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

Report of Inspection

CO Report No. 50-275/70-4

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

Date of Inspection: September 15 and 16, 1970

Date of Previous Inspection: July 6, 1970

Inspected by:

A. D. Johnson — 10/16/70
A. D. Johnson — Date
Reactor Inspector

A. D. Johnson for — 10/16/70
W. D. Kelley, CO:II — Date
Reactor Inspector (Constr)

Reviewed by:

G. S. Spencer — 10/16/70
G. S. Spencer — Date
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

Scope of Inspection

Pursuant to PI 3800/2 and the master inspection schedule: (1) continued inspection activities outlined in Attachment E, Other Class I Structures (QA-QC review for fabrication and erection of steam generator supports), (2) review status of previously reported deficiencies, and (3) aside from normal inspection activities, Mr. Kelley Construction Inspector CO:II, independently reviewed, in general, procedures, NDT inspections and quality of workmanship associated with the construction of the containment liner and the liquid holdup tanks.

SUMMARY

Safety Items - None

Noncomformance Items - None

Status of Previously Reported Problems

1. Subsequent to the previous inspection, a construction deficiency notice was issued by CO:V regarding a deficiency in radiographic examination of welded seams in the plate material of the containment liner. The thickness of the reinforcement on several welds was observed to be greater than that permitted by the governing code, ASME, Section VIII, Paragraph UW-51.

   The licensee's subsequent investigation of the radiographed containment liner welds disclosed that 444 feet of liner weld required grinding and reradiographic examination. This work had been complete by the time of the current inspection. Approximately 20 of the 444 radiographs showed defects requiring repairs. (Section D. 1).

Other Significant Items

1. Overall completion of construction activities was estimated to be 15% on September 15, 1970. (Section B.)

2. The licensee inspection of the identification stamping on the primary loop piping in storage failed in several instances, to meet the Westinghouse specification. However, the stamping will be in compliance with the applicable code provisions providing the minimum design thickness has not been infringed upon. This nas yet to be determined. (Section D.2)

3. The primary piping at the Pismo Beach Storage area has been placed under cover to protect it from adverse environmental conditions. (Section D.3)

4. The effect of the structural steel channels on operations of the containment spray system has been evaluated by engineering personnel and found acceptable. (Section D.4)

5. A special mockup section of the area between the wide beam flanges and the containment liner at the base of the containment walls has been constructed. During the inspection, the special concrete mix was being placed in accordance with the procedures to be used when concrete is placed in the corresponding area of the containment walls. This project was being performed to provide assurance that concrete quality in the base of the containment walls will conform to the design specifications. (Section D.5)

6. A procedure is being formulated to delineate specific responsibilities within PG&E for verifying that all certification documents are valid and proper. (Section D.6)

7. A review of the QA discrepancy reports indicated that the disposition of items has been in accordance with the PG&E QA standard procedure.

8. The Murphy Pacific QA program for fabrication and erection of the steam generator supports appeared to include the necessary provisions when compared against the inspection guidelines provided in PI 3800/2, Attachment E.

9. A dye penetrant examination observed during the inspection was considered inadequate (Appendix A)

Management Interview

The inspectors met with Messrs. Wright, Farley, Hickman, Brady and other members of the PG&E site staff on September 16, 1970 to review the significant findings of the inspection. The principle item discussed was the implications of Mr. Kelley's observations relating to a liquid penetrant test of a root pass of a weld on one of the liquid holdup tanks.

The inspector acknowledged that neither PSAR nor code requirements nor safety ramifications was in issue, but that the observation raised the issue as to the value of the QC inspection effort. The contract specifications require

a liquid penetrant test of the root pass and both a PDM and PG&E inspector observed that test without raising an objection while both Mr. Kelley and Mr. Garvin indicated that the test was performed improperly. (See Appendix A of the report.)

The inspector explained that activities associated with the construction of the holdup tanks was purposely chosen because of the absence of specific PSAR construction requirements and thus should show PG&E's normal practice associated with design and construction of a structure which will contain some radioactive materials.

Mr. Wright stated that the Construction Department's policy was to assure that tests required by the contract were to be accomplished as specified whether or not the test is actually needed. He said that the QC inspector was without authority to decide whether a contractor could deviate from specified and accepted procedures and was responsible to report deviations from such procedures to the appropriate site engineer for evaluation and resolution in accordance with the provisions of the QA discrepancy procedure. He added that both PDM's and PG&E's QC efforts related to work performance will be investigated to determine the circumstances and significance of the observed apparent deficiency in implementation of the QA program. He concurred that if the records of tests fail to truly reflect work performance the records are worthless.

In addition to the above item the inspector indicated that it appeared that appropriate followup action has been initiated concerning identified deficiencies noted during the previous inspection in June, 1970.

In response to the inspectors specific question concerning the location at which the concrete is being sampled (as requested by CO:HQ memorandum dated 8/10/70), Mr. Farley stated that their evaluation has shown that sampling at the batch plant is preferable when all factors are considered in the manufacture,sampling, transportation and placement of concrete at the Diablo site. He said they intend to continue sampling at the batch plant unless directed otherwise. (See Section D.1. of CO Report No. 275/70-2 for details concerning location of concrete sampling.)

DETAILS

A. Persons Contacted

R. L. Wright	-	Resident Electrical Engineer, Acting Project Superintendent
R. V. Farley	-	Resident Civil Engineer
A. W. Hickman	-	Resident Mechanical Engineer
F. W. Brady	-	QA Engineer
R. W. Wood	-	QA Engineer
P. L. Bussolini	-	QC Coordinator
B. Good	-	QA Engineer - San Francisco
L. J Garvin	-	QC Engineer - San Francisco
[illegible]	-	[illegible]

B. Construction Status

Overall completion of construction of the Diablo Project was estimated by PG&E's Construction Department to be approximately 15% on September 15, 1970. Construction activities have been delayed during the past three months as a result of a 6 week dispute concerning a jurisdictional question between the carpenters and fitters.

A detailed review of the project schedule, and discussion with Mr. H. Manning, Office Engineer, led the inspector to an independent estimate that the project was from 10 to 12 months behind its original schedule. A reasonable estimate of completion of construction appeared to be late spring of 1973, rather than the original estimate of the summer of 1972. PG&E site management chose not to officially state that the project was behind schedule, but agreed that the inspector's estimate was not unreasonable, barring further unforeseen delays or events which possibly could advance the project completion date.

C. Administration

Since the previous inspection in June, 1970, Mr. L. Carr, Quality Assurance Engineer, terminated his employment with PG&E to resume his duties as Professor of Mechanical Engineering at California State Polytechnic College located in San Luis Obispo, California. Also Mr. Murin, Quality Assurance Engineer, terminated to join Serria Power Company in Nevada.

Mr. R. W. Wood has joined Mr. Brady to replace Mr. Marin and the two individuals now form the current onsite Quality Engineering group. Mr. Wood has been with PG&E for approximately one year and had previously been assigned engineering duties in San Francisco.

On the General Construction Department side, Mr. Garvin the Quality Control Coordinator for onsite work (reporting directly to the Project Superintendent) has been transferred to San Francisco to assist Mr. Bain - Construction Superintendent. Mr. Bussolini, formerly a QC Engineer (Civil), has been appointed as the onsite Quality Control Coordinator for the General Construction Department.

D. Resolutions of Previous Issues

During the previous inspection several items were brought to the licensee's attention for evaluation and possible action. The following information summarizes the licensee's disposition of the items.

1. Inadequacy of the Radiographic Examination of Containment Welds

This item was the subject of a Construction Deficiency Notice (CDN) sent to the licensee on July 21, 1970. The licensee returned an adequate reply to the CDN dated August 17, 1970.

The records at the site showed that PG&E's inspection of the pertinent containment welds required that approximately 444 feet of welded seam be ground down to remove excess reinforcement to enable radiographic examination in accordance with the applicable code provisions (UW-51). Of the 444 feet of welds reexamined, 20 radiographs (each one foot in length) showed defects which required weld repair. The nature of the defects detected after grinding were porosity, incomplete fusion, and slag.

2. Indentation Stamping of Class 1 Piping

Indentifiaction markings on the primary loop piping in storage at the Pismo Beach storage facilities were to be of the "low-stress, interrupted - dot type mechanical stamping in accordance with Westinghouse requirements of WPS 838601A". The referenced specification requires that, "The impressions produced shall not exceed a depth of 1/64-inch and shall have rounded bottoms with a radius not less than one-fourth of the width of the impression at an impression depth of 0.010 inch". According to Messrs. Brady and Hickman, PG&E's inspection of the impressions confirmed that the bottoms of the impressions were rounded, however, several impressions were found to exceed the depth specification of 1/64 (0.0156) inch. The maximum measured depth was 0.027 inch. A dial indicator depth gauge had been used to make the measurements. In view of the findings, PG&E has formally requested Westinghouse to demonstrate that the impression depths outside of the Westinghouse specification have not infringed on the minimum design wall thickness. Also, according to a communication from the Chief Mechanical Engineer to the Director of Quality Engineering, PG&E, the Vendor inspector group had been requested to verify that the fabricator is using the proper dies and techniques in the shop. As a side note, during a recent compliance inspection of the particular pipe vendor, it was verified that proper dies were in use. However, it appears that the technique to prevent excessive depth may need further evaluation by the vendor which the licensee intends to determine during his ongoing vendor inspection program.

3. Protection of Stainless Steel from Salt Air Environment

In view of the proximity of the site to the ocean the question was raised during the previous inspection as to what detrimental effect, if any, the salt air environment would have on stainless steel

component stored in the yard area without protection for an extended period of time. Mr. Hickman stated that the primary piping at the Pismo Beach storage area had been covered. However, he pointed out that a certain amount of chloride contamination from the air and handling was inevitable. He said the components would be throughly clean and rinsed with chloride free water before installation. He also indicated that the tape used to cover the weld preparation ends while in storage had been specified to be chloride free. Further he said that all stainless steel components arriving at the storage would be evaluated to assure proper storage commensurate with component performance and safety functions.

Mr. Hickman added that as a practical matter, 60 ppm has been established as the chloride concentration limit in water used for hydrostatically testing equipment for non-primary coolant system stainless steel components such as the liquid holdup tanks. Subsequent to the hydro test, the equipment is required to be rinsed with water with chloride concentrations of less than 10 ppm and are to be rinsed until the rinse shows a chloride concentrations value of 10 ppm or less. Later, the inspector learned that the corresponding Westinghouse chloride limit for primary piping was 1.0 ppm.

4. Effect of Structural Steel Channels an Operation of Containment Spray

The inspector was shown a letter from the Chief Mechanical Engineer answering the inquiry from the Director of Quality Engineering as to whether the leak chase channels on the inside face of the containment liner were consistent with the design evaluation of the containment spray system which referred to a liquid film barrier (PSAR-2, page 64).

Engineering explained that there was no question of conformance or an unreviewed safety question as the record is explicit that the channels will be inside (PSAR-2, Page 5-50). Thus, no corrective action was considered necessary. The Chief Mechanical Engineer's letter went on to point out that the paragraph at the bottom of page 6-64 shows no intent to produce a flowing film of water down the face of the liner. Rather, the cold liner plate and any spray wall impingement would afford a wetted surface which would have some qualitative value in trapping radioactive particles out of the containment atmosphere. It would therefore be a better leakage barrier than would a dry surface. He further pointed out that the analysis takes no quantitative credit for wet walls, as had been made clear in the same section. He wrote that the containment spray solution will be much more effective as droplets in free fall through the atmosphere. The layout of spray nozzles attempts to minimize the amount of spray impingement on the walls. Also of interest, he

added that there was some value in post accident recovery in having the radioactivity remain in the containment (trapped on the channels) rather than circulating through the residual heat exchanger, (Safety injection loop) in the Auxiliary Building.

5. Placement of Special Concrete in Area Between Wide Beam Flanges and Containment Liner

The bottom section of the containment walls are to be constructed with wide beam flanges (20 feet in length) installed in the center of the concrete portion of the wall. The construction plans require that the flanges be installed and that a special concrete mix (see CO Report No. 50-775-3) be placed by dropping the concrete between the flanges and the containment liner over the installed reinforcing steel. To provide assurance that the placement procedures and design mix produce the desired concrete quality and structural integrity of this section of the containment walls, the licensee decided to construct a mockup section to enable analysis of the end product.

During the current inspection the inspectors observed that a mockup section had been constructed. The section appeared to be approximately 20 feet in height and about 16 feet in width. All reinforcing steel was observed to be installed similarly to that already installed around the containment building. Also the inspector observed a strain gauge had been installed in a location similar to that planned for installation in the containment wall.

Mr. Brady explained that the procedures used to pour the mockup section will be identical to those used for placing the concrete in the containment wall. He said this included time. Plans for pouring the mockup section were to pour a two foot elevation section each hour. Therefore ten hours had been scheduled to pour the section. Also Brady said the test section should provide information on possible effects placement of concrete might have on the strain gauges to be installed in various locations throughout the containment walls.

6. Verification of Quality Control Information on Certification Documents

In response to the question raised during the previous inspection, as to whether or not PG&E plans to have someone within the company confirm that the data provided on certification documents conform to the applicable specification and code requirements, Mr. Brady

stated that the company policy is to assure that the product meets the specifications. Therefore, a specific procedure is being prepared to provide clearly who within PG&E is responsible for this type of verification.

E. QA Construction Deviation Reports

The inspector reviewed the QA records of deviations and minor variations. During the review the inspector confirmed that the disposition of identified discrepancies in construction activities have been processed in accordance with the licensee's QA discrepancy procedure. Since start of construction activities, the record shows 132 resolved minor variations and 32 deviations. The substance of the more recent discrepancies appeared to the inspector to have been properly classified and appropriately resolved. During the past several months the nature of discrepancies ranged from excessive slump of manufactured concrete (minor variation) to installation of materials contrary to the contract specifications (deviation).

F. Other Class I Structures - Steam Generator Supports (QA-QC Program)

Guy F. Atkinson Company has installed the anchorage for the steam generator supports as discussed in CO:Report No. 50-275/3. However, Murphy-Pacific Corporation, Oakland, California has been awarded the contract to furnish, fabricate and erect the structural steel to form the supports. Also Murphy-Pacific's contract calls for fabricating and installing the structural steel for the primary coolant pumps, pressurizer, main steam and feedwater supports.

Murphy-Pacific has selected Testing and Controls Inc., Oakland, California to provide the Quality Assurance program for the project in accordance with the PG&E and Murphy-Pacific contract provisions. Testing and Control Inc., has prepared a QA manual which sets forth the program to be implemented to assure that Murphy-Pacific will be in the position to demonstrate to PG&E that the supports have been fabricated and erected in conformance with the contract specifications. PG&E has reviewed and approved the QA manual.

Pursuant to PI-3800/2, the inspector reviewed the QA-QC Manual approved by PG&E for the work to be performed. A section of the manual described the general guidelines and program to be applied to the project. The section also appropriately delineated objectives, controls and responsibilities. A second section of the manual was devoted to detailed instructions pertaining to the various procedures required to provide the quality assurance program necessitated by the contract. A third section provided the sample forms to be used during performance of the contract specification to assure appropriate documentation of the quality of the work performed.

The inspector confirmed that the provisions of the QA-QC manual had incorporated appropriate provisions for the work to be accomplished based on the inspection criteria outlined in PI-3800/2, Attachment E.

The inspector also confirmed that the QA-QC manual had incorporated appropriate provisions (based on the inspection guideline provided in PI-3800/2, Attachment E) to demonstrate quality and performance of work as required by the contract specifications.

Pacific Gas and Electric Company
Diablo Canyon Nuclear Stations Units 1 and 2
San Luis Obispo County, California

APPENDIX A

Reactor Containment Liner and Liquid Holdup Tanks Welding and Nondestructive Testing

W. D. Kelley
Reactor Inspector (Construction)

CO Report No. 50-275/70-4

SCOPE

An announced inspection was made on September 15 and 16, 1970, at the Pacific Gas and Electric Company (PG&E), Diablo Canyon Nuclear Station (PWR), San Luis Obispo County, California. The purpose of the inspection was to review the nondestructive testing procedures and techniques being utilized, the capabilities of the NDT inspectors involved and evaluate the welding of the reactor containment liner and the liquid holdup tanks.

SUMMARY

Pittsburgh-Des Moines Steel Company (PDM) has a quality control group at the site that is independent of construction and the nondestructive examination is performed by NDT technicians, not by the boilermakers. (See Section B.)

The PDM welding procedures were written and qualified in accordance with Section IX of the ASME Code at their Pittsburgh, Pennsylvania, facilities. (See Section C.)

The PDM weldors on the reactor containment liner were qualified at the site in accordance with Section IX of the code. Two weldors were brought to the site by PDM and qualified for weld stainless steel in accordance with Section IX of the Code for welding on the liquid holdup tanks. (See Section C.)

The radiographs of the reactor containment liner and the liquid holdup tank meet ASME Code requirements; however, the liquid penetrant examination of the root pass of the liquid holdup tank was observed by the compliance inspector as being done incorrectly and witnessed by a PG&E inspector who had limited informal training in liquid penetrant examination. (See Section D.)

Excessive grinding of the weld reinforcement of the liquid holdup tank was observed by the inspector. The grinding into the base material had not gone below minimum wall thickness which was verified ultrasonically and was accepted by the code inspector. (See Section E.)

DETAILS

A. Persons Contacted

PG&E

F. Brady - QC Engineer
H. Petersen - Mechanical QC Engineer
R. Bafus - Electrical QC Engineer
R. L. White - QC Engineer

B. Good	-	QC Engineer
R. V. Farley	-	Civil Engineer
R. L. Bussolini	-	QC Engineer
R. Maxwell	-	Civil Engineer
R. W. Wood	-	QC Engineer
A. W. Hickman	-	Mechanical Engineer
L. J. Garvin	-	QC Engineer

PDM

G. Mendex	-	QA Field Engineer
G. Wooley	-	QA Radiography Coordinator
J. Muller	-	QA Engineer

B. Quality Control

The erection of the containment liner is being performed by PDM using boilermakers from San Francisco California Boilermakers Local No. 6 on their Contract No. 39711 with PG&E. The PDM labor contract with the boilermaker San Francisco Local does not require that the nondestructive testing be performed by boilermakers as required by the National Transit Local of the Boilermakers Union.

PDM has established an independent quality assurance section that does all nondestructive testing and does not report to the site construction force but reports to the chief engineer at their Western Division office, Santa Clara, California.

C. Welding

The welding of the containment liner was done in accordance with welding procedures that were written and qualified in PDM's Pittsburgh, Pennsylvania, facilities where they have their Metallurgy and Welding Engineering staff. The welding procedures used are referenced on the erection drawing using the AWS weld symbols.

An attempt was made to weld the liquid holdup tanks on their side using automatic welding equipment and erecting the complete tank. The process proved to be too slow and the erection procedure was revised to erect the tanks in the vertical position using manual welding. The welding procedure used for welding these tanks were qualified in PDM's Pittsburgh, Pennsylvania, facilities.

The welders were qualified at the site in accordance with the welding procedures that they would be using. The weldor qualification test taken by

the weldors for welding on the reactor containment were for manual metal arc welding of ASME P-1 carbon steel grade materials in the horizontal and vertical positions in accordance with Section IX of the ASME Code. About 45% of the boilermaker weldors sent to the site by the Boilermaker Union failed to pass these tests. After the weldor passed the qualification tests, the first ten feet of his production weld was spot radiographed and if 50% repair was required, he was discharged. A bar chart record is kept by the quality control group of the total footage of welding of each weldor and the total footage of repairs. If the repair rate exceeded 10%, the weldor is subject to being discharged.

The erection of the liquid holdup tanks is being performed by PDM on their Contract No. 39715 with PG&E. Two boilermaker weldors were brought to the site by PDM to weld these tanks and they are the only weldors permitted to do any welding on them.

These two weldors, doing the welding of the liquid holdup tank, were qualified in the horizontal vertical positions for ASME P-8 stainless steel grade materials using the metal inert gas process.

The welding procedures and welding procedure qualification are on file at the site and the file contains only those welding procedures and procedure qualifications that are referenced on the approved erection drawings. The weldor qualifications are on file and the file includes the record of those weldors that failed the qualifications test as well as those who have welded on the two contracts.

The welding procedures, welding procedure qualifications, and weldor qualification were reviewed by Region II inspector and they met the requirements of Section IX of the ASME Code.

D. Nondestructive Testing

The nondestructive testing of the reactor containment liner and liquid holdup tanks is under the supervision of Mendez, QA Field Engineer, who is certified as a Level III per SNT-TC-1A for radiography, dye penetrant, magnetic particle and ultrasonic. Mendez has had years of experience in the nondestructive field which included working for independent test laboratories. The responsibility of assigning the taking of radiography, recordkeeping, interpretation of radiographs, and filing the radiographs are the responsibility of the QA Radiography Coordinator, Wooley, who is certified to Level II for radiography. The dye penetrant examination is performed and evaluated by Muller, certified to Level II.

The radiographs are presently filed at the site. Radiographs were selected by the Region II inspector from the rollout drawings of the reactor containment and liquid holdup tanks and there readily obtained by Wooley. The

radiographs of both reactor containment and liquid holdup tanks met the requirements of ASME Code for density, penetrameter placement and shimming. The Region II inspector agrees with the interpretation of Wooley on the radiographic readout sheets.

A visual inspection of the liquid holdup tanks was made while a dye penetrant examination was being performed by Muller on the grinded area of the root pass prior to welding the outside of Tank No. 2-2, Seams 1-H-1 and 1-H-2. The application of the dye and the dwell time met the dye penetrant procedure but the cleaning in the area to be examined and the application of the developer were done improperly. The dye was not removed sufficiently from the area being examined to prevent a pinkish cast to the developer when applied. Also the developer was being applied using an aerosol can in a high wind. The inspector Muller attempted to shield the spray from the high wind with his body which resulted in his inability to observe the application of the developer which resulted in too light a coat. A PG&E inspector, J. Domino, who had limited informal training in dye penetrant examination, was witnessing the dye penetrant examination; he was the replacement for the vacationing inspector who had been trained in dye penetrant examination.

E. Excessive Grinding of Welds on Liquid Holdup Tank

A visual inspection of the liquid holdup tanks revealed excessive grinding of the welds reinforcement before radiography. The excessive grinding resulted in the thinning of the base material on either side of the weld. Mendez stated that the area had been measured ultrasonically by the Magnaflux Corporation.

Mendez stated that the first ultrasonic technician sent to the site by Magnaflux was unable to get repeatability in his reading and Magnaflux was advised of his inability to get good date. The second visit to the site was Magnaflux's NDT Supervisor, J. Ortega, who was certified to Level III per SNT-TC-1A for ultrasonics.

A PG&E interoffice memorandum dated July 27, 1970, signed by J. T. Duffy stated that the design calculation required the minimum thickness of the bottom head be 0.115 inch, the minimum thickness of the shell be 0.206 inch, and the minimum thickness of the top head be 0.099 inch. The top and bottom head were fabricated from 3/16-inch plate and the shell from 1/4-inch plate. The Magnaflux report states that none of the areas of excessive grinding are less in thickness than that required by the design calculation. The design requirement and Magnaflux test results have been reviewed and accepted by the ASME Code Inspector, A. L. Quinn, of the Factory Mutual Insurance Company.

Pacific Gas and Electric Company
Diablo Canyon Nuclear Stations Units 1 and 2
San Luis Obispo County, California

APPENDIX A

Reactor Containment Liner and Liquid Holdup Tanks
Welding and Nondestructive Testing

W. D. Kelley
Reactor Inspector (Construction)

OO Report Nos. 50-275/70-
50-323/70-

SCOPE

An announced inspection was made on September 15 and 16, 1970, at the Pacific Gas and Electric Company (PG&E), Diablo Canyon Nuclear Station (PWR), San Luis Obispo County, California. The purpose of the inspection was to review the nondestructive testing procedures and techniques being utilized, the capabilities of the NDT inspectors involved and evaluate the welding of the reactor containment liner and the liquid holdup tanks.

Summary

Pittsburgh-Des Moines Steel Company (PDM) has a quality control group at the site that is independent of construction and the nondestructive examination is performed by NDT technicians, not by the boilermakers. (See Section B.)

The PDM welding procedures were written and qualified in accordance with Section IX of the ASME Code at their Pittsburgh, Pennsylvania, facilities. (See Section C.)

The PDM weldors on the reactor containment liner were qualified at the site in accordance with Section IX of the code. Two weldors were brought to the site by PDM and qualified for weld stainless steel in accordance with Section IX of the Code for welding on the liquid holdup tanks. (See Section C.)

The radiographs of the reactor containment liner and the liquid holdup tank meet ASME Code requirements; however, the liquid penetrant examination of the root pass of the liquid holdup tank was observed by Region II being done incorrectly and witnessed by a PG&E inspector who had no training in liquid penetrant examination. (See Section D.)

Excessive grinding of the weld reinforcement of the liquid holdup tank was observed by Region II inspector. The grinding into the base material had not gone below minimum wall thickness which was verified ultrasonically and was accepted by the code inspector. (See Section E.)

DETAILS

A. Persons Contacted

PG&E

F. Brady - QC Engineer
H. Petersen - Mechanical QC Engineer
R. Bafus - Electrical QC Engineer
R. L. White - QC Engineer

B. Good - QC Engineer
R. V. Farley - Civil Engineer
R. L. Bussolini - QC Engineer
R. Maxwell - Civil Engineer
R. W. Wood - QC Engineer
A. W. Hickman - Mechanical Engineer
L. J. Garvin - QC Engineer

PDM

G. Mendez - QA Field Engineer
G. Wooley - QA Radiography Coordinator
J. Muller - QA Engineer

B. Quality Control

The erection of the containment liner is being performed by PDM using boilermakers from San Francisco California Boilermakers Local No. 6 on their Contract No. 39711 with PG&E. The PDM labor contract with the boilermaker San Francisco Local does not require that the nondestructive testing be performed by boilermakers as required by the National Transit Local of the Boilermakers Union.

PDM has established an independent quality assurance section that does all nondestructive testing and does not report to the site construction force but reports to the chief engineer at their Western Division office, Santa Clara, California.

C. Welding

The welding of the containment liner was done in accordance with welding procedures that were written and qualified in PDM's Pittsburgh, Pennsylvania, facilities where they have their Metallurgy and Welding Engineering staff. The welding procedures used are referenced on the erection drawing using the AWS weld symbols.

An attempt was made to weld the liquid holdup tanks on their side using automatic welding equipment and erecting the complete tank. The process proved to be too slow and the erection procedure was revised to erect the tanks in the vertical position using manual welding. The welding procedure used for welded these tanks were qualified in PDM's Pittsburgh, Pennsylvania, facilities.

The welders were qualified at the site in accordance with the welding procedures that they would be using. The welder qualification test

taken by the weldors for welding on the reactor containment were for manual metal arc welding of ASME P-1 carbon steel grade materials in the horizontal and vertical positions in accordance with Section IX of the ASME Code. About 45% of the boilermaker weldors sent to the site by the Boilermaker Union failed to pass these test. After the weldor passed the qualification tests, the first ten feet of his production weld was spot radiographed and if 50% repair was required, he was discharged. A bar chart record is kept by the quality control group of the total footage of welding of each weldor and the total footage of repairs. If the repair rate exceeded 10%, the weldor is subject to being discharged.

The erection of the liquid holdup tanks is being performed by PDM on their Contract No. 39715 with PG&E. Two boilermaker weldors were brought to the site by PDM to weld these tanks and they are the only weldors permitted to do any welding on them.

These two weldors, doing the welding of the liquid holdup tank, were qualified in the horizontal and vertical positions for ASME P-8 stainless steel grade materials using the metal inert gas process.

The welding procedures and welding procedure qualification are on file at the site and the file contains only those welding procedures and procedure qualifications that are referenced on the approved erection drawings. The weldor qualifications are on file and the file includes the record of those weldors that failed the qualifications test as well as those who have welded on the two contracts.

The welding procedures, welding procedure qualifications, and weldor qualification were reviewed by Region II inspector and they met the requirements of Section IX of the ASME Code.

D. Nondestructive Testing

The nondestructive testing of the reactor containment liner and liquid holdup tanks is under the supervision of Mendez, QA Field Engineer, who is certified as a Level III per SNT-TC-1A for radiography, dye penetrant, magnetic particle and ultrasonic. Mendez has had years of experience in the nondestructive field which included working for independent test laboratories. The responsibility of assigning the taking of radiography, recordkeeping, interpretation of radiographs, and filing the radiographs are the responsibility of the QA Radiography Coordinator, Wooley, who is certified to Level II for radiography. The dye penetrant examination is performed and evaluated by Muller, certified to Level II.

The radiographs are presently filed at the site. Radiographs were selected by the Region II inspector from the rollout drawings of the reactor containment and liquid holdup tanks and there readily obtained by Wooley. The radiographs of both reactor containment and liquid holdup tanks met the requirements of ASME Code for density, penetrameter placement and shimming. Region II inspector agrees with the interpretation of Wooley on the radiographic readout sheets.

A visual inspection of the liquid holdup tanks was made while a dye penetrant examination was being performed by Muller on the grinded area of the root pass prior to welding the outside of Tank No. 2-2, Seams 1-H-1 and 1-H-2. The application of the dye and the dwell time met the dye penetrant procedure but the cleaning in the area to be examined and the application of the developer were done improperly. The dye was not removed sufficiently from the area being examined to prevent a pinkish cast to the developer when applied. Also the developer was being applied using an aerosol can in a high wind. The inspector Muller attempted to shield the spray from the high wind with his body which resulted in his inability to observe the application of the developer which resulted in too light a coat. A PG&E inspector, J. Domino, who had no training in dye penetrant examination, was witnessing the dye penetrant examination; he was the replacement for the vacationing inspector who had been trained in dye penetrant examination.

E. Excessive Grinding of Welds on Liquid Holdup Tank

A visual inspection of the liquid holdup tanks revealed excessive grinding of the welds reinforcement before radiography. The excessive grinding resulted in the thinning of the base material on either side of the weld. Mendez stated that the area had been measured ultrasonically by the Magnaflux Corporation.

Mendez stated that the first ultrasonic technician sent to the site by Magnaflux was unable to get repeatability in his reading and Magnaflux was advised of his inability to get good data. The second visit to the site was Magnaflux's NDT Supervisor, J. Ortega, who was certified to Level III per SNT-TC-1A for ultrasonics.

A PG&E interoffice memorandum dated July 27, 1970, signed by J. T. Duffy stated that the design calculation required the minimum thickness of the bottom head be 0.110 inch, the minimum thickness of the shell be 0.206 inch, and the minimum thickness of the top head be 0.099

inch. The top and bottom head were fabricated from 3/16-inch plate and the shell from 1/4-inch plate. The Magnaflux report states that none of the areas of excessive grinding are less in thickness than that required by the design calculation. The design requirement and Magnaflux test results have been reviewed and accepted by the ASME Code Inspector, A. L. Quinn, of the Factory Mutual Insurance Company.