 6 on the attached process sheet (QC Insp. hold point), which was signed off, was not signed by the Pullman certified QC Inspector as noted. QC hold points (Step 11 and 12) were then signed by a certified QC inspector who was unaware of the invalid signature at Step 6".

The disposition of the NCR was "Use as is pending acceptable RT and upon UE&C review and concurrence." Further, it stated in block 10 of the NCR form, Steps to Prevent Recurrence "None required. Responsible individual is indeterminate."

UE&C disposition of the NCR essentially concurred with the P-H disposition. The UE&C disposition stated that "the signing off of a hold point by unauthorized personnel is a very isolated act."

16.2 NRC Staff Follow-up

The staff discussed the NCR with the following P-H personnel on 8/30/84:

- B. Steadman - NCR Lead Engineer
- W. Becksted - QA Manager
- J. Martin - QC Supervisor (by telephone)
- J. Butler - Construction Superintendent

P-H personnel candidly discussed the forged QC inspector signature with the staff. P-H management discussed the forged signature with craft personnel (particularly the welder and fitter performing the work). No one would admit to forging the QC inspector's signature, nor could anyone be found who had witnessed the forgery. The QC inspector stated that he definitely had not signed off the hold point and that someone had forged it. No other QC inspector had signed for the noted inspector, and no QC inspector had witnessed the act. P-H therefore made the decision that the guilty party was indeterminate and felt all they could do for corrective action was to verify the adequacy of the weld.

The NRC staff suggested several things that could have been done to prevent recurrence of such practices. P-H QA manager agreed to consider these.

On 8/30/84 the NRC staff met with the PSNH(YAEC) QA Manager and the QA special project manager to discuss the NCR and inadequate P-H corrective action. The PSNH(YAEC) QA Manager was not aware of the situation but expressed concern. He discussed the issue of falsification and said PSNH was concerned. In anticipation of such a problem and in an attempt to prevent such occurrence, he had prepared a draft memorandum which discussed the issue and had attached to it a Wall Street Journal article which discussed falsification of records and other construction related problems of nuclear power plants. This draft had recently been approved for issue by the Vice President. PSNH(YAEC) agreed to followup on the specific matter.

On 8/31/84 the NRC staff discussed the NCR with the QC inspector whose signature had been forged. He stated that it was definitely forged. He was not aware of any other forged signatures and did not know of any other quality of workmanship problems. He stated that he was not satisfied with the initial corrective actions/disposition of the NCR. The staff advised him that the NRC was concerned and that additional corrective actions were being taken (these are described in Section 16.3). In addition, the staff advised him that if he experiences problems in resolution/disposition of quality problems in the future, he should attempt to resolve them through the P-H, UE&C and YAEC management chain; but if the effort was unsuccessful he could surface his concerns to the NRC Resident Inspector.

16.3 Licensee and Contractor Followup Subsequent to NRC Involvement

PSNH (YAEC) QA Manager held a meeting on 8/30/84 with YAEC, UE&C, and P-H personnel to discuss the forged QC inspector's signature.

P-H issued a memorandum dated August 30, 1984 to all P-H employees which discussed falsification of documents and the penalty for falsifying documents or providing misleading information.

YAEC has assigned a member of the QA staff to investigate the matter.

16.4 Noncompliance

The falsification of documents and forging of QC inspectors signatures to quality control records is a significant matter. The licensee's contractors addressed only the remedial aspects of corrective action and did not address, nor take preventive action that would prevent recurrence of the forgery.

This is a noncompliance with the requirements of 10 CFR 50, Appendix B, Criterion XVI.

17. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Unresolved items are discussed in paragraphs 3.3 and 11.5

18. Exit Interview

A management meeting was held at the conclusion of the inspection on August 31, 1984 to discuss the inspection scope and findings as detailed in this report. The attendees at this meeting are identified in paragraph 1 by asterisk. No written information was provided to the licensee at any time during the inspection.

SUPPLEMENT A

Combined Inspection Report 50-443/84-12 and 50-444/84-06

Summary of Nondestructive Examinations
Performed By NRC
Nondestructive Examination Van Crew

1.0 Introduction

This report is a summary of items inspected during the week of 8-27 through 8-31-84 at Seabrook Nuclear Power Station by the NRC Nondestructive Examination Van.

An independent measurements inspection was performed using nondestructive examination and measurements on ASME, class 1 and 2, and B31.1 weldments and base material. In addition to the weldments and base material, concrete was inspected for compressive strength.

The following inspections were performed utilizing 1 regional base NDE (Nondestructive Examination) technician and 2 NDE contracted technicians.

2.0 Non-Destructive Examination

2.1 Visual (ASME)

Twenty-five pipe weldments and adjacent base materials were inspected for reinforcement, surface and overall workmanship per NRC procedure NDE-14, Rev. 0.
Results: No violations were identified.

2.2 Visual (B.31.1)

Forty-one pipe weldments and adjacent base materials were inspected for reinforcement, surface and overall workmanship per NRC procedure NDE-14 Rev. 0.
Results: No violations were identified.

2.3 Thickness (UT)

Fifty-eight pipe weldments and adjacent base materials were measured for minimal wall thickness per NRC procedure NDE-11, Rev. 0 using a Nortec NDT thickness gauge. Minimum wall thickness was determined by using an ASTM standard pipe size and nominal thickness chart.
Results: No violations were identified.

2.4 Liquid Penetrant Examination

Twelve pipe weldments and adjacent base material were examined by the liquid penetrant method per NRC procedure NDE-9, Rev. 0, addenda SB-1-0-1; Welds examined were ASME class 1 and ANSI-B31.1.
Results: No violations were identified.

2.5 Radiographic Examination

Five weldments were examined by radiography using an iridium 192 source per NRC procedure, NDE-5, Rev. 0, addenda SB-1-5-1; welds examined were ASME class 2.
Results: No violations were identified.

2.6 Material Verification

A qualitative and quantitative chemical analysis was performed on seven pipe spool pieces, stainless steel type 304 using the Texas Nuclear Instrument Alloy Analyzer per NRC procedure NDE-17.
Results: No violations were identified.

2.7 Concrete Examination

Six areas were tested using the Windsor probe system; an average of (3) three probes each were used to evaluate compressive strength of the concrete tested. Examinations were performed per NRC procedure NDE-16, Rev. 0 and ASTM-C-803-75T.
Results: Areas tested at or above 7000 psi. No violations were identified.

2.8 Ultrasonic Examination

An ultrasonic examination was performed on weld 1-EX-4125-01-SW-B. An ultrasonic reflection was observed on the CRT screen having a length of approximately 6 inches. This was determined to be a geometric reflector at the weld root by supplemental radiography. Calibration standards were not available for this examination because there is no volumetric examination required. Calibration was made using a miniature field calibration block (Rompas).
Results: No violations were identified.

3.0 Review of Radiographic Records

The inspector reviewed seven complete sets of radiographs with reader sheets for technique, film quality and weld integrity.

Results: No violations were identified.
Comment: (1) One radiograph reviewed, 1-CBS-1222-07 FW-F0706 was observed to have an area of approximately 1" concavity due to the window used during the weld fit-up with a consumable insert. Areas are radiographically acceptable per NRC procedure NDE-5, Rev. 0, addenda SB-1-5-1.