

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

Report of Inspection

CO Report No. 50-275/69-5

Licensee: Pacific Gas & Electric Company  
Diablo Canyon No. I  
License No. CPPR-39  
Category A

Date of Inspection: May 6-7, 1969

Date of Previous Inspection: April 30, 1969

Inspected by: W. E. Vetter 5-13-69  
W. E. Vetter  
Reactor Inspector

Reviewed by: G. S. Spencer 5/13/69  
G. S. Spencer  
Senior Reactor Inspector

Proprietary Information: None

SCOPE

Type of Facility: Pressurized Water Reactor  
Power Level: 3250 MW  
Location: San Luis Obispo, California  
Type of Inspection: Vendor Inspection  
Accompanying Personnel: G. S. Spencer (REGION V)  
W. A. Crossman (REGION II)

Scope of Inspection: The Cameron Iron Works (CIW) and the Southwest Fabricating and Welding Company (SWFWCO) facilities, both located in Houston, Texas, were visited on May 6-7, 1969. The purpose of the visits was to:

1. Review quality assurance-quality control programs maintained by CIW and SWFWCO relative to the Diablo Canyon Unit 1 reactor primary piping.
2. Review welding and radiography problem areas associated with the Palisades reactor primary piping at the request of CO: Region III.

Mr. Spencer accompanied the inspector to make a performance appraisal and to become familiar with vendor inspection activities in general. Mr. Crossman participated in the visit activities primarily for the purpose of becoming acquainted with CIW and SWFWCO QA-QC programs.

#### SUMMARY

The results of the visit indicate that adequate QC programs exist, in the case of both CIW and SWFWCO, but that essentially no formal QA programs have been provided (see Sections A and B of this report). A review of the Palisades reactor project welding and radiography problems indicates that adequate and timely resolution has taken place (see Section C. of this report).

#### DETAILS

##### A. Cameron Iron Works

The Cameron Iron Works (CIW) was visited during the morning of May 6, 1969. The visit included a tour of the pipe manufacturing portion of the plant, a sampling of QC records and a short discussion concerning QA-QC program provisions. Personnel contacted during the visit included:

Mr. J. L. Wyche - Manager, QC, CIW  
Mr. R. B. Hodgins - Supervisor, QC, CIW  
Mr. R. D. Page - QC Representative, Westinghouse  
Mr. P. E. Wecker - Senior Material Inspector, PG&E

Following the tour of the pipe manufacturing portion of the plant, Mr. Hodgins produced a QC file containing a sampling of QC records pertaining to the PG&E Diablo I reactor facility. By way of review, the inspectors "followed" one section of the Diablo I primary piping through the manufacturing process by reference to:

1. Westinghouse purchase orders
2. Mill certifications (check analyses)
3. Purchase specifications
4. Dye penetrant inspection procedures (MIL-STD-767)
5. Ultrasonic testing procedures
6. Processing instructions (code requirements)
7. Processing instructions (heat treatment)
8. Processing instructions (torchcut mults)
9. NDT results (production traveler sheets)

Based on a limited records and procedures sampling effort, it appears that the primary piping for Diablo I (now stored at SWFWCO) has been fabricated in compliance with applicable codes and in conjunction with adequate QC and production control procedures. The records established the existence of programs to assure (1) proper approval for changes in the processing programs, (2) review of NDT results and (3) final, complete review of manufacturing records by Westinghouse personnel. Shipment of the pipe to SWFWCO appears to have been consistently contingent upon Westinghouse written approval. Mr. Page said that, in addition to the review of manufacturing records (traveler sheets) and review of NDT results, he periodically reviews NDT equipment calibration results and techniques. Mr. Wecker added that his activities at CIW were similar, although not quite as intense, to those described by Mr. Page.

As a final item of discussion, Mr. Wyche described the CIW QC program and responded to several questions by the inspectors, Mr. Page and Mr. Wecker. According to Wyche, the CIW QC staff totals approximately 130 persons, headed by himself as the QC Manager. He said that in addition to a QC supervisor, the QC staff consists of 12 floor supervisors. The balance of the staff, he said, are inspectors assigned to the following QC Groups.

- a. Quality Control Procedures
- b. Measuring and Test Equipment
- c. Tool and Dye Inspection
- d. In-Process Inspection
- e. Magnetic Particle Inspection
- f. Fluorescent Penetrant Inspection
- g. Dye Penetrant Inspection
- h. Radiographic Inspection
- i. Ultrasonic Inspection
- j. Hydrostatic Testing
- k. Source Inspection
- l. Final Inspection

When questioned about the existence of a QA program to support the CIW QC program efforts, Mr. Wyche said that such a program in the formal sense of the words, was not provided. He explained that, while he was

aware of the existence of such programs elsewhere and of their potential value, he did not consider them to be necessary at CIW. A strongly emphasized Process Control Program effort, plus almost hourly contact with the QC staff by himself and/or Mr. Hodgens, Wyche said, eliminated any need for a formal QA program effort.

As a result of Mr. Wyche's comments, comments by Messrs. Page and Wecker and observations by the inspector during the visit, it appears that: (1) the CIW total QC effort includes, intrinsically without conscious programming, the basic constituents of an adequate QA program and (2) that the licensee - contractor QA efforts are reasonably consistent with acceptable practice and the criteria of PI 3300.

B. Southwest Fabricating and Welding Company (SWFWCO)

The SWFWCO was visited during the afternoon of May 6, and again on May 7, 1969. The visit included a tour of the portion of the plant used to fabricate stainless steel piping and the plant radiography facilities, a review of the plant pipe fabricating procedures, a review of the plant QC programs and discussions with the following persons.

Mr. G. L. Lockwood	- President & Chief Executive Officer, SWFWCO
Mr. C. L. Skidmore	- Vice President & General Manager, SWFWCO
Mr. R. C. Green	- Chief Engineer, SWFWCO
Mr. F. E. Sewell	- Chief Inspector & Radiologist, SWFWCO
Mr. B. A. Grahm	- Sales Administrator, SWFWCO
Mr. R. D. Page	- QA Representative, Westinghouse
Mr. P. E. Wecker	- Senior Material Inspector, PG&E
Mr. J. L. Day	- Inspection-Radiography, Bechtel Corporation
Mr. B. McDaniel	- Inspection-Radiography, Bechtel Corporation
Mr. C. Q. Hills	- Senior Engineer, Consumers Power Company

As a first order of business it was determined that, although pipe from CIW and pipe fittings from the Electric Steel Company (ESCO) Portland, Oregon, were on plant, fabrication efforts had not been started relative to the PG&E Diablo Canyon No. 1 reactor. For this reason, QC processing records other than receiving reports for the pipe and fittings, were not available for review. In the absence of such records, the inspectors reviewed records and/or documents listed below.

1. SWFWCO Quality Assurance Program

This is a nine page document delineating each of the programs and/or steps to be followed during pipe fabrication activities.

2. Weld Rod Control Procedures

This procedure was found to be consistent with standard good practice.

3. Welding Inspection Record

This record is a 15" x 24" blueprint which includes a spool piece drawing and a history of each weld performed. The weld history includes weld procedures, welder identifications, NDT performance signoff (except final X-ray signoff) material requirements, heat numbers and other information which may be considered pertinent at the discretion of QC personnel.

4. Purchase Specifications

Typical - not related to the PG&E Diablo Canyon No. I reactor.

5. Warehouse Receiving Reports

Typical - as well as related to Diablo Canyon No. I.

6. Mill Certifications

For Diablo Canyon No. I piping.

7. Radiographic Inspection Reports

SWFWCO format for internal use as well as for submittal to customers.

8. Liquid Penetrant Inspection Procedures

These procedures appeared to be adequately consistent with standard, acceptable practices.

9. Radiographic Procedures

The procedures were provided to SWFWCO by Westinghouse and are to be followed by SWFWCO during fabrication of Diablo Canyon No. I primary piping. According to Mr. Lockwood, the SWFWCO radiography procedures are more demanding (QA-wise) than any of the customer supplied procedures.

10. Weld Repair Procedures

These procedures appeared to be consistent with code requirements.

11. Welding Procedures

These procedures include detailed instructions for each of the several types of welding performed; i.e., TIG, MIG, etc.

12. Qualification Tests of Welding Procedures and Operators

These forms were noted to be conventional in appearance and to contain the usual information.

The results of the document-records review and comments by SWFWCO, Westinghouse and Bechtel personnel indicate that the SWFWCO QC program is well documented and more than adequately comprehensive. The review, and comments by Westinghouse, PG&E, Bechtel, and Consumers Power Company personnel, indicates that adequate Licensee-Contractor QA program techniques (per PI 3800 criteria) have been established and will be applied to the PG&E Diablo Canyon No. I reactor project. Specifically, Westinghouse plans to provide purchase orders, purchase specifications, fabrication instructions and inspection coverage designed to assure desired quality. Mr. Page said that he plans to look at all of the weld radiographs and to sample all of the QC records generated during the course of the project. Also, Mr. Wecker plans to make a similar, but less intensified effort.

Following a question-and-answer session concerned with the SWFWCO QC program QA provisions, which are discussed in general terms in the SWFWCO Quality Assurance Manual, the inspector stated that there appeared to be a singular lack of both verbal and written definition. Further discussion and comment by SWFWCO, PG&E, CP and Bechtel personnel led to a consensus on the part of SWFWCO people that written clarification of the QA program functions and responsibilities was needed. At the conclusion of the visit, Mr. Lockwood said that appropriate measures would be taken on a priority basis.

C. Palisades Reactor Primary Piping

At the request of CO:Region III personnel, potential problem areas relative to the Consumers Power Company (CP) Palisades reactor project were discussed with SWFWCO, Bechtel and CP representatives.

1. Primary Piping Rust Deposits

As a result of an examination of an interior weld seam on a 14 inch diameter shop fabricated "T" and elbow fitting for

the Emergency Core cooling system (ECCS) Consumers Power (CP) personnel became concerned about an apparent weld defect (see CO Report No. 50-255/68-9, Section B.). Further examination of the weld seam disclosed significant deposits of rust on the inside of the pipe...restricted to an area about 3/4 inches wide and common to the weld seam only. An investigation into the problem by CO, Bechtel and CP resulted in a conclusion on the part of CP that, although not particularly desirable, the rust deposits did not present a significant problem insofar as primary coolant contamination was concerned. At the conclusion of the investigation, all parties concerned agreed that the source of the rust was most likely one of the following:

- a. Brushes and grinding tools of improper material.
- b. Brushes and grinding tools of proper material but contaminated.
- c. Carbon steel particles in the hydrostatic test water.
- d. Although not identified as a possible source of the rust, SWFWCO stated that they planned new construction so that it would be possible to isolate the plant carbon steel and stainless steel fabrication facilities.

During the current visit, the inspectors obtained the following information relative to the rust problem.

First, CP still feels that the extent of the rust deposition is relatively insignificant and strongly rejects any program of pickling and passivation of the affected fittings.

Second, test programs at SWFWCO conducted by SWFWCO and Bechtel personnel indicate that the rust occurs as a result of moisture which precipitates out of the air inside of the pipe as a function of diurnal temperature changes. Mr. McDaniel said that he had witnessed several tests involving the sealing of "dry" pipe sections (normally done as a condition for storing finished pipe) and unsealing the sections 24 hours later. He said that, upon unsealing the pipe sections, significant quantities of water were found at the low ends of the pipe.

Third, the rust deposits appear to be directly related to the welding operation in that no other areas of rust have been found..either as a result of routine examination of finished pipe or as a result of the tests.

Fourth, no further tests or evaluations relative to the rust deposition are planned except on a possible "for interest only" basis.

## 2. Quality of Radiography

A review of radiographs associated with the weld defect identified in 1., above, led to concern on the part of CP that the SWFWCO radiography procedures may be substandard in the area of density control. Subsequent investigation revealed that film densities varied from a low of 0.9 and a high of 4.0 by reference to Eastman Kodak filmstrip density comparator (code limits are 1.7 to 2.5). Moreover, during the review of film densities, CP personnel noted two apparent weld defects which had not been previously detected. As a result of the apparent discrepancies, in film density control and additional weld defects, a Bechtel metallurgist was sent to the SWFWCO plant to review a number of radiographs. About 400 radiographs were reviewed and several questionable welds were detected. Consequently, agreement was reached that the production radiographs for the Palisades ECCS piping assembled by SWFWCO should be 100 percent reviewed. Approximately 5800 radiographs were reviewed by Bechtel personnel and 400 of these were tagged "questionable" and sent to Bechtel's San Francisco offices for further review.

On May 7, 1969, the inspectors requested a "current status" discussion session with concerned personnel. The results of the discussion session which included the following participants, are listed.

Mr. G. L. Lockwood - President, SWFWCO  
Mr. C. Q. Hills - Consumers Power Company (CP)  
Mr. B. McDaniel - Bechtel Radiologist  
Mr. J. L. Day - Bechtel Radiologist (Inspection)  
Mr. F. E. Sewell - SWFWCO Radiologist (Inspection)

- a. Of the 400 radiographs sent to San Francisco for review as suspect substandard, Bechtel confirmed that 66 of the radiographs did, indeed, exhibit substandard characteristics to some degree. The substandard indications included such items as improper penetrometer positioning as well as weld defects.
- b. Of the 66 radiographs showing possible substandard characteristics, 22 have been tagged as showing weld defects and are to be field repaired (spot repair) by Bechtel.

- c. In addition to the 22 radiographs indicating defective welds, 5 more of the 66 radiographs have anomalous indications to the extent that Bechtel has requested re-radiography. The balance of the 66 radiographs (39) as well as the remainder of the initial 400 subject to review, are considered to be well within code by San Francisco Bechtel personnel.
- d. Mr. McDaniel pointed out that essentially all of the questionable radiographs were related to 4 to 6 inch diameter thinwall (schedule 10-20) pipe and that piping of this size presents difficulty both in the area of radiography and film reading. Most of the radiographs, he said, required a maximum of "judgement" during review due to the inherent difficulties involved. Messrs. Hills, Day and Sewell agreed with McDaniel's comments.

3. Corrective Action

Corrective action, relative to each of the items discussed above, is as follows:

- a. As stated earlier, no further activities are scheduled in conjunction with the rust problem discussed in C.1., above.
- b. SWFWCO has purchased a densitometer (McBeth) which is used to determine the density of all radiographs. According to Mr. Sewell, the densitometer is calibrated several times during each day of usage by reference to an Eastman Kodak film strip density comparator.
- c. Although SWFWCO management personnel feel strongly that their radiography personnel are well qualified and that defect detection is and has been at a better-than-average level, plans have been completed to bring in "outside experts" in an effort to develop maximum capability on the part of the SWFWCO NDT staff. Mr. Green said that the outside experts are persons employed in a full time capacity as radiography instructors.