SEP 0 2 1981

Docket No. 50-423

Northeast Nuclear Energy Company
ATTN: Mr. W.G. Counsil
Senior Vice President-Nuclear
Engineering Operations
P.O. Box 270
Hartford, Connecticut 06101

Gentlemen:

Subject: Investigation 50-423/80-08

This refers to the investigation conducted by Messrs. R.K. Christopher and W. Sanders of this office on August 15-18, 1980 at Millstone Nuclear Power Station, Unit 3, of activities authorized by NRC License No. CPPR-113 and to discussions of our findings held by Mr. Christopher of this office with members of your staff at the conclusion of the investigation.

Areas examined during this investigation are described in the Office of Inspection and Enforcement Investigation Report which is enclosed with this letter. Within these areas, the investigation consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the investigators.

Within the scope of this investigation, no items of noncompliance were found.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosed investigation report will be placed in the NRC's Public Document Room. If this report contains any information that you (or your contractors) believe to be exempt from disclosure under 10 CFR 9.5(a)(4), it is necessary that you (a) notify this office by telephone within ten (10) days from the date of this letter of your intention to file a request for withholding; and (b) submit within 25 days from the date of this letter a written application to this office to withhold such information. Consistent with section 2.790(b)(1), any such application must be accompanied by an affidavit executed by the owner of the information which identifies

	R1:E&I	R1:DETI	R1:DETI	R1:E&I	R1:DRPI
RI:DETI	Christopher/wb	Sanders	Tripp	Carlson	Brunner
	8/27/81		9/1/81	8/28/81	9/1/81

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the document or part sought to be withheld, and which contains a full statement of the reasons of the basis which it is claimed that the information should be withheld from public disclosure. This section further requires the statement to address with specificity the considerations listed in 10 CFR 2.790(b)(4). The information sought to be withheld shall be incorporated as far as possible into a separate part of the affidavit. If we do not hear from you in this regard within the specified periods noted above, the report will be placed in the Public Document Room. The telephone notification of your intent to request withholding, or any request for an extension of the 10 day period which you believe necessary, should be made to the Supervisor, Files, Mail and Records, USNRC Region I, at (215) 933-5223.

No reply to this letter is required; however, should you have any questions concerning this investigation, we will be pleased to discuss them with you.

Sincerely,

/s/ original signed by Keimig

for Eldon J. Brunner, Chief,
Project Branch No. 1, Division
of Resident and Project
Inspection

Enclosure: Office of Inspection and Enforcement
Investigation Report No. 50-423/80-08

cc w/encl:
K. W. Gray, Construction Quality Assurance Supervisor
E. R. Foster, Director of Generation Construction
J. F. Opeka, Vice President, Nuclear Operations
R. T. La Lenat, Manager, Generation Facilities Licensing
D. G. Diedrick, Manager of Quality Assurance
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
State of Connecticut

cc w/o encl:
J.J. Carey, Vice President-Nuclear Division, Duquesne Light Company

bcc w/encl:
Region I Docket Room (with concurrences)
Chief, Operational Support Section (w/o encl)

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION I

Report No. 50-334/80-17
50-423/80-08

Docket .. 50-334
50-423

License No. DPR-66 CPPR-113 Priority -- Category B A

Licensee: Duquesne Light Company
435 Sixth Avenue
Pittsburgh, Pennsylvania 15219

Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06101

Facility Name: Beaver Valley Power Station, Unit 1
Millstone Nuclear Power Station, Unit 3

Investigation at: Pittsburgh, PA; Stuart, FL; Paradise, KY; St. Francisville, LA; and Waterford, CT

Investigation conducted: June 3, 1980 through December 4, 1980

Investigators: for Robert T. Carlson 8/21/81
R. Keith Christopher, Investigation Specialist date

for Lowell E. Tripp 8/20/81
Wilbert F. Sanders, Reactor Inspector date

Approved by: Lowell E. Tripp 8/20/81
Lowell E. Tripp, Chief, Materials and Processes Section date

Robert T. Carlson 8/21/81
Robert T. Carlson, Director, Enforcement and Investigation Staff date

Investigation Summary: Investigation from June 3, 1980-December 4, 1980 (Report Nos. 50-334/80-17; 50-423/80-08

Areas Investigated: The investigation was to determine why the weld penetrations in the shell nozzles of eight Category I field fabricated storage tanks constructed by Graver Tank and Manufacturing Company, were welded with seal welds despite engineering requirements for full penetration welds, and why the Graver quality control and erection records do not accurately reflect the work done. Additionally, the investigation examined the circumstances surrounding the finding of three sets of duplicate radiographs of the reactor containment liner at Beaver Valley 1 and examined the construction records of the Millstone 3 reactor containment liner which was also built by Graver.

Region I Form 12
(Rev. April 1977)

Results: Interviews of involved Graver and licensee personnel and review of pertinent construction records determined that the quality control inspection records were completed without the required inspections actually being done, and that the nozzle welds were not installed as required by engineering specifications. No additional evidence was found to indicate that there was a direct attempt to shortcut the construction requirements. The radiographs in question were confirmed to be duplicates but limited in its occurrence to this incident. No recurrence of this problem was identified at Millstone 3.

I. SUMMARY

This investigation was initiated to determine the circumstances surrounding the welding of the shell nozzles of eight Category 1 field fabricated storage tanks built by Graver Tank and Manufacturing Company, in 1971 through 1973 for the Duquesne Light Company at the Beaver Valley Power Station, Unit 1.

On April 15, 1980, during welding associated with an in-process modification, the licensee determined that a weld joint in one of the nozzles in the refueling water storage tank was welded with a seal weld despite engineering specification requirements for full penetration welding of the nozzle joints. Further examination determined essentially all of the nozzle welds in the Category 1 tanks were incorrectly made by the contractor, Graver. This occurred despite the fact that all of the Graver quality control (QC) inspection and erection records reflected examination for and acceptance of the welds as full penetration welds. This occurrence was documented by the licensee via LER 80-025 dated April 30, 1980.

Review of all pertinent documents, including engineering specifications, weld procedures and API 650 modified specifications, confirmed that full penetration welding was clearly required on the nozzle joints.

Interviews of the involved Graver quality control inspectors determined that the welds were never inspected as indicated on the erection control sheets which were filled out based on oral communications between the production crews and the QC inspectors. Additional interviews of quality control personnel from the principal construction contractor, Stone and Webster Engineering Corporation (Stone and Webster) and the licensee determined there was no active second level quality control program in effect on these tanks at the time of construction.

Interviews of local union welders involved in the tank construction, local union pushers, and involved Graver personnel failed to establish any evidence of or motive for intentially shortcutting the construction requirements on the tanks. The interviews did determine that all instructions relative to construction requirements of the tanks was the responsibility of the Graver Field Construction Foreman and that the union personnel were completely dependent on them for work directions. Graver personnel that were interviewed had no explanation as to why the welds were incorrectly made.

As a result of the defective welds found in the tank welding done by Graver, the licensee examined for acceptability the radiographs of welding done on the reactor containment liner, the construction of which was the only other work done by Graver at Beaver Valley 1. This examination determined that

the QC inspector responsible for inspecting the tanks also performed and interpreted the radiography on the liner. During the review, three sets of radiographs out of a total of 447 were found to be duplicates of other radiographs. During interview, the QC inspector neither confirmed nor denied that he duplicated the radiographs and provided no explanation regarding the duplication. No other individuals were identified as having any knowledge relative to the duplicate radiographs.

Corrective action was initiated by the licensee to repair the nozzle welds in question by grinding and rewelding the joints to full penetration welds. Additionally, engineering analysis determined that integrity of the reactor containment liner was not diminished, and repair was not required.

As a result of the welding discrepancies found at the Beaver Valley 1 facility, additional investigation was conducted at the Millstone Nuclear Power Station, Unit 3 in Waterford, Connecticut to insure the integrity of the reactor containment liner which was also constructed by Graver (now Graver Energy Systems, Inc.) using some of the same personnel that were involved in the construction at Beaver Valley 1.

Interviews of Graver QC personnel regarding their inspection activities and recordkeeping surfaced no indication of a similar problem at Millstone 3. Additionally, all liner radiographs were interpreted by NDE Level III examiners from Stone and Webster Engineering Corporation, the architect engineer/constructor, and NUSCO, and were verified by the NRC Reactor Inspector. No discrepancies in these radiographs were noted during the review.

II. PURPOSE OF INVESTIGATION

The purpose of this investigation was to determine why the weld penetrations in the shell nozzles of eight Category I field fabricated storage tanks built by Graver Tank and Manufacturing Company at Beaver Valley 1 in 1971-1973 were welded with seal welds despite the engineering specification requirements for full penetration welds, and to determine why and how the Graver quality control inspectors verified these welds as full penetration welds on the erection control records.

The investigation also inquired into the circumstances surrounding the finding at Beaver Valley 1 of three sets of radiographs of the reactor containment liner welds that appeared to be duplicates of other radiographs, and examined the construction of the Millstone 3 reactor containment liner which was also built by Graver.

III. BACKGROUND

During pipe welding on April 15, 1980 associated with an in-process modification being made at Beaver Valley 1, the licensee determined that a weld joint between a 12 inch low-head safety injection pump suction pipe and the refueling water storage tank (RWST) had been incorrectly made during initial plant construction (Circa 1973). The weld, apparently made by the tank fabricator, Graver Tank and Manufacturing Company, was required to be a "full penetration" groove weld but was found to be only a "seal" weld having negligible penetration in the base metal.

Additional licensee examination indicated essentially all welds called for as full penetration welds in the RWST and the demineralized water storage tank (DWST) were incorrectly made as seal welds by the same fabricator during initial construction. Similar deficiencies were identified in nearly all of the tanks supplied by Graver including nonsafety-related tanks in the boron recovery system and auxiliary boiler fuel oil system.

All of the applicable drawings and engineering specifications invoked API 650 modified, which required a full penetration weld between the nozzle neck and shell. A preliminary review of records by the licensee determined that the quality and erection control records prepared by the Graver quality control inspectors indicated inspection and approval as full penetration welds in the nozzle joints.

As a result of defects found in the tank welding, the licensee examined for acceptability the radiographs of welding done by Graver on the reactor containment liner which was done under separate contract. During this examination, three sets of radiographs were found that appeared to be duplicates of other radiographs of welds made elsewhere in the liner.

IV. DETAILS

A. CONTRACT DETAILS

Under Contract No. BVC-198 dated January 22, 1971, Graver Tank and Manufacturing Company (Graver) entered into agreement with the licensee, Duquesne Light Company, to erect a total of 11 field fabricated storage tanks for the Beaver Valley Power Station, Unit 1. Under terms of the contract, the tanks were built to the requirements of Stone and Webster Engineering Corporation (Stone and Webster) engineering specification BVS-183 which invokes API 650 modified.

The field erection portion of the contract was based on the cost plus formula. The tanks to be built under this contract were:

	Tank ID No.	Quantity	Description of Tank	Seismic Category
1.	WT-TK-11	1	Turbine Plant Demineralized Water Storage Tank	2
2.	WT-TK-9	1	Filtered Water Storage Tank	2
3.	AS-TK-4	1	Fuel Oil Storage Tank	2
4.	BR-TKS-2A,B	2	Boron Recovery Test Tanks	1
5.	BR-TSK-4A,B	2	Coolant Recovery Tanks	1
6.	BR-TKS-6A,B	2	Primary Water Storage Tanks	1
7.	QS-TK-1	1	Refueling Water Storage Tank (RWST)	1
8.	WT-TK-10	1	Demineralized Water Storage Tank (DWST)	1

B. ENGINEERING AND DESIGN REQUIREMENTS FOR SHELL, HEAD AND NOZZLE JOINTS

By contract agreement the tanks were to be built, as shown and described to the engineering specification of BVS-183 entitled Field Fabricated Storage Tanks. The Stone and Webster drawing entitled "Typical Details for Pressure Vessels - ST-HV-1," specifies the attached nozzles to have full penetration welds. Additionally, the Stone and Webster drawings for specific tanks, i.e., demineralized water storage tank and refueling water storage tanks state "All shell head and nozzle joints shall be full penetration welds unless noted elsewhere on the drawing and shall be constructed in accordance with the latest API Standard 650." In reviewing the API 650 reinforcement details documents it was determined that "all shell opening connections which require reinforcement such as nozzles, manholes, and clean out openings shall be attached by welds fully penetrating the shell."

C. AS FOUND CONDITION OF REFUELING WATER STORAGE TANK

The welding discrepancies in the nozzle joints were initially identified and reported on April 15, 1980 by the licensee when a piping modification was being made to the internal piping of the refueling water storage tank (RWST or QS-TK-1 or TK-1). The modification required the attachment of a 12 inch schedule 40 ASTM A 312, Type 304L pipe to the end of the N3 nozzle low-head safety injection suction pipe at the inside wall of the tank. The grinding of the weld that joins the nozzle to the wall inside of the tank revealed a weld which did not penetrate the full thickness (3/8 inch) of the tank wall and could be classed as a seal weld. Exhibit 1 is a drawing reflecting the as found versus the as required weld condition.

A review of the contractual documents listed below show them to be specific in the requirements for full penetration welds for attached nozzles:

1. Stone and Webster Engineering Corporation Specification - BVS-183 for Field Fabricated Tanks.

2. Standard Drawing STD HV-1.

3. Duquesne Light Company Drawing No. 8700-RV-24A.

4. Stone and Wesbster Engineering Corporation Drawing No. 1170-RV-24A.

5. Graver Tank and Manufacturing Company Drawing No. B-31477-0.

6. Weld Procedure No. 47, Supplement 2, Rev. 6.

7. American Petroleum Institute Specification API 650 Modified.

Subsequent to identification of the discrepancy on nozzle N3, the remaining nozzles to shell welds were examined and found not to be in accordance with the specifications and the approved engineering and Graver drawings. A total of 16 nozzle welds on this tank were removed and rewelded to meet the requirements of the specifications.

During the repair of the RWST nozzle/shell welds, a dye penetrant inspection revealed a linear indication in a vertical weld seam made by Graver. The indication, determined to be lack of fusion, was removed by grinding, rewelded, and inspected for acceptance. The indication initiated a review and reinterpretation of the original seam weld radiographs made by the contractor. Based on the review, three radiographs previously accepted by the contractor were rejected. Additionally, radiography was performed to verify previously taken radiographs and reexamine other random locations. The additional radiographs were acceptable, however the weld areas shown on the three

radiographs that were rejected were located below the concrete line and therefore were not accessible for radiography. These three areas were repaired from the inside of the tank and examined with ultrasonic techniques.

A review of the following weld metal issue records for the RWST (QS-TK-1) disclosed additional information related to the credibility of these records:

Six inch, N5, Liquid Inlet, Weld Inside 9-25-73-W. Naughton-Welder
Six inch, N9, Shell Connection. Weld Inside 9-25-73-W. Naughton-Welder
Three inch, N15, Level Transmitter, Weld Inside 9-25-73-W. Naughton-Welder
Four inch, N6, Liquid Outlet, Weld Inside 9-25-73-W. Naughton-Welder
Four inch, N16, Shell Connection, Weld Inside 9-25-73-W. Naughton-Welder
One and one-half inch, N12, Shell Nozzle, Weld Inside 9-25-73-W Naughton-Welder
One and one-half inch, N13, Shell Nozzle, Weld Inside 9-25-73-W. Naughton-Welder
Twelve inch, N4, Liquid Outlet Weld (2) Outside 9-25-73-W. Naughton-Welder

This would represent eight welds on the inside of the tank or approximately 119 linear inches of weld 3/8 inches thick put in by the same welder on the same day using five pounds of 1/8 inch electrodes. The records for the previous day show that the same welder made a total of 15 welds on the outside of the tanks to complete approximately 257 linear inches of weld using six pounds of 1/8 inch electrodes.

INVESTIGATOR'S NOTE

The unusually large amount of deposited weld metal and the total number of welds represented by the above is in excess of normal expected production, and in fact would have indicated that something less than the required full penetration welding was being performed.

D. AS FOUND CONDITION OF DEMINERALIZED WATER STORAGE TANK

As a result of the discrepancies described in the RWST, radiography was performed on three randomly selected nozzle penetrations in the demineralized water storage tank (DWST or WT-TK-10 or TK-10) by the licensee. This confirmed that lack of fusion existed and that repair was necessary. With the exception of two roof penetrations, all ten remaining penetrations were ground and rewelded to full penetration welds as required by the specifications. An analysis of the safety implications of the two roof penetrations was performed by the licensee confirming that no repairs were necessary to these two welds.

Concurrent with the weld repairs of the nozzle/penetrations, the original construction radiographs of the tank seam welds were reviewed and reinterpreted by the licensee's Level III radiography examiner. This review identified three radiographs which were originally accepted by the construction contractor and were considered to be code rejectable by the licensee examiner. Areas previously radiographed by the contractor were re-radiographed in addition to other randomly selected areas, which revealed additional rejectable code indications present in two of the horizontal seams. A second set of radiographs were taken to determine the extent of the unacceptable conditions in the horizontal seams. The additional radiographs also contained rejectable indications and it was apparent that both entire seams were unacceptable, therefore both horizontal seam welds were removed and repaired to meet the code requirements. Since requirements for these welds were clearly specified in the contractual documents listed supra, additional working records were reviewed:

1. Erection Control Sheets (Travelers).

2. Weld Rod Issue Records.

3. Graver QA Manual-Qality Assurance Function Procedure No. 02-60310.

4. Graver QA Manual-Quality Control Function Procedure No. 03-60310.

5. Graver QA Manual-Quality Control Function Procedure No. 08-60310.

A comparative review of the quality control acceptance signatures on the Graver erection control sheets with the actual conditions observed in the nozzle welds, specifically the sequence of (1) preparation of plate edges of opening, (2) inspection of fitup, and (3) dye check of root bead, lead to the implication that the actual inspections had not been performed prior to the signoff, and that the inspection record was not representative of the work actually performed.

E. AS FOUND CONDITION OF REMAINING CATEGORY I TANKS

Subsequent to the discovery of discrepancies in the RWST and the DWST, the remaining Category I storage tanks were examined by the licensee over a period of seven months as they became operationally available. This examination determined that the nozzle welds in the aforementioned Category I tanks had the same welding deficiencies in the shell nozzles as was found in the RWST and the DWST (i.e., seal welds versus full penetration welds). The welds in question were ground and rewelded to full penetration welds as required by the specifications. Appended as Exhibit 1 to this report is a sketch detailing the as found condition of the welds versus the required weld.

F. DETERMINATION OF QUALITY ASSURANCE/QUALITY CONTROL RESPONSIBILITIES

Interviews of management personnel from Graver, Duquesne Light Company, and Stone and Webster determined that the prime QA/QC responsibility for these tanks rested with Graver who supplied their own quality control inspectors. Second level quality control rested with Stone and Webster, however Stone and Webster had no site QA program responsible for monitoring construction of the tanks. According to the field quality control superintendent for Stone and Webster at that time, any examination of Graver work was limited to a review of quality control records during quarterly audits conducted by representatives from the Stone and Webster Audit Office in Boston, Massachusetts. Similarly, the licensee had no established program or criteria for actual field inspection of work done by Graver and appeared to rely on the field inspection activities of Graver and the follow-up audits by Stone and Webster.

G. INTERVIEW OF MR. BERNARD G. FEDDERSEN, FIELD QUALITY CONTROL SUPERINTENDENT, STONE AND WEBSTER, ON JUNE 12, 1980

Mr. Fedderson was interviewed by Investigator R. K. Christopher and Reactor Inspector Wilbert Sanders. Feddersen stated that he was in the position of Superintendent, Field Quality Control for Stone and Webster at Beaver Valley 1 in February, 1972 and remained in that position until mid-1974.

Feddersen said he knew of no documentation or engineering change that would have authorized Graver Tank and Manufacturing Company to alter the tank construction specifications from full penetration welds to seal welds on the nozzles. He said any such change would have to be on an engineering and design conformance report submitted by Graver to Stone and Webster for approval. He said that any such change should have been in the files of either the licensee or Stone and Webster or both. Feddersen said he knew of no such design change submitted. Feddersen said at the time of construction, Graver furnished their own quality control inspectors to inspect the work on the tanks. He said Stone and Webster had no site quality control program responsible for monitoring the construction of the tanks. He said the Stone and Webster site quality control department at Beaver Valley was responsible for all the other activities on site but not Graver's. Feddersen opinioned that the prevailing attitude at the time was that Graver and its personnel were the experts in tank construction and were best suited to monitor their own work. He said surveillance of the tank construction was limited to periodic audits of construction by the Boston Audit Office of Stone and Webster. He said that to the best of his recollection these audits were conducted quarterly and would usually consist of 2 to 5 inspectors coming to this site to primarily audit the paperwork and they spent very little time inspecting actual physical work. Feddersen said the chances of any Stone and Webster auditor actually examining a weld on a tank nozzle at that time would have to be described as miniscule.

With regard to quality control, Feddersen opinioned that neither Stone and Webster or Duquesne Light Company were sophisticated enough in their quality control responsibilities and procedures or in their actual conducted surveillances at that time to detect a welding problem such as was discovered in the tanks. He said this would have particularly been true if the erection records reflected the use of correct procedures.

Feddersen also recollected that the Graver field production foremen should have been responsible for actually implementing the construction criteria, i.e., use of full penetration welds on the nozzles and that the union personnel would work only as directed by those individuals. A result of interview detailing information provided by Feddersen regarding construction practices at that time is appended to this report as Exhibit 2.

H. REVIEW OF GRAVER ERECTION CONTROL RECORDS FOR FIELD FABRICATED STORAGE TANKS

The Graver erection control sheets for all the Category I tanks were reviewed by the NRC investigators. It was noted t at seven of the eight Category I tanks had been inspected and approved by one Graver quality control inspector identified as Mr. William Welsh. The remaining tank, the RWST (QS-TK-1), had been inspected by Mr. Mark Skates, another Graver QC inspector. In all cases the QC inspectors verified in writing on the erection control sheets that the nozzle welds were full penetration and were examined and approved by the inspectors while the work was in progress. Significantly of note, the records indicate that the QC inspectors verified preparation of the plate edges of openings even though the pieces were not beveled for the weld preparation. Additionally, all of the inspection records were stamped by the Authorized Nuclear Inspector (ANI). Representative samples of the erection control sheets are appended as Exhibits 3 and 4 to this report.

INVESTIGATOR'S NOTE

With respect to the erection control sheets, the manner in which the inspectors signed off, typed-in welders names and the date patterns suggest that the inspection records were filled in at a later date and all at the same time rather than at the time of any actual physical inspection of a weld process.

I. REVIEW OF QUALITY ASSURANCE AUDIT REPORTS

According to the licensee, the audits were conducted quarterly by corporate based auditors for Stone and Webster and for the licensee, and consisted primarily of record and procedure review. Only a small portion of these audits could be located for review.

In an audit conducted on June 2, 1970, the licensee auditors reported "Welder controls appeared somewhat loose. Foreman instructs welders on type rod and job. They did not appear cognizant of welding paramaters and welders appeared to work on experience rather than by procedures."

Similarly, Stone and Webster conducted an audit at the Graver plant in East Chicago, Illinois during the same time period. During that audit, similar problems with welders and welder control were observed as is noted in the above report. Specifically, it stated that welders did not appear to be cognizant of the parameters set forth in the procedures and that they primarily worked from their own experience vice required procedures. No known formal response from Graver or identified changes in operating procedures in response to these audits were found by the NRC investigators.

J. REVIEW OF GRAVER QUALITY CONTROL FUNCTION PROCEDURE NO. 03-60310

This procedure, effective November 1, 1971, was to provide a written guide for Quality Control to follow in the exercise of its function in accordance with the quality assurance program.

Part E of this procedure entitled "Fabrication and Assembly" states "All fabrication, assembly, test, and inspections must be conducted in conformity with the drawings, specifications, and with the sequenced operations as outlined in the approved process control sheets and erection control sheets."

This same procedure further states "It is required that actual operations follow the plan, and that it is expected that the signature of inspectors and welding supervisors attesting to the use of qualified procedures, personnel methods, and equipment as well as to inspection operations be posted as they occur. At any one point, the process sheets must reflect the true status of the work. When any inspection procedure requires reporting, the documentation generated to record the test results will be provided with adequate identification that must also appear on the process control sheets and the erection control sheets."

K. REVIEW OF GRAVER QUALITY CONTROL FUNCTION PROCEDURE NO. 08-60310 (QUALITY CONTROL RESPONSIBILITY, FIELD ERECTION PHASE)

During review of this procedure the following applicable guidelines were noted: Part C of this procedure states "Welding procedures specified on the erection control sheets shall always be available for reference by the welders or inspectors." Additionally, the procedure states "The welding operations shall be monitored for deviations from the norms of the procedure."

This procedure also assigned specific responsibilities to both quality control inspectors and production supervisors for control of construction as follows:

> "The Construction Foreman shall check the welding operations either personaly or by delegating this function to a qualified individual. The observer shall sign and date the erection control sheets in the appropriate space to attest that the procedure was followed. The observer's name shall be legible. Graver inspectors will witness the examination and when the test results indicate compliance with the specifications, the inspector will sign and date the erection control sheets.

L. EXAMINATION OF GRAVER RADIOGRAPHY RECORDS FOR REACTOR CONTAINMENT LINER (BEAVER VALLEY 1)

As a result of the apparent anomalies found in the nozzle welds of the tanks and the discrepancies in the quality control inspection records of those tanks, the licensee conducted a review of the available Graver construction and inspection records of the reactor containment liner. This liner was fabricated and erected by Graver in accordance with engineering specification BVS-136 and purchase order BVC-65. All shop and field welding was specified to be random radiographed in accordance with paragraph UW-52 of the 1968 edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. The prime QA/QC responsibilities belonged to Graver. Stone and Webster was responsible for secondary surveillance and auditing during erection.

The types of anomalies detected in the tank erection review were not found during the record review of the reactor containment liner. However, during a licensee review of 447 Graver spot radiographs, three sets of radiographs (a set consisting of two radiographs of the same weld area) appeared to be duplicates of three other sets with the exception of the weld identification number. Identifying characteristics such as the weld surface, weld contours, marks in the plate materials, slag and porosity in the weld appeared to be identical. This opinion as to duplication was shared by two licensee Level III radiography examiners, and was confirmed by the NRC Reactor Inspector.

The duplicate radiographs are identified as follows (Given as weld identification numbers):

1. H7P3T1 and H8P8.

2. H8P4 and H9P8.

3. R9V10R and R10V12R.

A Graver drawing that shows locations of spot radiographs taken on the cylindical shell portion of containment liner, and which identifies the locations of the duplicate radiographs, is appended as Exhibit 5.

M. DATE MATRIX OF DUPLICATE RADIOGRAPHS

The radiography of the field welds in the reactor containment liner was completed by doing a "ring" at a time as the welding was completed. Each duplicate radiograph was apparently made by taking an additional radiograph at one of the radiography locations for the next ring above the ring with the missed radiograph. This duplicate radiograph was given the identification number for the missed radiograph. As an example, the first duplicate radiograph with identification No. H7P3T1 of the weld for ring No. 7 was made using an acceptable radiograph of the weld from the same location on ring No. 8 as the radiograph with identification No. H8P8.

An examination of the layout drawing correlated with the dates of the radiography reveals the following:

1. Duplicate Radiographs H7P3T1 and H8P8

   Ring No. 7 was radiographed on March 11, 1971 and March 13, 1971 except for weld H7P3T1, which was recorded as being radiographed on March 31, 1971. In comparison, ring No. 8 including weld H8P8 was recorded as being radiographed on March 31, 1971.

2. Duplicate Radiographs H8P4 and H9P8

   Ring No. 8 was radiographed on March 31, 1971 with the exception of weld H8P4, which was recorded as being radiographed on April 15, 1971. In comparison, ring No. 9, including weld H9P8 was recorded as being radiographed on April 15, 1971.

3. Duplicate Radiographs R9V10R and R10V12R

   Ring No. 9 was radiographed on April 15, 1971 with the exception of weld R9V10R which was recorded as being radiographed on May 22, 1971. In comparison, ring No. 10 including weld R10V12R was recorded as being radiographed on May 22, 1971.

N. EXAMINATION OF THE "RECORDS OF RADIOGRAPHS" PERTAINING TO THE DUPLICATE RADIOGRAPHS

The completed Record of Radiographs Forms that certified the welds for which duplicate radiographs were used reflect that in these instances the machine operator and processor was Graver QC inspector, William Welsh, and the reviewer was the Graver supervisor, C. W. Funkhouser. Additionally, all of the records pertaining to the duplicates were reviewed and signed by Alexander L. Hollid, NDE Level II examiner for Stone and Webster. It should also be noted that the Graver Record of Radiographs Forms that certified the welds in question referred to the incorrect section of the ASME Code. The Graver certification states that the radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1, instead of Paragraph UW-52 of the 1968 edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, which is applicable. Copies of the Record of Radiographs Forms in question are appended to this report (Exhibits 6 through 10).

INVESTIGATOR'S NOTE

It appears that the likelihood of the Stone and Webster reviewer (A. J. Hollid) identifying the duplicate radiographs in the review process would be remotely possible.

O. INTERVIEW OF MR. H. WILLIAM THOMAS, SITE ENGINEER, STONE AND WEBSTER BY NRC INVESTIGATOR R.K. CHRISTOPHER ON JULY 2, 1980

Mr. Thomas, who reviewed and reinterpreted the radiographs for the licensee, stated his opinion that it appeared that radiographs of certain welds were apparently missed during original erection. As a result, duplicate films were made of subsequent weld joints and substituted for the radiographs which had not been taken. Thomas said the duplication was probably achieved by taking a second radiograph on the same date, at the same location, with only the weld identification number changing. Thomas conjectured the duplications were an attempt by the Graver radiographer to log a sufficient number of radiographs to meet the spot radiography requirements rather than being done as an attempt to subvert the process control. Thomas further conjectured that when the radiographer missed a radiograph at a lower elevation, he was unable to go back and take the radiograph because of the rework that would be required to remove the leak chase channel which had been installed; therefore, a radiograph at a higher elevation was substituted for the one missed at the lower elevation.

P. NRC RELIANCE ON GRAVER PROCEDURES AND RECORDS

The original construction of the refueling water storage tank was examined during an inspection conducted in March, 1973 by the then Atomic Energy Commission (Report No. 50-334/73-04 pertains). The AEC inspector, in accordance with procedure, relied on his audits of the Graver procurement specifications, drawings, purchase order requirements, QC records and construction and material records, in addition to examining the finished weld, to make his determination of acceptability of the welding being done on that tank.

INVESTIGATOR'S NOTE

Examination of the finished weld would, in all probability, not have enabled the inspector to distinguish between a full penetration weld and a seal weld.

Q. INTERVIEWS OF INVOLVED GRAVER QUALITY CONTROL INSPECTORS

1. Interview of Mr. William M. Welch, Quality Control Inspector for Graver, by NRC Investigator R. K. Christopher on July 16, 1980

Mr. Welch said he worked as a quality control inspector at the Beaver Valley 1 construction site from early 1970 to March 1973. Welch said he was the only Graver quality control inspector at the site and that he reported to Mr. William Funkhouser, the Graver quality control supervisor.

Welch said during the construction of the tanks the Graver field foremen were responsible for instructing the local union welders on the type of welding required and that these individuals (welders) were totally reliant on Graver foremen for work instructions.

When questioned regarding his inspection of the tank nozzle welds he admitted that he never visually inspected any of the nozzle welds on any of the tanks. Welch said he was told to fill out the erection control sheets when he received word that a particular job was completed. Welch said he relied on the Graver foremen, whom he identified as Mr. John Carter and Mr. John Crow, and primarily Mr. Carter, to tell him when the work was completed so he could fill out the erection control sheets at a later, more convenient time. Welch said he was never pressured, threatened, or told not to do the inspections but maintained that as a new inspector he didn't know he actually was required to look at the tank welds.

Welch did state that while he did not feel he was being pressured, under the Graver management structure he could at any time have been transferred to a position where he would have to work for a forman whom he had previously given a difficult time as a result of his Quality Control inspections. Welch said he knew of no reasons or motives for the production crews to shortcut the tank construction. He said the only personnel that could possibly have benefitted from shortcutting the job would have been Mr. John Carter, the construction foreman, who would periodically get bonuses for meeting production schedules. Welch said he was unaware as to whether or not the bonus system was in effect during the Beaver Valley 1 construction. Welch was then questioned regarding his involvement in the radiography process of the reactor containment liner. He said he did all of the radiography except for the first ring which was done by Mr. Funkhouser. Welch said that after shooting the ring, he or Funkhouser and primarily himself would plot the shots to assure that they had taken a sufficient number of radiographs to meet the requirements.

Welch was shown the Graver Record of Radiographs of the duplicate shots. He denied that he signatured the documents indicating he

processed and reviewed the radiographs. He conjectured that Mr. Funkhouser filled in the records for him.

Welch then examined the duplicate radiographs and agreed that they were in fact duplicates. While acknowledging that he did all of the radiography, he denied intentionally duplicating any of the radiographs. Welch stated he simply had no explanation for the duplications and said it was too long ago to remember any of the circumstances surrounding the work. After being shown the date pattern of the radiographs, Welch stated he could neither confirm or deny that he had duplicated the radiographs.

With regards to his work as a quality control inspector at the Millstone 3 station, Welch adamantly denied any similar pattern of duplication of radiographs at that site. With respect to his inspection methods at Millstone 3, he stated that he and all inspectors at the site actually inspected all required hold points and made all required inspections before signing any quality control documents. He said at no time on this site did he rely on verbal assurance from production personnel. At the conclusion of the interview, Welch was requested to provide a sworn statement regarding this information. Welch declined to provide a sworn statement. Detailed results of the interview are appended to this report as Exhibit 11.

2. Interview of Mr. Martin Skates, Quality Assurance Engineer for Graver, on June 19, 1980

Mr. Skates was interviewed at the Graver Energy Systems corporate headquarters in East Chicago, Indiana by Region I Reactor Inspector, Wilbert Sanders, and Region III Investigator, Gerry Phillips. Skates said he had been the Graver QC representative at the Beaver Valley 1 site during the installation and welding of the N3 nozzle in the refueling water storage tank (QS-TK-1). According to the record, Skates signed off as having performed the required inspection for each of the ten work sequences listed in the erection control sheet on dates which ranged from 9-20-73 to 10-4-73. Skates stated after reviewing the copies of the erection control sheets bearing his signature that the signatures were his but that he didn't know why these sequences were signed off when the work had not been performed. He also stated that he worked on the primary containment equipment hatch most of the time and only worked on the tanks for five weeks. He stated that he didn't remember the welding of the tank nozzles. He did recall that the tank was in two halves and that he worked on the fit-up and the welding of the circle seam of QS-TK-1 (RWST). He also stated that he didn't remember the erection control sheets being located at the work station to be signed off as the work was completed, but that they were probably located in the contractor office with the drawing specifications. Most of the instructions and requirements were transmitted from the office to the actual work location by word-of-mouth. Skates described his position as fresh out of the union ranks and assigned to work for the site QC engineer, Mr. Funkhouser, who reported to the site manager. He stated that he had very little QC independence and did anything that was needed such as fitter, putting up scaffolding, grinding, and non-destructive testing and supervising as needed and inspecting. He said it was not uncommon for the boiler makers/welders to inspect their own work and report the results to the inspectors or QC supervisors who would sign the inspection records accordingly. No further information was provided by Skates.

3. Interview of Mr. Clarence William Funkhouser, Former Quality Control Supervisor for Graver, by NRC Investigator R.K. Christopher on July 24, 1980

Mr. Funkhouser stated he has been retired from Graver since October, 1972 after working at the Beaver Valley 1 construction project from 1970 as the quality control supervisor. He said that at the Beaver Valley 1 project he had only William Welch under him to conduct the quality control functions and that it was impossible for any one individual, particularly a new person such as Welch to keep up with the required inspections.

Funkhouser said he rarely inspected any work in progress and relied on the production foreman to tell him when a job was completed. In referring to his signature on the erection control sheets for the tanks, he said his signature meant nothing more than the fact that he had looked at the erection sheets for completion rather than any personal knowledge as to the type of work completed.

Funkhouser said he was not aware that Welch never looked at any of the nozzle joints in the tanks and said that he didn't recall ever telling Welch not to look at the welding. Funkhouser said he was never asked to, or pressured to suspend the quality control function at Beaver Valley 1 in the interest of production. Nor was he ever offered any type of financial inducement to help get the work done ahead of schedule. He said he was not aware of whether or not Graver was offering bonuses to their production foremen. In any case, according to Funkhouser, the quality control personnel would not have been included in the bonus system.

Funkhouser confirmed that the local union welders were completely reliant on the Graver foreman (John Carter) for directions as to welding requirements. Funkhouser also said that because of union rules the Graver production foremen were required to provide instructions to a union "pusher" rather than directly to the welders themselves. Funkhouser opinioned that the local personnel stood only to lose money and work time if they individually attempted to shortcut the job by making seal welds instead of the required full penetration welds. Funkhouser also said that it was clear at the time that full penetration welds were required and he could provide no explanation as to why the welds were incorrectly made. However, Funkhouser opinioned that such a mistake could not have been made inadvertently. Rather, he conjectured that someone on the production side took advantage of the lack of quality control inspections to hurry the work for some unknown reason. He said he had no information to support this assertion and stated that it was only his opinion.

With respect to the duplicate radiographs on the containment liner, Funkhouser said he did the radiography on the first ring only and that William Welch did all the remaining rings. He said Welch also did most of the interpretations. With regards to his signature on the record of radiographs, Funkhouser said that he filled out all of the radiograph records including Welch's signature to save time and paperwork. Funkhouser also commented that there was no standard of secondary review of the radiographs by Stone and Webster or Duquesne Light Company at the time. He also said that Welch did most of the layouts and that he (Welch) could easily have missed a shot and he (Funkhouser) would never have known it.

Funkhouser said he had no knowledge that any of the radiographs were duplicated. After examining the layout of the liner and examining the date matrix of the duplicates, Funkhouser opinioned that Welch had to have purposely duplicated the radiographs because of the difficulty that he would have incurred in returning to a lower level ring to take one radiograph to get the required number of shots. Again, he stated that he had no personal knowledge that Welch had actually done this. Detailed results of the interview with Mr. Funkhouser are appended to this report as Exhibit 12.

R. INTERVIEWS OF GRAVER PRODUCTION PERSONNEL FROM BEAVER VALLEY 1 CONSTRUCTION PROJECT

1. Interview of James A. Thompson, Former Site Superintendent for Graver, by R.K. Christopher on December 4, 1980

Mr. James A. Thompson was interviewed at the St. Lucies' Nuclear Power Station, Stewart, Florida. He said he is currently Assistant Site Manager for Florida Power and Light Company at the St. Lucies' Unit 2 construction project. He confirmed that he was the Graver site superintendent from December, 1969 until approximately October, 1971 at the Beaver Valley 1 construction project. He said in 1971 he was replaced by Mr. Richard Kimball. Thompson said that to the best of his recollection most of the field fabricated storage tanks were constructed after he left the site.

Thompson said that as site superintendent he was primarily involved in the administration, labor, and customer problems and did not get involved in the field construction of the tanks. He said that Mr. John Carter, who is now deceased, was the field superintendent and responsible for insuring that the construction was completed in compliance with engineering specifications. He said that all the foremen, pushers, and welders were from the local union hall and responded to the directives handed down through John Carter. He said the only exception to this was during the assembly of one alumimum tank when National Tank Manufacturers (NTM) welders had to be brought in because none of the local welders could pass the welding test for this tank.

Thompson said that while the local foremen took their directives from John Carter, it was his opinion that they should also have had access to the drawings and should have been able to uncover any mistake being made in the welding.

With respect to the quality control records and quality control inspections, Thompson said he was not aware that there was any requirement for field quality control inspection of the tanks but if there was, he opinioned that the QC inspectors, William Funkhouser and William Welch, would have been so overwhelmed with work from the containment liner that they could not possibly have kept up with the required inspections. Thompson said he had no personal knowledge or reason to believe that the QC personnel were not doing the inspections as required.

Thompson said he could see no reason or incentive to shortcut the project either on the part of Graver or the local union personnel. He said the Graver contract was a cost plus basis and provided no financial incentive for early completion or cost curtailment. He also said the local union welders stood only to lose work and money by shortcutting the welding on their own initiative.

Thompson continued that there were no other contracts pressing at the time of the tank job so there was no reason to get the Graver personnel off the site and on to a new project. Thompson denied having any knowledge of or receiving any complaints regarding pressure being exerted on the QC personnel or construction personnel in relation to the construction of the tanks or the containment liner. He also stated that there were no financial incentives offered to production personnel at the Beaver Valley project for finishing the job ahead of schedule since there was no schedule. He said if there was any inclination towards production on the tanks it would have been on the part of the local welders who would have wanted to slow the job down to collect more wages. He maintained that there was no reason for John Carter to rush the job through in that he had purchased a home in the Pittsburgh area and there was no personal incentive for him to leave. He said he had no knowledge of any attempts on Carter's part to shortcut any of the construction project. He reaffirmed that the responsibility to get the tank assemblies completed belonged to Carter and that he would also have been responsible for directing that the work be completed in compliance with the requirements.

Thompson said he recalled having no particular problems with the QC inspectors (Funkhouser and Welch). He recalled that Funkhouser was retiring from Graver at Beaver Valley and that Welch was being trained on the tanks to take his place. Thompson said he had no knowledge of any falsification of the quality control records and said he didn't recall having any instance in which problems were identified as related to these inspectors. He said any conflict over design or engineering requirements between quality control and construction would have been resolved at his level, however he recalled having no such conflicts regarding the tanks that required his resolution. He again stated that there was no pressure being exerted by Graver or Stone and Webster regarding the tank assemblies and that they held a low priority in the construction. Thompson opinioned that the majority of emphasis and attention by Carter was directed toward the construction of the containment liner and that the lack of significance placed on the tanks may have contributed to mistakes being made, including the welding of the nozzle joints. Thompson said that he could provide no further information that was pertinent to this investigation.

2. Interview of Mr. Richard Kimball, Former Site Superintendent for Graver, by NRC Investigator R. K. Christopher on December 4, 1980

Mr. R. Kimball confirmed that he replaced Mr. James Thompson as the Graver site superintendent at the Beaver Valley construction project. He could not recall when he actually took over for Thompson but surmised it must have been in late 1972. He said he was only there a short time and that the only work he recalled going on at the time was the removal of girders from the containment. He said he does not recall any details of work that was going on related to the tanks and surmised that all of the fit-ups must have been completed when he took over. In any case, Kimball said even if they were doing nozzle fit-ups on the tanks, he was unaware of its status or progress.

Kimball stated his opinion that Graver foremen had very little control over the local union personnel and the work on the tanks. He said the foremen were limited to providing directions to local union pushers who then had the responsiblity of passing instructions on to the work crews.

Kimball denied having any knowledge of any type of pressure being exerted or acts of intimidation or financial inducements being extended to the welders or any other workers including quality control inspectors in an attempt to speed up or shorcut the tank construction. He said he knew of no financial or contractual necessity to shortcut the tank job and that there was nothing to gain from the standpoint of the Graver Corporation and would only serve to hurt the local union personnel financially.

Kimball said it was his recollection that Mr. John Carter, the Graver area foreman, was, in all probability, responsible for providing the local union personnel with directions as to the requirements of the tank construction. He again reiterated that Carter could only pass the directions on to the local pushers who then directed the welders. Kimball also stated he had no knowledge as to the actual activities of the Graver QC inspectors and denied any knowledge of their falsifying quality control records.

Kimball said he did not think the working crews and their immediate foremen had access to the drawings and design specifications of any work they might have been doing. He recalled that John Carter primarily had control of the review responsibility for interpreting the drawings for the field crews.

Kimball concluded that he was only on the site a short time and had only minimal contact and personal knowledge of field work, particularly with regards to the tank construction. He conjectured that the tanks had such a low priority for construction plus the standard of the time (i.e., pre-10 CFR 50 Appendix B implementation) that it just didn't receive the attention it should have.

3. Interview of Mr. Jesse Crow, Production Foreman for Graver, by NRC Investigator R. K. Christopher on August 14, 1980

Mr. Crow said he recalled being involved in the construction of two aluminum and two steel tanks at the Beaver Valley construction project. He said he was an area foreman at the site for a short time and had approximately five people in his crew from the local union. Crow said by union regulations, he gave all instructions to the "pusher" to pass on to the welders and never directly instructed them on welding requirements.

Crow said he recalled that the nozzle joints required full penetration welds because it was standard industry construction. Crow said he instructed the pushers on making full penetration welds and that he assumed that type of weld was made on the nozzle joints.

Crow said he had no knowledge of any attempts to shortcut the construction and had no idea why the nozzles were welded by a seal weld. Further, he said no one in any way offered him inducements or threatened him in order to shortcut the work process.

Crow said he did not read the drawings for construction requirements and that to his recollection the quality control department should have generated information as to the type of welding required. He said he and the other foreman, John Carter, instructed the pushers on the type of welding to be used.

Crow said John Carter was at the site the longest period of time and that he was the primary production foreman on the project and that he (Carter) had most of the welders under him and generated most of the production directives. Crow concluded that he had no recollection of the QC inspectors rejecting welding work on the nozzles and that he had no contact with them regarding this. He had no explanation as to why the welds were incorrectly made and reiterated he was at the site only for a short time. Detailed results of the interview with Crow are appended as Exhibit 13.

4. Interview of Mr. James Offutt, Former Engineer For Graver, by NRC Investigator R.K. Christopher on August 21, 1980

Mr. Offutt stated he is currently employed by Barnard and Burk, Inc., as a maintenance superintendent. He advised that Aerojet, Inc. is the parent company of Barnard and Burk as well as Graver Tank and Manufacturing Company. He confirmed that he was formerly employed by Graver and acted as a "floating engineer" working out of the Graver East Chicago office. He said this position required that he spend approximately one-half of his time at the Beaver Valley project during 1971 and 1972. He said his primarily responsibility was the erection of the roof on containment and that he had very little involvement in the erection of the storage tanks.

Offutt said that to the best of his recollection, John Carter, Jack Crow and possibly Glenn Nelson were involved in the erecton of the storage tanks. He also recalled that just prior to completion of the tank erections Mr. Richard Kimball replaced Jack Thompson as the site superintendent. Offutt opinioned that only one tank was erected while Kimball was the site superintendent.

Offutt said he thought that the National Tank Manufacturer (NTM) boilermakers were involved in the tank construction since Graver was primarily an NTM company, however he felt that the NTM personnel didn't do any of the welding. He said there was a lot of friction between the local union welders and the NTM personnel and coupled with what he termed as sloppy labor management there was a great deal of difficulty controlling the local union welders. He confirmed that under a local union agreement the Graver welding foreman who had responsibility for providing directions and relating engineering requirements to the welders was not permitted to directly instruct the welders but had to relay the directions through a local union pusher.

Offutt said he could think of no reason why anyone would have attempted to shortcut the construction of the storage tanks. He had no knowledge of any threats, harrassment, or financial inducements being exerted on or offered to either Graver personnel or local union personnel to shortcut the project. He opinioned that if anything, the jobs were slow at that time and there was no big rush to finish. He also said there was no financial benefit to be gained by the company to finish the job ahead of schedule. Offutt said he was not aware of any bonuses being offered to the Graver personnel at Beaver Valley for work productivity as incentive at that time.

Offutt said he knew of no engineering change that would have allowed the use of seal welds instead of full penetration in the nozzle fit-ups. Offutt advised at this time that he did not get

involved in reviewing the tank drawings or interpreting the prints for the construction crews.

Offutt said he didn't know what type of pressure, if any, the Graver QC inspector (William Welch) was under at Beaver Valley. He thought the line of authority went directly from the quality control personnel to the site superintendent for resolution of any problems. Offutt recalled that Welch was relatively new in quality control at the time and short on experience. Offutt concluded by stating his opinion that the area foreman (John Carter) was very sloppy in his work and always did jobs very fast and often overlooked details. Offutt said Beaver Valley was the last plant built under the old Graver management system and before the full impact of 10 CFR 50, Appendix B had been felt. Offutt conjectured that the climate and philosophy of construction at that time was the contributing factor to the mistakes being made on the tank erections.

5. Interview of Mr. Paul E. Koehler, Former "Pusher" for Graver, by NRC Investigator R.K. Christopher on December 2, 1980

Mr. Koehler was interviewed in the presence of Mr. Ron Callan, manager of contracts for Graver who was present at Koehler's request. Koehler confirmed he worked for Graver at the Beaver Valley project but said he was only there for a matter of weeks while work was being completed on the last tank (QS-TK-1, refueling water storage tank). He said he acted in the capacity of a "pusher" on the last tank but said he did not recall any of the nozzle welding being done at the time he was involved in its assembly. He recalled that most of the welding he was involved with was the seam welding. He also recalled that on the last tank the QC inspector was Mr. Mark Skates, who is still a Graver employee.

Koehler said he took all of his directions on tank construction from Mr. John Carter, the Graver foreman. He denied that there was any pressure being exerted at the time to get the tank done. However, he stated that his experience of working with John Carter led him to believe that Carter was very sloppy in his work and always in a hurry. Koehler said, while it didn't happen during his short stay at the Beaver Valley project, he had several arguments with Carter over what he felt were Carter's attempts to shortcut jobs. He said, that while working with Carter on a non-nuclear site, Carter used to come behind the QC inspectors and remove their marks and tell the welders not to worry about repairing the weld that had just been marked by the quality control inspectors. Koehler reiterated that he was not personally aware of any shortcuts Carter took on the Beaver Valley project. He said he was not aware of any pressures being made on Graver QC inspectors nor did he receive any complaints from local union welders regarding the progress or quality of the work being done. Koehler said that of his own recollection and knowledge he knew the nozzle welds were required to be full penetration but he maintained that he had no involvement in nozzle welding.

Koehler described the work process as the foreman reviewing the drawings or prints to get the specific specification requirements for layout and cutting. He said the foreman (because of union requirements) had to first tell the pusher what was required and the pusher would then provide the welders with the information as to what method was to be used for a job. He said the Graver site superintendent would have general knowledge regarding progress, etc., but that he would not get involved in any actual field directives.

He concluded that he had no knowledge as to how the nozzle welds were made in an incorrect manner at Beaver Valley 1 and maintained that he never received any directions from Graver to either change the specifications or to hurry and shortcut the project in order to get done ahead of schedule.

S. ADDITIONAL GRAVER CONTACTS

Two individuals, identified as Mr. Glenn Nelson and Mr. Thomas Boyd, were identified in the above interviews as possibly being involved in the tank construction. However, contact with these individuals determined that they were not involved in the construction project at Beaver Valley 1.

INVESTIGATOR'S NOTE

As was previously stated, Mr. John Carter, the primary production foreman responsible for constructing the tanks, is deceased.

T. INTERVIEWS OF PERSONNEL FROM LOCAL 154 OF THE INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS (IBEW)

During review of the Graver quality control and erection records of the field fabricated storage tanks, the local union welders and crew pushers who did the actual welding of the nozzle joints were identified by researching the welder identification marks and matching them with the associated name on weld rod distribution records. The welders are identified as follows:

Mr. William Naughton
Mr. Albert Rausch
Mr. Edward Bliss
Mr. Louis Stone
Mr. Earl L. Keifer
Mr. Richard McKenna
Mr. Michael Pcsolyar
Mr. Ernie Molnar
Mr. Fred Reef

These interviews provided essentially common results: While many of the welders recalled welding seal welds in the nozzle fit-ups, none had any knowledge that the nozzle welds required full penetration and none of the individuals recalled anything that had been done during the construction process to indicate that they were intentionally being directed to violate the engineering requirements and building specifications.

These individuals were in unanimous agreement that all directions as to how to erect the tanks were given by either Mr. John Carter or Mr. Jack Crow of Graver and primarily by Mr. Carter. They also confirmed that by union regulations these individuals were not permitted to directly tell them (the welders) how to do the work and that the Graver foremen were required to tell the union pusher who in turn gave them directions.

None of these individuals interviewed recalled detecting any sense of pressure to complete the tank erection and there didn't appear to be any pressing timetable for completion. Further, none of the individuals indicated that they had in any way been directly approached, threatened or intimidated or offered any type of financial inducement to do a "hurry up job" on the tanks.

Similarly, no one recalled ever dealing with the Graver quality control inspectors and didn't recall any weld ever being rejected or nozzle fit-up welds that had to be ground and rewelded. Neither did any of the welders recall there ever being any hold points on the nozzles that required them to get Quality Control approval before continuing a weld.

In summation, these individuals could provide no information that would establish a mot ve, reason or incentive to intentionally shortcut the erection requirements of tanks and provided no indication that such an attempt was made. All of the individuals were steadfast to their recollection that they were totally reliant on the directions provided by Graver foreman (John Carter) for the type of welding to be done and did nothing without those directions being received through the local union pushers.

1. Interview of Mr. Chester S. Zalnasky, IBEW 154,by NRC Investigator R. K. Christopher on October 8, 1980

Mr. Zalnasky stated as a member of IBEW 154 he worked on the Beaver Valley project for a period of approximately 30 months during the 1970-1973 time period. Of that time, he said he worked as a pusher on the storage tanks for approximately 10 months. Zalnasky said the actual welding was performed by local welders under the direction of Graver foremen, specifically John Carter or Jack Crow. Zalnasky said he normally worked directly through the Graver foreman for directions as to what type of welding procedure should be followed. He explained that the union regulations prohibited Graver supervisors from giving direct work orders to the local union personnel and that the Graver personnel would relay any instructions to the pusher who would then instruct the welders. He said the welders were completely reliant on the instructions they received from Graver foremen through their pusher and would only weld as directed to do so. Zalnasky said no one from Graver ever indicated that they wanted the job shortcut or to in any way ignore construction requirements. He again noted that he and the local welders were not directly knowledgeable of the requirements as they rely on Graver for instructions.

Zalnasky said he recalled no great push to finish the project and was not aware of Graver personnel or anyone else being offered any type of inducement to finish the job ahead of schedule. Zalnasky said that many times he went directly to Crow or Carter, the Graver foremen, and directly asked them for directions on the tank requirements. He said he recalled that the nozzle welds were put in as seal welds at the time of construction. However, he said he could not recall being told to specifically use seal welds on the nozzle fit-ups. He continued that on the tanks he was involved in, Mr. Crow gave most of the instructions on the tank assemblies and he could only surmise that Crow directed him to use seal welds on the nozzle fit-ups but he had no specific recollections of those instructions.

Zalnasky said he did not recall the Graver QC inspectors ever inspecting any of the nozzle welds or rejecting any of them. He also said he didn't recall either himself or any of the other welders ever having access to the drawings of the tanks nor was there ever any desire on their part to look at the requirements. Zalnasky opinioned that intentionally shortcutting the work by the local welders was to their detriment in terms of income so he could see no plausable reason for the local welders independently ignoring directions or welding procedures. Zalnasky recalled that the Graver site manager (Jim Thompson) walked through the construction area on a few occasions but stated his opinion that Thompson had very little knowledge of the construction activities on the tanks. He said the tank assemblies were primarily the responsibility of John Carter, the Graver main foreman.

Zalnasky concluded that there were no indications at the time of construction that the tanks were being assembled in variance to the requirements. He did conclude by stating that all directions in terms of assembly, requirements and specifications were the responsiblity of the Graver foremen (Carter and Crow) and that the local union personnel relied on those individuals for assembly requirements.

U. ADDITIONAL INVESTIGATION RELATED TO THE GRAVER WORK AT THE MILLSTONE 3 NUCLEAR POWER STATION

1. Reactor Containment Liner Radiograph Review

Due to the discovery of the duplicate radiographs at Beaver Valley 1, a follow-up investigation was made at Millstone 3 to audit the radiographs done on the reactor containment liner at that site by Graver (now Graver Energy Systems, Inc.). This review was made by Mr. James Whedbee, Stone and Webster NDE Level III examiner and Mr. J. L. Peterson, NUSCO NDE Level III examiner, and was witnessed by W. F. Sanders, Reactor Inspector, USNRC Region I. The review consisted of reinterpretation to the requirements of ASME Section VIII UW51 for 415 spot radiographs and 21 retakes. The film was tabulated in chronological order by date of exposure to review for film duplication. Based on this review, no indication of a similar radiograph problem recurring at Millstone 3 was identified.

2. Interview of Mr. James Fennema, Graver Site Manager at Millstone 3, by NRC Investigator R.K. Christopher on July 16, 1980

Mr. Fennema was interviewed at Millstone 3 regarding the quality control program and the practice of giving production bonuses at the Millstone 3 construction project. He confirmed that the company was giving productivity awards in the form of cash bonuses. He said that included himself, the general foreman, and pushers employed by Graver who each received a different bonus percentage. According to Fennema, the bonus was based on a cost saved and schedule of completion criteria. He said that there was no bonus incentive offered to union welders, production workers, or quality control inspectors. He said that to his knowledge the Millstone 3 project is the only ongoing program in which Graver has a bonus program. Fennema said the bonus programs were common in the industry and regarded as a standard inducement practice to production. He stated his position that he did not believe the bonus program created a potential for "hurry up and sloppy work" practices and said he had no reason to believe that any such problem as related to Beaver Valley 1 existed at the Millstone 3 project. He also stated that he had no indications that the quality control program was not being fully implemented or that any of the required inspections were not being physically completed.

3. Interview of Mr. Wallace R. Walker, Field Quality Control Supervisor for Graver, by NRC Investigator R. K. Christopher on July 16, 1980

Mr. Walker related that he has been employed by Graver for 12 years, having originally obtained his position through the National Tank Manufacturers (NTM). He further explained that while he is a member of the boilermaker's union he is not affiliated with the local unions.

With regard to the Beaver Valley project, Walker said he was involved only in the LP testing of the containment liner and was not involved in either the construction of the storage tanks or quality control inspections. Walker said that because of his relatively short stay at the Beaver Valley project and the small amount of work being done while he was there he had no knowledge as to the management and/or labor problems that were associated with that project. He said he did not know Mr. William Funkhouser, the field quality control superintendent at that time, and he did not know of the work responsibilities or methods involved in the inspection program at Beaver Valley 1.

Walker stated, that from his own knowledge, the Graver general foreman at the time at Beaver Valley (John Carter) would have been responsible for looking at the drawings and specifications to insure that proper directions were given as to the type of welding to be done. He also felt that the local foremen would have had the opportunity to review the drawings if he desired.

While he had no personal knowledge of the work being done on the storage tanks at Beaver Valley, Walker said he could see no advantage or reason to shortcut the job either by Graver or by the local union personnel and knew of no pressure being exerted by anyone relative to completion of the tanks.

With regards to the quality control program at Millstone 3, Walker said William Welch and Boyd Barnes were the Graver QC inspectors responsible for weld examinations and radiography. He said William Welch did all radiography and interpretations on the containment liner.

Walker said these inspectors personally witnessed the welder qualifications on test plates before they are permitted to weld. Walker stated that the quality control requirements were non-specific as to the quality control responsibility for examining weld preparations. He said that to the extent allowed by manpower, the inspector will look at as many welds as possible. He did state that certain welds were required to be examined and for those welds, hold points are established and closely followed. He also stated that the inspectors do spot examinations of radiography of the seam welds.

With regards to radiography, Walker said that after Welch finishes the interpretation of radiographs he (Walker) signs the record of same. He said his signature is not based on personal knowledge of the welds or of radiograph acceptability but on Welch's inspections and what he records.

Walker said the Graver inspectors are required to physically examine a weld or preparation before they sign any quality control verification sheet and they are not permitted to rely on any one individuals' word that something has been completed. Walker said that he could in no way compare the quality control activities at Beaver Valley to the present program at Millstone 3. He said the advent of Appendix B requirements and its implications have completely changed the degree of competency of the QC program. Walker said he is not aware of the inspectors at Millstone 3 being either intimated or pressured with respect to their quality control responsibilities and has no reason to suspect that any quality control records are being signed off by the inspectors before actual examination of a item. He concluded that he had no reason to question the accuracy of, or veracity of the radiographs done by William Welch and that he has full authority to reject or accept the quality of a weld based on either physical examination or radiography.

4. Interview of Mr. Boyd Barnes, Field Quality Control Inspector for Graver, by Region I Investigator R.K. Christopher on July 17, 1980

Mr. Barnes said he has been a FQC inspector for Graver since August of 1977 and has been at Millstone 3 in that capacity since 1979. He said he primarily is involved in MP, LP, and visual inspection. Barnes said he has never signed a QC verification record without first physically doing a inspection. He said he is very carful not to let production personnel go beyond hold points that would negate his inspection. Barnes said this has happened on several occasions with production personnel who did not want to wait for inspections and he has made them arc out the welds so he could make his inspecton. Barnes said that outside of the usual grumblings by production personnel he has experienced no pressure to ignore quality control requirements in the interest of productivity. He opinioned that the Millstone 3 project was being operated in a sound, safe manner. He concluded that he is not permitted to participate in the Graver bonus program and cannot receive any financial incentives for production accomplishments.

V. STATUS OF INVESTIGATION

This investigation is being submitted in a CLOSED status.

EXHIBITS

1. Weld Joint Sketch
2. Results of Interview with Mr. Bernard Fedderson
3. Quality Control and Erection Record of QS-TK-1
4. Quality Control and Erection Record of QS-TK-10
5. Lay Out Drawing of Beaver Valley 1 Containment Liner
6. Graver Tank Record of Radiographs
7. Graver Tank Record of Radiographs
8. Graver Tank Record of Radiographs
9. Graver Tank Record of Radiographs
10. Graver Tank Record of Radiographs
11. Results of Interview with Mr. William Welch
12. Results of Interview with Mr. William Funkhouser
13. Results of Interview with Mr. Jesse Crow

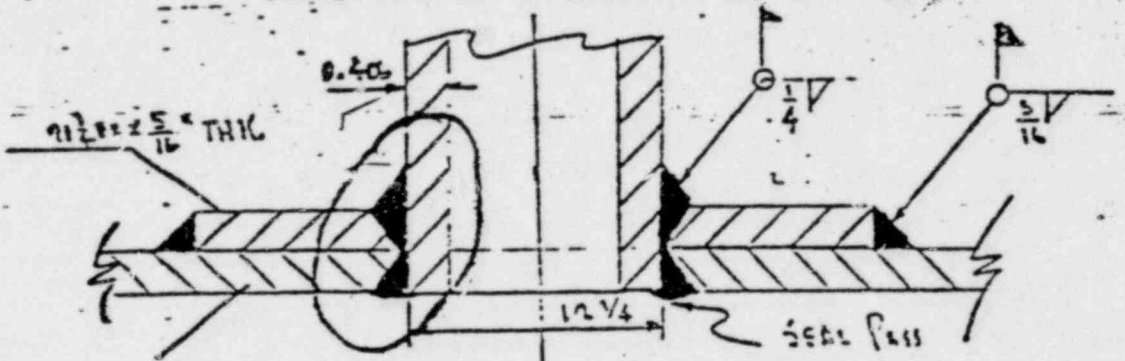
CALCULATION IDENTIFICATION NUMBER				
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	PAGE 3
12648.41	EMD - MECHANICAL	31-12A		

INTRODUCTION

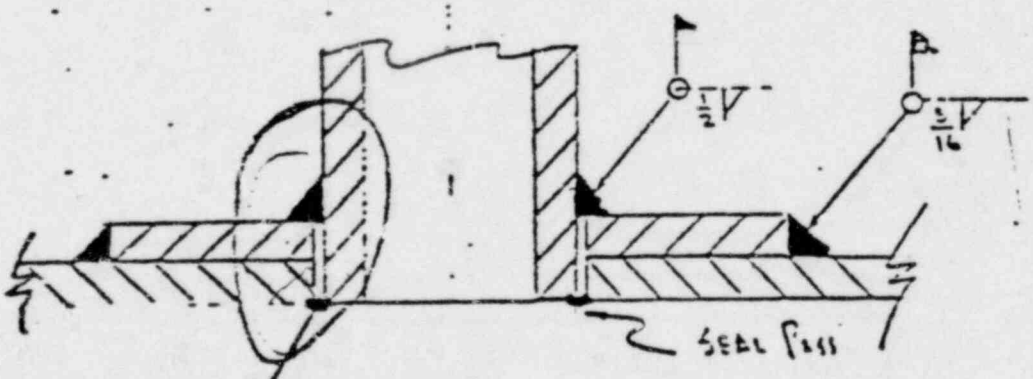
CONNECTION N1 OF B.V. UNIT 1 REFUELING WATER STORAGE TK. WAS NOT INSTALLED AS REQUIRED BY F.I.I-650 OR BY STONE & WEBSTER PROCUREMENT SPEC B.V.S-183. THE SPEC. REQUIRES A FULL PENETRATION WELD BETWEEN THE NOZZLE NECK & SHELL AND BETWEEN THE NOZZLE NECK & REINFORCING PAD; IT ADDITIONALLY REQUIRES THAT THE PAD-NECK FULL PENETRATION BE CAPPED WITH A FILLET & REQUIRES A CIRCUMFERENTIAL PAD-SHELL FILLET AROUND THE OUTSIDE OF THE PAD.

THE TK. MFGR. DID NOT COMPLETE THE PENETRATION WELDS; THEREFORE THE ONLY WELDS HOLDING N1 TO THE PAD & SHELL, ARE THE FILLETS.

CONNECTION N1 AS REQUIRED BY BVS-183



"AS-FOUND" CONDITION



SECTION OF TK.

THIS CALCULATION CHECKS THE STRESSES IN THE FILLETS CAUSED BY DBE PIPING LOADS

U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region 1, King of Prussia, Pennsylvania

Results of Interview with Mr. Bernard G. Feddersen

Mr. Bernard G. Feddersen, employed by the Stone and Webster Engineering Corporation, was interviewed on 6/12/80 by Investigator R. Keith Christopher and Reactor Inspector Wilbert Sanders at the Goodyear Atomic Plant in Piketon, Ohio. Feddersen was interviewed regarding his knowledge of construction practices and quality control procedures and responsibilities during the construction of Beaver Valley 1 Nuclear Power Station. In this interview Feddersen related essentially the following information:

As background, Fedderson said he was currently the field quality control superintendent for Stone and Webster Corporation at the Goodyear Atomic Plant, Piketon, Ohio. During the previous several years he stated that he has worked in the quality control area at numerous nuclear plants and installations for the Stone and Webster Corporation. Fedderson said he assumed the position of Superintendent, Field Quality Control for Stone and Webster at the Shippingport (Beaver Valley 1) Nuclear Power Station in February 1972 and remained in that position until mid-1974.

The nature of the welding deficiencies found in a series of Graver installed tanks was explained to Feddersen at this time. He said he knew of no documention or engineering change that would have authorized Graver Tank Company to alter the tank building specifications from full penetration welds to seal welds on the nozzels. He said if there was any such change it would have to have been on an engineering design and change report (EDCR) submitted by Graver Tank to Stone and Webster Corporation for approval. He said that any such change should have been in the files of either the licensee (Duquesne Light Company), Stone and Webster or both.

Feddersen was then asked to describe the field quality control responsibilities which were in effect at the time of the construction of the tanks (Circa 1972-1973). In response, Feddersen said Graver Tank Company furnished their own quality control inspectors for the work on the tanks. He said Stone and Webster Corporation had no site quality control program responsible for monitoring the construction of the tanks by Graver. He said the Stone and Webster site quality control department at Beaver Valley 1 was responsible for all of the other jobs on the site but not Graver's. It was Feddersen's opinion that the prevailing attitude at the time was that Graver Tank Company and its personnel were the experts in tank construction and were best suited to monitor their own work. He said surveillance of the Graver Tank Construction project was limited to periodic audit of the construction work by the Boston Audit Office of Stone and

Webster Corporation. Feddersen said, to the best of his recollection, these audits were conducted approximately four times a year and that the audit usually consisted of two to five inspectors coming to the site to inspect the work that was actually being done during the time they were on the site. He said the auditors would have an audit plan to inspect the specific items and that they would follow this plan closely. He said that if the records were retained by Stone and Webster one could expect to find on file the numbered audit plans, findings, and track of open items at the time. Feddersen said it was his opinion that the auditors spend 80% of their time reviewing records and 20% of their time inspecting actual physical work on the site. He said the Boston auditors relied primarily on the accuracy of the paperwork rather than on any physical examinations of work, progress, or quality. Feddersen said the chances of any Stone and Webster quality control auditor actually examining a weld on the tank nozzles would have to be described as miniscule. Feddersen said he had no input to the inspection plan that was followed by the auditors other than if something he had randomly noticed while walking through the construction area had been called to his attention. He cited such areas as electrode control and general work area cleanliness as examples of his limited input. He reiterated that the Stone and Webster site quality control personnel had no surveillance responsibilities on the Graver Tank construction. He said the only exception to this policy would have been if the auditors during the course of their audit had found a specific problem and later tasked him to actually examine the progress of that particular area of concern. Feddersen recalled no examination of welding problems or any indication of welding deficiencies other than electrode control as a result of these audits by the Boston based audit teams.

With regard to the quality control, Feddersen opinioned that neither Stone and Webster or Duquesne Light were sophisticated enough in their quality control responsibilities and procedures or in actual conducted surveillance to detect that there would have been a welding problem such as has been discovered in the tanks. He said this would particularly be true if the records reflected the use of the correct procedures. Feddersen was then queried as to his recollections of the Graver site management at the time of the tank construction. While he could not remember identities, he recalled that Graver had a site manager who controlled overall work as related to scheduling criteria. He said directional flow was from the site manager to the general foreman and from general foreman down to the crew foreman and welders. Feddersen said the foreman should have been responsible for actually implementing the construction criteria, i.e., the use of full penetration welds on the nozzles. Feddersen said it was his recollection that Graver had one quality control supervisor on the site who answered to the home office in Chicago and that at any one time he had from one to three quality control inspectors in the field.

Feddersen said he knew the two quality control inspectors (Skates and Welch) that signed off on the questioned erection control sheets. He opinioned that the emphasis at that time was on getting the job done and felt that the Graver quality control personnel weren't really directed by anyone as to the specification requirements for the work that they were inspecting. In his opinion, Feddersen said the men who actually constructed the tanks were more likely to "weld the way they welded every other tank" vice pay any attention to drawing specifications. Feddersen also opinioned that with regards to the procedures on the erection control sheet, the inspectors in those days usually took the welder's word for his work and would fill out the erection control sheets later in the office without ever looking at the weld. Feddersen reiterated that this was only his opinion and perception of the industry at that time. He also stated that this type of practice was common to the industry at that stage.

When reminded that the American Petroleum Institute (API) standard of the industry at that time for these type of tanks also require full penetration welds, Feddersen said he could give no logical reason why the welds were put in as seal welds instead of full penetration welds.

Feddersen said he did not feel there was any direct attempt to short cut the construction of the tanks but recalled that at the time, a large number of plants were being constructed so that there was always a continual push on the part of contractors to get a job done and go on to another job. He also noted that from a practical viewpoint, it was his recollection that the tank work was based on the cost plus fixed fee contract so that the quicker you could get your job done and get your men on another job the better return you got on your money. During this discussion Feddersen continued to state that he felt this was just "the standard of the industry at the time" rather than a deliberate attempt to short cut the construction process. Feddersen also noted that Graver had the contract for the containment liner and that it was a separate contract from the tank construction project. He said the two contracts were separate entities of work but were administratively controlled by the same group of Graver site management. Fedderson said 98% of his quality control responsibilities as related to Graver centered on the construction of the containment liner.

In conclusion Feddersen said he could not recall any recurrent problems with Graver Construction at that time except in the general area of weld rod control and general cleanliness on the job site. He emphasized that Graver was considered the expert in tank construction at that time and the emphasis of surveillance in quality assurance at that time was based on a total reliance on Graver to do the job as specified and to provide accurate records to document his work.

Feddersen provided no further information pertinent and the interview was terminated at 5:15 pm.

R. Keith Christopher

R. Keith Christopher, Investigator

Wilbert F. Sanders

Wilbert Sanders, Reactor Inspector

GRAVER TANK & MFG. CO. — ERECTION CONTROL SHEET

HEAT & SLAB NO. _____

ORDER NO. 55076 TK-1

ASSEMBLY DESCRIPTION & DRAWING REFERENCE: M3 (12" Shell Conn.) B25 & B26 B-31477

INSTALL FITTING NO. 1st. Ring 2'-6" Elev. 95°

LINE NO.	CODE NO.	ACTIVITY DESCRIPTION	INSPECTION BY	INSPECTION DATE
1		Identify & inspect material	[illegible]	9-20-73
2	591	Lay out & cut opening	[illegible]	9-21-73
3	591	Prepare plate edges of opening	[illegible]	9-21-73
4	00	Install fitting Procedure No.	[illegible]	9-21-73
5	00	Inspect fit up	[illegible]	9-21-73
6		Weld inside Wld. William Naughton Procedure No. 47	[illegible]	10-2-73
7		Dye check root bead Procedure No. PT 2	[illegible]	10-2-73
8		Weld outside Wld. William Naughton Procedure No. 47	[illegible]	9-24-73
9		Visual inspect weld	[illegible]	9-25-73
10		Dye check inside finished weld Procedure No. PT 2	[illegible]	10-4-73

Acceptance: Graver Q.C. [illegible]

Lumbermens Mutual Casualty [illegible]

Graver Tank & Mfg. Co.

ORDER NO 5507 (60210) (60311) DRG NO B-31477-0

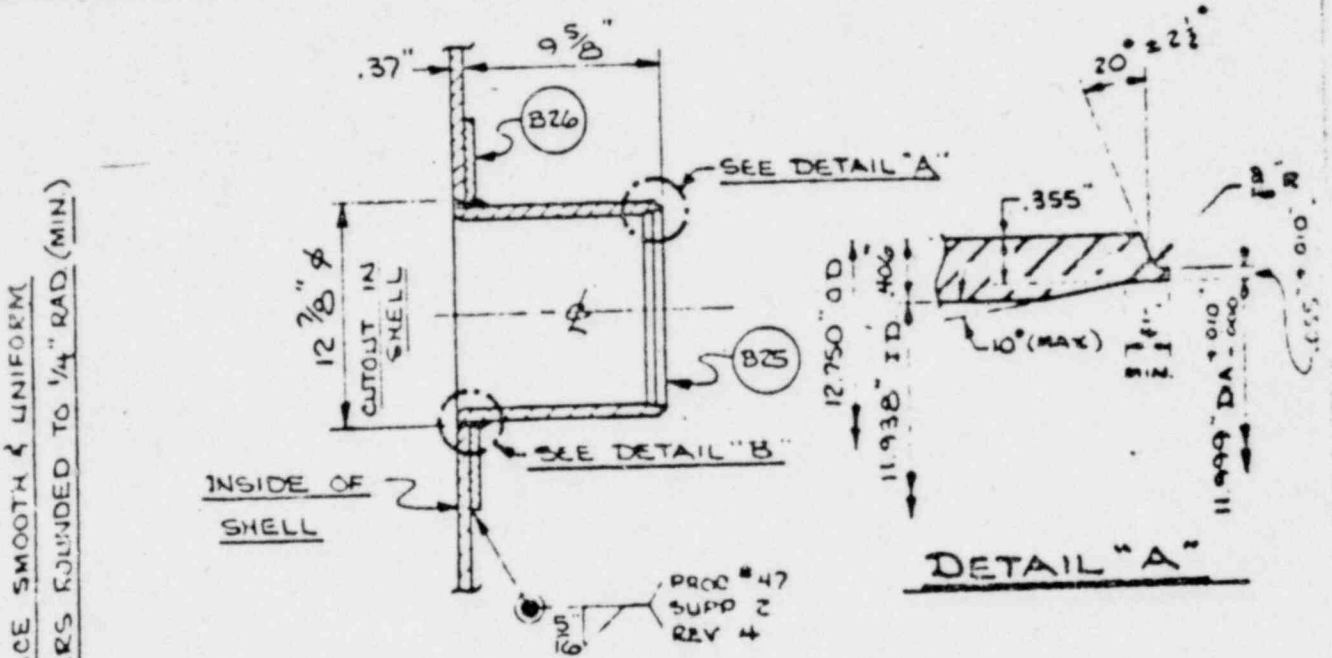
DR. RR DATE 6/22/71 CH JHS DATE 7/28/71

NO.	DATE	REVISIONS
1		
2		
3		

12" ϕ SHELL CONN'S. (LIQUID OUTLET)

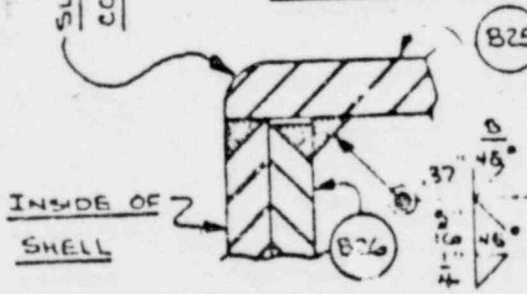
ITEM	QTY	DESCRIPTION	ADV
B25	3	SMLS. PIPES 12" ϕ, SCH 40 x 10 1/8" LG (BOE)	X44
		(ASTM A312 TYPE 304L STAIN ST'L.)	
B26	3	R CIRCLES 5/16" x 12 7/8" ID x 20 3/4" OD.	X14
		(ASTM A240 TYPE 304L STAIN. ST'L. H.R.A.(R)	

0 0 3 9 2

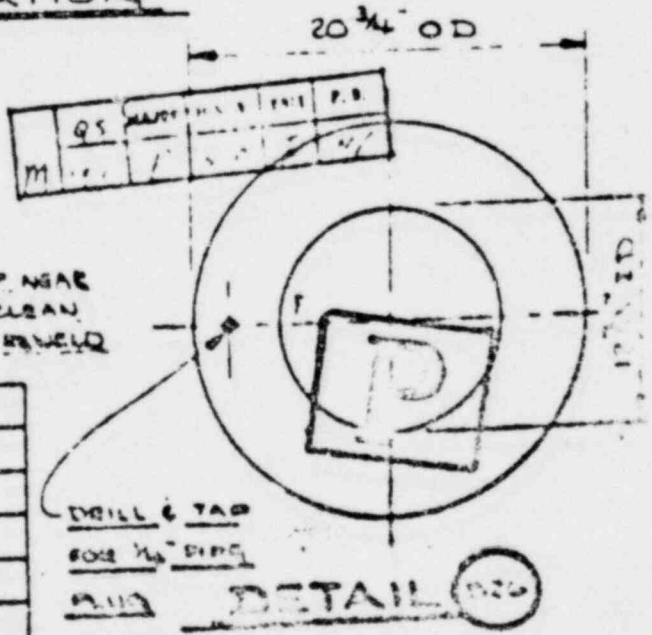


SECTIONAL ELEVATION

DETAIL "A"



DETAIL "B"



DETAIL B26

BEAVER VALLEY POWER STATION ~ UNIT #1	
O.F.E. Nº 8700	C.O. Nº 3468
P.O. Nº BVC-198	J.O. Nº 11700
STONE & WEBSTER ENGINEERING CORP	
DUQUESNE LIGHT COMPANY	
REFUELING WATER STORAGE TANK QS-TK-1	

GRAVER TANK & MFG CO. FABRICATION CONTROL SHEET

HEAT & SLAB NO.

ORDER NO. 55077-TK#CO

ASSEMBLY DESCRIPTION & DRAWING REFERENCE: 529183-0

INSTALL FITTING NO. C1-1"6000# HALF SH. COUPLING (BY JACS RETURN)

EL. 1'-8" AT-1030

LINE	CODE NO.	ACTIVITY DESCRIPTION	INSPECTION BY	INSPECTION DATE
1		Identify & inspect material	B. Welch	2-26-73
2		Lay out & cut opening		
3		Prepare plate edges of opening		
4		Install fitting Procedure No. 205		
5		Inspect fit up		
6		Weld inside AG Procedure No. 205		
7		Dye check root bead Procedure No. PT 2		
8		Weld outside S Procedure No. 205		
9		Visual inspect weld		
10		Dye check inside finished weld Procedure No. PT 2	B. Welch	2-27-73

Acceptance: Graver Q.C. Bill Welch

Lumbermens Mutual Casualty

EXHIBIT 4

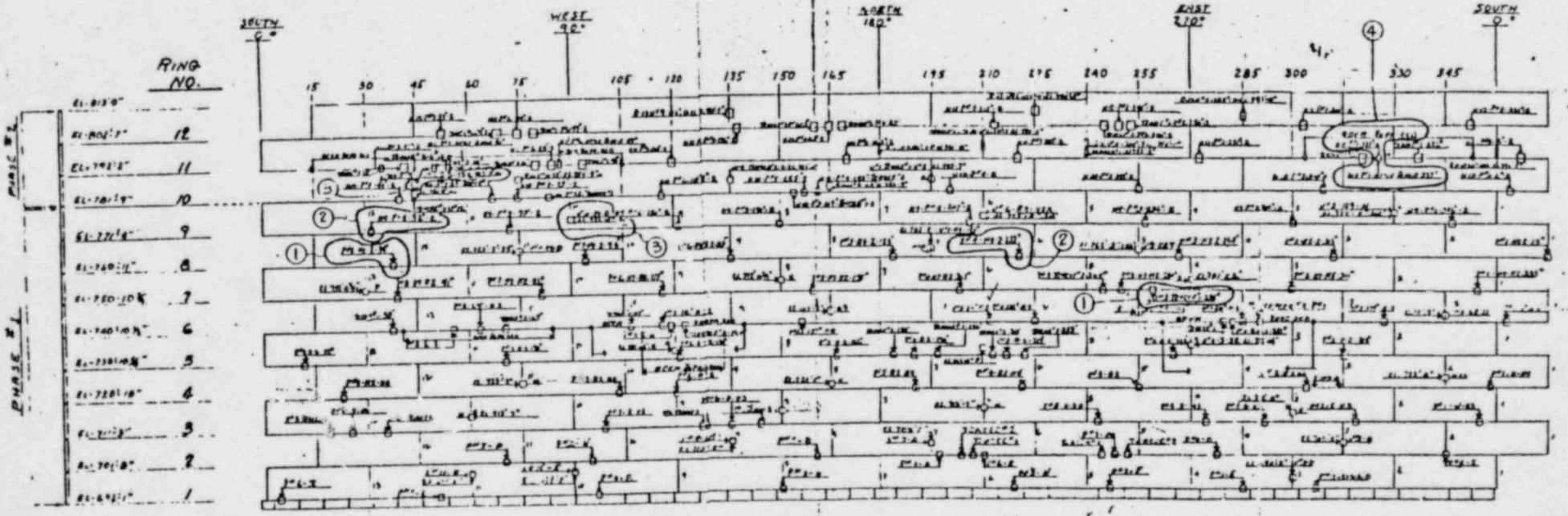


EXHIBIT 5

THIS DRAWING IS MARKED TO IDENTIFY LOCATIONS OF RADIOGRAPHS ON THE REACTOR CONTAINMENT LINER CYLINDRICAL SHELL.

ITEM NO	PAR. NO.	ACTUAL RT			IMAGINARY RT		
		ID No.	RING	LOCATION	I.D. NO	RING	LOCATION
(1)*	III.1.a.1	H8P8	8	39°	H7P37	7	258°
(2)	III.1.a.1	H9P8	9	32°	H8P4	8	222°
(3)	III.1.a.1	R10V1BR	10	45°	R7V10R	9	90°
(4)	III.1.a.2	H11P1R	11	327°	H11P1R*	11	327°

* THIS IS AN ACTUAL RADIOGRAPH ALSO

NP

O — DENOTES X-RAY

ATTACHMENT "1"

DRAWER SHEET NO. 54650

Graver Tank & Mfg. Co.

SHT. 1 OF 1 SHEET

GRAVER TANK & MFG. CO.

CODE

RECORD OF RADIOGRAPHS
ASME SECTION III
CLASS A & B VESSELS

S-Slag P-Porosity
NF-Non Fusion C-Crack
UC-Undercut RE-Retake

FILM NO.	ORIG-INAL	REPAIRS 1	2	3	4	5	REMARKS
V 1	OK						Ring 11 Vertical Seam
V 5	NF	OK					
Tracer #1	OK						
" #2	OK						
V 7	OK						
P 1	NF	OK					
Tracer #1	NF						Repairs made in accordance
" #2	NF						with ASME SEC III-PAR N-528
P 2	OK						
P 3	OK						Saw cut in parent metal, repaired
P 4	OK						and dye checked
P 5	OK						
P 6	NF	OK					
Tracer #1	NF						
" #2	NF						Repairs made in accordance
P 7	NF	OK					with ASME SEC III-PAR N-528
Tracer #1	P						
" #2	NF						
P 8	OK						

We certify the above radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1.

GRAVER TANK & MFG. CO.

BY C. W. Lunsford

NDT LEVEL II

EXHIBIT 6 (Page 1)

0012

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS

ORDER NO. 56650 (60250) VESSEL NO. 1

SEAM IDENTIFICATION Ring #11 Verts & Horz

BASE METAL: SPEC. A516 GRADE 60 THICKNESS 3/8

WELDING PROCESS: Manual Automatic PROCEDURE NO. 205 Verts 206 Horz

JOINT DESIGN: BEVEL Verts SINGLE V Manual

VEE ______ DOUBLE ______

"J OR U" ______ SQUARE BUTT Horz Automatic

X-RAY MACHINE: MAKE Ind-X

K.V.P. RATING 200 FOCAL SPOT SIZE 1.5 X 1.5 mm

FILM: BRAND NAME GAFSTAR TYPE A

LEAD SCREENS: USED ✓ THICKNESS: FRONT .005 INCHES

NOT USED ______ BACK .010 INCHES

SINGLE FILM ______ DOUBLE FILM ✓ DUPLICATE FILM ______

EXPOSURE CONDITIONS: VOLTAGE 190 KV. CURRENT 2 ma TIME 4 Min. 45 Sec.

PROCESSING: MANUAL ✓ MACHINE ______

SHOOTING SKETCH on reverse side - show Markers, film and service distances

MACHINE OPERATOR Bill Welch DATE 5-28-71 To 7-6-71

PROCESSOR Bill Welch DATE 5-28-7 To 7-6-71

REVIEWER C.W. Linkhouser NDT LEVEL II DATE 5-28-7 To 7-6-71

Alexander L. Hollid II

8-4-71

A1/1

ORDER UNIT P.O. [illegible] 57 165

P

EXHIBIT 6 (Page 2)

GRAVER TANK & MFG. CO.

CODE

RECORD OF RADIOGRAPHS
ASME SECTION III
CLASS A & B VESSELS

S-Slag P-Porosity
NF-Non Fusion C-Crack
UC-Undercut RE-Retake

FILM NO.	ORIG-INAL	REPAIRS 1	2	3	4	5	REMARKS
V 4	OK						Ring 7 Vert & Long 3/4
V 8	OK						
V 12	OK						
P 1	OK						
P 2	OK						
P 3	NF	OK					
Trace #1	OK						
#2	OK						
P 4	OK						
P 5	OK						
P 6	OK						
P 7	OK						
P 8	OK						

We certify the above radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1.

GRAVER TANK & MFG. CO.

BY C. W. Linderkauser

NDT LEVEL II

EXHIBIT 7 (Page 1)

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS

ORDER NO. 56650 (60250) VESSEL NO. 1

SEAM IDENTIFICATION Ring 7 Long & Vertes 3/8

BASE METAL: SPEC. A516 GRADE 60 THICKNESS 3/8

WELDING PROCESS: Automatic subarc Manual PROCEDURE NO. 206 205

JOINT DESIGN: BEVEL ✓ Vert SINGLE ✓ Manual

VEE _____ DOUBLE _____

"J OR U" _____ SQUARE BUTT ✓ subarc

X-RAY MACHINE: MAKE IND-X

K.V.P. RATING 200 FOCAL SPOT SIZE 1.5 X 1.5 mm

FILM: BRAND NAME ANSCO TYPE A

LEAD SCREENS: USED ✓ THICKNESS: FRONT .005 INCHES

NOT USED _____ BACK .010 INCHES

SINGLE FILM _____ DOUBLE FILM ✓ DUPLICATE FILM _____

EXPOSURE CONDITIONS: VOLTAGE 190 KV. CURRENT 2 ma TIME 4 45 Sec. Min.

PROCESSING: MANUAL ✓ MACHINE _____

SHOOTING SKETCH on reverse side - show Markers, film and service distances

MACHINE OPERATOR Bill Welch DATE 3-11-71 3-13-71

PROCESSOR Bill Welch DATE 3-11-71 3-13-71

REVIEWER C. W. Pinkhouser NDT LEVEL II DATE 3-13-71

STEP	MAJOR	MINOR	UNIT	P.C.
HC	4	5.7	1	65

P

Alexander L Hollid
S & W.

REVIEWED. J. Hall (F.M.)

00124

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS
ASME SECTION III
CLASS A & B VESSELS

CODE

S-Slag
NF-Non Fusion
UC-Undercut
P-Porosity
C-Crack
RE-Retake

FILM NO.	ORIG-INAL	REPAIRS 1	2	3	4	5	REMARKS
V 8	NF	OK					Ring 10 Vertical Seam 3½
Tracer #1	OK						
" #2	OK						Was wrong identification Marked Tracers marked 2 with no 1
V 11	OK						
V 12	NF	OK					
Tracer #1	OK						
" #2	OK						
P 1	OK						
P 2	OK						
P 3	OK						
P 4	OK						
P 5	S	OK					
Tracer #1	OK						
" #2	OK						
P 6	OK						
P 7	S&P	OK					
Tracer #1	OK						
" #2	OK						
P 8	OK						

We certify the above radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1.

GRAVER TANK & MFG. CO.

BY C H Lambkins

NDT LEVEL II

EXHIBIT 8 (Page 1)

A1
1

0011?

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS

ORDER NO. 56651 (60250) VESSEL NO. 1

SEAM IDENTIFICATION Ring #10 Horz & Verts

BASE METAL: SPEC. A516 GRADE 60 THICKNESS 5/8

WELDING PROCESS: Manual Automatic PROCEDURE NO. 205 Verts 206 Horz

JOINT DESIGN: BEVEL Verts SINGLE ✓ Manual

VEE ______ DOUBLE ______

"J OR U" ______ SQUARE BUTT ✓ Automatic

X-RAY MACHINE: MAKE TNd-X

K.V.P. RATING 200 FOCAL SPOT SIZE 1.5 X 1.5 mm

FILM: BRAND NAME GAFSTAR TYPE A

LEAD SCREENS: USED ✓ THICKNESS: FRONT .005" INCHES

NOT USED ______ BACK .010 INCHES

SINGLE FILM ______ DOUBLE FILM ✓ DUPLICATE FILM ______

EXPOSURE CONDITIONS: VOLTAGE 190 KV. CURRENT 2 ma TIME 4 Min. 45 Sec.

PROCESSING: MANUAL ✓ MACHINE ______

SHOOTING SKETCH on reverse side - show Markers, film and service distances

MACHINE OPERATOR Bill Welch DATE 5-11-71 5-15-71 5-22-71

PROCESSOR Bill Welch DATE " " "

REVIEWER CW Funkhouser NDT LEVEL II DATE 5-11-71 - 5-15-71 & 5-22-71

Alexander L. Hollis II

8-4-71

AI/I

S	STR.	MAJOR	MINOR	UNIT	P.O.
	40	4	5.7	1	65

EXHIBIT 8 (Page 2)

00115

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS
ASME SECTION III
CLASS A & B VESSELS

CODE

S-Slag
NF-Non Fusion
UC-Undercut
P-Porosity
C-Crack
RE-Retake

FILM NO.	ORIGINAL	REPAIRS 1	2	3	4	5	REMARKS
V 5	OK						Ling & Vertc & horz 3/8"
V 7	OK						
V 11	OK						
P 1	OK						
P 2	OK						
P 3	OK						
P 4	OK						
P 5	OK						
P 6	OK						
P 7	OK						
P 8	OK						

We certify the above radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1.

STRU. | WELDS | INSCR | UNIT | P.O.
S | W | 4 | 57 | 1 | 65

P

GRAVER TANK & MFG. CO.

BY C.W. Funkhauser

NDT LEVEL II

EXHIBIT 9 (Page 1)

00123

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS

ORDER NO. 56650 (60250) VESSEL NO. 1

SEAM IDENTIFICATION Ring & horz & Verts.

BASE METAL: SPEC. A 516 GRADE 60 THICKNESS 3/4

WELDING PROCESS: Automatic Sub arc / Manual PROCEDURE NO. 206 / 205

JOINT DESIGN: BEVEL Verts SINGLE – Manual

VEE ______ DOUBLE ______

"J OR U" ______ SQUARE BUTT ✓ Sub arc

X-RAY MACHINE: MAKE Ind-X

K.V.P. RATING 200 FOCAL SPOT SIZE 1.5 X 1.5 mm

FILM: BRAND NAME ANSCO TYPE A

LEAD SCREENS: USED ✓ THICKNESS: FRONT .005 INCHES

NOT USED ______ BACK .010 INCHES

SINGLE FILM ______ DOUBLE FILM ✓ DUPLICATE FILM ______

EXPOSURE CONDITIONS: VOLTAGE 190 KV. CURRENT 2 ma TIME 4 Min. 45 Sec.

PROCESSING: MANUAL ✓ MACHINE ______

SHOOTING SKETCH on reverse side - show Markers, film and service distances

MACHINE OPERATOR Bill Welch DATE 3-31-71 / 4-1-71

PROCESSOR Bill Welch DATE 3-31-71 / 4-1-71

REVIEWER C W Funkhouser NDT LEVEL II DATE 4-1-71

SYS.	STRU.	MAJOR	MINOR	UNIT	P.O.
	RC	4	5.7	1	65

P

Alexander L. Holliel
S&W.
Level II

Reviewed J. Ball (f.m.)

EXHIBIT 9 (Page 2)

00121

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS
ASME SECTION III
CLASS A & B VESSELS

CODE

S-Slag
NF-Non Fusion
UC-Undercut
P-Porosity
C-Crack
RE-Retake

FILM NO.	ORIGINAL	REPAIRS 1	2	3	4	5	REMARKS
V 2	OK						Ring & Vert. & Shary 3/8"
V 6	OK						
V 10	NF	OK					
Trace #1	OK						
" #2	OK						
P 1	OK						
P 2	OK						Will be little low at junction of pipe & Eye checked
P 3	OK						
P 4	OK						
P 5	OK						
P 6	OK						
P 7	OK						
P 8	OK						

We certify the above radiographs meet N624 of ASME Section III, Appendix IX of Section III and Radiographic Examination Procedure No. 1.

STRU.	MAJOR	MINOR	UNIT	P.O.
HC	4	57	1	165

GRAVER TANK & MFG. CO.

BY C. W. Simpkinson

NDT LEVEL II

EXHIBIT 10 (Page 1)

A1
1

00120

GRAVER TANK & MFG. CO.

RECORD OF RADIOGRAPHS

ORDER NO. 56651 (60250) VESSEL NO. 1

SEAM IDENTIFICATION Ring #4 Horz & Verts

BASE METAL: SPEC. A 516 GRADE 60 THICKNESS 3/8

WELDING PROCESS: Manual / Automatic PROCEDURE NO. 205 Verts / 206 Horz

JOINT DESIGN: BEVEL Verts SINGLE ✓ Manual

VEE ______ DOUBLE ______

"J OR U" ______ SQUARE BUTT ✓ Automatic

X-RAY MACHINE: MAKE Ind-X

K.V.P. RATING 200 FOCAL SPOT SIZE 1.5 X 1.5 mm

FILM: BRAND NAME GAFSTAR TYPE A

LEAD SCREENS: USED ✓ THICKNESS: FRONT .005 INCHES

NOT USED ______ BACK .010 INCHES

SINGLE FILM ______ DOUBLE FILM ✓ DUPLICATE FILM ______

EXPOSURE CONDITIONS: VOLTAGE 190 KV. CURRENT 2 ma TIME 4 Min. 45 Sec.

PROCESSING: MANUAL ✓ MACHINE ______

SHOOTING SKETCH on reverse side - show Markers, film and service distances

MACHINE OPERATOR Bill Welch DATE 4-15-71 / 4-16-71

PROCESSOR Bill Welch DATE 4-15-71 / 4-16-71

REVIEWER C.W. Funkhouser NDT LEVEL II DATE 4-15-71 / 4-16-71

A1 / 1 8-4-71

Alexander L Hollid II

P

S	STRU.	MAJOR	MINOR	UNIT	P.C.
	SC	4	57	1	65

0011

Results of Interview with Mr. William M. Welch

William M. Welch, employed by the Graver Tank and Manufacturing Company, was interviewed on July 16, 1980 by R.K. Christopher, Investigator Region I and Reactor Inspector Wilbert Sanders. The interview was conducted at the Millstone Nuclear Power Station, Waterford, Connecticut. Welch was interviewed relative to his roll as a Quality Control Inspector for Graver during construction of the Beaver Valley Power Station Unit 1. In this interview Welch related the following information.

He said that he has been employed by the Graver for fifteen years and he originally worked exclusively in radiography and was in training by Graver for quality control inspections. He confirmed that he worked at the Beaver Valley station as a quality control inspector for approximately thirty-three months from early 1970 to March 1973.

He said at the time he was the only Quality Control inspector and that Mr. William Funkhouser was the quality control supervisor. He also recalled that Mr. Jim Thompson was the Graver Site Superintendent, Mr. John Carter and then Jack Crow were the Area Foremen who were primarily responsible for the construction of the tanks.

Welch said that on the tank assemblies the foremen were supposed to look at the construction drawings and to then instruct the welders, who were drawn from local union halls, as to how to do the welding. Welch said the local welders were totally reliant on Graver for their work instructions.

When asked to describe his method of inspection of tank nozzle welds Welch admitted that he never visually inspected any of the nozzle welds on any of the tanks. Welch said the QC Supervisor, William Funkhouser, told him to just fill out the Erection Control Sheets when he received work that a particular job was done. He said he just took the work of various people including Carter and Crow that a particular job was done and that he would then fill in the Erection Control Sheets later.

Welch said it was the first time he had been assigned as a quality control inspector and that he didn't know he was actually supposed to physically look at the weld preparations during tank assembly. Welch said that as the only QC inspector it would have been impossible for him to conduct examinations of every weld preparation. He also stated that to the best of his recollection, there were no designated holdpoints on the tanks so if the inspector wasn't called, which he was not, he would never know the status of any welding work at any one time.

Welch said he felt no direct pressure to get the job done but that he just wouldn't have the time to do any actual inspections on the tanks. He denied that he was at any time threatened, or offered any type of inducement to not look at the welding work. He said he just continually relied on people's word as to the consistency and quality of the welding being done.

EXHIBIT 11

Welch said that in the Graver structure he could have at any time been transferred to a less desirable position if the management was dissatisfied with his work or that on a new job he may have to go back to working for foremen whom he had previously given a hard time or been responsible for holding up production while he was a quality control inspector. Welch said the Beaver Valley tank job was the first time that Graver ever used the Erection Control Sheets and that a Mr. Bobby Warren from the Corporate Quality Control office in Chicago came to the site after the job was in progress and told him he had to start filling out the Erection Control Sheets. Welch reiterated that he never looked at the nozzle welds either in preparation or as a finished product and only filled out the forms when told the job was done. Welch said one of the tanks was already constructed by the time they started using the Erection Control Sheets and he had to backfit the Erection Sheet after the job was completed. He also restated his position that he filled out the forms as directed by the QC Supervisor, Mr. Funkhouser.

Welch said he knew of no reason why the production supervisors would want to shortcut the job but conjectured these foremen received a bonus if the job was finished ahead of schedule.

Welch said that to the best of his recollection, he filled out most of the Erection Records based on information he received from the Graver Area Foreman whom he recalled as being John Carter and possibly a Clarence Boyd. Welch stated that at the time he felt he was subordinate to the individuals and to a certain extent working for them. While his direct supervisor was Mr. Funkhouser, he said he did not feel that he was working as an independent entity from the production crews and was therefore required to follow the directives of production supervisors.

Welch said he knew of no reason why he was told not to inspect the work being done on the tanks and at the time the tank construction didn't seem to have a lot of emphasis as compared to the containment liner. He reiterated it would have been impossible for any one inspector to inspect tanks plus do radiography work required on the containment liner as he did.

Welch said there was no advantage to be gained by shortcutting the construction of the tanks on the part of the local union personnel or on the part of the Graver Management. He opinioned that the only people who had anything to gain by shortcutting the job would have been the Graver job foreman, i.e. John Carter. Welch explained that on these types of jobs the company production foreman could receive bonuses if they got a job finished ahead of schedule. He said he was not actually knowledgeable as to whether or not bonuses were given to the Graver foremen at Beaver Valley but he said that he knew that Carter had received a bonus for similar work at the Millstone project.

Welch denied having any knowledge as to the actual condition of the welds in the tank nozzles and had no reason to believe that the job was being shortcut. He recalled hearing no complaints from any of the welders as to the way the work was being done.

He denied ever being offered any type of financial inducement or gifts in return for his not inspecting work as required. He reiterated that Funkhouser told him to just fill out the Erection Control Sheets when he was told the work was done.

With regards to his present assignment as Quality Control Inspector at Millstone Unit 3 construction project, Welch stated that the inspectors including himself followed the work and that at all the required holdpoints they visually made all the required inspections before signing any of the QC documents. He stated that the inspectors did not take the word of any one individual with regards to work that was being conducted. Welch commented that the QC inspection program at Millstone was extensive and an entirely different operation from that at Beaver Valley in 1971.

Welch was then questioned in regard to his involvement in the radiography work on the Beaver Valley containment liner. Welch said Funkhouser did the radiography on the first ring and he did all of the work on the remaining nine rings. Welch said he would shoot an entire ring at a time and would do all of the radiography himself although he did have the assistance of a local union steward (whom he could not identify) who assisted him in setting up the machine. Welch said that as a norm the construction crews set up the scaffolding and he would then set up his machine and shoot as many shots as possible and then develop them. Welch said either he or Funkhouser would plot the shots and determine if they had a sufficient number of acceptable radiographs. Welch said he did 100% of the radiography after the first ring because Funkhouser, primarily because of his age, never climbed the scaffolding to do any of the work or observation on the higher levels.

At this time Welch was showed the Graver Record of Radiographs for the duplicate welds that reflect his signature as the operator and processor of the radiographs. Welch denied that the signatures were his and stated that while he did the radiography he never filled out these records. His only explanation was that Funkhouser must have filled out the records for him.

Welch was then showed the duplicate radiographs. Welch examined the x-rays and was in agreement that the shots were duplicates. Welch, while acknowledging that he did all the radiography initially denied intentionally duplicating any of the radiographs. Welch stated he simply had no explanation for the duplicates and said it was too long ago for him to remember any details or working conditions that would have prompted him to intentionally duplicate the radiographs. After being shown the pattern of duplicate graphs which indicated intentional duplication, Welch stated that he could not confirm or deny that he had made the duplicate radiographs.

Welch denied any similar duplication of radiographs at Millstone Unit 3. He also advised that this was the first nuclear plant he had worked at since the Beaver Valley project.

Welch was then requested to provide a sworn statement regarding the above information. He was also advised of the ramifications cited in 18 US Code 1001 regarding false or fictious statements. Welch stated that he had spoken with Mr. Jim Halfman, the Graver Corporate Quality Control Manager who advised him not to provide a statement. Welch then declined to reduce his comments to the form of a sworn statement.

R. K. Christopher, Investigator

Wilbert F. Sanders, Reactor Inspector

Results of Interview with Mr. Clarence W. Funkhouser

Mr. Clarence William Funkhouser was interviewed at his personal residence on July 24, 1980, by Region I Investigator R.K. Christopher. Funkhouser was interviewed relative to his roll as the Quality Control Supervisor for Graver Tank and Manufacturing Company during construction of the containment liner and field fabricated storage tanks at the Beaver Valley Power Station, Unit 1.

Funkhouser stated he had been employed by Graver for 30 years and that he retired from the company in October 1972 after working at the Beaver Valley Unit 1 construction site from 1970 until October 1972. He said he had been in quality control for Graver since 1966 as a full time responsibility. He confirmed that he was the QC Supervisor for both the containment liner and storage tank construction projects.

Funkhouser said only Mr. William Welch was assigned to him as an inspector during that time. Funkhouser said that he rarely inspected any work that was in progress and mainly relied on the production foreman to tell him when an item of work was completed. In referring to his signature being on a portion of the Erection Control Sheets for the tank assemblies, Funkhouser said his signature meant nothing more than the fact that he had looked at the forms for completeness and did not reflect any actual inspection of work on his part. Funkhouser also recalled that at the time that tank assemblies had begun they (Graver Quality Control) didn't have the Erection Control Sheets to fill out. He said these forms were put into use sometime after one of the tanks had already been completed and it was necessary to backdate the Erection Control Sheets for that tank.

Funkhouser said he had very little to do with the tank fabrications as 90% of his time was involved in the construction of the containment liner. Funkhouser said he never asked for any additional manpower for quality control but he acknowledged it woul .e been impossible for Welch to inspect all of the nozzle welds in the tanks and to keep up an accurate status sheet on the welding. However, he said he was not aware of the fact that Welch never looked at any of the nozzle welds. Funkhouser also said he did not recall ever telling Welch not to look at the welding and to just fill out the paperwork. He also noted that this was Welch's first experience working in quality control and that for the most part he was in training at the time the tanks were being constructed. Funkhouser denied that he was ever asked in any manner to suspend or alter quality control functions in the interest of allowing production to continue. He also said he was never offered any type of bonus money for helping to get the project completed ahead of schedule. While he was aware that bonuses were given to some production personnel for finishing a project ahead of schedule, he could not recall if bonuses were being given at the Beaver Valley site. In any case, Funkhouser said quality control personnel were not included in the bonus program.

Funkhouser said the welders were from the local union hall and were reliant on Graver foremen for directions as to what type of welding to do. He also said that because the welders were local he was not permitted by the union to direct any

orders of modifications to the welders themselves and that any information had to go through the local union pusher. Funkhouser said the local welder stood only to loose work time and money by independently doing the welds as seal welds instead of full penetration. Funkhouser said that in his opinion, it was amply clear to everyone that full penetrations were required on the nozzle welds.

Funkhouser said that from an organizational standpoint he would answer directly to the Graver Site Superintendent (Mr. Jim Thompson) but he said during that time period he was at the site, he had only minimal contact with him.

Funkhouser denied having any knowledge that the nozzle welds were incorrectly made and he denied knowing of any directives from Graver Site Management that allowed a change to the specification requirements for full penetration welds.

Funkhouser said to the best of his recollection, the Graver Foreman (John Carter) would have had primary responsibility to insure that the tanks were built according to specifications. He said that the local union welders would have to rely on Graver foremen for assembly requirements.

While he maintained that he had no knowledge of any attempts to shortcut the tank construction, Funkhouser said he did not feel that such a mistake could have been made, rather Funkhouser conjectured that it could only have happened if someone from the production side took advantage of the fact that Welch wasn't inspecting any of the nozzle welds and intentionally shortcut the welding work for some reason. Funkhouser did not identify any individuals who could have been involved in this type of work practice and stated that it was only his opinion that this may have happened. Funkhouser also noted that he retired from the job before most of the tanks were finished leaving only Welch as the quality control inspector.

Funkhouser was then asked to what extent he had contact with the Authorized Nuclear Insurer (ANI) who also stamped the Erection Control Sheets as acceptable. In response, Funkhouser said he didn't know who the (ANI) was or what their function was in relation to the inspection of the tanks. Funkhouser said he recalled having some contact with a QC inspector from Stone and Webster at the site, but that was limited to the containment liner. Funkhouser could not recall who this individual was. He also stated his opinion that the Graver Management should have realized that one quality control inspector could not possibly have fulfilled the inspection requirements on this project but there was not impetuous to add additional personnel.

Funkhouser restated his opinion that the Graver foremen should have been aware of the type of welding being done on the nozzles and should have been individuals who provided local pushers with instructions on the welding requirements.

In defense of Welch, Funkhouser said he didn't recall that there were any holdpoints established on the nozzle welding that would have forced the welders to stop work until the inspection was done. Funkhouser also confirmed that under the Graver system Welch could have been moved back into the production welding on the job which could affect his desire to do strict quality control inspections. He

explained that a QC inspector could cause considerable delay to a production foreman who may retaliate against the inspector later if he was returned to production welding and had to work for that same foreman.

With regards to the construction of the containment liner, Funkhouser said he did the radiography on the first ring only and that Welch did the shooting on the remaining eleven rings. He said Welch took over because he, (Funkhouser) was nearing retirement and was having difficulty climbing scaffolding. He said the radiography was done a ring at a time and that Welch used the same scaffolding as the erectors except for those occasions where they couldn't reach a certain spot and the boilermakers had to set up special scaffolding.

Funkhouser said Welch set up the machine to take the radiography, did the shooting and most of the interpretations. Funkhouser said he did a minimal amount of interpretations on the shots. Funkhouser also said he could not recall Welch having to return to a ring to take additional shots because he didn't have the required number of radiographs on a ring. He said he assisted Welch in plotting the shots occasionally but doesn't recall him being deficient as to the number of required radiographs.

Funkhouser was then showed the Graver record of radiographs that reflected he had reviewed the radiographs and that Welch had shot and processed them. Funkhouser said it was his recollection that he filled out all the paperwork records for Welch. He said he was signing the radiograph records as a convenience for Welch who was usually in containment taking the radiographs. Funkhouser confirmed that all of the signatures on the records including Welch's were made by him. He said that in signing Welch's name, he was not intentionally intending to misrepresent Welch's signature rather he was only filling information to identify who took and processed the radiographs. He said he would fill out the radiograph records and evaluation sheets as he reviewed the radiographs usually a ring at a time. He also noted at this point that the Stone and Webster reviewer would periodically look at the radiographs for acceptability but there was no established plan of secondary review by Stone and Webster.

Funkhouser continued that he thought Welch kept the roll-out sheets of the liner and plotted the majority of the shots. He said he never counted the shots but just periodically assisted Welch in locating them on the roll-out. Funkhouser said Welch could easily have been short on the required number of shots and he wouldn't have picked it up.

Funkhouser was then shown the roll-out drawing of the containment liner rings and showed the related position of the new radiographs. He said he had no personal knowledge that any of the radiographs had been duplicated but stated it appeared that by the pattern of the duplicates they had to have been done on purpose. Funkhouser said that if a radiographer found he didn't have enough shots on a ring it would be much easier to take a good radiograph on the next ring and then change the weld identification number and shoot it again. Funkhouser stated his opinion, that based on the plot layout of the duplicates, Welch must have shot the duplicates intentionally.

Funkhouser concluded that at no time during his employment by Graver was he ever intimidated or asked to shortcut a job in any way including the Beaver Valley project. Funkhouser said the majority of his time at Beaver Valley was devoted to organizing and reviewing documents and in keeping up with the codes. He said Welch had access to all the records and documents and had to know what the requirements were for the tanks and the containment radiography. He denied telling Welch not to look at items and to just fill out paperwork. He said it was his opinion that the production personnel who were building the tanks took advantage of Welch not doing the inspections to shortcut the job for some unknown reason. He again clarified that he had no support for his assertion and that it was based on the explained circumstances of the incidents only. Funkhouser provided no further information.

R. K. Christopher, Investigator

Results of Interview of Jesse E. Crow

Mr. Crow was interviewed on August 14, 1980, between 11:10 a.m. and 12:40 p.m. at the TVA construction site located in Paradise, Kentucky, by R.K. Christopher and R.H. Smith, Investigators, from the NRC Region I office.

Mr. Crow was informed that he was being interviewed regarding the tanks that had been fabricated by Graver at Beaver Valley approximately 9 years ago. Mr. Crow acknowledged that he had been a foreman for Graver at Beaver Valley and worked there about 8 months.

Mr. Crow stated that he was a site foreman on the present job in Kentucky and had worked for the Graver Tank and Manufacturing Company for 32 years. He also stated that he planned to retire in March 1981.

Mr. Crow stated that he could recall working as the foreman on 4 tanks at Beaver Valley, 2 were steel and 2 were aluminum. The two aluminum tanks were fabricated on a foundation and were from 20 to 30 feet in diameter. Mr. Crow was an Area Foreman and had about 5 people in his crew. He stated that they were Boilermakers out of the local union and a "Pusher" was assigned to the crew. Crow gave all instructions to the Pusher and did not direct the craftsmen.

Crow said he did not remember specifications but did recall that all tanks required Quality Control (QC). He also recalled that all nozzles on the tanks required full penetration welds since this is standard construction. Crow instructed the pusher on making full penetration welds and stated that to the best of his knowledge the tanks should have had full penetration welds.

In reviewing the welding records provided to Crow, he stated that he did not receive any bonus for the BV job and was never told that there was one. He also said that he was never pressured or pushed to rush the job to completion.

Crow stated that he was never asked by Welch (QC) about welds and had no discussions with Welch about the welds.

Crow stated that as far as he knows, a welder could back gouge or make a weld and the foreman wouldn't know since he did not put on a welding hood and inspect the welds. Crow said he could not remember that anyone tried to shortcut the job and was never told to rush the job. Crow stated that he didn't know how the welds could have been made as seal welds and had no idea of who would have instructed people to make seal welds.

EXHIBIT 13

Crow stated that he remembered Jim Thompson coming around once or twice on the job. Said he also remembered both QC people being Funkhouser and Welch and shared a trailer with them that Crow was in and out of 3 or 4 times each day.

Crow stated that he did not read the drawings for the tanks since there was an Engineer on the job who he thinks was either Clay or Clark. Crow said that QC would generate information as how to weld. Crow stated that he and the other foreman, Carter, would tell Pushers what welds to make but Crow said he never told anyone to make a seal weld. Crow stated that he was well aware that nozzles on tanks should be put in with full penetration welds and that he had never been told by Graver to cheat on the job.

Crow stated that he had been called on the telephone by James Kuplic out of the Chicago office. Crow said Kuplic told him about the seal welds being found and Crow said he told Kuplic the same thing, i.e. he could not explain it.

Crow stated that John Carter was at BV before he went there and was still there when Crow left. Crow said that Carter was the main foreman on the BV job and was over containment liner work and also over the tank fabrication.

Crow stated that he could recall that the Pusher for his crew had a first name of Chester. He said that there were 20 to 25 Boilermakes on the tank job and that he had five of them and Carter the remainder. Crow said he also felt that Lynn or Glenn Nelson and Tom Boyer were at Beaver Valley as foreman. Crow did not know if Clarence Boyd worked there.

Crow again stated that he did not of any-way that the seal welds could have been put in or why the workers would put them in since they would be shortening their employment.

Crow stated that BV was his first nuclear site and had not been to another. He stated that he felt he had been sent there as a kind of fill in since there was no other work to his knowledge until a later job he left for. Crow stated that there was nothing unusual about his leaving BV other than he was transferred to another job. Crow said he may have gone home for a few weeks but didn't remmber for sure.

Crow again stated that he did not receive a bonus at BV and was never told of there being one. He also explained that Graver had a bonus plan on some jobs and that the bonus for Graver employees was based on the amount of money saved on the job.

Crow stated that he knew that Welch worked with x-rays prior to BV but did not know whether Welch had been in QC before BV. Crow also stated that Welch did not work for him at BV but that it would be possible for Welch to end up on another job working under a foreman that he may have been working with on site as a QC man.

Crow explained that he had been working for Graver Tank and Manufacturing Company which is headquartered in Houston, Texas. He said the Chicago office was Graver Energy Systems Inc. and the two offices seemed to operate separately.

Crow stated that he would not be concerned of repeating what he had told the NRC investigators while under oath as a witness if called as one. He again stated that he had no knowledge of the tanks being fabricated at BV with seal welds instead of full penetration welds.

Interview completed at 12:40 p.m.

R K Christopher
R. K. Christopher, Investigator

R. H. Smith
R. H. Smith, Investigator

EXHIBIT 13