U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V

Report of Inspection

CO Report No. 50-275/70-2

Licensee: Pacific Gas & Electric Company
Construction Permit No. CPPR-39
Category A

Date of Inspection: June 23-26, 1970

Date of Previous Inspection: March 2-5, 1970

Inspected by: A. D. Johnson 7/29/70
A. D. Johnson
Principal Reactor Inspector

J. L. Crews 7/30/70
J. L. Crews
Reactor Inspector

Reviewed by: G. S. Spencer 7/17/70
G. S. Spencer
Senior Reactor Inspector

Proprietary Information: None

SCOPE

Type of Facility: Pressurized Water Reactor

Power Level: 3250 Mwt

Location: Diablo Canyon, San Luis Obispo County, California

Type of Inspection: Routine - Announced

Accompanying Personnel: None

Scope of Inspection: Pursuant to 3800/2 and the master inspection schedule, the requirements prescribed in Attachment C (Containment) were completed with the exception of the containment proof test. Inspection of Other Class I Structures was initiated. The steam generator supports, liquid holdup tanks and the gas decay tanks were selected for review. Also, the procedures were reviewed for receiving and storage of the reactor vessel at Alameda, California where the vessel will be stored until August 1970. In addition to the scheduled inspection items, the status of the deficiencies identified in CO Report No. 50-275/70-1 was determined.

SUMMARY

Safety Items - None

Items of Nonconformance - The thickness of the reinforcement on several containment building liner plate welds was observed to be greater than that permitted for radiography by the governing code, ASME, Section VIII, Paragraph UW-51. A construction Deficiency Notification is to be issued by CO:V covering this deficiency. (Section H.)

Status of Previously Reported Problems

1. Containment Building Liner Material Certification
   Following the last inspection, a Construction Deficiency Notification was issued by CO:V regarding a deficiency in the testing of the liner plate materials. The deficiency resulted from the fact that the test specimens for the liner materials had been heat treated (normalized), whereas the plate materials had been supplied by the mill in the as-rolled condition.

   Prior to the current inspection, approximately 120 liner plates were returned to the mill for normalizing heat treatment. Re-tests were conducted for the balance of the material, using test specimens which were obtained either from plate trimmings or from the plates themselves. All test results showed satisfactory material properties. (Section H.I.)

2. Weld Rod Control
   Weaknesses were observed at the time of the last inspection, in the care and control of low hydrogen electrodes.

   At the time of the current inspection no deficiencies were observed with regard to weld rod control. Signs have been posted warning operators of electrode control procedures. Heated holding ovens, equipped with temperature measuring devices, have been installed within the welding area. (Section I.)

Other Significant Items -

1. Overall completion of construction activities was estimated to be 13.7% on June 25, 1970. The Construction schedule has slipped by approximately four months from the original schedule. (Section B.)

2. Mr. Carr, Site Quality Assurance Engineer plans to terminate his full time employment with PG&E on August 1, 1970 and return to his duties as Professor of Mechanical Engineering at California State Polytechnic College located in San Luis Obispo, California.

   Mr. R. H. Baulig, the Westinghouse Site Manager has moved to the site. (Section C.)

3. The inspection requirements were completed as prescribed by 3800/2 concerning containment concrete and installation of the liner. (Section D., G., H., & I.)

4. The licensee plans further evaluation of the conditions and circumstances associated with the placement of concrete in the area between the 20 foot long wide beam flanges and the containment liner located at the base section of the containment building wall. (Section D. 3.)

5. Inspection of other Class I structures was initiated pursuant to PI 3800/2, Attachment E. Items selected for review were: (1) The Steam Generator Supports, (2) The Liquid holdup Tanks, and (3) The Gas Decay Tanks. (Section E.)

6. The reactor vessel has been received and stored at the Murphy Pacific's yard in Alameda, California. Plans were to transfer the vessel to the site during August. Confirmation was made that the vessel was being handled and stored in accordance with approved procedures. (Section F.)

7. The official QA procedure for on site discrepancy control was published on June 5, 1970. The new procedure has clarified the ambiguity identified during the previous inspection. (Section L.)

8. Receival, storage and routine surviliance of materials at the licensee's storage yard at Pismo Beach were found to be governed by approved procedures. However the licensee plans to review the procedures in view of the following observations:

   a. Protection of Stainless Steel Components from Salt-Air Environment

      The inspectors observed the storage of main loop (stainless steel) piping in the yard at Pismo Beach. In response to the inspectors' expressed concern for stainless steel materials in a potentially salt-air environment, PG&E project personnel are considering inside storage or other suitable protection (plastic covering, etc.) for these materials.

   b. Low Stress Stamping of Class 1 Piping

      Tools were not available at the site to determine if indentation stamping observed on main loop piping was of a low stress type. Tools for making such measurements will be procured by the project staff. (Section J.)

9. The installed containment liner anchor studs were observed to be L shaped as described in the PSAR and not straight as planned and as reported in CO Report No. 50-275/69-4. (Section M.)

Management Interview - The inspectors met with Messrs. Hersey, Friedrichs, Carr and other members of the site staff on June 26 to review the significant findings of the inspection. The following items were discussed.

1. Radiography of Containment Liner Welds (Section H.2.)

The inspector stated that the reinforcement on several welds which had been radiographed was of greater thickness than that permitted by the governing code, ASME, Section VIII, UW-51. (1/18-inch verses 1/16-inch)

Mr. Hersey stated that all welds would be reinspected, with particular attention to reinforcement, and that where necessary the welds would be re-radiographed after grinding.

The inspectors stated that PG&E should expect correspondence from CO:V relating to this deficiency.

2. Indentation Stamping of Class 1 Piping (Section J.)

The inspector stated that PG&E representatives were unable to satisfactorily answer the question of whether stamping observed on the main loop piping was of a low stress type.

Mr. Carr stated that tools are to be procured for making such a determination, and that this information would be available at the time of the next CO inspection.

3. Protection of Stainless Steel Materials from Salt-Air Environment (Section J.)

Considering the close proximity of the Diablo Canyon site and the Pismo Beach storage yard to the ocean; the inspector asked to what extent potential contamination of stainless steel materials by a salt-air environment had been evaluated. Specific reference was made to such item as core internals, etc.

Mr. Hersey stated that stainless steel materials at the Diablo Canyon site are to be stored either inside a warehouse or covered with plastic or other suitable materials.

4. Effect of Structural Steel Channels on Operation of Containment Spray System (Section K.)

Mr. Hersey stated that the inspector's observation regarding the covering of the containment building seam welds with structural steel channels would be referred to the Engineering Department for evaluation.

5. Special Concrete For Area Between Wide Beam Flanges and Containment Liner

Mr. Fredricks indicated that the plan to install a special design mix of concrete in the area between the wide beam flanges and the containment liner at the base of the containment sides will receive further evaluation. A determination will be made as to whether a mockup section of the area should be poured to demonstrate that the resulting concrete meets the design requirements.

6. Verification of Quality Control Information on Certification Documents

The inspector informed the group that he had attempted to determine whether anyone within PG&E had reviewed the information contained in all of the documents related to the fabrication of the gas decay tanks for completeness and consistency with the appropriate code requirements. The finding was that although several people assure that the proper documents are available and that random audits were made of the contained information, no one had checked all of the information to assure that it was consistent with the pertinent code requirements. The inspector added the comment that PG&E's procedure requires a review of the documents and that possibly assuring the certifications are present is what is meant by the requirement. The inspector stressed the fact that he was not implying that all the information had to be reviewed by a PG&E employee; but rather that the finding was being pointed out to assure that PG&E's management was aware of the extent of their reviews.

DETAILS

A. Persons Contacted

W. R. Hersey	- Project Superintendent
R. R. Friedrichs	- Resident Civil Engineer
L. G. Rasmussen	- Field Engineer
G. V. Richards	- Director, Quality Assurance
M. W. Mayer	- Field Engineer
C. Erwin	- Assistant Resident Mechanical Engineer
F. W. Brady	- Quality Assurance Engineer
L. J. Garvin	- Quality Control Engineer
J. Arnold	- Inspector (Pismo Beach Warehouse)
L. G. Carr	- Quality Assurance Engineer
J. L. Murin	- Quality Assurance Engineer
D. Maxwell	- Civil Engineer (Concrete Testing Labora
J. Muller	- Assistant Quality Control Engineer, Pittsburgh-Des Moines Steel Co. (PDM)
R. H. Baulig	- Site Manager, Westinghouse Corporation

B. Construction Status

Overall completion of construction activities was estimated by PG&E's construction department to be 13.7% on June 25, 1970. Construction of the containment building was estimated to be 35.1% complete. The Auxiliary building completion was 46.6%. Mr. Hersey indicated that construction delays have resulted in a slippage of approximately four months from their original schedule.

C. Administration

1. Quality Engineering Section

Mr. L. Carr, Site Quality Assurance Engineer, plans to return to California State Polytechnic College located in San Luis Obispo, California and resume his duties as Professor of Mechanical Engineering. He plans to terminate his full time employment with PG&E on August 1, 1970. Mr. Carr has been on a leave of absence from the College during the past year. Mr. Richards indicated that Carr would be available in the future for consultation. Richards also stated that at least during the immediate future the responsibilities of the site Quality Engineering Section will be discharged by the remaining two Quality Assurance Engineers, Messrs. Brady and Murin.

2. Westinghouse

Mr. Baulig, the Westinghouse Site Manager, established an office at the construction site on March 23, 1970. Mr. Baulig indicated additional Westinghouse personnel will join his staff as needed.

D. Containment - PI 3800/2 Attachment C - Concrete

During the current visit the inspector completed the inspection requirements prescribed by PI-3800/2 concerning manufacture, testing and placement of concrete for the containment building.

1. Review of QC System

a. Location of Testing

Section 5.1.2.3.a of the PSAR provides that sampling of concrete shall be performed pursuant to ASTM C172. Therefore, in accordance with Section 3 of ASTM C172, the concrete is sampled as it is dumped from the batch plant to the conveying vehicle. Mr. Maxwell showed the inspector the results of tests performed during October 1969 and January 1970 where duplicate samples were taken from the batch plant and from the truck when the concrete was transferred to the placement bucket. Generally, the results showed the slump values to be less (up to 1 inch) at the pour site from that measured at the batch plant. Also, when the samples were taken from the first part of the concrete discharged from the truck the slump values were generally higher than that measured at the batch plant. A typical set of values from samples obtained at the batch plant and then again

at the pour site is as follows:

Location	Slump	Strength-psi	(60 day)
Batch plant	3½"	6420	6509
Pour site (First portion of batch)	4"	6385	6632

According to Maxwell the procedure of sampling at batch plant provides a better method to assure consistency in the maufacturing of the concrete and provides a truer indication of the water cement ratio than if the procedure required sampling from the conveying vehicle at the pour site. He stated that since the concrete is normally placed within 15 minutes from the time of manufacture, problems involved with segregation are corrected when the load is placed and vibrated in the forms.

b. Piping Used For Pumped Concrete

According to Mr. Carr, Atkinson uses transfer buckets for placing concrete in the containment building. He stated that the construction personnel were aware of the problems involved with pumping concrete through aluminum pipe and that if in the future concrete were to be placed by pumping, aluminum pipe would not be used.

2. Followup Observation of Work

a. Slump, Stregnth and Entrainment Tests

During witnessing of concrete sampling, measurement of slump and air content and the making of the compressive test specimens, the inspector confirmed that the activities were performed in accordance with the following standards as prescribed in the PSAR and required by the contract specifications.

Standard Method	ASTM Standard
1. Sampling fresh concrete	C-172
2. Test for slump	C-143
3. Test for air content	C-321
4. Making and curing concrete compressive test specimens	C-31

In addition to the above observations the inspector confirmed through discussions with Mr. Maxwell that the "Standard Method for Compressive Strength of Molded Concrete Cylinders" ASTM-C39 is used to determine the strength of the manufactured

concrete. During a previous visit, the inspector had witnessed actual operation of the testing apparatus. Based on the previous operation and the current discussions with Mr. Maxwell, it appeared that the compressives strengths have been determined in accordance with the prescribed standard.

b. Proper QC Inspections

In addition to the contractor inspectors, PG&E maintains a staff of inspectors who continually monitor the activities of the contractors. The inspectors are responsible to witness and confirm that the activities of the contractor conform to the contract specifications. PG&E inspectors were observed to be witnessing activities related to manufacture of concrete at the batch plant, and to placement at the pour site. Also PG&E inspectors were observed witnessing the preparation and splicing of rebar to assure that the cadwelds were made properly.

3. Special Concrete Manufacture and Placement

The first section of the vertical side walls of the containment are to be constructed by installing 12 inch wide flange beams (20 feet long) circumferentially around the containment liner. The beams are positioned vertically and rest on the base mat. (Figure 5 shows the beams) The edge of the beams are to be located a distance of 12 inches from the liner plate. The concrete to be installed between the liner wall and the beams will be reinforced circumferentially with steel hoop and diagonally by helicoidal bars (No. 18 reinforcing steel).

The licensee has approved a special concrete mix to be placed in the space between the flanges and the containment liner. The mix was designed for a strength of 3000 psi; with the slump specified as 5 inches. The maximum aggregate size was specified to be 3/4 inch.

Mr. R. R. Friedrichs, Resident Civil Engineer, explained that the conditions of the pour had been reviewed with Design Engineering and contractor (G. F. Atkinson Co.) personnel. According to Mr. Friedrichs, all interested parties had concluded that the use of the special design mix, along with careful placement and vibration of the concrete, should result in quality concrete. He stated that, since the pour space is limited to approximately 12 inches, the segregation that would occur should not be significant and that careful vibration should assure proper consistency of the concrete. Friedrichs indicated the increase in slump and vibration should eliminate any significant voids. However, as a crude check to assure against gross voids,. the quantity of concrete placed will be compared to the calculated volume of the space to be filled.

Subsequent to the discussions and during the management interview, Friedrichs stated that consideration would be given as to whether or not to build a mockup section of the area and make a pour so that the resulting concrete could be analyzed.

E. Other Class I Structures

Pursuant to PI 3800/2, Attachment E, the liquid holdup tanks, gas decay tanks and the steam generator supports were selected for review.

1. Liquid Holdup Tanks

Pittsburgh Des Moines Company (PDM) is field fabricating the five liquid holdup tanks described in Section IX of the PSAR. The contract specifications for the tanks are attached as Appendix A.

a. Review of QC System

PDM's quality control program was reviewed in depth in conjuction with installation of the containment liner. From a discussion with Mr. Muller, Assistant Quality Assurance Engineer, PDM, and a general review of PDM's procedures the inspector ascertained that applicable procedures were in effect to control the fabrication of the tanks. Verification was made that the procedures covered the applicable inspection items concerning welding requirements listed in PI 3800/2 Attachment E (4805.04). Also, the inspector confirmed that appropriate QC procedures had been formulated and implemented and were consistent with the applicable inspection items under PI 5405.04 as shown in PI 3800/2.

b. Followup Record Review

PDM maintains construction weld maps of the tanks. The maps identify each piece of of material used in the construction of the tank, each weld and the weldor, and the NDT inspections (liquid penetrant of root pass and final, and the radiographic examination). In addition, the map shows all areas which required repair. The inspector chose at random an identified section of the shell plate and requested the backup records. Mr. Muller was able from the information on the weld map to retrieve with ease from the record files the following documents as requested by the inspector.

(1) Overall stepwise construction procedure

(2) Approved weld procedures and weldor qualifications

(3) Approved NDT procedure and qualifications of the NDT technicians

(4) Material certifications

During the review of the records, the inspector confirmed that the recorded information was sufficient to demonstrate that the tanks were being constructed in accordance with the specified requirements. For example, the inspector compared both the chemical composition and physical characteristics of valves shown on several material certification reports with those prescribed in the code. The valves were found to be within those specified in ASTM A-240. The signature of a member of the PG&E quality control group was on the bottom of each certification. Mr. Carr indicated that the signature

indicated that the individual had reviewed the documents and that the content of the document was consistent with the prescribed specifications.

2. Gas Decay Tank

The six gas decay tanks for use by both Units 1 and 2 were fabricated in Berkeley, California by the Berkeley Steel Construction Co. The tanks have been delivered to the site and stored in the area of the auxiliary building where they will later be installed.

A review of the contract specifications and the data package supplied by Berkeley Steel confirmed that the tanks had been constructed in accordance with the requirements prescribed in Section XI of the PSAR. The fabrication records showed that:

a. All materials were certified to comply with the specification requirements. The shell plate material was certified to conform to the requirements of ASTM-285C F3. An independent check by the inspector of the chemical and physical values shown on several certification reports confirmed that the material composition and characteristics conformed to the ASTM standards.

b. The vessel was inspected by the state code inspector and stamped. A picture of the code stamp showed that the tank had been radiographed and heat treated. The record of the heat treatment showed that the vessel had been treated at approximately 1200° F.

c. The root pass of all welds was magnetic particle tested followed by a full radiograph examination of the completed welds. Radiographic inspection was performed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII Subsection UW-51. The magnetic particle examination was performed in accordance with ASME Boiler and Pressure Vessel Code Section VIII Appendix VI.

d. Weldors and weld procedures were qualified as required by the provisions of ASME Boiler and Pressure Vessel Code Section IX.

e. The tanks were hydrostatically tested at a pressure of 225 psi. (150% of design). While in storage at the site, 5 psi. of nitrogen is being maintained in the tanks.

In addition to the above information confirmed by the inspector from the data package, the PG&E vendor inspection reports showed that the tanks had been fabricated under an approved Quality Assurance program and that the tanks had been constructed in accordance with the contract specifications. The reports indicated that PG&E's inspector had visited the vendor's shop on approximately 10 occassions.

In response to the inspector's query as to whether someone within PG&E had reviewed the entire data package to assure that the information in the documents were consistent with the various contract and code requirement, Mr. Carr checked with Engineering, Inspection and Construction personnel and concluded that although several individuals had performed independent audits of random documents, no one had reviewed the entire package to assure the completeness and accuracy of the information contained therein.

3. Steam Generator Supports

Guy F. Atkinson Company has installed the anchorage system for the steam generator supports. The Murphy Pacific Corporation has been awarded the contract to fabricate and erect the supports. Detailed information concerning Murphy Pacific's procedures were unavailable at the site during this inspection since Murphy Pacific personnel had not yet moved onto the site.

The anchorage system consists of a steel plate (ASTM-516) 4" x 8" x 18" embedded two feet in the base mat concrete and Cadwelded to the reinforcing steel. This plate is joined by two-inch bolts (ASTM-490) to a plate 1" x 30" x 32" (ASTM-516) which forms a portion of the containment liner. The bolts do not pass through the plate, but are coupled to the plate by fittings welded to each side of the plate.

The material certification for both the plates and the bolts were reviewed by the inspector. A check of the information contained on the certifications confirmed that the material conformed to the specification prescribed by the pertinent ASTM Standards.

F. Reactor Vessel

The reactor vessel arrived in Alameda, California, during the week of June 22, 1970. The vessel was unloaded at the Murphy Pacific dock where it will be stored until August, then transferred to the site. Mr. Richards stated that the vessel is stored in a fenced area and that a guard has been posted for security considerations. He also stated that a temporary shed will be constructed over the vessel to protect it from adverse environment conditions and that fire protection provision will be provided. The Bigge Crane and Rigging Company of San Leandro, California, has the responsibility for the handling of the vessel. Mr. Erwin showed the inspector a draft of the procedure to be used by Bigge along with several comments made by the Construction Department. Erwin stated the draft, along with the comments, had been forwarded to the responsible engineer in San Francisco, California, and that Bigge, Westinghouse, Murphy Pacific personnel, and the responsible engineering and construction personnel of PG&E met and discussed the procedures in depth on June 22, 1970 prior to PG&E's formal approval of their use. According to Richards, PG&E maintains surveillance of all activity concerning handling of the vessel. The inspector observed from the draft that

although much of the procedure was general in nature, it appeared to be comprehensive in scope. The comments made by the Construction Department personnel generally called for more detail concerning specific items.

G. Cadweld Splicing, Inspection and Testing

The records of Cadweld splice testing were reviewed and the splicing procedures were witnessed by the inspectors. The records reviewed and the splicing operation witnessed were those involving the No. 18 size diagonal reinforcing steel in the cylindrical walls of the containment building. (See Figure 1)

The records revealed that 5 Cadweld operators had been qualified for splicing the No. 18 rebar in the diagonal (60° from horizonal) position. The results of tensile tests conducted on qualification test splices by each of the five operators showed that the splices developed a strength of a least 100,000 psi, which is in excess of the specified tensile strength (90,000 psi) for the bar being spliced.

The project records contained the results of the tensile testing of one production and one sister Cadweld splice which were made in the diagonal position using No. 18 rebar. The test results showed that these splices developed stress levels of 100,000 psi and 95,750 psi, respectively, prior to failure of relaxation of the test load.

The inspectors witnessed the production of a Cadweld splice in the diagonal reinforcing steel for the reactor containment building. The splicing procedure included the following steps:

1. The bar ends were precleaned by sandblasting
2. The bar ends were preheated to $\geq$ 250°F with a gas torch
3. The bar ends were cleaned to a rather bright surface appearance using a wire brush.
4. Marks were applied 12 inches from the ends of the bars to provide a reference for centering the splice sleeve.
5. A square stock spacer was used to seperate the ends of the bar within the sleeve by approximately 3/16-inch. (The bars had been supplied by the mill with square-cut ends)
6. The Cadweld powder was agitated by the operator by rotating and shaking the plastic bag in which it was contained, to eliminate possible segregation or the powder material.
7. A Pittsburgh Testing Laboratory inspector witnessed portions of the splicing operations.

No deficiencies were observed while witnessing the splicing procedure or during a subsequent visual inspection of the finished splice by the inspectors.

H. Containment Building Steel Liner

1. Material Certification

During the previous inspection in March, 1970[1], the inspectors learned that the test coupons for the containment building liner plate material had been normalized, whereas the plate material had been supplied in the "as rolled" (not normalized) condition. This deficiency was contained in a Construction Deficiency Notification (CDN) issued to PG&E by CO:V on April 7, 1970. In response to the CDN, PG&E proposed, in a letter dated May 7, 1970, a program of corrective action which involved the retesting of some plate materials and the heat treatment of other plate materials in order to have representative tests for all plate materials.

Erection of the steel liner had progressed to include installation of the reactor pit, floor and five cylindrical wall rings. The plates for cylincrical rings 1 through 4, plus the floor and reactor pit liner are of material supplied by the mill in the "as rolled" condition. The plates for cylindrical rings 5 through 14 are of material which had been returned to the mill and undergone normalizing heat treatment. The records showed that a total of 119 plates were normalized by the U. S. Steel, Provo, Utah mill on April 6-7, 1970.

For those plates which were normalized, the original tests results have been accepted by PG&E since this material was heat treated in a manner similar to the origional test specimens. The results of an audit of the origional mill tests reports by our inspector were contained in the report of our inspection in March, 1970. In a letter dated May 14, 1970, the U. S. Steel Corporation confirmed that the 119 plates of steel were heat treated in a continous normalizing furnace at the temperature specified for the origional test coupons (1650°F) for 30 minutes per inch of stack height.

For those plates of material which were not normalized by the mill, the following retesting program had been completed, according to the records. For all material in the floor plates, test coupons were prepared from mill trimmings which were traceable to the heats involved. For cylindrical rings 1 through 4, test coupons were obtained from the finished plates (See Figure 2). According to the records, coupons were prepared and retested for all of the above materials at the U. S. Steel, Provo, Utah mill during March and April, 1970.

[1] CO Report 50-275/70-1, dated April 3, 1970, pages 20-22

The material in Cylindrical ring No. 1 was selected for detail review of the retesting results by the inspector. The plates for this ring had been prepared from 5 heats of material, for which a summary of the test results are given in Table 1.

Table 1 - Physical Properties Reported by USS - Containment Liner Plates, Ring 1

Heat No.	Yield Point, psi	Tensile Strength, psi	Elong. in 8-in,%	Impact, Ft-Lbs*
91E668	42,900-47,500	70,700-77,700	23-30	29-99
99E360	44,300-48,000	73,000-78,600	19-28	40-140
97E441	46,100-47,400	78,200-78,800	22-23	17
93E427	46,500	75,700	24	38
94E352	44,200-45,900	72,700-74,800	19-26	16-38

* - Average of 3 tests at +20°F.

The summary of physical properties shown in table 1 are within the limits required by the governing specification, ASTM A516, Grade 70, with impact properties of at least 15 foot-pounds average at a test temperature of + 20°F.

2. Liner Plate Welding and Nondestructive Testing

The quality control records relating to the erection, welding and nondestructive testing of the containment building liner were reviewed, tours of the welding area were made and discussions relating to these activities were held with Messrs. Rasmussen, Brady, Garvin and Maher. The following information and observations resulted.

The reactor pit liner was selected by the inspector for review of the nondestructive testing of weld seams. The records which were reviewed included the following:

a) Magnetic particle test reports

b) Radiographic inspection reports

c) Vacuum box testing reports

d) Checklists for weld joint fit-up.

e) PG&E Field Engineer's daily logbooks

f) Working field drawings (preliminary weld maps)

Collectively, the records showed that the required quantity of nondestructive testing had been conducted during erection and welding of that portion of the steel liner (reactor pit) reviewed. The contract requires 10% radiography or, for those weld seams where radiography is not possible, 10% magnetic particle or dye penetrant inspection of the weld seams in the steel liner. All seams are also required to be 100% vacuum box tested at a vacuum of 5 psi and leak chase tested at $\geq$47 psi.

The records revealed that the weld joints in the reactor pit liner had been subjected to a 100% magnetic particle inspection. Also, according to the records, the vertical and horizontal seams in the first two cylindrical rings of the liner had been 100% radiographed.

Approximately 50% of the horizontal weld seam which joins rings 3 and 4 had been radiographed. In response to the inspector's inquiry, Messrs. Brady and Maher stated that PG&E had required 100% magnetic particle or radiographic inspection of these weld joints because the contractor (PDM) had failed to maintain adequate records and checklists regarding joint fit-up.

While touring the containment building area, the inspector observed an excessive amount of reinforcement on some weld joints which had been radiographed. Measurements by the inspector revealed that at several locations on seam welds 2H and 3H (the second and third horizontal weld joints in the cylindrical portions of the liner) the reinforcement was as much as 1/8-inch. (See Figure 3). These measurements were made in the presence of Mr. Brady. The plate thickness at each of the seam welds was 3/8-inch. The governing code for radiographic inspection of the linder, ASME, Section VIII, Paragraph UW-51, limits the thickness of reinforcement to 1/16-inch for plate thickness up to 1/2-inch. This deficiency was discussed at the time of the Management Interview. At this time Mr. Hersey stated that all seam welds which had been radiographed would be reinspected by PG&E, and that those which had an excessive reinforcement thickness would be ground and re-radiographed.

I. Weld Rod Control

During the previous inspection in March, 1970, apparent weaknesses were observed in the implementation of procedures for the care and control of low hydrogen weld electrodes.[2]

[2]CO Report 50-275/70-1, dated April 4, 1970, pages 22-23.

Observations during the current inspection revealed no deficiencies with regard to the care and control of these materials. Signs had been posted within the welding area which cautioned operators in the care of weld rod (see Figure 2). It was also observed that holding ovens for the electrodes had been repositioned such that they are now within the welding area. The ovens had been equipped with thermometers, which was not the case at the time of the previous inspection.

J. Material Storage and Identification

The inspectors, together with Messrs. Carr, Murin, Erwin and Garvin, visited the PG&E warehouse and storage area in Pismo Beach, approximately 10 miles south of the Diablo Canyon site. The warehouse and storage yard at this location is being operated by the Bigge Crane and Rigging Company under contract to PG&E. A PG&E inspector (Mr. Arnold) is assigned to the area, and when questioned by the inspectors stated he performs receiving and routine surveillance inspections. Such inspections are aimed principally at determining any damage to equipment during shipment and proper maintenance of equipment in storage, according to Mr. Erwin. The inspector confirmed from the inspection records that the approved receiving and storage procedures were being implemented.

Two observations by the inspectors were the subject of particular discussion with PG&E representatives. It was observed that the Westinghouse-supplied primary loop piping was stored in the yard. Although the ends of the piping were covered and taped, no protective covering was otherwise provided. The inspectors inquired of Messrs. Carr and Garvin as to what consideration had been given to the inside storage or other protection of these or other stainless steel materials at both Pismo Beach and the Diablo Canyon site. Specific reference was made to the "salt air" environment at both locations and their proximity to the ocean (see Figure 4). Mr. Garvin said that he had inquired of the PG&E Engineering Department about this matter, and was informed that no special environmental protection measures were necessary for this material.

At the time of the Management Interview, Mr. Hersey informed the inspectors that stainless steel components at the Diablo Canyon site are to be either stored in a warehouse or covered with plastic or other suitable packaging materials. He said that similar provisions would be considered for the components at the Pismo Beach storage area.

The inspectors also observed that indentation stamping had been employed in identifying the main loop piping. Some of the interrupted-dot stamps were observed to penetrate rather deeply into the surface of the pipe. The inspectors inquired as to whether these stamps were of a low stress type. The PG&E representatives stated that they were ill prepared to answer the inquiry because they had no tools for determining this fact. At the time of the Management Interview, Mr. Garvin stated that tools were to be ordered so that measurements could be made to determine if the stampings were of a low stress type.

K. Possible Compromise of Containment Spray System Effectiveness

While touring the containment building, the inspector observed that the interior surfaces of all liner seam welds are to be covered with a 2-inch structural steel channel (see Figure 2). The inspector inquired as to the possible effect these channels might have in impairing the effectiveness of the containment spray system in washing the walls of fission products or other radioactive contaminants following an accident. In this regard, the following statement from the PSAR for Diablo Canyon, Unit No. 2, Paragraph 6.33, was called to the attention of the PG&E representative.

> "...In addition to depressurization, the spray system will be effective in scrubbing fission products from the containment atmosphere. Also, condensation and spray striking the surface of the steel liner will generate a liquid film which will act as a barrier to leakage....However quantitative credit is taken only for absorption of reactive and/or soluble forms of iodine in the analysis of the hypothetical accident..."

At the time of the Management Interview, Mr. Hersey stated that the inspector's observation would be called to the attention of the design engineers for their evaluation.

L. Discrepancy Control

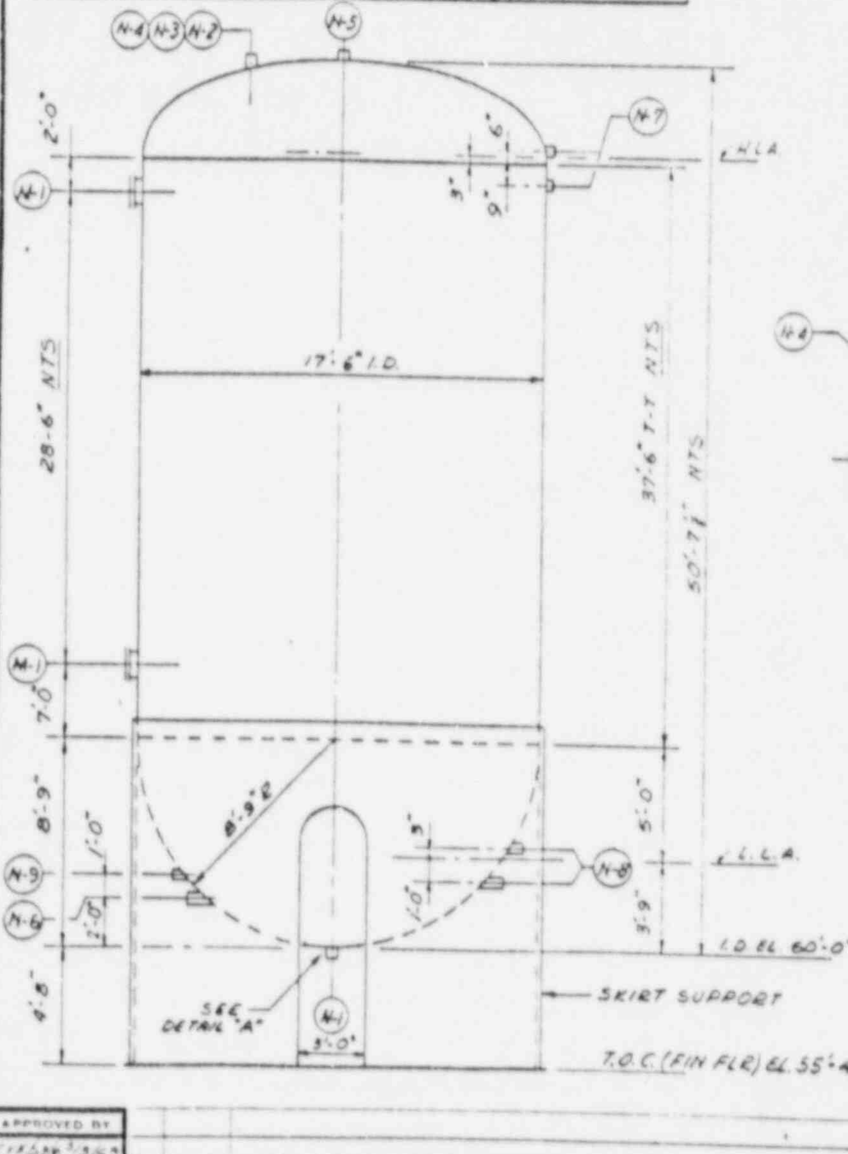
During the previous inspection, the licensee indicated that the wording ambiguity in the discrepancy report procedure concerning items exempt from the formal reporting requirements would be clarified. On June 5, 1970, the official PG&E Quality Assurance procedure was published. The procedure is 15 pages in length and appeared to comprehensively and clearly express the current practices in use. The ambiguity discussed previously was eliminated by the following provision in the procedure. "Departures from requirements which are minor in nature and can be corrected in the normal course of work are not to be considered as discrepancies. Such departures require no special action beyond satisfaction of the inspector....In case of doubt, a departure from requirements should be classified as a discrepancy and resolved in accordance with this procedure." Attached as Appendix B of this report is a diagram showing the route of reports for resolution of discrepancies.

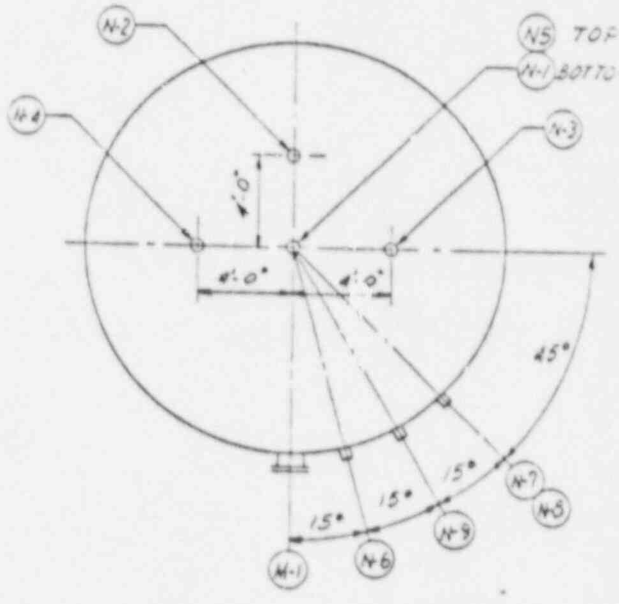
M. In Section B of CO Report No. 50-275/69-4 the inspector reported that contrary to the general description of the containment building provided in Section 5.1.2 of the PSAR, the containment liner anchor studs would be straight rather than the described L shape. The L-shaped studs were designed to hook around the reinforcing steel. At a later date the inspector learned that the design had been changed to include the L-shaped studs. During the current inspection the inspector observed that the L-shaped studs were being installed as described in the PSAR.

(APPENDIX A) 1

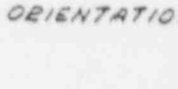
NOZZLE SCHEDULE

ITEM NO.	NO REQD	NOM SIZE	NOZZLE RATING	FACING	END PREP	SPEC	SERVICE
N-1	1	4"	SCH 40S	B.W.	TO MATCH SCH 40S PIPE	USAS B16.9	TANK OUTLET
N-2	1	4"	SCH 40S	B.W.		USAS B16.9	TANK INLET
N-3	1	3"	SCH 40S	B.W.		USAS B16.9	RELIEF VALVE
N-4	1	2"	3000#	½ S.W. CPLG		USAS B16.11	TANK INLET
N-5	1	2"	3000#	½ S.W. CPLG		USAS B16.11	VENT
N-6	1	¾"	3000#	½ S.W. CPLG		USAS B16.11	LEVEL TRANSMITTER ELEMENT
N-7	2	1"	3000#	½ S.W. CPLG		USAS B16.11	HIGH LEVEL ALARM ELEMENT
N-8	2	1"	3000#	½ S.W. CPLG		USAS B16.11	LOW LEVEL ALARM ELEMENT
N-9	1	¾"	3000#	½ S.W. CPLG		USAS B16.11	SAMPLE ELEMENT
M-1	2	18"	150#	RF FLGD		USAS B16.5	MANHOLE WITH DAVIT





NOZZLE ORIENTATION (TYPICAL)



DETAIL "A"

APPENDIX A (1)

APPROVED BY		
	CHG. DATE	DESCRIPTION

D. V. KELLY No. 9269 MECHANICAL

SUPV. BY I. F. HALL DSGN A. L. SIMMONS DR R. VELASQUEZ CH O.K.	UNITS 1 & 2 REQUIREMENTS FOR LIQUID HOLD-UP TANK DIABLO CANYON	SUPERSEDES SUPERSEDED BY SHEET NO. 1 OF 2 SHEETS
DATE 3-3-69 / SCALE NONE	DEPARTMENT OF ENGINEERING PACIFIC GAS AND ELECTRIC COMPANY SAN FRANCISCO, CALIFORNIA	DRAWING NUMBER 049025

1.0 GENERAL SPECIFICATIONS

1.1 Service: Liquid Hold-Up Tank
1.2 Arrangement: In accordance with Dwg. No. 049025, Sh. 1
1.3 Capacity: 83,220 gal - Nominal Gross
1.4 Contents: Radioactive borated reactor coolant
1.5 Location: Indoors - Ambient temperature 110°F Maximum, 50°F Minimum
1.6 Design, fabricate, test, and inspect in accordance with ASME Boiler and Pressure Vessel Code, latest edition, Section III, Class C. Compliance with N-2113 is required. Tank may contain lethal fluid. Code stamp required.

2.0 DESIGN CONDITIONS

2.1 Design Pressure: Internal 15 psig, External atmospheric
2.2 Design Temperature: 200°F
2.3 Hydrostatic Test Pressure: Code
2.4 Seismic Design: Class I
Seismic Design Accelerations: Horizontal 0.20 g, Vertical 0.13 g

3.0 MATERIAL REQUIREMENTS

3.1 Shell
3.2 Support Skirt
3.3 Heads
3.4 Manway Necks
— ASTM A-240 Type 304, hot rolled, annealed and pickled

3.5 Manway Flange
3.6 Manway Blind Flange
— ASTM A-182 F304

3.7 Nozzles

4.0 WELDING AND WELD EXAMINATION

4.1 All tank welds shall be full penetration butt welds.
4.2 Welders and Welding Procedures shall be qualified in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section IX.
4.3 Full radiographic examination of welds is required. Radiographic examination procedure and acceptance shall be in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Appendix IV and paragraph UW-51.
4.4 All root passes, after backgrinding, and all final weld surfaces on austenitic stainless steel components shall be liquid penetrant examined. Liquid penetrant examination procedure and acceptance shall be in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Appendix VIII.
4.5 All final weld surfaces on ferromagnetic components shall be magnetic particle examined. Magnetic particle examination procedure and acceptance shall be in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Appendix VI.

UNITS 1 & 2

APPROVED BY
CHG. DATE

DRWN BY F. Hall
DESIGN
CH.
O.K.
DATE SCALE

REQUIREMENTS FOR LIQUID HOLD-UP TANK

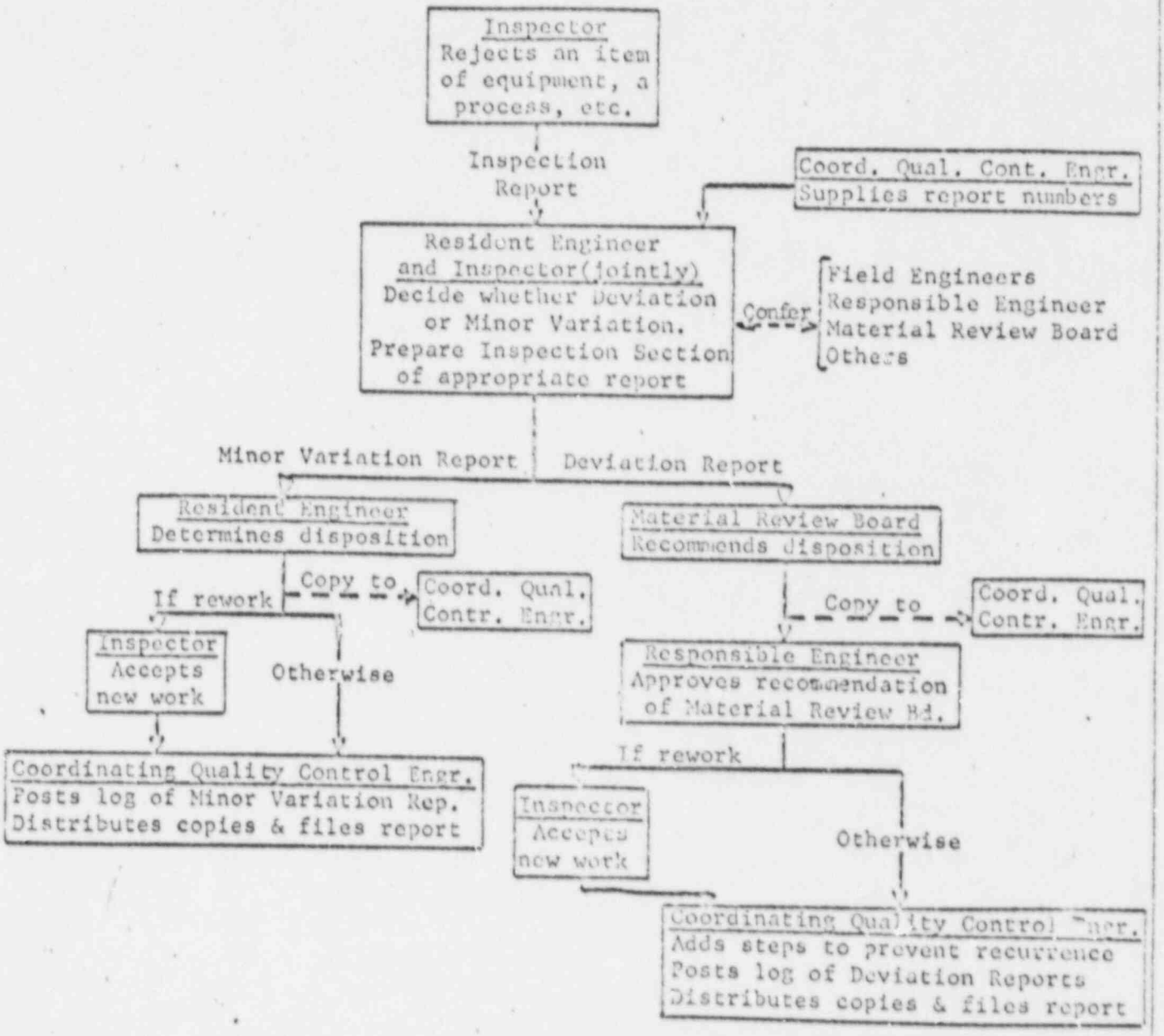
DIABLO CANYON

Department of Engineering

PACIFIC GAS AND ELECTRIC COMPANY

DRAWING NUMBER

DIAGRAM SHOWING ROUTE OF REPORTS FOR RESOLUTION OF DISCREPANCIES



APPENDIX B

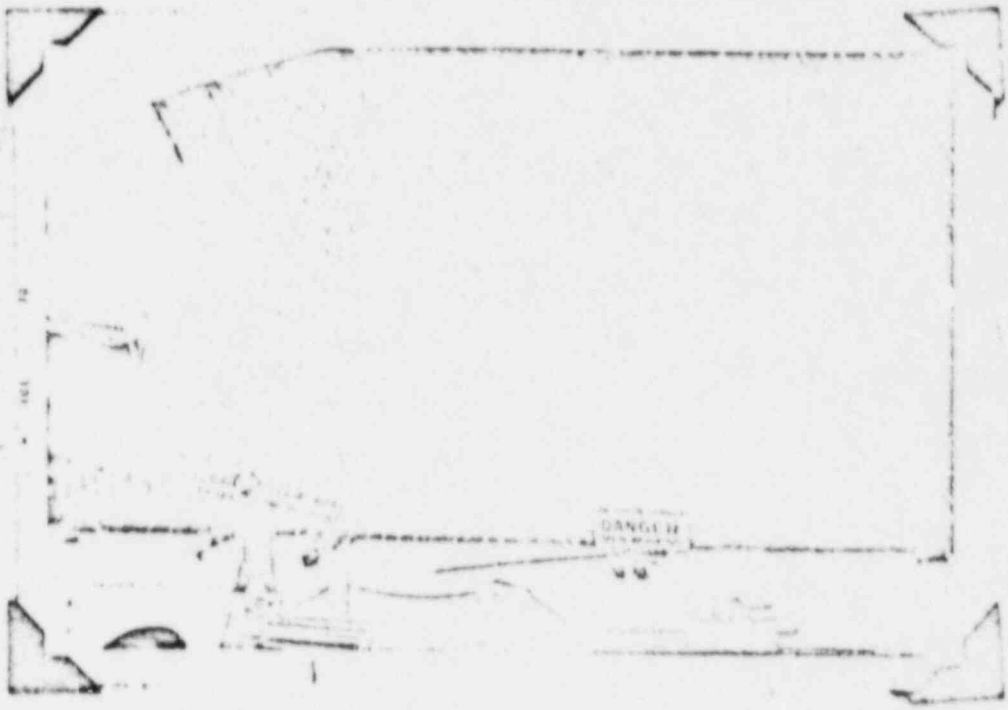


FIGURE 1 - Diagonal Reinforcing Steel for Diablo Canyon Unit No. 1 Containment Building

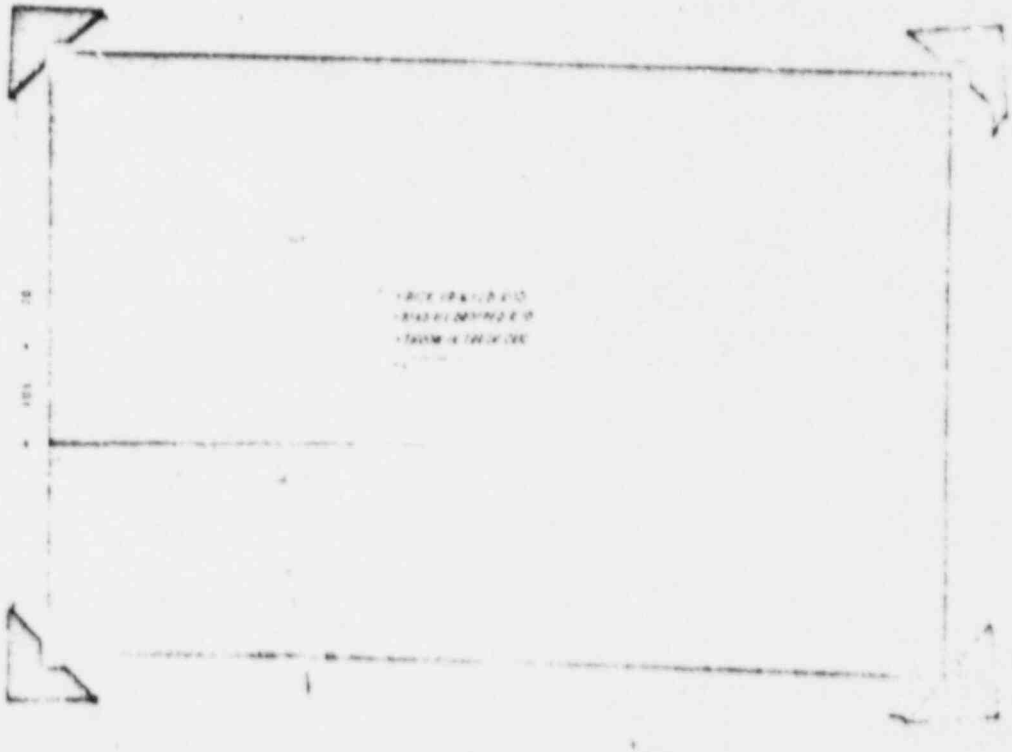


FIGURE 2 - Containment Building Liner, Diablo Canyon, Unit No. 1 (Note in Center of Photograph Where Coupons were Removed for Retest of the Liner Material

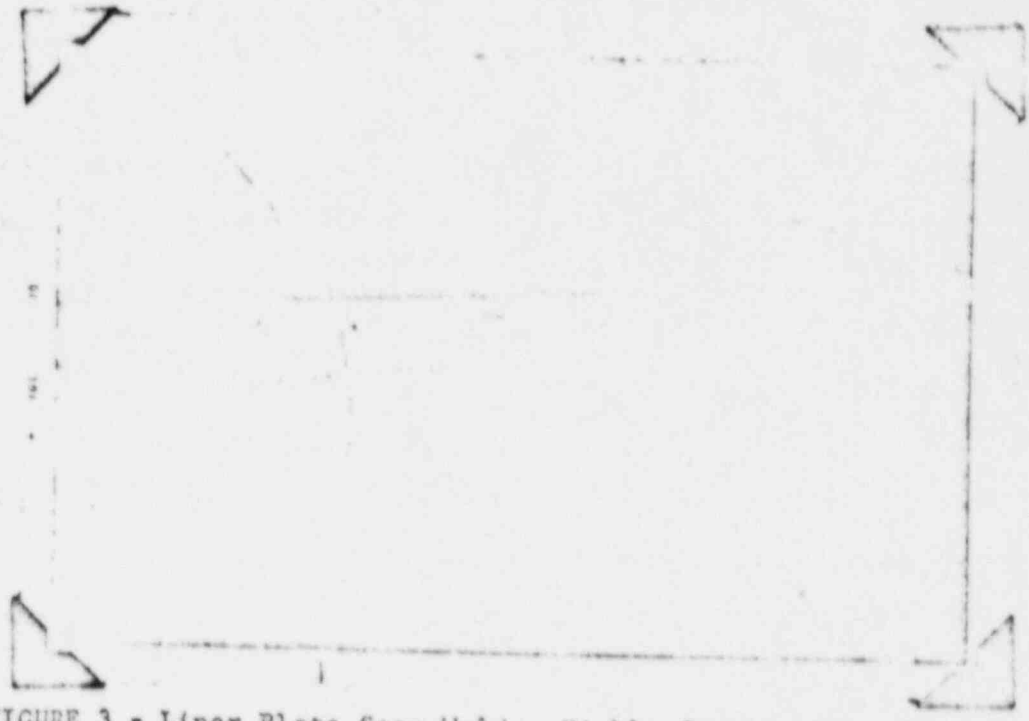


FIGURE 3 - Liner Plate Seam Welds, Diablo Canyon, Unit No. 1. The Reinforcement Thickness was Excessive in Some Locations

FIGURE 4 - Diablo Canyon Construction Site. (Note Close Proximity to Ocean)

FIGURE 5 - Wide Flange Beams to be Installed in the Base Section of the vertical walls of the Containment Building.

FIGURE 3 - Liner Plate Seam Welds, Diablo Canyon, Unit No. 1. The Reinforcement Thickness was Excessive in Some Locations

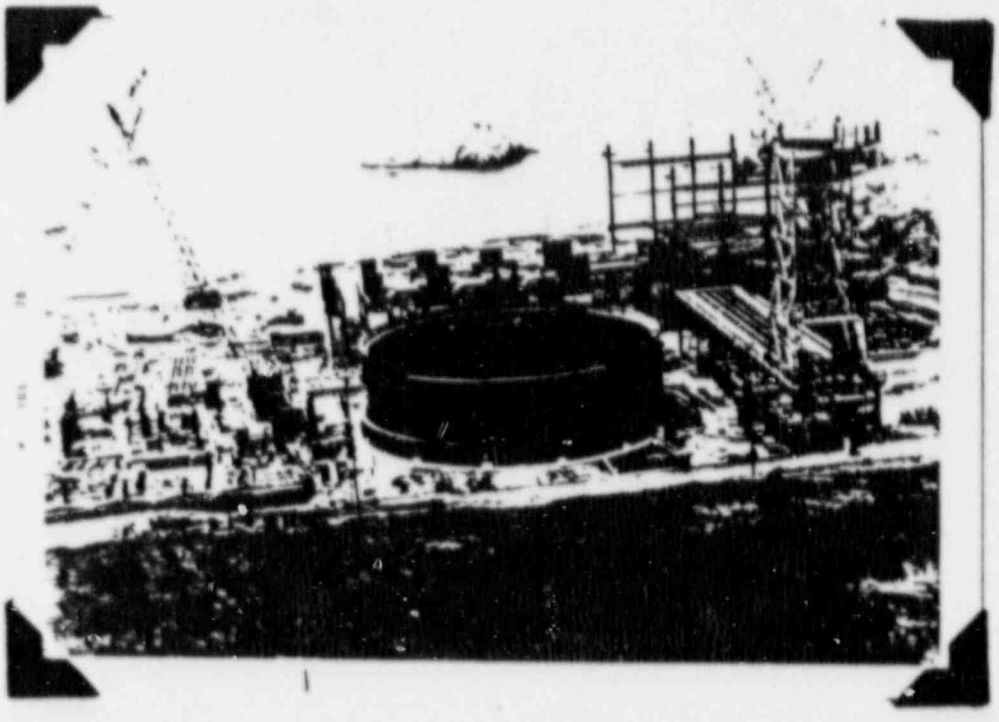


FIGURE 4 - Diablo Canyon Construction Site. (Note Close Proximity to Ocean)

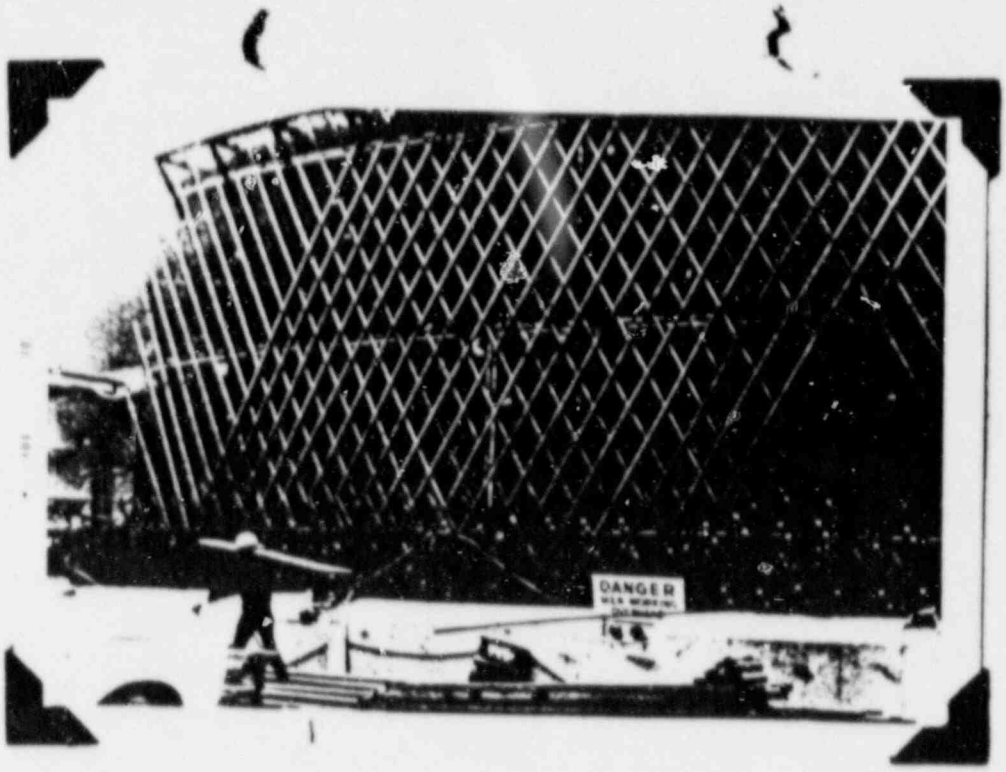


FIGURE 1 - Diagonal Reinforcing Steel for Diablo Canyon Unit No. 1 Containment Building

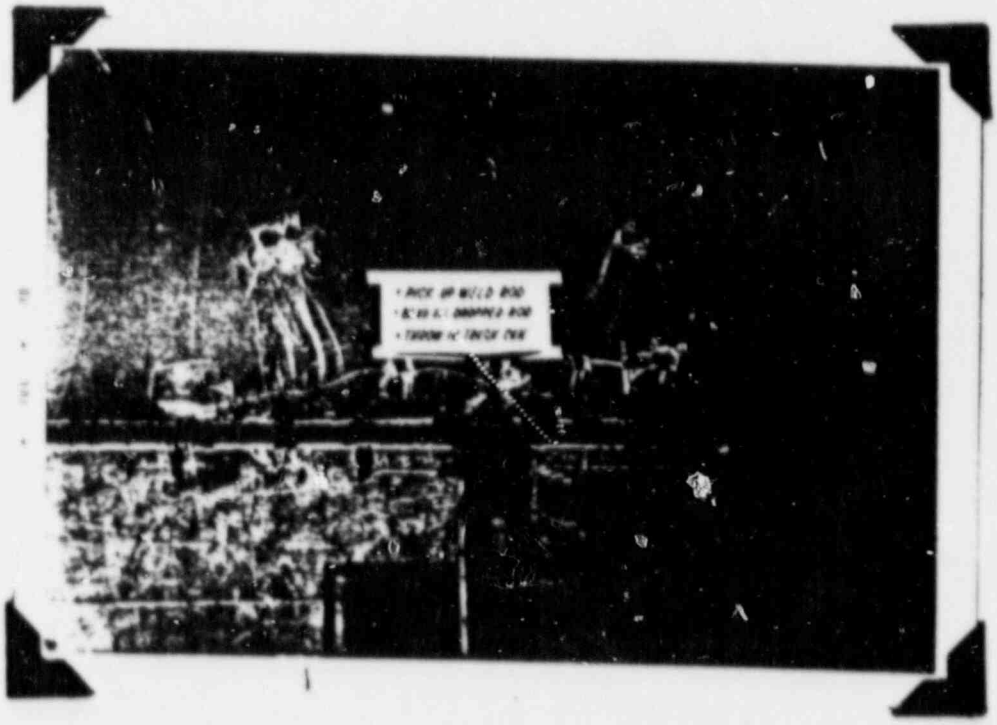


FIGURE 2 - Containment Building Liner, Diablo Canyon, Unit No. 1 (Note in Center of Photograph Where Coupons were Removed for Retest of the Liner Material

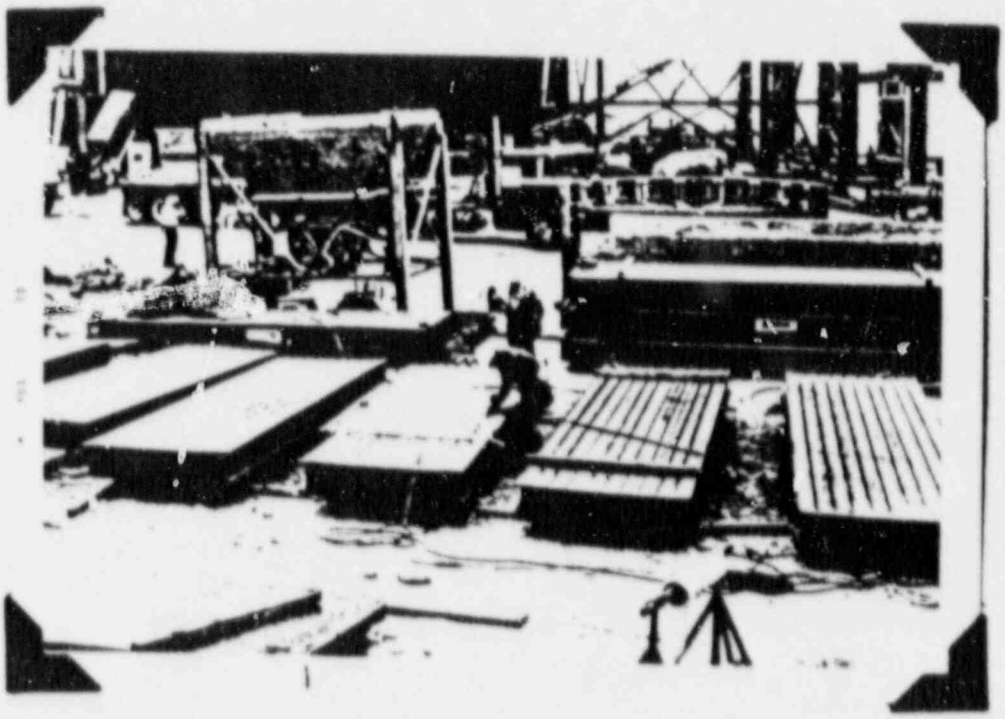
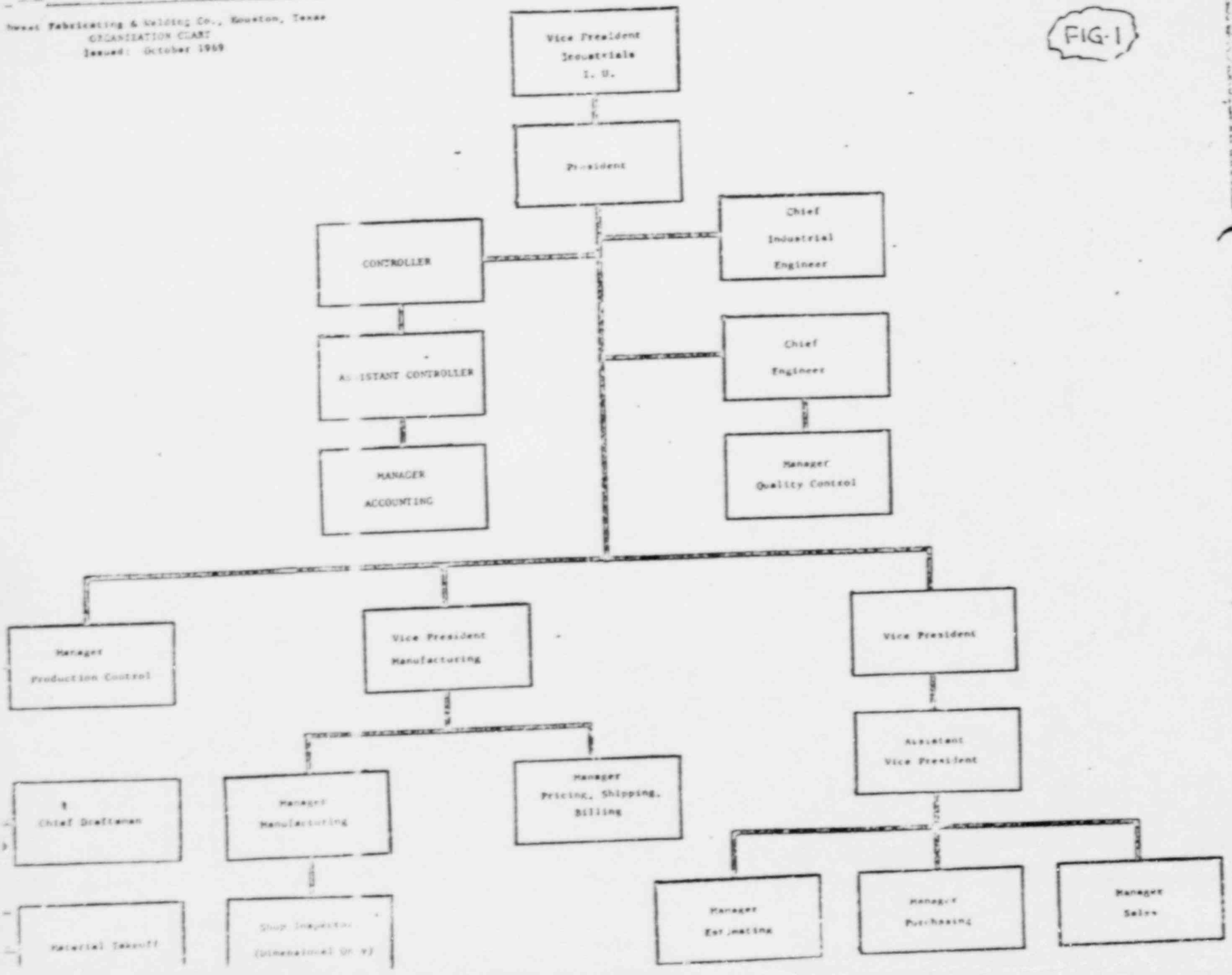


FIGURE 5 - Wide Flange Beams to be Installed in the Base Section of the vertical walls of the Containment Building.

Newest Fabricating & Welding Co., Houston, Texas
ORGANIZATION CHART
Issued: October 1969

FIG-1



Southwest Fabricating & Welding Co., Houston, Texas
QUALITY CONTROL ORGANIZATION CHART
Issued: October 1969

FIG-1A

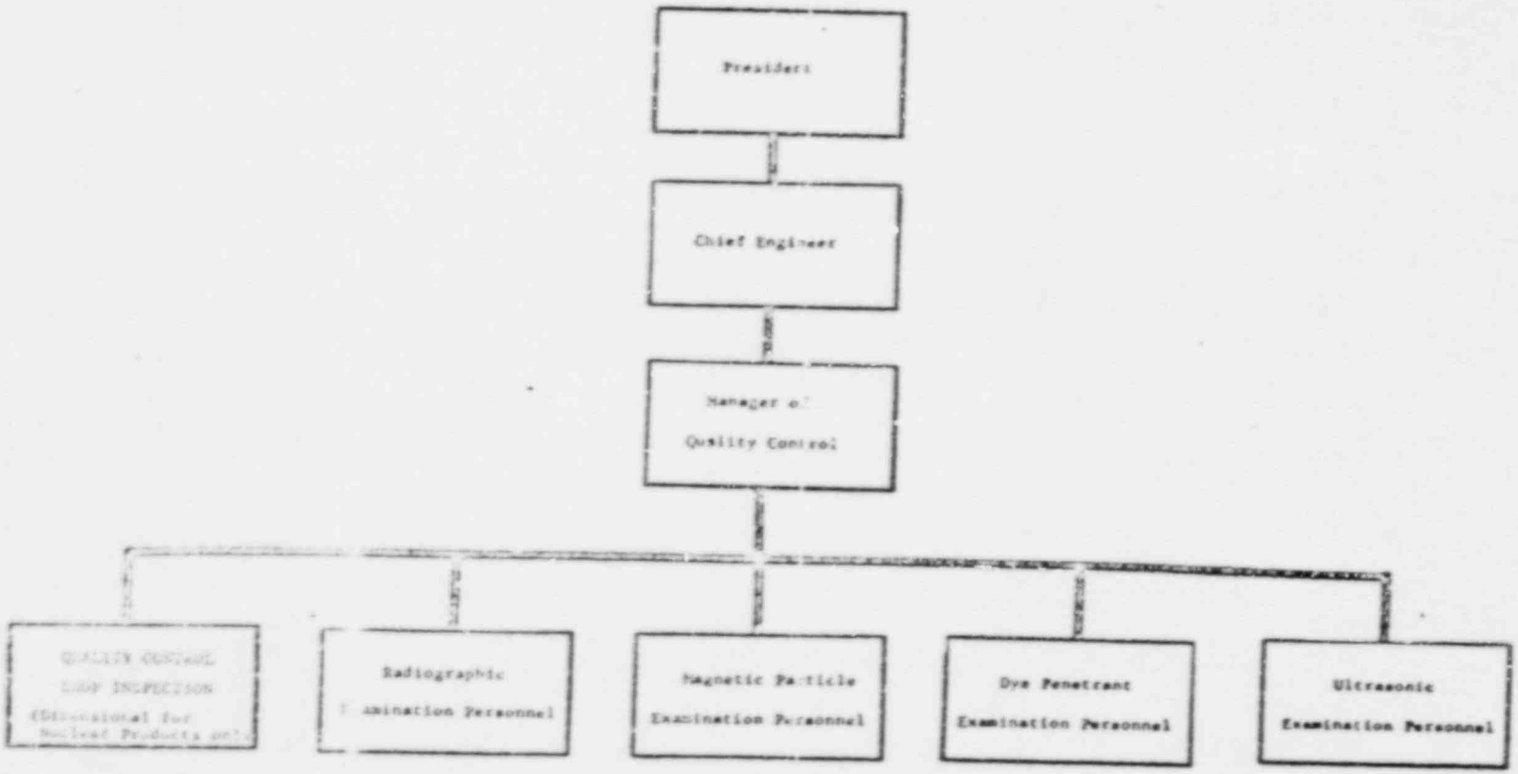
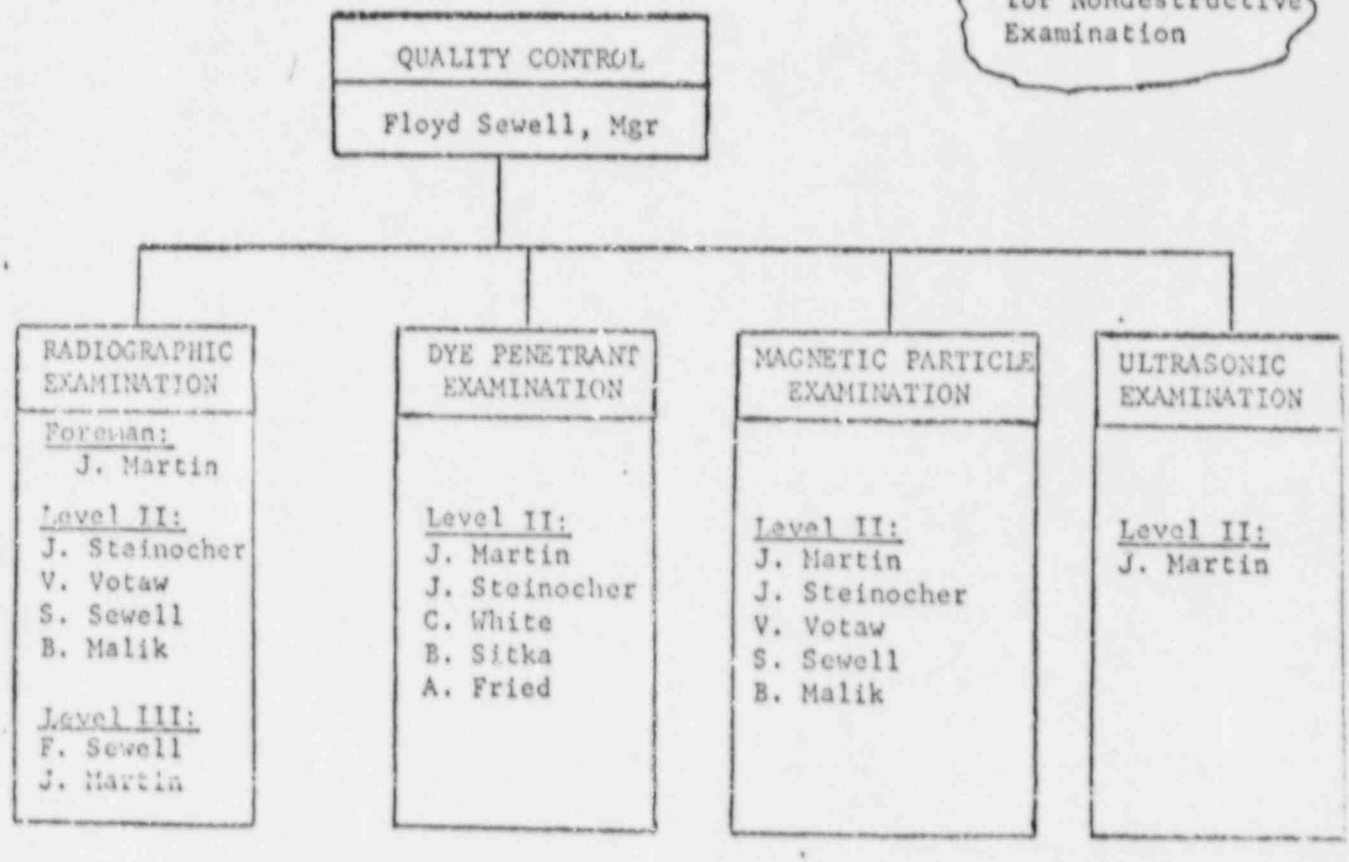


Fig. 1A
QC Organization for Nondestructive Examination



Code USAS B31.0 Issue 1967

Part No. MSP-LOOP-A-1

DATA, OPERATIONS, OR RECORDS

Welding Procedure, Welder Symbol, Heat No., Inspector Initials & Date

Initial/Date: QC Insp / Auth. Insp

Weld Number or Bend Number

Section	Data, Operations, or Records	Item No.	Spec. Req'd.	SFW Insp.	SFW QC Insp.	Auth. Insp.	Cust. Insp.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Welding Procedure (Show for each weld).	1	✓	✓				PB-HA1	PB-HA1	PB-HA-3	P2-HA-3	P2-HA-3	P2-HA-3	83	P2-HA-3
Welder Symbol	[illegible]	2	✓		✓										
	[illegible]	3	✓		✓										
	[illegible]	4	✓		✓										
	[illegible]	5													
		6													
Heat No.	TIG wire	7	✓		✓										
	TA wire	8	✓		✓										
	[illegible] (Cat No.) [illegible]	9	✓		✓										
	[illegible] wire	10	✓		✓										
	MIG wire	11													
	Consumable insert	12													
	Backing ring	13													
		14													
		15													
Weld Examination	Fit-up inspection	16	✓	✓	✓										
	visual (root pass)	17	✓		✓										
	dye penetrant (root pass) per Procedure: WAPD-1-REV4 (*)	18	✓		✓										
	dye penetrant (final) per Procedure: WAPD-1-REV4	19	✓		✓										
		20													
	magnetic particle (final) per Procedures (*)	21													
		22													
	radiographic (intermediate) per Procedures (*)	23													
	radiographic (final) per Procedure: WAPD-2-REV2 (*)	24	✓		✓										
		25													
	ultrasonic (for defects) per Procedures (*)	26													
		27													
		28													
		29													
Bends	bending per Procedures (*)	30													
		31													
		32													
Operation on Fabricated Piece	components & mill test inspection papers checked	33	✓		✓										
	postweld heat treat	34													
	dimension check (final)	35	✓	✓	✓										
	hydro test	36													
	painting per Procedures (*)	37													
	cleaning per Procedure: WAPD-4-REV-0 (*)	38	✓		✓										
	shipping preparation per Procedures: WAPD-4-REV-0 (*)	39	✓		✓										
		40													
		41													
Record	mill test cert. / mill test certif. package	42	✓		✓										
	radiographic film package	43			✓										
	Heat treat. (furnace chart) package	44													
	[illegible]														

Notes:
1. (*) Show Procedure No.

FIG 14

FINAL ACCEPTANCE

Southwest Fabricating and Welding Co. Quality Control Manager — Date

Authorized Inspector — Date

Cust. Inspector

SOUTHWEST FABRICATING & WELDING CO. [illegible]

[illegible] Data & Fabrication, Operations, and Records

Exhibit D