

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275/82-36
Docket No. 50-275 License No. DPR-76 Safeguards Group _____
Licensee: Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94106
Facility Name: Diablo Canyon Unit 1
Inspection at: Diablo Canyon Site, San Luis Obispo County, California
Inspection conducted: October 3, 1982 through October 30, 1982

Inspectors: *D. F. Kirsch* 11/19/82
for J. D. Carlson, Sr. Resident Reactor Inspector Date Signed
M. M. Mendonca 11/19/82
for M. M. Mendonca, Resident Reactor Inspector Date Signed
Approved by: *D. F. Kirsch* 11/19/82
D. F. Kirsch, Chief, Reactor Projects Section No. 3 Date Signed

Summary:

Inspection on October 3 through October 30, 1982 (Report No. 50-275/82-36)

Areas Inspected: Routine inspections of plant operations, surveillance testing, physical security, maintenance, TMI Task Action Plan Items, emergency drill, interface with offsite emergency response organization, and design changes and modifications. The inspection involved 151 inspector-hours by two NRC Resident Inspectors.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

- *R. C. Thornberry, Plant Manager
- *R. Patterson, Plant Superintendent
- *J. M. Gisclon, Power Plant Engineer
- *D. A. Backens, Supervisor of Maintenance
- *J. A. Sexton, Supervisor of Operations
- J. V. Boots, Supervisor of Chemistry and Radiation Protection
- W. B. Kaefer, Technical Assistant to the Plant Manager
- R. G. Todaro, Security Supervisor
- *R. T. Twiddy, Supervisor of Quality Assurance
- *R. C. Howe, Regulatory Compliance Engineer

The inspectors also interviewed a number of other licensee employees including shift supervisors, reactor and auxiliary operators, maintenance personnel, plant technicians and engineers, quality assurance personnel and members of General Construction.

*Denotes those attending the exit interview on October 29, 1982.

2. Operational Safety Verification

During the inspection period, the inspectors observed and examined activities to verify the operational safety of the licensee's facility. The observations and examinations of those activities were conducted on a daily, weekly, or monthly basis.

On a daily basis, the inspectors observed control room activities to verify compliance with limiting conditions for operation as prescribed in the facility Technical Specifications. Logs, instrumentation, recorder traces, and other operational records were examined to obtain information on plant conditions, trends, and compliance with regulations. Shift turnovers were observed on a sample basis to verify that all pertinent information on plant status was relayed.

During each week, the inspectors toured the accessible areas of the facility to observe the following:

- a. General plant and equipment conditions.
- b. Maintenance activities and repairs.
- c. Fire hazards and fire fighting equipment.
- d. Ignition sources and flammable material control.
- e. Conduct of selected activities for compliance with the licensee's administrative controls and approved procedures.

- f. Interiors of electrical and control panels.
- g. Implementation of the licensee's physical security plan.
- h. Plant housekeeping and cleanliness.

The inspectors talked with operators in the control room, and other plant personnel. The discussions centered on pertinent topics related to general plant conditions, procedures, security training, and the applicable work activities involved.

A nonconformance report was examined which documented a leaking relief valve on the backup nitrogen accumulator for the power operated relief valve. The inspectors confirmed that the deficiency was appropriately identified and tracked, by the licensee's system, to the completion of corrective action.

No items of noncompliance or deviations were identified.

3. Maintenance

Maintenance activities on various Engineered Safety Features valves were reviewed by the inspectors during the month. The inspectors verified that proper approvals, system clearances and tests on redundant equipment were performed, as appropriate, prior to conducting maintenance on safety-related systems or components. The maintenance activities were performed by qualified personnel using appropriate maintenance procedures. Replacement parts were examined to verify proper certification of materials, workmanship and tests. During the actual performance of maintenance activities, the inspectors verified the implementation of proper fire protection controls and housekeeping. Upon completion of the maintenance activity, the valves were tested prior to returning the system or component to service.

No items of noncompliance or deviations were identified.

4. Surveillance

Surveillance testing activities on the control room isolation system chlorine detectors were examined by the inspectors. These examinations included verification that proper procedures were used, test instrumentation was calibrated and that the system or component being tested was properly removed from service, if required by the test procedure. Following completion of the surveillance tests, the inspectors verified that the test results complied with Technical Specification acceptance criteria and were reviewed by the cognizant licensee personnel. The inspectors also verified that corrective action was initiated, if required, to determine the cause for any unacceptable test results and that the system or component was restored to operable status consistent with technical specification requirements.

5. Emergency Preparedness - Drill Observation

The inspectors witnessed an emergency drill on October 20, 1982. The inspectors observed the drill conduct, emergency facility manning and capabilities, use of emergency procedures, emergency classification techniques, emergency mitigation activities, and protective measures for site personnel and the public.

At one point in the drill scenario, the feasibility of pressure reduction using the pressurizer power operated relief valves was discussed. This evolution was necessary to reduce pressure in order to inject the accumulator volume into the RCS. The licensee concluded that approved guidelines appropriate to the drill conditions did not exist (for example, low reactor vessel water level and high core temperatures) and that an analysis would be needed to establish such guidelines. The licensee committed to prepare such guidelines. This item will be examined during a future inspection (82-36-01).

No items of noncompliance or deviations were identified.

6. Emergency Preparedness - Coordination with Offsite Agency

The inspectors observed the interaction of the licensee with the California Department of Forestry (CDF) while combating a grass fire around the plant site during October 16-19, 1982. The inspectors attended a critique of this event, between CDF and licensee personnel, on October 22, 1982. The inspectors found that the fire response actions, by CDF and the licensee, demonstrated timely communications, acceptable personnel actions and training, and generally good cooperation between CDF and the licensee. Items needing improvement were identified and are being acceptably addressed.

No items of noncompliance or deviations were identified.

7. Design Changes and Modifications

Work activities on the incore thermocouple system and containment annulus structural steel were observed. The activities were conducted in accordance with specification and drawing requirements. Control of tools, fire prevention and welding activities appeared appropriate.

No items of noncompliance or deviations were identified.

8. TMI Task Action Plan Items

Item III.D.1.1: Primary Coolant Sources Outside Containment

The inspector reviewed test results and leakage reduction measures for the Hydrogen Purge/External Recombiner System and the Containment Spray System. Test results for the Gaseous Radwaste System and the NSSS Sampling System will be examined during a future inspection.

No items of noncompliance or deviations were identified.

9. Exit Interview

The inspectors met with licensee representatives, denoted in paragraph 1, on October 29, 1982, and discussed the scope and findings of the inspection.

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JAN 10 1983

Docket No. 50-275

Pacific Gas and Electric Company
 P. O. Box 7442
 San Francisco, California 94106

Attention: Mr. Philip A. Crane, Jr.
 Assistant General Counsel

Gentlemen:

This refers to the special announced inspection conducted by Messrs. P. J. Morrill, A. D. Johnson, and M. M. Mendonca of this office during the period December 8-23, 1982, of activities authorized by NRC License No. DPR-76. Mr. Morrill and Mr. Johnson of our staff discussed our findings with Mr. J. Hoch and other personnel of your staff on December 23, 1982.

Areas examined during this inspection relate to the procurement and use of Midland-Ross "Super-Strut" material. The inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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OFFICE	RV/jk	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>		
SURNAME	MORRILL	JOHNSON	MENDONCA	KIRSCH	BISHOP		
DATE	1/6/83	1/6/83	1/6/83	1/6/83	1/7/83		

JAN 10 1983

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,



T. W. Bishop, Chief
Reactor Project Branch No. 2

Enclosure:
Inspection Report
No. 50-275/82-41
50-323/82-19

cc w/o enclosure:
J. L. Schuyler, PG&E
J. D. Shiffer, PG&E
W. A. Raymond, PG&E

cc w/enclosure:
R. C. Thornberry, PG&E (Diablo Canyon)

bcc: RSB/Document Control Desk (RIDS)

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Resident Inspector
Project Inspector

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275/82-41, 50-323/82-19

Docket Nos. 50-275, 50-323 License No. DPR-76

Licensee: Pacific Gas and Electric Company

P. O. Box 7442

San Francisco, California 94120

Facility Name: Diablo Canyon Nuclear Power Plant

Inspection Locations and Dates: (1) Pacific Gas and Electric Company
San Francisco, California
December 8-23, 1982

(2) Diablo Canyon Power Plant
San Luis Obispo, California
December 8-9, 1982

Report by:	<u>P. J. Morrill</u> P. J. Morrill, Reactor Inspector	<u>1/6/83</u> Date Signed
	<u>A. D. Johnson</u> A. D. Johnson, Enforcement Officer	<u>1/6/83</u> Date Signed
	<u>P. J. Mendonca</u> M. M. Mendonca, Resident Inspector	<u>1/6/83</u> Date Signed
Approved by:	<u>D. F. Kirsch</u> D. F. Kirsch, Chief, Reactor Projects Section No. 3	<u>1/6/83</u> Date Signed

Summary:

Inspection during period of December 8-23, 1982 (Report No. 50-275/82-41 and 50-323/82-19)

This special announced inspection was conducted to examine the licensee design and procurement requirements for "Super Strut" material as installed for Class 1E raceway supports. The inspection effort involved 54 inspector-hours by three NRC inspectors.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Pacific Gas and Electric Company (PG&E)

J. Hoch, Project Manager
D. Rockwell, Assistant Construction Superintendent
M. Jacobson, Project Quality Assurance Engineer
E. Vahler, Project Quality Engineer
W. Valstrom, Project Electrical Engineer
T. DeUriarte, Corporate Quality Assurance Engineer
B. Lu, Project Licensing Engineer
G. Wu, Licensing Engineer
M. Tresler, Project, Piping Group Leader

Bechtel Power Corporation (B)

D. Hardie, Assistant Project Engineer for Quality
F. Morsy, Project, Civil Engineering Group Leader
M. Yan, Project, Civil Engineer

Foley Electrical Contractors (Foley)

V. Tennyson, Quality Control Manager

The inspectors also discussed material described in this report with other engineering personnel employed by the organizations listed above.

2. Introduction

As a consequence of allegations regarding quality of welding and materials, the Region IV Vendor Program Branch (VPB) conducted an inspection of the Midland-Ross "Super Strut" manufacturing facility during the period December 6-8, 1982. The Region IV inspector described his findings to members of the Region V staff at the end of his inspection. These findings indicated that materials supplied by "Super Strut" may have been inadequate for use in Class I structures. The VPB inspector also informed the Region V staff that the "Super Strut" material manufactured at the Oakland facility had been used at nuclear plants in Region V, including Arizona Public Service' Palo Verde, Pacific Gas and Electric's Diablo Canyon, and Washington Public Power Supply System's WNP-1 and 4 plants. The VPB inspector explained that in the case of the Diablo Canyon Plant, the "Super Strut" material was purchased through Foley Electrical Contractors as commercial grade material. In the case of the material purchased for WNP-1 and 4 some testing of the spot welds had been incorporated into the contract and, reportedly, some testing of the Super Strut material had been done for the Palo Verde plants.

3. Region V Examination

(a) Purpose and Scope

This Special Inspection was conducted to determine (1) the quantity of "Super Strut" material used at Diablo Canyon (2) the facts surrounding the use of this material by the licensee, and (3) licensee compliance to the regulatory commitments and requirements relevant to the use of this "Super Strut" material.

(b) Methods of Inspection

The inspectors assigned to this task discussed the information described in 2. above with members of NRR staff as well as the licensee's staff (see paragraph 1). In addition to these discussions the inspectors examined the following documents:

- (1) PG&E Contract No. 22-C-8802-2, "Contract for Performance of Work - Installation of wiring, small electrical equipment and installation (Phase B) at Company's Diablo Canyon Power Plant, Units 1 and 2, located near Avila Beach, San Luis Obispo County, California" executed February 24, 1972.
- (2) PG&E Specification No. 8802, "Specification for Installing Wiring, Small Electrical Equipment and Instrumentation (Phase B), Unit 1 - Diablo Canyon Site (optionally for Unit 2)" original dated May 28, 1971.
- (3) PG&E Drawing 050029, Rev. 41 (299 pages) "Notes, Symbols and Typical Details for Raceways and Wire - Diablo Canyon Unit 1 and 2."
- (4) PG&E Drawing 050030, Rev. 30, (639 pages) "Notes, Symbols and Typical Details for Design Class 1E Electrical Raceway Supports - Diablo Canyon Units 1 and 2."
- (5) PG&E letter, Herbst to Hersey, dated June 17, 1971 discussing the issuance and use of PG&E drawing 050030 relative to the PG&E/Foley Contract.
- (6) Foley Electrical Purchase Orders:
 - 21075-Y-573-15, dated March 19, 1976 with Electric Supply of Vallejo
 - 040279-Y-576-15, dated February 20, 1980 with AMFAC Electrical Supply (AMFAC)
 - 21045-Y-573-15, dated March 8, 1976 with Electric Supply of Vallejo
 - 020013-Y-576-15, dated December 3, 1979 with AMFAC

028680-Y-576-15, dated August 31, 1979 with AMFAC
21764-Y-573-15, dated March 24, 1977 with AMFAC
028230-Y-576-15, dated March 13, 1978 with AMFAC
21773-Y-573-15, dated March 29, 1977 with AMFAC
040506-Y-576-15, dated March 20, 1980 with AMFAC
029832-Y-576-15, dated January 24, 1978 with AMFAC

- (7) Foley Engineering Disposition Requests 8670 dated May 28, 1980 and 7654 dated February 17, 1978.
- (8) Foley "Procedure for Inspecting in the Grid" GI-1 Rev. 2 Unit 1 and 2, dated September 29, 1978.
- (9) Foley "Support Reverification Program" dated December 21, 1981.
- (10) Unistrut Corporation "General Engineering Catalog Number 9".
- (11) Super Strut "Engineering Catalog Number 3".
- (12) Diablo Canyon FSAR, Sections 3.2, 3.10, 8.1, 8.3, and 17.0.
- (13) IE Information Notice No. 79-14 dated June 11, 1979, "Safety Classification of Electrical Cable Support Systems."

(c) Inspection Results

The inspectors determined that the "Super Strut" materials were widely used in the Diablo Canyon project in approximately 11,000 out of approximately 24,000 supports in the plant. The material consisting of brackets and struts (raceway supports) was used to support cable trays, conduits, tubing, and instrumentation for both Class 1 and non-Class 1 equipment.

Representatives of the licensee's Civil Engineering group stated that the supplier's engineering data had been used for design purposes. They also stated that for design purposes back to back strut material, spot welded together, was assumed to act as a composite member and not as two independent struts. If no credit were taken for the spot welds, the licensee's engineers stated that they could not predict the reduction in capacity to carry loads without looking at each support on a case-by-case basis. They also stated that the raceway supports were being evaluated with new (more stringent) criteria as a consequence of the Independent Design Verification Program (IDVP).

The licensee's construction personnel stated that no QA requirements were prescribed for the purchase of this material, but that the design and installation of the class 1 raceway and instrument supports was subject to PG&E's QA program. The inspectors were also informed that although many audits of Foley by PG&E had been conducted, neither PG&E nor Foley had conducted audits of Midland-Ross facilities. The PG&E Materials Department had listed the Midland-Ross (Super Strut) Oakland facility as a qualified supplier for commercial grade material, based on past experience with this supplier.

The licensee's engineering personnel stated that the "Super Strut" material was purchased as commercial grade, off-the-shelf material and that design, installation and on-site inspection were to class 1 quality standards. The inspectors observed that "Super Strut" and/or "Unistrut" were specified on PG&E's design drawings for raceway supports as well as in the PG&E contract specification with Foley. In the purchase orders, Foley identified that the "Super Strut" material was for Class 1 use and required "Certificates of Compliance" to purchase order requirements as well as mill certifications (where appropriate) from Midland-Ross.

In addition to the "certificates of compliance" and mill certifications furnished by Midland-Ross the inspectors observed that the Super Strut material had been receipt inspected by Foley for overage, shortage, damage, and conformance to the purchase order(s). A licensee General Construction representative stated that prior to 1978 Foley completed raceway inspection sheets for all class I raceway supports. In 1978 the "Grid Inspection Program" was implemented which reinspected 100% of the Class 1 raceway supports to identify and correct deficiencies and to update the Master Hanger list. Reportedly, since October of 1981 on-site Quality Control (QC) had examined approximately 8000 raceway supports for the IDVP and it was expected that an additional 6000 to 8000 will be examined as a result of modifications. Although none of these examinations or inspections have looked specifically at the welding done by Midland-Ross, they have directed licensee inspectors to verify configuration, location, bolting, and general adequacy of construction.

Discussions with PG&E personnel, and NRC staff members as well as an examination of the Diablo Canyon FSAR indicated that no specific quality assurance requirements for the purchase of raceway supports had been prescribed. The inspector did observe that IE Information Notice 79-14, dated June 11, 1979, states that the seismic category 1 supports "should be designed to withstand the SSE and remain functional" and that "the pertinent quality assurance requirements of Appendix B to 10 CFR 50 should be applied...." The licensee is therefore responsible to determine and impose the "pertinent quality assurance requirement of Appendix B," as appropriate. Licensee representatives stated that this notice had been distributed to responsible engineering and operations personnel.

The inspector also was informed via discussions with other NRC staff members that Bechtel had submitted a report, describing testing of raceway supports, done by ANCO, "Cable Tray and Conduit Raceway Seismic Test Program, Report No. 1053-21.1 Volumes 1 through 4." The tests were done in 1978 and the results were submitted by Bechtel on the Calloway, Grand Gulf, and Palo Verde dockets to justify dampening factors other than those specified in Regulatory Guide 1.61. The report documented the testing of a multi-span cable tray system with supports and cables. The support materials were of the Super Strut, Unistrut, and/or Power Strut types, all of which appear to be interchangeable.

The subject of "Super Strut" use at Diablo Canyon will be further examined following the additional actions discussed in paragraphs 4. and 5. below.

4. Additional NRC Actions

In addition to an examination into the use of "Super Strut" at Diablo Canyon the NRC staff has initiated action to review the engineering acceptability of this product in Class IE electrical systems at Diablo Canyon and other nuclear power plants. This review will include consideration of the acceptability of commercial grade, off-the-shelf materials for Class IE supports and the extent of special process (welding) control required for shop welding of support components. Results of this review will be reported separately.

5. Exit Meeting

The inspectors met with licensee representatives on December 23, 1982 to describe the scope and findings of this inspection. Licensee personnel committed to conduct an evaluation to determine the adequacy of the "Super Strut" commercial grade material for its intended use and take whatever corrective action was appropriate to assure the functional adequacy of the installed materials at the Diablo Canyon Nuclear Power Plant. Subsequently, on December 30, 1982, licensee representatives informed the inspector that by January 28, 1983 PG&E personnel would identify discrete tasks to resolve this matter (Followup Item No. 50-275/82-41-01).

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JAN 10 1983

Docket No. 50-275

Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94106

Attention: Mr. Phillip A. Crane Jr.
Assistant General Counsel

Gentlemen:

This refers to the routine, monthly inspection conducted by Messrs. J. D. Carlson and M. M. Mendonca of this office, during the period of December 5, 1982 through January 1, 1983, and the inspection effort of Mr. P. J. Morrill of this office on December 2, 1982 at your corporate offices, of activities authorized by NRC License No. DPR-76, and to the discussions of our findings held by Messrs. Carlson and Mendonca with Mr. Thornberry and other members of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained herein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

Should you have any questions about this inspection, we will be glad to discuss them with you.

Sincerely,

cc w/enclosure:
R. C. Thornberry, PG&E (Diablo Canyon)

(Signature)
T. W. Bishop, Chief
Reactor Projects Branch No. 2

Enclosure:
NRC Inspection Report
No. 50-275/82-42
cc w/o enclosure:
J. L. Schuyler, PG&E
J. D. Shiffer, PG&E
W. S. Raymond, PG&E

bcc: RSB/Document Control Desk (RIDS)
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Sandra Silver (Report only)
Resident Inspector
State of CA

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SURNAME	CARLSON	MENDONCA	MORRILL	KIRSCH	BISHOP		
	1/14/83	1/14/83	1/14/83	1/14/83	1/14/83		

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U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No: 50-275/82-42

Docket No. 50-275 License No. DPR-76 Safeguards Group _____

Licensee: Pacific Gas and Electric Company

P. O. Box 7442

San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 and 2

Inspection at: Diablo Canyon Site, San Luis Obispo County, California

Inspection conducted: December 2, 1982 through January 1, 1983

Inspectors: P. J. Morrill Jr 1-14-83
J. D. Carlson, Sr., Resident Inspector Date Signed

P. J. Morrill Jr 1-14-83
M. M. Mendonca, Resident Inspector Date Signed

P. J. Morrill 1-14-83
P. J. Morrill, Reactor Inspector Date Signed

Approved by: P. J. Morrill Jr 1-14-83
D. F. Kirsch, Chief, Reactor Projects Section No. 3 Date Signed

Summary:

Inspection from December 2, 1982 through January 1, 1983 (Report No. 50-275/82-42)

Areas Inspected: Routine inspections of plant operations, surveillance testing, physical security, follow-up of allegations regarding the RHR system, maintenance, the licensee's audit program and emergency preparedness activities. The inspection involved 128 inspector-hours by three NRC inspectors.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

a. Site

- *R. C. Thornberry, Plant Manager
- *R. Patterson, Plant Superintendent
- *J. M. Gisclon, Power Plant Engineer
- D. A. Backens, Supervisor of Maintenance
- *J. A. Sexton, Supervisor of Operations
- *J. V. Boots, Supervisor of Chemistry and Radiation Protection
- *W. B. Kaefer, Technical Assistant to the Plant Manager
- *R. G. Todaro, Security Supervisor
- *R. T. Twiddy, Supervisor of Quality Assurance
- *R. M. Lockett, Interim Regulatory Compliance Engineer

b. Corporate

- **J. O. Schuyler, Vice President Nuclear Power Generation
- **W. A. Raymond, Manager Quality Assurance
- **T. G. de Uriarte, Senior Engineer (Audits)
- F. J. Dan, Supervisor Electrical Engineer
- R. Otto, Electrical Engineer
- T. Crawford, Senior Mechanical Engineer
- J. McCracken, Senior Mechanical Engineer
- G. C. Wu, Licensing Engineer

The inspectors also interviewed a number of other licensee employees including shift supervisors, reactor and auxiliary operators, maintenance personnel, plant technicians and engineers, quality assurance personnel and members of General Construction.

*Denotes those attending the exit interview of January 7, 1983.

**Denotes those attending the exit interview of December 14, 1982.

2. Operational Safety Verification

During the inspection period, the inspectors observed and examined activities to verify the operational safety of the licensee's facility. The observations and examinations of those activities were conducted on a daily, weekly or monthly basis.

On a daily basis, the inspectors observed control room activities to verify compliance with limiting conditions for operation as prescribed in the facility Technical Specifications. Logs, instrumentation, recorder traces, and other operational records were examined to obtain information on plant conditions, trends, and compliance with regulations. Shift turnovers were observed on a sample basis to verify that all pertinent information on plant status was relayed.

During each week, the inspectors toured the accessible areas of the facility to observe the following:

- a. General plant and equipment conditions.
- b. Maintenance activities and repairs (See Section 3).
- c. Fire hazards and fire fighting equipment.
- d. Ignition sources and flammable material control.
- e. Conduct of selective activities for compliance with the licensee's administrative controls and approved procedures.
- f. Interiors of electrical and control panels.
- g. Implementation of selected portions of the licensee's physical security plan.
- h. Plant housekeeping and cleanliness.

The inspectors talked with operators in the control room, and other plant personnel. The discussions centered on pertinent topics of general plant conditions, procedures, security, training, and other aspects of the involved work activities.

No items of noncompliance or deviation were identified.

3- Maintenance

Maintenance activities on a safety injection accumulator isolation valve motor and a rod drive power supply motor-generator set were reviewed by the inspectors during the month. Observations by the inspectors verified that proper approvals were obtained and system clearance and tests of redundant equipment were performed, as appropriate, prior to conducting maintenance on safety related systems or components. The inspectors verified that qualified personnel performed the maintenance and used appropriate maintenance procedures. Replacement parts were examined to determine the proper certification of materials, workmanship and tests. During the actual performance of maintenance activities, the inspectors verified proper fire protection controls and housekeeping. Upon completion of the maintenance activity, the component was tested prior to return to service.

No items of noncompliance or deviation were identified.

4. Surveillance

Surveillance testing on 4 KV relays and contacts, and atmospheric steam dump instrument loops were reviewed by the inspectors. Observations by the inspectors including verification that proper procedures were used, test instrumentation was calibrated, and that the tested system or component was properly removed from service as required by the test procedure. Upon completion of the surveillance tests, the inspectors verified that the test results met the acceptance criteria of the Technical Specifications and were reviewed by the cognizant licensee personnel. The inspectors also verified that corrective action was initiated, if required, to determine the cause for any unacceptable test results and to restore the system or component to an operable status consistent with the technical specification requirements.

No items of noncompliance or deviations were identified.

5. Emergency Preparedness

The inspectors reviewed and observed an emergency drill by a plant fire brigade and industrial safety and fire protection training.

No items of noncompliance or deviations were identified.

6. Audit Program and Implementation

The inspector reviewed the licensee's audit program and implementation thereof to determine if the program conformed to ANSI N-18-7-1976 and ANSI N 45.2.12-1977. In addition, the inspectors verified that auditor qualifications were consistent with ANSI N 45.2.23-1978.

The following procedure manuals that describe the licensee's Audit Program were reviewed:

a. Quality Assurance Manual for Nuclear Power Plants

- (1) Section SVIII - Audits
- (2) Section SVI - Corrective Action
- (3) Procedure 10.1 - Nonconformance and Corrective Actions
- (4) Procedure 11.1 - Audits Performed by Company Departments
- (5) Procedure 11.1, Supp. 1 - Open Items Report

b. Nuclear Power Generation Manual - Quality Assurance

- (1) Procedure 1.1 - QA Department Program and Organization
- (2) Procedure 2.2 - Training and Indoctrination
- (3) Procedure 15.1 - Nonconformance Reports
- (4) Procedure 16.1 - Open Item Reports
- (5) Procedure 17.1 - Auditor Qualifications
- (6) Procedure 18.2 - QA Audits
- (7) Procedure 18.6 - Planning/Scheduling of Audits

c. Quality Auditor Handbook

Based upon the review of the above noted procedures, the inspectors determined that the licensee's QA Audit Program conforms to the criteria of ANSI N 18.7-1976 and ANSI N 45.2.12-1977.

The inspectors reviewed the licensee's auditor qualification program, tests, and records to ensure audits were being conducted by properly qualified auditors. The inspectors determined the licensee's auditor qualifications were consistent with ANSI N 45.2.23-1978.

Next, the inspectors reviewed the following audit reports to determine if audit plans, checklists, findings and corrective action followups were being performed properly:

- a. Audit #12300 - "Criterion XVIII - Audits"
- b. Audit #20400 - "Criterion XV - Nonconformances and Criterion XVI - Corrective Action"
- c. Audit #20416 - "Criterion XV and XVI"
- d. Audit #20500 - "Fire Protection"
- e. Audit #21011 - "Status of Open OIR's"
- f. Audit #20919 - "Technical Specifications"
- g. Audit #21111 - "Containment Annulus Steel"

The inspectors determined that the audits were being conducted properly using the prescribed audit plans and checklists; however, tracking of "Open Items" was weak in that audited organizations were not responding to adverse audit findings in accordance with the criteria of Section 4.5 of ANSI N 45.2.12-1977. Specifically, estimated completion dates (ECD) were being exceeded with no new (ECD's) being established. Additionally, the audit findings were being tracked using the licensee's "Commitment Control System" that assigns a noncontrolling priority to all adverse audit findings. The inspectors identified to management that some of the findings would have resulted in technical specification violations if fuel loading had commenced without correction of the identified problems from audit findings. During the exit interview, the licensee committed to having revised ECD's for all outstanding Open Item Reports by February 1, 1983, and prioritizing all outstanding Open Item Reports by February 28, 1983 (82-42.01).

No items of noncompliance or deviations were identified.

7. Review of Stone and Webster Construction Audit

As part of the Independent Design Verification Program (IDVP), Stone and Webster Engineering Corporation (SWEC) was tasked with the evaluation of the construction quality assurance program at Diablo Canyon under the auspices of Teledyne Engineering Service (TES). The inspectors reviewed the following documents and discussed the audit with PG&E representatives to determine how open item reports were being generated and dispositioned.

- a. Adjunct Program for Evaluation of Construction Quality Assurance - Rev. 1 dated 10/1/82 (TES document).
- b. Construction Quality Assurance Evaluation (SWEC Project Procedure 4-2-1 dated 10/22/82).
- c. Diablo Canyon Verification Program (DCVP) Procedure #1 - Interface with Consultants.
- d. DCVP Procedure #2 - Program Resolution Reports.

The inspectors determined the scope of the audit was to evaluate the as-built quality of two contractors: 1) Guy F. Atkinson Co. - Containment Building Contractor, and 2) Wismer and Becker Co. - installation of NSSS piping. The above noted procedures described the auditing process to be used and handling of audit findings. The inspectors have reviewed the program for familiarization. At the present time, the SWEC onsite audit team has

completed the as-built audit and has generated twenty-nine Open Item Reports (OIR). So far, the licensee has dispositioned eighteen of the OIR's. The inspectors will complete the review in this area when the remainder of the OIR's are dispositioned (82-42-02).

No items of noncompliance or deviations were identified.

8. Open Items Followup

Plant Administrative procedures C451 and D756 have been prepared to assure reinstatement of Environmental Qualification conditions after maintenance or surveillance testing. This closes open items 80-16-01 and TI-15-41.

9. Allegations Regarding the Diablo Canyon Residual Heat Removal System

On December 2, 1982 the inspector met with licensee representatives to discuss allegations regarding the Diablo Canyon residual heat removal (RHR) system. These allegations had also previously been examined at the jobsite and documented in Region V inspection reports 50-275/82-26 and 50-323/82-13. The following paragraphs paraphrase the allegations, summarize the inspection, and state the findings of the inspector.

- (a) Allegedly there were no control and interlock circuit drawings for motor operated valves 8701 and 8702 (RHR hot leg suction isolation valves). The inspector examined PG&E drawings 437592 "Residual Heat Removal Flow Control Valves", and 103058 "Circuit Schedule 480 Volt for Busses F, G, H" circuits H19P00 through H19P12 and G25P00 through G25P13. The inspector observed that these drawings describe the power, control, and interlock circuits for the subject valves. The allegation was not substantiated.
- (b) Allegedly no one knew how these circuits were routed in the plant. Licensee project engineering personnel stated that in addition to the drawings described above, the raceway schedule depicts circuits in a particular conduit, the conduit drawings show conduit locations in the plant, and the circuit schedule itemizes the pull data for each wire in the plant. They also stated that the drawings and schedules were available to the plant staff through the site document control center if this material was not available in the control room. The inspector had previously verified that this type of documentation was properly controlled and readily available to the plant staff. This allegation was not substantiated.
- (c) It was alleged that the design was no good in that the control/interlock circuits are routed from the "hagen" racks via the solid state protection system to the relays which shut the valves. Licensee engineers explained that this was a standard Westinghouse design and that the "hagen" racks took low level analogue signals and (in this case) used bistables to

- generate signals in the milliamp range. The solid state protection system completes the logic function and generates a larger output signal (amps.) which in turn actuates relays in the auxiliary logic cabinet. They explained that they were not in a position to change this arrangement (since it is a Westinghouse design) and that they were unaware of any problems with this arrangement. The inspector examined the location of the components of the RHR isolation valve control and interlock circuits to verify the licensee's statements. The allegation was substantiated to the extent that the circuits were as alleged, however there was no apparent deviation from regulatory requirements or safety criteria.
- (d) It was alleged that a design change request (DCR) submitted about February 1981 to get "rid of that system" (i.e. RHR hot leg suction isolation interlocks) has never been acted upon by PG&E. The inspector verified that there were no outstanding DCRs on PG&E drawing 437592 (which depicts the system in question) and that none were originated from or arrived at the Diablo Canyon project. The site Resident Inspectors verified that no DCRs were outstanding for this drawing at the jobsite. This allegation could not be substantiated.
- (e) It was alleged that the FSAR, Chapter 5, paragraph 5.7, pages 37b and 38 as well as Chapter 7, paragraph 6.2, pages 3 and 4 describe the automatic high pressure/high temperature isolation of the RHR system from the reactor coolant system, and that this is inconsistent with the technical specifications section 3.4.9.3 which requires AC to be removed from the associated valves (8701 and 8702) thereby disabling the automatic isolation features. Therefore the FSAR should be amended. Licensee representatives showed the inspector Table 6.3-10 of the FSAR which shows that the valves are to be shut and racked out at power and open and racked out during shutdown cooling mode. This is in accordance with NRC direction. The licensee representatives also stated that the entire FSAR would be updated (with inconsistencies removed) in September 1983 in accordance with 10 CFR 50. The allegation was partially substantiated, but no safety problem or noncompliance with regulatory requirements was identified.
- (f) The allegor stated that the FSAR section 3.1.3 states that spurious closure of normally open/fail open valves is not considered as either a passive or active failure and is not analyzed for at all which is a problem. Licensee engineers explained that there were no reasonable failure modes which would cause normally open/fail open or normally closed/fail closed valves to change state. The only possibility they could imagine was a "copper octopus" which caused selective shorting. This issue had been dealt with in the Fire Protection Review and was one reason that certain valve circuit breakers were racked out after the valve was placed in the desired position. As far as control circuits are concerned, any short with 120 volts or higher would cause the logic circuits to go to a fail safe condition due to the overwhelming signal strength (normal signals are 4 to 20 milliamps). The allegation could not be substantiated.

- (g) It was alleged that there was no low flow alarm for the RHR system and that there should be one. The inspector verified that an RHR pump trip is annunciated, that shut RHR suction valves are indicated, and that the subcooling meter was available to ensure adequate core cooling. Licensee representatives pointed out that the RHR pumps have a miniflow recirculation to maintain some flow, and that the monitor light box indicates valves or circuits in the incorrect state. The inspector concluded that the allegation was correct in that there was no "low flow" alarm, but also concluded that there appeared to be no requirement or necessity to have one.
- (h) It was alleged that an RHR pump ran without flow for 5 minutes in September 1981, and that this event was not reported as required by administrative procedure C-12 and 10 CFR 50.72. The site resident inspector verified that a Nuclear Plant Problem Report (DCI-81-OP P1057) and the associated corrective action was completed. The allegation was not substantiated.
- (i) It was alleged that the RHR hot leg suction does not meet the single failure criteria for function (suction from reactor coolant system hot leg), that newer plants had this feature, and that this portion of the system should be redundant to meet 10 CFR 50 Appendix A Design Criteria. The inspector verified that this function was not safety related in the Diablo Canyon plant design by examining the FSAR. The inspector observed that the suction from the containment sump and from the refueling water storage tank were both safety related and arranged to meet regulatory requirements for redundancy. The inspector also observed that some other plants did have two RHR suction lines but that these plants used a different nuclear steam supply system vendor. The inspector concluded that the allegation was correct in that the RHR suction line was redundant only for the purpose of reactor coolant system isolation, but that there was no apparent safety problem or deviation from regulatory requirements associated with this design.
- (j) It was alleged that nuclear plant problem reports (NPPR) were not getting management review which is a violation of administrative procedure C-12 and that NPPR DC 1-81-OP P1057 had been signed off after this shortcoming was identified to management. Other NPPRs should be examined. The Resident Inspectors observed that other NPPRs were being given appropriate management review and resolution. The allegation was not substantiated.
- (k) It was alleged that NPPRs DCO 79 TI P0006 and 79 TI P0117 are still open after three years and should be closed. The Resident Inspectors observed that response to NPPR P0006 was complete and that response to P0117 was underway. The allegation was substantiated, but no particular safety or regulatory significance could be attached to this situation.
- (l) It was alleged that a change to the Plant Manual Volume 16, reactor coolant pump "lo oil level" alarm should have been changed to "lo-hi oil level" but had not been corrected eight months after the correction had been submitted. The Resident Inspectors identified this allegation to the licensee. The licensee initiated a NPPR (DCI-83-TN-P0001) and the problem is to be resolved. The licensee personnel that were interviewed, were not previously aware of this problem. The allegation was substantiated.

The inspector concluded that the allegations were partially correct but that these had no apparent safety significance or deviations from regulatory requirements.

10. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) and discussed the scope and findings of the inspection.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V

1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

Staff Exhibit 44
NRC Inspection Report: 50-275/83-14
50-323/83-11

MAY 11 1983

TE HQ FILE COPY

Docket Nos. ✓ 50-275
50-323

Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

Attention: Mr. Philip A. Crane Jr.
Assistant General Counsel

Gentlemen:

This refers to the routine, announced inspection conducted by Mr. P. J. Morrill of this office, on March 1, 2 and 31, 1983, of activities authorized by NRC License No. DPR-76 and Construction Permit No. CPPR-69, and to the discussions of our findings held by Mr. Morrill with Mr. Kelmenson and other members of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained herein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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Pacific Gas and Electric Company

- 2 -

MAY 11 1983

Should you have any questions about this inspection, we will be glad to discuss them with you.

Sincerely,

/s/

T. W. Bishop, Chief
Reactor Projects Branch No.2

Enclosure:
NRC Inspection Report
Nos. 50-275/83-14
50-323/83-11

cc w/o enclosure:
J. L. Schuyler, PG&E
J. D. Shiffer, PG&E
W. S. Raymond, PG&E

cc w/enclosure:
R. C. Thornberry, PG&E (Diablo Canyon)

bcc: RSB/Document Control Desk (RIDS)

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Project Inspector

RV *PJM*
P.Morrill:dh
5/6/83

DJK
D.Kirsch
5/9/83

TB
T.Bishop
5/10/83

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/83-14
50-323/83-11

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Docket Nos. 50-275
50-323

License Nos. DPR-76, CPPR-69

Licensee: Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

Facility Name: Diablo Canyon Units 1 and 2

Inspection at: Pacific Gas and Electric Company Offices
San Francisco, California

Inspection conducted: March 1, 2 and 31, 1983

Inspector:

P. J. Morrill
P. J. Morrill, Reactor Inspector

5-6-83

Date Signed

Approved By:

D. F. Kirsch
D. F. Kirsch, Chief, Reactor Projects
Section No. 3

5/9/83

Date Signed

Summary:

Inspection March 1, 2 and 31, 1983 (Report Nos. 50-275/83-14 and 50-323/83-11)

Areas Inspected: Routine announced inspection of IE Bulletins and Circulars, follow-up of previous licensee commitments, and independent inspection. The total inspection effort required 21 Inspector-hours by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons contacted

*R. Baciarelli, Licensing Engineer
M. Threlkeld, Office Administrator
*R. Kelmenson, Senior Engineer
J. Schiffer, Manager, Nuclear Operations
B. Lew, Project Licensing Engineer
W. Raymond, Manager, Quality Assurance
P. Beck, Mechanical Engineer
G. Wu, Licensing Engineer

The inspector also interviewed a member of other licensee employees including engineers, quality assurance personnel, and clerical personnel.

*Denotes those attending the exit interview on March 31, 1983.

2. IE Bulletin Follow-up

The inspector examined licensee procedures, reviewed appropriate licensee files, and interviewed licensee personnel to ascertain whether the licensee's responses were technically adequate, satisfied the bulletin requirements, and representative of the action taken by the licensee. The inspector examined licensee Administrative Procedure E-51, "NRC IE Bulletins, Circulars, and Information Notices" as well as licensee memo "Threlkeld to licensing staff and File" (No. 003) dated, February 24, 1983, "ACTS listings of NRC documents" in order to verify the adequacy of administrative controls and status of the licensee's actions with respect to open IE Bulletins.

IE Bulletin 79-04: "Incorrect Weights for Swing Check Valves Manufactured by Velan Engineering Corporation" (Closed). The inspector examined the licensee's responses (letters "Crane to Engelken" dated, October 16, 1979 and April 29, 1981) and files related to this Bulletin (PG&E No. 415). The inspector observed that the licensee's response to IE Bulletin 79-04, had been combined with that to IE Bulletin 79-14. When questioned as to why this had been done, the licensing personnel explained that IE Bulletin 79-14, required them to verify all inputs to the seismic analysis of Class 1 piping systems and that one of the inputs was the valve weights. Based on an examination of the following documents, the inspector verified that the licensee had correctly determined the weights of the subject valves and had adequately addressed the requirements of IE Bulletin 79-04.

Letter: "Locke to Engelken" dated, April 17, 1980
Re: IE Bulletin 79-14

Letter: "Crane to Engelken" dated, October 17, 1979
Re: IE Bulletin 79-14

Memo: "Maxfield to Walther" dated, September 25, 1979
Re: Check Valve Weights

Memo: "Chadham to Hall" dated, May 9, 1979
 Re: Review of Documents

Letters: "Westinghouse to PG&E"; PGE-4031, dated June 6, 1979;
 PGE-4005, dated March 19, 1979; AM-PSA-530, dated July 8,
 1979

IE Bulletin 79-15: "Deep Draft Pump Deficiencies" (Closed). The inspector examined the licensee's responses (letters: "Crane to Director, Division of Reactor Construction Inspection," dated, September 24, 1979 and "Crane to Miraglia," dated October 21, 1981) and the licensee's file documenting this topic (PG&E No. 476). The inspector observed that the bulletin had been satisfactorily closed for Unit 1 based on the first licensee submittal, but that no information had been submitted for Unit 2 and the licensee personnel had changed their position in the second submittal to state that Diablo Canyon did not have any deep draft pumps. The licensee was requested to explain the basis of this position since the Auxiliary Salt Water Pumps (22 feet long) appeared to be deep draft pumps. Subsequently the inspector discussed the matter with licensee engineering personnel and examined drawings of the Auxiliary Salt Water Pumps. A licensee engineer stated that they had determined that the problem with the deep draft pumps was due to long shafts with large spacing between journal bearings and that PG&E had over 12,000-hours of experience with the Unit 1 Auxiliary Salt Water Pumps with none of the problems described in the bulletin. The inspector verified the engineer's statements by examining the pump drawings and reviewing the operating history of Unit 1 and Unit 2 Auxiliary Salt Water Pumps.

IE Bulletin 79-23: Potential Failure of Emergency Diesel Generator Field Exciter Transformer (Closed). The inspector examined the licensee's response (Letter: "Crane to Engelken" dated, November 9, 1979) and discussed the status and electrical arrangement of the Unit 2 diesel generators with licensee engineering personnel. The inspector also observed that this bulletin had been closed for Unit 1 based on an examination of the field exciter circuit. The inspector verified that the Unit 2 diesel generator field exciter circuits were the same as the Unit 1 diesel generators and that the exciter circuits were not prone to recirculating currents. When questioned regarding the testing of the Unit 2 diesel generators, the licensee representative stated that, the Unit 2 diesel generators would be tested in April 1983 in accordance with Technical Specifications (Page 3/4 8-5) and that any problems encountered would be reported.

IE Bulletin 81-01: Surveillance of Mechanical Snubbers (Closed for Unit 1, Open for Unit 2). The inspector examined the licensee's responses (Letters: "Crane to Engelken" dated April 3, 1981, May 5, 1981, July 21, 1981, September 8, 1981, October 20, 1981, May 14, 1982, and November 22, 1982) and the licensee files associated with this Bulletin (PG&E Nos. 342 and 383). The inspector observed that the licensee had completed surveillance and reporting for the Unit 1 snubbers and had committed to complete the Unit 2 snubber inspections after the hot functional test prior to fuel loading. Lastly, a report was to be sent to the NRC 30 days after completion of testing.

IE Bulletin 82-02: Degradation of Threaded Fasteners in the Reactor Coolant Pressure Boundary of PWR Plants (Open for Unit 1, for information only for Unit 2). The inspector examined the licensee's response (Letter: "Schuyker to Engelken" dated, August 2, 1982) and examined licensee files associated with this Bulletin (PG&E Nos. 859 and 990). Based on previous inspection findings regarding this bulletin, the inspector questioned licensee personnel regarding correcting appropriate maintenance procedures. Subsequently, the inspector contacted site operations and maintenance personnel to verify that Procedure M-66 had been revised and approved by the licensee's Plant Safety Review Committee (PSRC). The inspector informed the licensee licensing personnel that Item 2 of the bulletin would remain open until inspection and reporting regarding Unit 1 threaded fasteners after the first refueling outage had been completed by the licensee and accepted by the NRC.

3. Follow-up of Previous Licensee Commitments

During inspection 50-275/82-42, an inspector observed that the estimated completion dates (ECD's) in the licensee's Commitment Control System (CCS) were being exceeded with no new ECD's being established and that audit findings were being tracked using the licensee's CCS and it's priorities which are not consistent with ANSI N45.2.12, which is a Quality Assurance program requirement. Also during that inspection the licensee had committed to having revised ECD's for all outstanding open item reports by February 1, 1983, and to prioritizing all outstanding open item reports by February 28, 1983.

During the current inspection the inspector examined the licensee's "QA Task Report Commitment Control System" and discussed the management of these commitments with the Manager of Nuclear Operation and the Manager of Quality Assurance to verify that the licensee's commitment had been satisfied. The inspector observed that open item reports and non-conformance reports had all been prioritized by QA and that the Manager of Nuclear Operations was also tracking these items. NRC Open Item 82-42-01 is closed.

4. Exit Interview

The inspector met with licensee representatives (dencted in paragraph 1) at the conclusion of the inspection and discussed the scope and findings of the inspection.

AUG 03 1983

IN HQ FILE COPY

Docket No. 50-275

83-26

Pacific Gas and Electric Company
77 Beale Street
Room 1435
San Francisco, California 94106

Attention: Mr. J. O. Schuyler, Jr.
Vice President, Nuclear Operations

Gentlemen:

Subject: NRC Inspection of Diablo Canyon Unit No. 1

This refers to the special announced inspection conducted by Messrs. J. Crews, A. Johnson, D. Kirsch, M. Mendonca, P. Morrill, J. Carlson, G. Hernandez and W. Wagner of this office during the period July 1-22, 1983, of activities authorized by NRC License No. DPR-76 and related to Licensee Event Report 83-006 which identified a potential less than minimum wall condition in the reactor coolant system.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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U.S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275

Docket No. 50-275

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License No. DPR-76

Licensee: Pacific Gas and Electric Company
77 Beale Street, Room 1435
San Francisco, California 94106

Facility Name: Diablo Canyon Unit No. 1

Inspection at: Diablo Canyon Site, San Luis Obispo County, California

Inspection conducted: July 1-22, 1983

Inspectors:

<u>G. Hernandez</u> G. Hernandez, Reactor Inspector	8/5/83 Date Signed
<u>W. Wagner</u> W. Wagner, Reactor Inspector	8/5/83 Date Signed
<u>J. Crews</u> J. Crews, Technical Assistant to the Administrator	8/5/83 Date Signed
<u>A. Johnson</u> A. Johnson, Enforcement Officer	8/5/83 Date Signed
<u>P. Mendonca</u> P. Mendonca, Resident Inspector	8/5/83 Date Signed
<u>J. Carlson</u> J. Carlson, Senior Resident Inspector	8/5/83 Date Signed
<u>P. Morrill</u> P. Morrill, Reactor Inspector	8/5/83 Date Signed
Approved by: <u>P. Morrill</u> D. F. Kirsch, Chief, Reactor Projects Sec. No. 3	8/5/83 Date Signed

Summary:

Inspection during the period of July 1-22, 1983 (Report No. 50-275/83-26)

Areas Inspected: Special announced inspection by regional and resident inspectors of the circumstances and facts relating to the licensee's discovery of apparent less than minimum code allowable wall thickness at or adjacent to welds in the reactor coolant system (RCS), which was initially identified in Licensee Event Report (LER) 83-006. The inspection involved 184 inspection-hours by seven NRC inspectors.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Individuals Contacted

a. Pacific Gas and Electric Company (PG&E)

G. Maneatis, Executive Vice President Facilities and Electric Resources Development
J. Schuyler, Vice President Nuclear Power Generation
R. Etzler, Field Construction Manager
D. Rockwell, Assistant Project Superintendent
R. Twiddy, Site Quality Assurance Manager
J. Shiffer, Manager Nuclear Operations
W. Raymond, Technical Assistant to the Vice President, Nuclear Power Operation
F. Dodd, Senior Metallurgical Engineer
S. Skidmore, Manager of Quality Assurance

b. Bechtel Corporation (Bechtel)

C. Dick, Project Management Team Member
H. Friend, Project Completion Manager

2. Background

On May 9, 1983 Pacific Gas and Electric Company (the licensee) representatives called the Region V staff to report that ultrasonic examination (UT) of RCS Weld Number WIB-RC-2-17 (in the Unit 1 RCS cold leg of loop No. 2) might be below specified minimum wall thickness. The licensee personnel committed to examine the remaining RCS girth welds in Unit 1 at that time. This telephone call was followed up with a LER (No. 83-006) dated May 23, 1983.

On June 22, 1983 a member of the licensee's staff verbally informed the NRC that based upon additional ultrasonic measurements it appeared that minimum wall requirements might not be met in approximately nine additional weld areas. Members of the Region V inspection staff arrived at the Diablo Canyon site the following day and examined the latest information related to this issue. At the NRC exit meeting on June 23, 1983 the licensee committed to conduct a detailed investigation and to submit a report documenting these activities. This report (dated July 1, 1983) was submitted to the Region V office by PG&E letter "Schuyler to Martin" dated July 5, 1983.

On June 29, 1983 the NRC contracted with Parameter, Inc. to conduct independent UT examinations of the subject RCS welds and to assess the adequacy of this technique for thickness measurements in this piping. During the week of July 5, 1983, three Parameter, Inc. personnel conducted these examinations which were documented in a report (dated July 14, 1983) and forwarded by a letter "Foley to Morrill" dated July 14, 1983.

Subsequently, Region V conducted a public meeting on July 14, 1983 in the Region V offices to discuss the licensee's July 1, 1983 report with members of the licensee's staff, members of the Independent Verification Program, representatives of the Governor of the State of California, and representatives of the joint intervenors. A transcript of that meeting was taken which was subsequently distributed to all parties to the Diablo Canyon licensing proceedings along with the Parameter Report dated July 14, 1983.

Examinations of license records and measurements in progress had been examined on June 23-24, June 29 - July 1, July 7-8, July 12-13, and July 20-21, 1983 by the Region V staff. This report documents these inspection activities and the conclusions of the Region V staff.

3. Documents reviewed by the NRC included:

Westinghouse Specification No. G676341, Rev. 1, dated 4-11-67 "Reactor Coolant Seamless Pipe"

Westinghouse Specification No. G676342, Rev. 2, dated 4-6-67 "Reactor Coolant Cast Fittings"

Westinghouse Specification No. 676496, Rev. 0, dated 3-13-67 "Reactor Coolant Piping - Field Erection"

American Standard ASA B-31.1, 1955 Edition, Section 122 "Thickness of Pipe"

PG&E Deviation Report No. 39, written 10-7-70 and closed on May 5, 1971, to evaluate the effect of pipe spool marking depth on minimum wall thickness requirements

PG&E Procedure TG 83-01, Rev. 0, dated 6-29-83 "Temporary Procedure - RCS Piping Wall Thickness Measurements"

Mechanical measurement data for welds 1-1, 1-2, 1-4, 1-8, 1-11, 1-16, 2-1, 2-2, 2-17, 3-9, 3-13, 4-2, 4-16

PG&E Specification No. 8752 for Field Erection of RCS Piping (Wisner/Becker Specification)

PG&E Procedure N-UT-2, Rev. 0, dated 1-1-83, "UT Thickness Measurement Examination Procedure"

Southwest Fabricating & Weld Co. As-Built Drawings for pipe spools containing welds 1-1, 1-2, 1-11, 1-16, 2-1, 2-2, 2-17, 3-9, 4-16

Cameron Iron Works Data Sheets documenting minimum outside diameter, maximum inside diameter, maximum and minimum wall thickness measurements for pipe involved in RCS welds 1-1, 1-2, 1-11, 1-16, 2-1, 2-2, 2-17, 3-9, 4-16

Southwest Fabricating & Welding Company drawing no. SO.7524 Sheet Q giving details of shop and field weld tolerances for machining

4. Evaluation of Reactor Coolant System (RCS) Piping Wall Thickness

(a) Examination of Shop Manufacturing and Fabrication Records

The inspector reviewed records generated during fabrication of the reactor coolant loop (RCL) piping. This was to determine the adequacy of the quality assurance program during fabrication, and to establish whether or not minimum wall was maintained prior to the pipe being received at the jobsite. Specific records reviewed and the general results are described below.

Westinghouse Equipment Specification G-676341, "Reactor Coolant Seamless Pipe" listed the requirements that the suppliers (vendors) were responsible to meet during fabrication of RCS piping; this included dimensional requirements for inside and outside diameters (I.D. and O.D. respectively), and minimum wall thicknesses.

Cameron Iron Work Material Certifications provide dimensional measurements of the O.D., I.D. and wall thickness. Based on this data the inspector verified that the dimensional requirements of Westinghouse Specification G-676341 were met. These verifications were made for the hot leg, crossover leg and cold leg piping.

Southwest Fabricating and Welding Company (Southwest) as-built drawing for fabricated spool piece number PGE DC-663219-167-3 was examined. The inspector verified that minimum wall met the drawing requirements and was correctly approved for construction.

The inspector also reviewed a Southwest document addressing final inspection, prior to shipment, of 8 pipe sections and 4 elbows. This document stated that "dimensions were checked throughout and were within allowable tolerances".

Westinghouse records show that numerous inspections were performed by Westinghouse of their reactor coolant piping vendors. One memo stated that mechanical readings at the shop and field are compatible.

PG&E weekly inspection reports were written by PG&E inspectors during fabrication at Cameron and Southwest. These reports indicate that RCS pipe dimensions were checked and found acceptable.

PG&E QA Audit of Southwest verified that as-built dimensions conform to appropriate specifications.

(1) Cameron Iron Works, Inc.

During the manufacturing process at Cameron Iron Works Inc., measurements were taken and documented on each pipe section and heat number manufactured. These measurements consisted of

outside diameter, minimum and maximum inside diameter, and minimum and maximum wall thickness. The measurements were taken at distances of one inch and two feet from each end of the pipe section.

Westinghouse E Specification No. G-676341 specified acceptance criteria for maximum and minimum inside diameter, minimum wall thickness and minimum outside diameter for each size of pipe manufactured (i.e., for nominal inside diameters of 27.5 inches, 29 inches and 31 inches).

The inspector examined the data documented by Cameron Iron Works for the pipe sections containing weld numbers: weld 1-1 (field weld), weld 1-2 (shop weld), weld 2-1 (field weld), weld 2-2 (shop weld), weld 1-11 (shop weld), weld 1-16 (shop weld), weld 2-17 (shop weld), weld 3-9 (field weld), and weld 4-16 (shop weld). The data recorded and documented by Cameron demonstrates compliance with dimensional acceptance criteria specified in Westinghouse E Specification No. G-676341.

The inspector also performed independent calculations of wall thickness remaining based on counterboring for the shop and field welds. The counterboring and shop welding was performed by Southwest Fabrication and Welding Company (see next subsection).

This calculation was performed using the following equation:

$$\text{Wall Thickness} = \frac{(\text{Minimum Outside Diameter}) - (\text{Maximum Specified Inside Diameter})}{2}$$

Data for the minimum outside diameter was obtained from data recorded by Cameron Iron Works. The maximum inside diameter data was obtained from Southwest Drawing No. 80.7524, Sheet Q and Westinghouse E Specification No. G-676341. The Southwest drawing specifies weld preparation dimensions, counterbore dimensions, and tolerances.

The results of the inspector's calculations indicated that minimum wall thickness criteria were complied with in all cases. The results of these calculations were compared to the mechanically measured minimum wall thickness presented in Table V-1 of the PG&E Report on "Investigation of Reactor Coolant Pipe Weld Thickness at Diablo Canyon", transmitted to the NRC Region V on July 5, 1983. The results of the independent calculations, performed using worst case conditions, appeared consistent with the wall thickness obtained and documented by PG&E, and demonstrated compliance with the Westinghouse minimum wall thickness acceptance criteria.

(2) Southwest Fabricating and Welding Co.

This company machined the counterbore on the pipe sections manufactured by Cameron and completed the shop welds. The

documentation indicates that the machining operations were performed as specified on Southwest detail sheet Q. Southwest has documented, by letter to Westinghouse, dated July 19, 1983, that wall thickness was checked with micrometers to verify that the minimum thickness specified on the detail sheet and sheet Q was satisfied and, further, that since this check was only to verify that thickness was adequate, actual thicknesses were not recorded. Southwest also states, in that letter, that in-service inspection preparation of welds was performed on the shop welds of the 31 inch inside diameter crossover legs while all other shop welds were furnished in the "as-welded" condition.

(3) Source Inspection Document Review

The inspector examined representative records of source inspections, performed by PG&E, of Southwest Fabricating and Cameron Iron Works. These records documented that PG&E inspectors made dimensional spot-checks and verified wall thicknesses of selected pipe spools.

The records documented that one pipe (4153 cold leg) was found to be less than minimum wall thickness in one location. It was subsequently repaired by welding and reinspected by Cameron.

(4) Westinghouse Electric Company

As Nuclear Steam Supply System supplier, Westinghouse furnished the RCS piping including a quality control release form with each piece. On these forms Westinghouse documented acceptance of dimensional records. However, the dimensional records were not included with the documentation package on shipment. PG&E, therefore based their acceptance on the documentation supplied by Westinghouse indicating that Westinghouse had accepted the dimensional records.

(b) Examination of Records of Field Erection and Welding of Reactor Coolant System Piping

Records of the erection and welding of the reactor coolant system (RCS) piping for Unit 1 were examined. Specific records which were examined included documentation for field weld numbers WIB-RC-1-1, 2-1 and 3-1.

The records indicated that weld fitup was examined and "signed-off" by three parties (Wisner & Becker, the California Code Inspector, and PG&E) for weld number 2-1. For Welds 1-1 and 3-9 the records indicated an additional sign-off of weld fitup by Westinghouse.

The records also indicated that measurements were recorded by Wisner & Becker inspectors of the pipe wall thickness after weld fitup. These measurements were recorded for each quadrant of the weld. According to PG&E General Construction Department personnel,

these measurements involved the placement of a mechanic's straight edge axially spanning the weld preparation area, with the depth of pipe wall determined by measurement from the straight edge to the top surface of the weld preparation land area at the root of the weld. The records indicated (with the exception of two quadrant measurements for weld 2-1, where the recorded value was not legible) wall thickness in each instance to be in excess of the minimum design wall thickness.

The inspector performed an independent calculation, using the data described above and the minimum allowed land thickness from drawing Sheet Q, to verify the wall thickness at the measured locations. The minimum allowed land thickness was 0.055 inches. Summing these dimensions indicates that the wall thickness remained above the specified minimum wall thickness in all locations measured by Wismer and Becker.

The records examined also included the logs of PG&E inspectors involved with inspection and surveillance of grinding of finished welds in the RCS during the period of early March 1975 through mid-May 1975. These records indicated essentially daily surveillance over this grinding activity. The records also contained acceptance criteria, established by PG&E's Engineering Department, for the grinding of the outside diameter of the welds. These criteria included the requirement that "...weld crowns should be ground smoothly down to the height of +1/16 inch max., -0 inch min. from the adjacent pipe surface level...." The criteria also specified that grinding should be confined to the weld metal. The records indicated that this grinding was performed in preparation for ultrasonic inspection of the welds.

(c) Examination of Pacific Gas and Electric Company Deviation Report No. 39.

The inspector examined the subject deviation report. The report documents that, following receipt of the RCS piping spools at the warehousing area, PG&E became concerned that the observed depth of spool identification marking indentations may infringe on specified minimum wall thickness requirements.

Using ultrasonic wall thickness measurements PG&E rejected spool 1-1. The Westinghouse site manager made arrangements to measure wall thickness using state of the art optical and ultrasonic equipment. Optical measurements verified that wall thickness exceeded the specified minimum.

During these measurements a conflict developed between the data obtained ultrasonically and optically. The theory was advanced that the Type 316 SST material, used for the RCS pipe, was not homogenous in all heats thus causing the ultrasonic wave velocity to vary between heats.

When the UT instrument was calibrated to a known thickness of a specific heat number the material thicknesses (measured

ultrasonically) exceeded minimum wall specifications. However, data taken indicate that, even by calibrating the instrument to a specific heat, a difference of 2.0% to 4.5% existed between micrometer (mechanical measurement) data and UT data.

Westinghouse conducted an evaluation of the UT technique applied to extruded stainless steel material. The conclusions were: (a) the UT equipment used initially by PG&E was not accurate in the 2.5 inch range; and (b) the UT equipment must be calibrated on the same heat number (material) as the piece to be tested. The findings of this evaluation indicate that a sonic velocity difference of almost 4% existed from one heat number to the other. Furthermore, discussions with an industry expert indicated that sonic velocity variances of up to 10% had been observed, mainly due to the differences experienced by material in the heat treatment and stress level.

Examination of this Deviation Report indicates that Ultrasonic examination techniques were not a sufficiently reliable means for measuring wall thickness in this type of material.

(d) Examination of Ultrasonic Test Procedure

The inspector examined PG&E procedure no. N-UT-2, Rev. 0, dated January 1, 1983, titled "UT Thickness Measurement Examination Procedure." This procedure was utilized in the calibration of instruments and examination of the RCS piping.

The calibration section requires that an appropriate calibration block be used of the same material (material having similar chemical analysis, mechanical properties and microstructure) and product form (material manufactured by casting, rolling or forging for plate, etc.) as the material to be measured.

Furthermore the calibration section requires (following calibration to a step wedge), that the response of an intermediate thickness should not deviate by more than 1% of the range under test.

Discussions with licensee representatives involved in the UT process indicated that compliance with the above 1% criteria could not be consistently obtained.

The inspector questioned the validity of the ultrasonic measurement technique as applied to the RCS piping for the following reasons:

- . The response of the UT instrument to an intermediate thickness could not be consistently maintained within 1% of the range under test.
- . Data obtained in the resolution Deviation Report No. 39, in 1971, indicated that the ultrasonic method of wall thickness measurement was not reliable when applied to RCS piping.

The material used in the calibration of the instrument potentially had a far different microstructure than the material under test. The sensitivity of the UT technique to different material heat numbers was amply demonstrated in the resolution of Deviation Report No. 39 in 1971.

Use of a step wedge for calibration doesn't adequately provide a product form calibration standard since the material under test had a curved surface.

For the above reasons the inspector considers that the licensee had inappropriately placed a high degree of reliance on the RCS thickness measurements obtained by the ultrasonic nondestructive testing methods utilized in the identification and verification of the potential deviations from specified minimum wall thickness criteria.

(e) Verification of Mechanical and Ultrasonic Measurements

On July 1, 12 and 13, 1983, mechanical and ultrasonic measurements were observed and verified by an NRC inspector on five Reactor Coolant System girth welds. The licensee had previously identified nine Reactor Coolant System girth welds as being potentially below minimum wall in certain areas.

Mechanical measurements were performed on the inside and outside diameters of each weld area. The measurements were made at the horizontal and vertical axis of the pipe weld area, at the licensee identified minimum wall area, (as determined by ultrasonic examination) and at points selected by the NRC inspector. Ultrasonic thickness measurements were then performed for comparison with the mechanical measurements. The welds examined were welds Nos. 1-1, 2-1, 2-2, 2-17 and 3-9. For weld no. 3-9 the minimum wall point was determined to be in the heat affected zone of the weld.

The inspector observed that while the ultrasonic thickness measurements of the vertical and horizontal axis of each weld were consistent with previous licensee ultrasonic data, in most cases the previously identified licensee minimum wall point could not be relocated. In almost all cases a new minimum wall point was recorded.

The following tabulation is a comparison of minimum wall mechanical measurements obtained during the NRC inspection, with the data reported by the licensee in their report entitled, "Investigation of Reactor Coolant Pipe Weld Thickness at Diablo Canyon", dated July 1, 1983.

<u>Weid No.</u>	<u>Required Minimum Wall Thickness</u>	<u>NRC Observed minimum wall data</u>	<u>PG&E Reported minimum wall data</u>
1-1	2.335	2.382	2.413
2-1	2.335	2.405	2.433
2-2	2.335	2.342	2.341
2-17	2.215	2.222	2.223
3-9	2.495	2.503	2.560

The mechanical measurements observed and verified by the NRC inspector indicated that the wall thickness was above minimum wall requirements for the five welds measured. The variations in the minimum wall data between the NRC and the licensee obtained data is attributed to the different persons taking the data, the cramped quarters involved in obtaining the data, and the difficulty of relocating the same spot on the RCS piping.

(f) Analysis of Mechanical Wall Thickness Measurements

The inspector performed an independent conservative verification of wall thickness by using the PG&E measurements of minimum outside diameter and the maximum allowed inside diameter (Drawing Sheet Q) to verify adequate wall thicknesses, in accordance with the following equation.

$$\text{Wall Thickness} = \frac{\text{OD} - \text{ID}}{2}$$

Where

OD = minimum recorded outside diameter

ID = maximum allowed inside diameter at bottom of weld land on counterbore (reference Drawing Sheet Q)

At one location at weld no. 3-9, the minimum measured outside diameter (at location 30°) was reported to 36.138 inches which was less than the 36.20 inches as specified in Westinghouse Specification No. G-676341. However, the mechanical measurements taken by the licensee and the NRC inspector (at this location) indicated that the minimum wall was 2.503 inches, which is greater than the required wall thickness of 2.495 inches. At another location on this pipe the licensee's data identified another point on the outside diameter which appears to be less than the required outside diameter. This point was reported as 36.167 inches, however the mechanical measurements at that location indicated a minimum wall thickness of 2.561 inches.

5. Open Item

As a separate issue, the licensee has been requested to provide additional information regarding any instances where ultrasonic wall thickness measurements were used for quality acceptance in stainless steel piping systems. This area will be further examined in a subsequent inspection (50-275/83-26-01).

6. Conclusion

Based on the foregoing information the inspectors concluded that there is reasonable assurance that RCS piping wall thickness meets or exceeds design requirements.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

RSB

Staff Exhibit 45
NRC Inspection Report: 50-275/83-27
50-323/83-19

AUG 18 1983

IN HQ FILE COPY

Docket Nos. 50-275, 50-323

83-27

Pacific Gas and Electric Company
77 Beale Street, Room 1435
San Francisco, California 94106

Attention: Mr. J. O. Schuyler, Vice President
Nuclear Power Generation

Gentlemen:

This refers to the routine, monthly inspection, conducted by Messrs. J. D. Carlson and M. M. Mendonca of this office during the period of July 3 through July 30, 1983, of activities authorized by NRC License No. DPR-76 and Construction Permit No. CPPR-69, and to the discussion of our findings held with Mr. Thornberry and other members of your staff at the conclusion of this inspection.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained herein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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AUG 18 1983

Should you have any questions about this inspection, we will be glad to discuss them with you.

Sincerely,

151
T. W. Bishop, Acting Director
Division of Resident, Reactor Projects
and Engineering Programs

Enclosure:

Inspection Report
Nos. 50-275/83-27
50-323/83-19

cc w/o enclosure:

J. D. Shiffer, PG&E
S. D. Skidmore, PG&E
P. A. Crane, Jr. PG&E

cc w/enclosure:

R. C. Thornberry, PG&E (Diablo Canyon)

bcc: RSB/Document Control Desk (RIDS)

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Project Inspector
Sandra Silver (w/o enc.)

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J. Carlson:dh
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K
M. Mendonca
8/18/83

K
D. Kirsch
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K
T. Bishop
8/18/83

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/83-27 and 50-323/83-19

IN HQ FILE COPY

License Nos. DPR-76 and CPPR-69

Licensee: Pacific Gas and Electric Company
77 Beale Street, Room 1435
San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 and 2

Inspection at: Diablo Canyon Site, San Luis Obispo County, California

Inspection conducted: July 3 - July 30, 1983

Inspectors: *D. F. Kirsch* 8/18/83
for J. D. Carlson, Sr. Resident Inspector Date Signed

D. F. Kirsch 8/18/83
for M. M. Mendonca, Resident Inspector Date Signed

Approved by: *D. F. Kirsch* 8/18/83
D. F. Kirsch, Chief, Reactor Projects Section 3 Date Signed

Summary:

Inspection during July 3 through July 30, 1983 (Report Nos. 50-275/83-27 and 50-323/83-19)

Areas Inspected: Unit 1: Routine, resident inspection of plant operations, surveillance testing, maintenance, and follow-up of an allegation. This inspection effort required 47 inspector-hours. Unit 2: Routine, resident inspection of preoperational testing/results, and plant tours. The inspection effort required one inspector-hour. The total inspection time involved 48 inspector-hours. This time does not reflect efforts in support of ASLAB hearings or RCS minimum wall problem follow-up.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

- *R. C. Thornberry, Plant Manager
- *R. Patterson, Plant Superintendent
- *J. M. Gisclon, Power Plant Engineer
- *D. B. Miklush, Supervisor of Maintenance
- *J. A. Sexton, Supervisor of Operations
- *J. V. Boots, Supervisor of Chemistry and Radiation Protection
- *W. B. Kaefer, Technical Assistant to the Plant Manager
- *R. G. Todaro, Security Supervisor
- *R. T. Twiddy, Supervisor of Quality Assurance
- *R. M. Lockett, Regulatory Compliance Engineer
- J. W. Shryock, Assistant Project Completion Manager

The inspectors also interviewed several other licensee employees including shift supervisors, reactor and auxiliary operators, maintenance personnel, plant technicians and engineers, quality assurance personnel and General Construction personnel.

*Denotes those attending the exit interview on July 29, 1983.

- - 2. Operational Safety Verification

During the inspection period, the inspectors observed and examined activities to verify the operational safety of the licensee's facility. The observations and examinations of those activities were conducted on a daily, weekly or monthly basis.

On a daily basis, the inspectors observed control room activities to verify compliance with limiting conditions for operation as prescribed in the facility Technical Specifications. Logs, instrumentation, recorder traces, and other operational records were examined to obtain information on plant conditions, trends, and compliance with regulations. Shift turnovers were observed on a sample basis to verify that all pertinent information on plant status was relayed.

During each week, the inspectors toured the accessible areas of the facility to observe the following:

- a. General Plant and Equipment Conditions.
- b. Maintenance activities and repairs (See paragraph 3).
- c. Fire hazards and fire fighting equipment.
- d. Ignition sources and flammable material control.
- e. Conduct of selected activities for compliance with the licensee's administrative controls and approved procedures.
- f. Interiors of electrical and control panels.

- g. Implementation of selected portions of the licensee's physical security plan.
- h. Plant housekeeping and cleanliness.

The inspectors talked with operators in the control room, and other plant personnel. The discussions centered on pertinent topics of general plant conditions, procedures, security, training, and other aspects of the involved work activities.

No items of noncompliance or deviations were identified.

3. Follow-up of a Local Citizen's Concern

At the Atomic Safety and Licensing Appeal Board hearing on July 19, 1983, a concern on anchor bolt installation was brought up by a member of the public to the resident inspectors. The concern was that in the 1976-77 time frame a bolt was found connected to a nut that was welded to the back of an embedded plate rather than anchored in the concrete wall.

The NRC construction inspector, who was responsible for inspecting Diablo Canyon in 1976-77 at the time the alleged problem took place and appropriate PG&E construction personnel for Diablo Canyon were interviewed. It was identified that during the 1976-1977 time frame there was a significant investigation into the area of anchor bolts for all design Class 1 pipe system anchors (PG&E Discrepancy Reports 282 for Unit 1 and 284 for Unit 2). At that time cut Anchor sleeves, discovered during a non-related repair of an anchor plate, were identified in Pullman Discrepancy Report (DR) No. 3160. Because of this report a sampling program was initiated. The sampling program identified problems including the same problem as that expressed for the current concern. From these findings PG&E DRs 282 and 284 were initiated.

The program related to PG&E DRs 282 and 284 required additional testing to establish acceptance criteria for anchor bolt installation, and examinations of 100 percent of Class 1 anchor work done prior to January 1977. After January 1977 additional QC inspection guidance and requirements for anchor bolts were initiated. A large number of anchor bolt repairs (about 10,000) were performed and documented to disposition of DRs 282 and 284. In addition, several inaccessible anchors were analyzed for acceptability. These corrective actions were examined by the NRC construction inspector at that time and were determined to be acceptable.

The individual who brought up the concern on July 19, 1983, was informed of the history and resolution of the problems, as identified above. He expressed appreciation for the information.

Currently, a licensee QA audit at Diablo Canyon has raised other questions related to electrical raceway and instrumentation anchors. This area is being followed up by the NRC inspectors (83-27-01).

No items of noncompliance or deviations were identified.

4. Preoperational Data Review (Unit 2)

The inspectors reviewed the preoperational test data for Test Procedures listed below:

- 33.1 Containment Isolation and Spray Initiation
- 33.2 Integrated Safety Injection Preoperational Test
- 33.4 Emergency Core Cooling Systems (Portions required prior to Hot Functional Testing)

The results appear to meet the acceptance criteria.

No items of noncompliance or deviations were identified.

5. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) on July 29, 1983, and discussed the scope and findings of the inspection.

MEMORANDUM FOR: Frank Miraglia, Chief Licensing Branch 3,
Division of Licensing, NRR

FROM: K. S. Herring, Systematic Evaluation Program Branch,
Division of Licensing, NRR

SUBJECT: TRIP REPORT REVIEW OF URS/BLUME HOSGRI ANALYSES OF
THE DIABLO CANYON AUXILIARY BUILDING, INTAKE STRUCTURE,
CONTAINMENT POLAR CRANE, AND CONTAINMENT ANNULUS

Introduction

Enclosure 1 identified concerns regarding PG&E's apparent failure to properly reflect the results and findings of final reports it received from URS/Blume in the docketed FSAR (Hosgri Report) and its piping, equipment, and component evaluations for the Diablo Canyon Auxiliary Building and Intake Structure. Enclosure 1 also identified a concern over the depth of the PG&E proposed Seismic Reverification Program in the structural area with regard to the analyses performed by URS/Blume for PG&E. To gain further insights into the analyses performed by URS/Blume and the adequacy of the related information contained in the docketed Hosgri Report, on January 25 and 26, 1982, I conducted a review of the URS/Blume calculation books for the Hosgri analyses of the Diablo Canyon Auxiliary Building, Intake Structure, Containment Polar Crane, and Containment Annulus. The results of this review are summarized below.

Review Results

Auxiliary Building:

- 1) 1977 Weight Discrepancy - The Cloud verification effort identified that a significant weight discrepancy of 35% between original Blume and later PG&E analyses existed at elevation 140'. The Blume calculation book indicated that discrepancies of about +16%, +9.6%, and -34% also existed at elevations 163', 115', and 100', respectively. The calculation book indicated that the original Blume weights were used in the analyses but gave no basis for this.

It appears that the use of these initial Blume weights in the Blume structural analyses was appropriate and not adequately documented in the initial calculations. ?

URS/Blume personnel stated that they had recently received a written explanation from PG&E describing that the weight discrepancy was due to an erroneous March 1977 run of the SHERVAL computer program and the lack of consideration of certain weights by the SHERVAL program. When a correct SHERVAL run was made, and the appropriate neglected weights were added to the SHERVAL weights, the weights compare well with those used by Blume in its Auxiliary Building analyses (see Enclosure 2). This was confirmed by PG&E personnel who further indicated that SHERVAL computed weights are used in conjunction with acceleration profiles from Blume's structural analyses to perform structural evaluations of walls. Although there are differences between the masses used in the SHERVAL analysis, and those actually present, PG&E personnel contended that the SHERVAL analysis results would not be significantly affected.

- 2) Elevation 100' Soil Spring Omission - Differences in spectra between the Hosgri Report N-S floor spectra for the Auxiliary Building and the final Blume report on the Auxiliary Building were identified by Cloud, and afterward found by the NRC to be attributed to an error in the incorporation of the soil spring at elevation 100' of the building model in the preliminary Blume analyses on which the FSAR (Hosgri Report) is based. This was corrected and included in the analysis on which the final report was based.

An October, 1978 transmittal from Blume to PG&E regarding a Blume design review reported this soil spring error but concluded that when the spring is included in the analysis, "...the result leads to higher estimates of responses and is thus conservative." Recent information indicates that this statement is not true with regard to certain of the N-S floor response spectra for the Auxiliary Building.

The Blume calculation book contains results of an evaluation conducted between 1/78 and 5/78 to determine the effects of neglecting the soil spring since this was erroneously omitted in earlier analyses. The study concluded that the responses in the N-S direction were indeed affected by the presence of the soil spring. Comparisons of floor spectra with and without inclusion of the soil spring were presented which indicated certain areas of the floor spectra were greater when the soil spring was included, especially for torsional response, and certain areas were lower. The calculation book indicated with no stated basis that this analysis was not used. The person at Blume who originated the 10/78 transmittal stated that (1) he was not aware of the 1/78-5/78 study and

(2) that although his 10/78 conclusions addressed "responses", he was referring only to building forces and peak structural responses not floor response spectra. It appears that this error was caused by (1) inadequate personnel interfaces within Bluma, and (2) lack of sufficient consideration, by Bluma personnel, of PG&E use of floor spectra in their piping and equipment evaluations.

Intake Structure:

Use of Inappropriate Spectra for PG&E Evaluations - All preliminary and the final Bluma reports regarding the Intake Structure indicated that the response spectra for the design of equipment at the roof level were similar to the ground spectra for most areas of the roof. No spectra were supplied in these reports and PG&E has used the ground spectra for its evaluations of all areas of the Intake Structure, including the roof. Spectra at several points at the roof were contained in the Bluma calculation book for this structure. One of those points was at the roof area above the Auxiliary Saltwater Pumps. Those spectra indicated significant spectral peaks in the 20-25 Hz range which are not present in the ground spectra. Bluma personnel indicated that PG&E had only recently requested these spectra and that Bluma was now in the process of peak broadening them for transmittal to PG&E. The PG&E review of the preliminary and final Bluma reports on the Intake Structure was not sufficient to detect this issue earlier.

Containment Polar Crane:

- 1) Polar Crane Analysis - The docketed FSAR (Hosgrafi Report) concerning the structural analyses and integrity of the Containment Polar Crane contains the results of the URS/Bluma 2-D nonlinear and 3-D linear elastic analyses of the polar crane. Results of these analyses (as relied upon by the NRC in Supplement 9 to its SER) indicated that the interaction ratios for stresses in the polar crane members are all less than 1.0; therefore, no overstresses are predicted. A later 3-D nonlinear analysis of this crane was performed by URS/Bluma and the results provided to PG&E by Bluma in a report dated July, 1979. This latter analysis indicated the potential for interaction ratios as high as 1.3 in the crane support columns, which is an overstress. The Bluma report concluded that this was acceptable since it was localized and there was only one peak load excursion.

Blume calculations considered the time phasing of loads and used actual average material properties to evaluate these members in the absence of the normal AISC Code margins. Also, load time histories for these members contained in the Blume calculation book indicated that while there was only one peak load excursion, the potential existed for several in the range of 80-90% of the peak. This analysis was disregarded and not docketed by PG&E regarding the structural integrity analyses. PG&E personnel indicated that when they received the July 1979 Blume report, a comprehensive review of the report was not conducted since the Blume conclusion that no modifications to the crane were required was not changed from previous reports. The PG&E review of the July 1979 Blume report was not sufficient to conclude that this report demonstrated that the analyses results presented in the FSAR were significantly less conservative than those contained therein and, therefore, may warrant further evaluation.

- 2) Dome Service Crane - The dome service crane analyses being performed by PG&E incorporate undocketed 3-D nonlinear Polar Crane analyses results which have not been reviewed by the NRC (see above discussion of the Polar Crane Analyses).

Containment Annulus Structure:

- 1) Reanalyses Models of the Annulus - The reanalyses of the Annulus that has been performed by Blume incorporate the original analysis model, with mass and stiffnesses revised to reflect the "as-built" configuration.
- 2) Annulus Spectra for Use in PG&E Piping and Equipment Evaluations - Blume personnel indicated to PG&E that piping and equipment should be evaluated using spectra corresponding to the "frame" on which it is supported, even when they are located near the center line between connected frames with different responses. This interconnection is not modeled in the Blume analyses. Therefore, this approach is based on consistent application of modeling assumptions.

The adequacy of this model is under detailed NRC review, using an independent NRC contractor's analysis of the Annulus structure.

Conclusion

Based upon the results of my review, as summarized above and in Enclosure 1, it is concluded that the information contained in the FSAR (Hosgri Report), on which the NRC Safety Evaluation Reports and its supplements are based, is not accurate concerning the Auxiliary Building, Intake Structure, and Containment Polar Crane. (The information for the Auxiliary Building and Intake Structure is based upon preliminary Blume reports and certain information was changed in the final Blume reports. The information concerning the Containment Polar Crane was superseded by later analysis results.) It appears that this has been caused primarily by a lack of thoroughness in technical review by PG&E of final URS/Blume reports and the associated analyses. Another contributor to the problem in the case of the Auxiliary Building appears to be that 1) inadequate personnel interfaces existed within Blume, and 2) Blume personnel focused considerations primarily on structure forces and peak responses, without sufficient consideration of PG&E use of floor spectra in their piping and equipment evaluations. In addition, a secondary contributor to the overall problems is Blume's failure to clearly indicate substantive changes between preliminary and final reports.

Considering the implications of this review of the URS/Blume analyses, it should be determined to what extent similar problems may exist throughout the analyses and evaluations presented in the FSAR (Hosgri Report). The implications of this problem can then be assessed.

Original Signed By:

Kenneth S. Herring
Systematic Evaluation Program Branch
Division of Licensing

cc: See next page.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 3 1982

MEMORANDUM FOR: Frank Miraglia, Chief
Licensing Branch No. 3
Division of Licensing, NRR

FROM: Kenneth S. Herring
Systematic Evaluation Program Branch
Division of Licensing, NRR

John R. Fair
Engineering & Technical Support Branch
Division of Engineering and Quality Assurance, NRR

SUBJECT: DIABLO CANYON SEISMIC VERIFICATION PROGRAM
INSPECTIONS - FEBRUARY 22 - 26, 1982

As a part of Region V's ongoing activities to keep abreast of the current Diablo Canyon seismic verification program, we conducted unannounced inspections at the R. L. Cloud offices on February 22 and 23, 1982, and at the PG&E offices on February 24, 1982. In addition, a walk-down of certain aspects of the Diablo Canyon design was conducted at the plant on February 25 and 26, 1982, to gain a better understanding of issues identified during the meetings at the R. L. Cloud and PG&E offices. Our observations and recommendations are discussed below.

R. L. Cloud Inspection

1) Piping and Supports

The piping analysis procedures, signed on 2/22/82, were reviewed. The procedures were based on criteria presented in Section 8.2 of the Hosgri Report with additional criteria for overlap (NUREG/CR-1980), decoupling (piping diameter ratio >4) and small diameter piping connected to large pipe (either (1) large pipe response in the span where the attachment point is located is greater than 20Hz or (2) the large line displacement <1/16 inch). The procedures did not include the load combination or stress allowable criteria.

Two of the R. L. Cloud employees performing piping analyses were interviewed. These employees were familiar with the piping analysis procedures and criteria.

Approved support evaluation procedures were not available at the time of the inspection. The support frequency calculations were available but they had not been approved at the time of the inspection. The results of these calculations showed 19 of the 20 supports met the PG&E criteria for frequency as reported in the R. L. Cloud progress report dated January 9, 1982. Review of the calculations showed that snubber

MAR 3 1982

flexibilities had not been included in the computations. Cloud employees stated that these calculations had not been approved and the snubber flexibilities would be included in the final calculations.

2) Equipment Calculation Review

The only completed, checked and approved calculation packages in any area were those for the Main Annunciator Cabinet located in the Cable Spreading Room and the Diesel Generator Fuel Oil Priming Tank. Review of these calculations indicated the following.

- a) Main Annunciator Cabinet - In the calculation of the cabinet response, 1) 12 ga. sheet metal side panels (25" x 85") were treated as simple beams without verification of the appropriateness of this assumption, 2) angle structural members were treated as simple beams without appropriate consideration of torsion, and 3) the locations of the centroids of the angles were computed erroneously. The last error was found to be due to an error in the handbook used for calculations, however, it appeared that insufficient consideration was given to the applicability of handbook formulas and the basic assumptions ingrained in handbook and simple beam formula formulations. Dr. Cloud agreed that the calculation should be redone. He further indicated that this calculation, in addition to 3 others, had been performed by EDAC under a previous, since cancelled, subcontract. These other calculations were found to be inappropriate by Cloud personnel and were being redone. The cabinet calculation was not checked in as much detail as the other 3 since it indicated that an EOI was to be generated. Therefore, he felt that this was an isolated occurrence of an approval of an erroneous calculation.
- b) Diesel Fuel Oil Priming Tank - No obvious errors were detected in the review of this calculation. However, insufficient attention was given in the evaluation of the concrete anchor bolts used for the supports. This appeared to be due to the low magnitude of the calculated seismic responses, however, we indicated to Cloud that these should be appropriately evaluated in all future calculations.

Given that an error was found in 1 of the 2 completed equipment calculations reviewed, it is recommended that the NRC staff review additional completed equipment calculations to determine whether or not this is an isolated case. In addition, it was observed that procedures for performing the analyses of all items in the Cloud verification effort have not yet been finalized by Cloud.

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PG&E Inspection

1) PG&E and Blume Civil Engineering Related Calculations

Several topics related to the calculations performed by the PG&E and Blume Civil Engineering personnel were discussed. These discussions are described below.

- a) Containment Polar Crane - Discussions similar to those which took place on January 29, 1982, between Mr. Herring and PG&E and Blume personnel were reported. Since that first discussion, PG&E had no new information relative to this issue and indicated that they intended to pursue it further. (See Trip Report K. Herring to F. Miraglia, February 3, 1982.)
- b) Containment Internal Structure Response Above Elevation 140' - The steam generator and pressurizer enclosures which extend about 40 feet above the operating deck (el. 140') were not modeled in the containment structural model. Therefore, floor spectra at el. 140' were used for the design of piping and equipment attached above el. 140' and coupled to these enclosures. The effects of the enclosure flexibility are being evaluated. They indicated that affected items include Main Steam and Containment Spray piping, and the safety and power operated relief valves. The analysis of the Containment Polar Crane in the parked and locked position (at the tops of the steam generator enclosures) is also affected since the flexibility of these enclosures was not considered in Blume's analyses of this crane.
- c) Containment Pipeway - This steel frame structure, attached to the containment shell exterior, was initially assumed rigid. It appears that this assumption is not valid and the effects of its flexibility are being investigated. PG&E indicated that items affected include the Main Steam, Main Feedwater and Auxiliary Feedwater piping, and the Main Steam Isolation Valves.
- d) Main Annunciator Cabinet - PG&E is analyzing the cabinet flexibility in light of Cloud's finding that it was not rigid as assumed initially. They indicated that their preliminary calculations were demonstrating that the cabinet was rigid. However, the PG&E personnel performing the analyses were not aware of the connection details for the doors, internal member and cabinet supports to substantiate the validity of the assumptions made in their analyses.
- e) Containment Exhaust Vent Structure Flexibility - Blume initially determined (November, 1970) that the exhaust vent had a natural frequency of 50 Hz and notified PG&E of this fact. In December, 1970, Blume determined that the 50 Hz was in error and that the frequency was 2 Hz.

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However, they never notified PG&E of this change. Hosgri evaluations done by PG&E relied upon the 50 Hz frequency and determined that the vent would remain elastic. PG&E stated that with a 2 Hz natural frequency, recent evaluations indicate that modifications are required for the vent to remain elastic under the Hosgri criteria and they are evaluating the feasibility of a non-linear analysis to demonstrate acceptability without modification.

- f) Annulus Spectra Revisions - Three revisions to the containment annulus spectra have occurred since the initial discovery of the annulus problem. The first accounted for appropriate orientation, and the second accounted for appropriate mass and stiffness distributions. PG&E indicated that the latest revision has been necessitated by Blume discovering (in a recent internal Blume design audit) that the upper vertical masses of the internal structure in the initial Hosgri analyses inappropriately included such items as the Steam Generator, Reactor and Reactor Coolant Pumps. In addition, the two masses of the internal structure were transposed in the recent evaluations.

Given these and previously identified problems relating to the analyses performed by Blume, PG&E stated that they were currently formulating a program to be instituted by Blume to check the adequacy of Blume's past analyses and to identify appropriate final analyses results. We indicated that we concurred with the need for such a program.

2) PG&E Piping Design and Construction

Recent R. L. Cloud progress reports have identified several as-built discrepancies during piping walk-downs. One issue identified was valve operator orientation. Correct measurements of valve operator orientations apparently were not made during the IE Bulletin 79-14 walk-downs. PG&E currently plans to walk-down all piping to record correct valve orientations.

According to PG&E the majority of the as-built dimensional discrepancies identified by Cloud were errors in drafting and not in the analyses. PG&E stated that the original piping drawings that were marked-up during the field as-built walk-downs were used by the piping analysts. These drawings were then sent to the drafting department to develop the final isometrics. These drawings were not treated as record drawings and therefore, were not subject to stringent quality control procedures. PG&E currently plans to upgrade the drawing controls on the piping isometric drawings and they also plan to perform a sample of 17 walk-downs to the IEB 79-14 criteria. This effort will require further NRC review when PG&E completes the current evaluations on all open items.

MAR 3 1972

3) Ongoing PG&E Investigations

In addition to the work described above, PG&E is in the process of instituting strong project management control of the in-house seismic reverification effort. Since PG&E has initiated and is initiating several additional internal programs to address the concerns identified by Cloud and themselves, it is recommended that the NRC staff meet with PG&E to discuss the adequacy of these programs and to address the open items identified to date. Special attention should be given to assuring that the resolution of problems is approached in an orderly fashion.

Site Visit Observations

On our site visit, we inspected the containment exhaust vent, the steam generator and pressurizer enclosures, and the Main Annunciator Cabinet. Our observations are presented below.

1) Containment Exhaust Vent

From a visual inspection of this structure, it appeared obvious that the natural frequencies were substantially lower than the 50 Hz calculated initially by Blume, and used by PG&E in its Hosgri evaluation of this structure.

2) Steam Generator and Pressurizer Enclosures

From a visual inspection of these structures, the potential for further amplification of motion above ei. 140' appeared obvious, especially considering the connection of the Polar Crane to the steam generator enclosures.

3) Main Annunciator Panel

From a visual inspection of this panel, it was observed that:

- a) The conception of this cabinet ingrained in the Cloud analyses was more representative of the physical configuration than that ingrained in recent PG&E evaluations.
- b) The analysis performed recently by PG&E contained several assumptions which were not representative of the physical situation.
- c) Several loose and missing bolts were obvious.

Based upon the above observations and the previous discussions of the problems in these areas, it appears that many of these problems could have been avoided if analysts had been required to walk down these structures.

Original signed by

Original signed by

Kenneth S. Herring
Systematic Evaluation Program Branch
Division of Licensing, KRR

Original signed by

John R. Fair

John R. Fair
Engineering & Technical Support Branch
Division of Engineering and Quality Assurance, I&E

cc:
See next page

DIABLO CANYON

Mr. Malcolm H. Furbush
Vice President - General Counsel
Pacific Gas & Electric Company ✓
P.O. Box 7442
San Francisco, California 94120

cc: Philip A. Crane, Jr., Esq.
Pacific Gas & Electric Company
P.O. Box 7442
San Francisco, California 94120

Janice E. Kerr, Esq.
California Public Utilities Commission
350 McAllister Street
San Francisco, California 94102

Mr. Frederick Eissler, President
Scenic Shoreline Preservation Conference, Inc.
4623 More Mesa Drive
Santa Barbara, California 93105

Ms. Elizabeth Apfelberg
1415 Cozadero
San Luis Obispo, California 93401

Mr. Gordon A. Silver
Ms. Sandra A. Silver
1760 Alisal Street
San Luis Obispo, California 93401

Harry M. Willis, Esq.
Seymour & Willis
601 California Street, Suite 2100
San Francisco, California 94108

Mr. Richard Hubbard
MHB Technical Associates
Suite K
1723 Hamilton Avenue
San Jose, California 95125

Mr. John Harris, Managing Editor
San Luis Obispo County Telegram-Tribune
1321 Johnson Avenue
P. O. Box 112
San Luis Obispo, California 93406

Mr. Malcolm H. Furbush

- 2 -

cc: Resident Inspector/Diablo Canyon NRS
c/o U. S. Nuclear Regulatory Commission ✓
P. O. Box 369
Avila Beach, California 93424

Ms. Raye Fleming
1920 Mattie Road
Shell Beach, California 93440

Joel Reynolds, Esq.
John R. Phillips, Esq.
Center for Law in the Public Interest
10951 West Pico Boulevard
Third Floor
Los Angeles, California 90064

Paul C. Valentine, Esq.
321 Lytton Avenue
Palo Alto, California 94302

Mr. Byron S. Georgiov
Legal Affairs Secretary
Governor's Office
State Capitol
Sacramento, California 95814

Herbert H. Brown, Esq.
Hill, Christopher & Phillips, P.C.
1900 M Street, N.W.
Washington, D.C. 20036

Mr. Richard E. Blankenburg, Co-Publisher
Mr. Wayne A. Soroyan, News Reporter
South County Publishing Company
P. O. Box 460
Arroyo Grande, California 93420

Mr. James O. Schuyler
Vice President - Nuclear Generation Department
Pacific Gas & Electric Company
P.O. Box 7442
San Francisco, California 94120

Bruce Norton, Esq.
Suite 202
3216 North 3rd Street
Phoenix, Arizona 85012

Mr. Malcolm H. Furbush

- 3 -

Mr. W. C. Gangloff
Westinghouse Electric Corporation ✓
P. O. Box 355
Pittsburgh, Pennsylvania 15230

David F. Fleischaker, Esq.
P. O. Box 1178
Oklahoma City, Oklahoma 73101

Arthur C. Gehr, Esq.
Snell & Wilmer
3100 Valley Center
Phoenix, Arizona 85073

Mr. Owen H. Davis, Director
Federal Agency Relations ✓
Pacific Gas and Electric Company
1050 17th Street, N.W.
Suite 1180
Washington, D.c. 20076

MAR 31 1982

TE HQ FILE COPY

Docket Nos. 50-275, 50-323 (OPS)

Pacific Gas and Electric Company
 P. O. Box 7442
 San Francisco, California 94120

Attention: Mr. Phillip A. Crane, Jr.
 Assistant General Counsel



Gentlemen:

Subject: NRC Inspection of Diablo Canyon Units 1 & 2

This refers to the routine inspection conducted by Mr. P. Morrill of this office on November 13, November 30, December 23, December 29, December 31, 1981 and January 6, 1982, as well as the inspections conducted by Messrs. P. Morrill and P. Joukoff of this office on January 7-8, 1982, of activities associated with the Seismic Reverification Program required by NRC Order Suspending License DPR-76 (CLT-81-30). Discussions of our findings were held by Mr. Morrill with Dr. R. Cloud of R. L. Cloud Associates, Inc., on December 31, 1981, and with Mr. I. Wollak and other members of your staff on January 8, 1982, at the conclusion of the inspection.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure(s) will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

D. M. Sternberg
 D. M. Sternberg, Chief
 Reactor Operations Projects Branch

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OFFICE	RV/jk					
SURNAME	MORRILL	JOUKOFF	YOUNG	STERNBERG	Bishop	
DATE	3/6/82	3/24/82	3/29/82	3/30/82	3/30/82	

MAR 31 1982

Enclosure:

Inspection Report

Nos. 50-275/82-02

50-323/82-02

cc w/o enclosure:

W. A. Raymond, PG&E

E. B. Langley, Jr., PG&E

R. C. Thornberry, PG&E (Diablo Canyon)

Sent to DMB for DCS processing

Distributed by RV:

State of CA (Hahn & Johnson)

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~~FOR~~ Resident Inspector

RHE (w/o enclosure)

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275/82-02
50-323/82-02

Docket No. 50-275, 50-323 (OPS) License No. CPPR-39, CPPR-69 Safeguards Group

Licensee: Pacific Gas and Electric Company

P. O. Box 7442

San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 & 2

Inspection conducted: (1) Pacific Gas and Electric Company, San Francisco, California
(2) URS/Blume and Associates, San Francisco, California
(3) R. L. Cloud Associates Inc., Berkeley, California

Inspection conducted: November 13 and 30, 1981, December 23, 29 and 31, 1981 and
January 6-8, 1982

Inspectors: P. Morrill 3-29-82
P. Morrill, Reactor Inspector Date Signed

P. Joukoff 3-29-82
P. Joukoff, Investigator Date Signed

Approved by: T. Young, Jr. 3-30-82
T. Young, Jr., Chief, Reactor Projects Section 2 Date Signed
Reactor Operations Project Branch

Summary:

Inspection of November 13 and 30, 1981, December 23, 29 and 31, 1981 and
January 6-8, 1982 (Report Nos. 50-275/82-02, 50-323/82-02)

Areas Inspected: Routine inspection of activities associated with the licensee's Independent Evaluation of Seismic Service Related Contract work performed prior to June 1978 pursuant to NRC Order Suspending Licensee (CLI-81-3). This inspection effort involved 64 inspector-hours on-site by two NRC inspector/investigators.

Results: The findings contained in this report will be evaluated in conjunction with other ongoing reviews related to the seismic adequacy of Diablo Canyon.

DETAILS

1. Persons Contacted

Pacific Gas and Electric (PG&E) Company

- * E. Kahler, Senior Quality Engineer
- * V. Ghio, Senior Civil Engineer
- * I. Wallak, Supervising Civil Engineer

R. L. Cloud Associates Inc. (Cloud)

- **R. Cloud, President
- **P. Chen, Project Engineer

URS/J. A. Blume and Associates (Blume)

- D. Lang, Project Manager
- L. Malik, Manager of Structures Department
- D. Jhaveri, Vice President, Deputy Manager, Nuclear and Energy Division

The inspectors also talked with and interviewed a number of other licensee and contractor employees.

- * Denotes those attending the exit meeting on January 8, 1982.
- **Denotes those attending the exit meeting on December 31, 1981.

2. Organization and Management

The inspector examined the R. L. Cloud and Associates (RLCA) proposed seismic reverification program dated December 3, 1981, and discussed the program implementation with Dr. Cloud and his employees. The inspector observed that RLCA had six full-time and three subcontracted engineers working on the reverification program. The inspector also observed that RLCA had contacted Stone and Webster for assistance on system design review in a letter dated December 23, 1981. Dr. Cloud informed the inspector that the Quality Assurance (QA) review to be done by Roger Reedy, Inc. (Reedy), was under way and that Reedy had set up his audit plans, was accumulating plans and manuals, had begun a preliminary review of the documents received to date, and was beginning to audit the various seismic subcontractors. The inspector also discussed RLCA reporting requirements with Dr. Cloud. Dr. Cloud stated that on or about the time of the November 3, 1981 meeting with the NRC his contract responsibility shifted from Mr. J. Rocca to Mr. G. Maneatis. As a practical matter, Mr. Rocca retained technical responsibility to assist RLCA in obtaining information while findings and identified problems were dealt with at Mr. Maneatis' level. RLCA employees felt that this arrangement had significantly speeded the flow of information from PG&E to RLCA.

3. Review of Cloud Progress Reports

The inspector examined the RLCA reports, listed below, and the RLCA files, and discussed items identified in the progress reports with RLCA personnel to verify adherence to the NRC's order (CLI-81-30) of November 22, 1981.

a. Progress Report of Seismic Service-Related Contracts Prior to June 1978.

Progress Report No. 1	11/2 - 11/10/81
Progress Report No. 2	11/11 - 11/23/81
Progress Report No. 3	11/24 - 12/8/81
Progress Report No. 4	12/9 - 12/21/81

b. Design Verification Program - Seismic Service Related Contracts prior to June 1978 dated December 3, 1981 (Program).

The inspector observed that the program had evolved through the use of the progress reports, in that RLCA personnel had deleted Westinghouse and General Electric from further consideration on the basis that they were primarily equipment vendors and whatever services they offered were in support of licensing. The inspector stated that this interpretation of the NRC's order should be documented and requested that RLCA employees document and justify their position. Subsequently, the documentation effort requested was included in RLCA's Progress Report No. 4 dated December 21, 1981, on pages 1 and 4.

The inspector also observed that RLCA employees had identified several items requiring follow-up and/or more information. During discussions with RLCA employees the inspector also determined that there was confusion regarding the applicable seismic spectra for equipment in the auxiliary building (see Paragraph 6 of this report). As a consequence of these observations, the inspector asked RLCA employees how they were keeping track of errors and items requiring follow-up. RLCA employees stated that they would use an "error/open item" identification system and would include copies of the "error and open item list" in subsequent progress reports. Subsequently, the inspector verified that this commitment was met in RLCA Progress Report No. 5 dated January 6, 1982.

4. Review of R. L. Clouds' Quality Assurance (QA) Program Implementation

The inspector examined the RCLA QA Manual, Revision 5, dated November 1981, and the RCLA QA Supplement, Revision I, dated December 1981, for the Seismic Reverification Program. The inspector also examined the records used to indicate which personnel had read and understood the manual and its supplement. The inspector observed that two engineers and one secretary assigned to the reverification program had apparently not read or signed the records. RLCA employees committed to have all appropriate project personnel read and sign this documentation. During the inspection period the inspector verified that this commitment was completed.

5. Review of Work in Progress

a. The inspector examined the seismic reverification program generic sample work in progress for the following items to verify accuracy and completeness.

- i) Component cooling water piping seismic model
- ii) Auxiliary building seismic model
- iii) Component cooling water heat exchanger seismic model
- iv) Charging System pump suction piping seismic model

The inspector discussed this work with the responsible engineers and verified that their work was based on PG&E drawings which had been verified at the plant by RLCA employees. The inspector determined that in one case, the auxiliary building, the RLCA employees were verifying the location of concrete block walls (i.e.: PG&E Drawing 438431, Revision 12, shows added block walls around the 480 volt switchgear) and other changes made after the Hosgri report was prepared, but were not verifying embedded items or all structural steel details.

b. The inspector examined the RLCA files (logs) related to the seismic reverification program to verify selected conclusions stated in the RLCA progress reports. The following specific items were examined.

- i) Electrical raceway supports: seven of 20 examined by RLCA appeared in error. PG&E is following up on this item.
- ii) Heating, ventilating, and air conditioning equipment: four equipment items were found by RLCA to have deficiencies in their qualifications. PG&E is following up this item.
- iii) Electrical conduit supports: RLCA questioned the method of qualifying the conduit. PG&E personnel were doing additional calculations to qualify these supports. RLCA intends to followup this PG&E work when it is completed.
- iv) Differences between field walk down data and PG&E drawings: PG&E resolving these on a case-by-case basis.

6. Outdated Seismic Spectra for Auxiliary Building

- a. While examining the RLCA work which identified problems described in the RLCA progress reports the inspector observed that the RLCA seismic analysis of piping located in the auxiliary building was on hold pending resolution of the seismic spectral inputs (spectra). RLCA employees showed the inspector that the docketed "Hosgri Report" (Section 4) dealing with the auxiliary building was different and in some cases less conservative than the URS/Blume final Seismic Report for the auxiliary building, dated October 1979. RLCA had requested resolution by PG&E as to which were the controlling seismic spectra in a letter, Cloud to Rocca, dated November 5, 1981. In a subsequent telephone call with URS/Blume (Cloud file P105-4-593-015), an RLCA employee was told that the north-south spectra for the auxiliary building in the May 1977 preliminary report were incorrect in that the soil spring (north-south) was left out of the model, that the October 1979 report corrected this error and that this (later) spectra is in all cases lower. RLCA employees were also sent an internal PG&E memorandum (DCM C-15 dated November 19, 1981), which indicated that figures 17 through 34 of the October 1979 report superseded figures 4-110 through 4-127 in the Hosgri report.

When questioned as to why RLCA did not bring this item to the NRC's attention, Dr. Cloud stated that at the time this issue came up he was interested in obtaining a set of spectra to conduct independent calculations to complete his work promptly and well. Prior to the NRC inspector discussing the issue, Dr. Cloud didn't know the status of the October 1979 report versus the Hosgri report but stated that the time issue would have to be clarified before his review could be completed. He felt that the RLCA work was still valid since his work could check the PG&E calculation and analysis methods using the Hosgri spectra and that wouldn't change the review of methodology. Dr. Cloud felt it was PG&E's responsibility to clarify the design basis of the plant and in the interim he intended to use the Hosgri (as defined by the ground spectra) report since it was based on close scrutiny by the NRC and a host of others. He also stated that any significant problem would have come out of the RLCA Auxiliary Building review in any case.

Based on this information, the inspection staff concluded that it was appropriate to continue the inspection efforts at URS/Blume's (Blume's) and PG&E's offices in San Francisco in order to determine the significance of the different spectra and the cause of the apparent delay for reporting this matter to the NRC. The inspectors met with Blume personnel on January 8, 1982 and with PG&E personnel on January 7 and 8, 1982 in San Francisco.

- b. Blume personnel stated that the auxiliary building report prepared in May 1977 was preliminary and marked as such. They went on to explain that their design review (dated October 27, 1978) had discovered the inadvertent omission of the soil springs at elevation 100 feet in the north-south direction and that this omission was corrected in the final October 1979 Report. Since this omission led to conservative results for the auxiliary building structural analysis, the Blume design reviewer concluded that the preliminary analysis was conservative. The spectra developed from the building responses were different and Blume expected PG&E to take appropriate action. Since most of the spectra peaks were lower it was thought by Blume personnel that loads would generally decrease. The inspector observed that generally translational spectra were reduced, torsional spectra increased, and frequency of peak responses increased. The inspector asked Blume personnel why they had told RLCA personnel on November 17, 1981 that the October 1979 report's spectra were "in all cases lower" (RLCA telecon record P105-4-593-015). Blume personnel responded that they had intended to communicate that "responses were lower" and that the October 1979 Auxiliary Building Report contained the spectra which should be used by RLCA.

In response to the inspector's questions Blume personnel stated that PG&E had requested them to analyze the impact of the changes in spectra on equipment, piping and components. They went on to state that only equipment in the Auxiliary Building, east side, above elevation 100 feet appeared to require some seismic qualification checks since other spectra for the Building were conservative. At the time of the inspection no adverse effect on equipment qualification had been identified. Based on an examination of the 1977-78 design reviews, Blume personnel felt that this problem (omission of soil springs in analysis) was unique.

- c. In response to questions by the inspectors, PG&E personnel stated that they believed that the October 1979 Report on the Auxiliary Building was given to PG&E by Blume to fulfill the Blume/PG&E contract. Four copies of the report were received, looked at briefly, and filed. None were sent to the NRC or used to amend the Hosgri Report as PG&E was unaware that the spectra changed from the preliminary (May 1977) report.

The inspector pointed out that the original Blume Report on Design Review dated October 27, 1978 had been reviewed by PG&E personnel on December 1, 1978 and accepted by the responsible supervisor on December 13, 1978 (PG&E Civil Engineering Department,

file 40.31). PG&E personnel stated that they did not do a "design review" of Blumes' work but only verified that Blume had asked and addressed the appropriate questions in their (Blumes') internal design review. PG&E personnel stated that, had they been aware of the different spectra between the preliminary and final reports, they would have done something.

Reportedly when Cloud personnel raised the issue in late October 1981, PG&E personnel prepared overlays to look at the differences and concluded that the differences "didn't look too significant". PG&E personnel did not report this item to the NRC because they were not sure if it was a problem and consequently tasked Blume to evaluate which areas of the Auxiliary Building were affected and what that would do to equipment qualifications. PG&E personnel stated that there were insufficient resources to devote to each "thing" that appeared to be of low impact from a technical viewpoint and that they were directing their resources to major items first. Reportedly the building was unaffected and only a limited number of equipment seismic qualifications might be unconservative. As a consequence, PG&E personnel cancelled the internal memorandum, DCM C-15 of November 19, 1981 (directing the use of the October 1979 report) with another memo dated November 25, 1981 until Blume's review is completed.

PG&E personnel also informed the inspector that they had initiated a nonconformance report (NCR) on this problem and that Engineering Quality Control (EQC) would followup resolution of the problem. The NRC, DCO-81-QA-N00S, indicated that PG&E personnel had reviewed reportability under 10 CFR 50.36 and 50.55(e) and had concluded that reporting cannot be made until the PG&E civil engineering review was completed.

The inspector examined the following documents to verify the licensee's and contractor's statements.

Hosgri Report - NRC Docket Files

May, 1977 and October 1979 "Auxiliary Building Dynamic Seismic Analyses for the 7.5M Hosgri Criteria" Reports

May 11, 1977 Transmittal Sheet - Transmitting the May 1977 Report

November 17, 1981 Dension/Long Telecon Cloud File P105-4-593-015

November 19 and 25, 1981 Letters (DCM C-15) Wollak to PG&E Engineering Staff

October 27, 1978 Blume Report on Design Review of the
Diablo Auxiliary Building

December 13, 1978 PG&E - Hosgri Design Verification of
The Auxiliary Building

November 20, 1981 - List of URS/Blume Hosgri Reports
(total of ten)

December 30, 1981 - NCR, DCO-81-QA-N00S Auxiliary Building

Undated Overlays of Seismic Response Curves for the
Auxiliary Building

The inspector observed that the entire matter had been handled in an informal manner in that (1) Blume was conducting the review based on verbal instructions, (2) the matter had not been identified to the NRC until the inspectors discovered it, (3) the items being identified by Cloud, PG&E and others were not being systematically identified and tracked in any one place or manner, and (4) the NCR written by PG&E and shown to the inspector was missing several signatures and dates. The inspector also observed that he had not detected any apparent deception or with holding of information and that the persons contacted had been very cooperative with the inspectors. PG&E personnel expressed concern that the problem of the Auxiliary Building spectra may not be a safety problem at all and that to report it is a problem prematurely would make it an issue regardless of its safety implications. They also pointed out that reporting this type of item was outside regulatory requirements. The inspector stated that these points were correct but added that there was extreme sensitivity to anything related to the seismic analysis of Diablo Canyon and that it might be in the licensee's best interest to report items of concern before someone else did.

7. The inspectors met with RLCA representatives on December 31, 1981 and with the licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on January 8, 1982. The inspectors summarized the scope of the inspection and the findings as described above.

MAY 27 1982

Docket No. 50-275

Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

Attention: Mr. Philip A. Crane, Jr.
Assistant General Council

Gentlemen:

Subject: Diablo Canyon Nuclear Power Plant Independent Design Verification
Program Meeting on May 15, 1982

This refers to the meeting held on May 15, 1982 regarding Diablo Canyon
Independent Design Verification Program activities.

Subjects discussed during this meeting are described in the enclosed
report.

In accordance with Section 2.790 of the NRC's "Rules of Practice,"
Part 2, Title 10, Code of Federal Regulations, a copy of this letter and
the enclosed report will be placed in the NRC's Public Document Room.

Sincerely,

Original signed by

T. W. Bishop

T. W. Bishop, Chief
Reactor Construction Projects
Branch

Enclosure:
NRC Inspection Report
No. 50-275/82-17

cc w/enclosure:
W. A. Raymond, PG&E
R. C. Thorberry, Plant
Manager, PG&E

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U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275/82-17
Docket No. 50-275 License No. CPPR-39 Safeguards Group _____
Licensee: Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

Facility Name: Diablo Canyon Nuclear Power Plant

Meeting Location: Pacific Gas and Electric Company Corporate Office,
San Francisco, California

Meeting Conducted: May 15, 1982

Report by: *T. W. Morrill* for P. J. Morrill, Reactor Inspector 5/27/82
Date Signed

Approved by: *T. W. Bish* Chief, Reactor Construction Projects 5/27/82
Branch Date Signed

Summary: A meeting was held with representatives of Pacific Gas and Electric Company, Teledyne Engineering Services, R. L. Cloud and Associates, Consultants for the Governor of California, the Joint Intervenors, and the Nuclear Regulatory Commission on May 15, 1982.

The meeting was requested by Teledyne for the purpose of developing a schedule for the Verification Program managed by Teledyne Engineering Services. The schedule was to be included in a proposed Teledyne Engineering Services Interim Technical Report.

DETAILS

1. Meeting Attendees

- a. Teddyne Engineering Services (TES)
W. E. Cooper, Verification Project Manager
- b. Pacific Gas and Electric Company (PG&E)
J. B. Hoch, Project Manager
R. F. Locke, Council
R. R. Fray, Verification Coordinator
B. S. Lew, Project Licensing Engineer
- c. Bechtel
H. B. Friend, Project Completion Manager
R. C. Anderson, Engineering Manager
J. R. Leahy, Project Cost and Scheduling Engineer
- d. R. L. Cloud and Associates (RLCA)
R. L. Cloud, President
E. Denson, Verification Project Manager
- e. MHB Associates
R. B. Hubbard, Consultant to Governor of California
- f. Center for Law in the Public Interest
J. R. Reynolds, Representative for Joint Intervenors
- g. Nuclear Regulatory Commission (NRC)
P. J. Morrill, Reactor Inspector

2. Meeting Objectives

The purpose of the meeting was to establish a schedule for completion of the verification program to be included in a TES interim technical report.

3. Background and Introduction

On May 8, 1982, TES sent a letter to PG&E proposing a joint meeting between PG&E, TES, and RLCA to obtain an indication of the PG&E schedule for the verification program. The TES letter also stated that some discussion of the additional sampling and verification of

the Independent Design Verification Program (IDVP) would be necessary to improve the clarity of presentation and refine the draft schedule, but would not substantially change the engineering plan. Since TES representatives would be in San Francisco on May 13, 14, and 15, 1982, the meeting was set up to occur on the morning of May 15, 1982. The NRC was invited on May 13, 1982, and subsequently invited representatives of the Governor of California and the Joint Inter-venors. The NRC was represented by an inspector from Region V. Bechtel personnel were present at the meeting in their capacity as part of the PG&E joint Project Organization which was discussed at a previous meeting with the NRC on April 30, 1982. (Meeting minutes dated May 18, 1982.)

4. TES Presentation

TES representatives explained the purpose and scope of the meeting. Dr. Cooper outlined isolated portions of the TES draft Interim Technical Report currently being worked on by TES and RCLA (see TES 13th Status Report). Dr. Cooper expected the interim report to be issued in early June 1982. TES requires some help from PG&E on schedule development for completeness in the report and scheduling their own work. After examining the items identified to date, TES had grouped each of them in one of nine groups. TES suggested that completion of the IDVP will run into August 1982 with current manning levels. This general schedule is also based on a one week turn around time for information from PG&E. The nine groups and additional work required by the IDVP are outlined below:

Buildings - TES is concerned with Design Control of Changes (including field changes).

Piping - TES feels that piping isometric drawings must be updated and that the weight and orientation of valves must be checked. Five additional piping analyses will be independently verified.

Piping Supports - TES is checking the two piping codes used (Adelpipe and Pipisd). They may compute support loads differently.

Small Bore Piping - Five additional samples of axial pipe runs and lug design will be reviewed to assess lug stress. The spacing criteria for supports do not appear to be all inclusive. Five samples of small pipe will be rigorously analyzed to verify engineering judgement used in the field.

Equipment - Frequency calculations for electrical equipment in the main control board will be reviewed. An additional sample of tanks will be analyzed for buckling of the skirt and sloshing loads on the roof. Two additional pump qualifications will be examined. Two additional samples of HVAC equipment will be examined.

Shake Tested Equipment - Confirm assumptions (location, test procedure, mounting, spectra, etc.) for all equipment seismically qualified by shake table testing excluding NSSS.

Conduit Supports - RLCA will verify Pw&E corrective actions after PG&E has completed field changes. TES will also check seismic inputs (PG&E Task 7100) after PG&E is finished. PG&E is to respond to criteria deficiencies (RLCA File 930).

HVAC Ducting - No additional sampling.

Hosgri Spectra - Hosgri and Blume spectra must be reconciled and controlled. Spectra must be developed for certain areas. Where preliminary or compromised spectra were used for equipment qualification, the spectra and qualification must be evaluated. PG&E must confirm that the correct spectra were used for all Hosgri qualification. TES will selectively verify new spectra.

5. PG&E/Bechtel

Bechtel personnel stated that the proposed finishing date for this work (August 31, 1982) did not look good to them. After a brief discussion of the additional sampling required by TES, the parties took a break. Upon return, the discussion started again dealing with scheduling. It was finally agreed that TES should issue the Interim Report without the inclusion of a schedule or without dates on the schedule. After a review and an opportunity for discussion, the PG&E/Bechtel personnel felt they could better derive a meaningful schedule.

6. NRC

The NRC representative asked how the licensee expected to improve the schedule. The licensee's representative stated that this could be accomplished by adding more resources (people) to the various organizations. The NRC representative stated that the notification time for this meeting had been very short and that, for future meetings, a week would be much more appropriate to allow notification and travel time.

7. MHB Associates

The Governor's consultant stated that the notification for the meeting had been too short and stated that it was taking too long to get copies of reports and letters from the NRC in Bethesda. In the ensuing discussion, PG&E states that they would serve all the parties for documents generated by PG&E, but TES was not under such a requirement and should not be, since it would divert them from their primary task. The Governor's representative stated that they would probably bring this problem to NRR's (Harold Denton) attention since they were not satisfied.

8 Center for Law in the Public Interest

The intervenor's representative generally supported the Governor's consultant and also requested a prompter distribution of documents generated by the IDVP.

The meeting adjourned with the understanding that TES would issue an Interim Technical Report in the near future without a schedule. PG&E/Bechtel would then be able to discuss the findings with TES and RLCA to establish a schedule.

JUN 29 1982

Docket Nos. 50-275
 50-323

TE HQ FILE COPY

Pacific Gas and Electric Company
 P. O. Box 7442
 San Francisco, California 94106

Attention: Mr. Philip A. Crane, Jr.
 Assistant General Counsel

Gentlemen:

This refers to the inspection activities conducted by Messrs. P. J. Morrill and J. H. Eckhardt of this office as well as Messrs. K. S. Herring, J. R. Fair, H. E. Schierling, P. T. Kuo, and H. E. Polk of the NRC headquarters offices during the month of May 1982, of activities authorized by NRC License No. DPR-76 and Construction Permit No. 69 related to the Diablo Canyon Independent Verification Program (IDVP). Mr. Morrill and others of our staff discussed our findings with Mr. M. Tresler of PG&E on May 14, 1982, with Mr. R. L. Cloud of R. L. Cloud and Associates on May 13, 1982, with Mr. W. E. Cooper of Teledyne Engineering Services on May 26, 1982, and with Mr. W. White of Bechtel Power Corporation on May 28, 1982. Mr. J. Knight of NRC Headquarters was also present as an observer during the inspection effort at Teledyne Engineering Services offices in Waltham, Massachusetts.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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IEDI

OFFICE	RV/dot						
SURNAME	MORRILL	ECKHARDT	FAIR	HERRING	BISHOP	STERNBERG	
DATE	6/28/82	6/28/82	6/28/82	6/28/82	6/28/82	6/29/82	

JUN 26 1982

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

S

D. M. Sternberg, Chief
Reactor Operations Project Branch

Enclosure:
IE Inspection Report
Nos. 50-275/82-20
50-323/82-10

cc w/o enclosure:
J. L. Schuyler, PG&E
J. D. Shiffer, PG&E
W. A. Raymond, PG&E

cc w/enclosure:
R. C. Thornberry, PG&E (Diablo Canyon)
W. F. Cooper, Teledyne

bcc: DMB/Document Control Desk (RIDS)

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RHE (w/o enclosure)
Resident Inspector

S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-275/82-20 and 50-323/82-10

Docket Nos. 50-275 and 50-323

License Nos. DPR-76 and CPPR-69

Licensee: Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

Facility Name: Diablo Canyon Nuclear Power Plant

Inspection Location
and Date(s):

- (1) Teledyne Engineering Services West Coast Office,
Hayward, California - May 6, 1982
- (2) Pacific Gas and Electric Company, Diablo Canyon
Site, Avila Beach, California - May 10-11, 1982
- (3) Pacific Gas and Electric Company Corporate Offices,
San Francisco, California - May 12-15, 1982 and
May 26-28, 1982
- (4) R. L. Cloud and Associates, Berkeley, California -
May 13, 1982
- (5) Teledyne Engineering Services, Waltham, Massachusetts -
May 25-26, 1982

Report by:

[Signature] for
P. J. Merrill, Reactor Inspector

6/28/82
Date

[Signature] for
J. R. Fair, Senior Mechanical Engineer

6/28/82
Date

[Signature] for
J. H. Eckhardt, Reactor Inspector

6/28/82
Date

[Signature] for
K. S. Herring, Senior Structural Engineer

6/28/82
Date

Approved by:

[Signature] for
T. W. Bishop, Chief
Reactor Construction Projects Branch

6/28/82
Date

Summary:

Inspection during period of May 6-28, 1982 (Report Nos. 50-275/82-20 and 50-323/82-10)

The inspectors examined the following areas: (1) Implementation of the Independent Verification Program including independence and qualification of personnel, review of independent calculations, examination of Quality Assurance programs and Project Procedures, examination of log files and discussions with personnel; and (2) Pacific Gas and Electric Company Technical Program efforts including an examination of field modifications, a review of Civil and Mechanical engineering procedures, as well as an examination of The Blume Internal Reviews and discussions with personnel. This inspection effort involved 112 inspector-hours by four NRC inspectors and 72 reviewer hours by three NRC Headquarters personnel.

DETAILS

1. Persons Contacted

Pacific Gas and Electric Company

J. B. Hoch, Project Manager
B. S. Lew, Licensing Engineer
R. R. Fray, Verification Program Coordinator
M. R. Tresler, Mechanical/Piping Group Supervisor
G. H. Moore, Project Engineer, Unit No. 1

Bechtel Power Corporation

H. B. Friend, Project Completion Manager
R. C. Anderson, Engineering Manager
W. White, Assistant Project Engineer, Seismic
J. K. McCall, Civil Group Supervisor

R. L. Cloud and Associates

R. L. Cloud, President
E. Dennison, Project Manager

Teledyne Engineering Services (TES)

W. E. Cooper, Project Manager
D. F. Landers, Vice President, Engineering
R. Wray, Assistant Project Manager, Seismic
G. Moy, Principal Engineer and Manager
C. G. Sprangers, Assistant Project Manager, QA
R. D. Foti, Manager, Projects
R. D. Ciatto, Civil/Structural, Team Leader
L. C. Noriega, Assistant Project Manager, Stone and Webster
J. H. Malohson, TES Quality Assurance
J. M. Cantalupo, Project Administrator
R. R. Boentgen, Manager, Testing and Instrumentation
R. C. Wilkinson, TES West Coast Manager, Projects

2. Teledyne Engineering Services Hayward Facility

An inspector visited the Teledyne Engineering Services (TES) Hayward office on May 6, 1982 to verify the scope and purpose of that office's involvement in the IDVP. Based on discussions with personnel and an examination of TES records the inspector concluded that the subject office did have personnel with mechanical and structural engineering expertise who would gather "as-built" data from the Diablo Canyon site. The inspector also concluded that this office would not become involved in the TES Technical Reviews.

3. Diablo Canyon Site Tour

An inspector and the NRR Project Manager for the Independent Verification Program (IDVP) toured the Diablo Canyon site on May 10 and 11, 1982 to determine the status of PG&E modifications and to determine the involvement and awareness of on site personnel. The inspector determined that modifications to pipe and conduit/cable tray supports were largely complete and that on-site operations and construction personnel were appropriately knowledgeable of and involved with the IDVP. The inspector also observed that PG&E and Bechtel personnel were in the process of formulating their working relationships with the consolidated Bechtel/PG&E organization.

4. PG&E and R. L. Cloud and Associates Offices

Two inspectors and the NRR Project Manager for the IDVP visited the PG&E and RLCA offices in San Francisco and Berkeley, respectively, during the period May 12-14, 1982 to verify adequate implementation of the IDVP plan and to review selected portions of the ongoing PG&E Technical (corrective) Programs. The inspectors examined the documents listed below:

PG&E Documents

P-19, dated May 6, 1982 "Procedure for Reviewing as-built piping isometrics against seismic and thermal computer analyses"
P-11, dated February 27, 1982 "Procedure for Seismic Analysis"
C-17, dated April 19, 1982 Design Criteria Memorandum (Spectra for use in engineering analyses)

RLCA Documents

QA Manual, dated March 22, 1982
Contract with PG&E, dated December 3, 1982
Diablo Canyon Independent Verification Program Project Specific Instructions, dated April 13, 1982

The inspectors also discussed the PG&E Technical Programs and calculations with PG&E and RLCA personnel.

The inspectors observed that Procedure P-19 had different criteria for measurement tolerances than the IEB 79-14 walkdown tolerances contained in Procedure P-11. PG&E representatives stated that P-19 tolerances were used for engineering evaluations of deficiencies noted in the walkdowns. The inspectors requested that PG&E document the basis for the increased tolerances. PG&E representatives stated that they are currently revising the procedure, and would document the basis for any tolerance increases for the revised procedure.

The inspectors observed that the RLCA contract referenced the appropriate PG&E QA requirements. RLCA personnel stated that they were waiting for PG&E modifications before re-review of the main annunciator cabinet. RLCA personnel also stated that TES was in the process of auditing RLCA and that their QA program may be superceded by the TES QA program.

5. Teledyne Engineering Services Offices

Two inspectors, the NRR Project Manager for the IDVP, and two technical reviewers from NRR visited the TES offices in Waltham, Massachusetts during the period May 25-26, 1982 to verify adequate implementation of the IDVP plan, to examine the independence and qualifications of TES personnel, and to verify adequacy and implementation of TES procedures. The inspector examined the following documents:

- IDVP-PP-005, Rev. 0 draft, dated 4/5/82 "Potential or Apparent Conflicts of Interest of Individuals"
- IDVP-PP-003, Rev. 0, dated 3/31/82 "Preparation of Open Item Reports, Error Reports, Program Resolution Reports, and IDVP Completion Reports"
- TES Letter dated 4/2/82, 5511-16, TES to PG&E Forwarding Program Management Plan
- TES Letter dated 4/14/82, 5511-26, TES to Stone & Webster, Roger F. Reedy & RLCA
- IDVP-PP-004, Rev. 0, dated 3/31/82 "Applicable Quality Assurance Requirements"
- TES QA Manual, March 21, 1980 and Project QA Program, project 5511, Rev. 3, dated 4/2/82
- Roger F. Reedy, QA Manual, Edition 1, Rev. 0, dated 12/22/81
- Project QA Program 5511, Rev. 0, dated 1/8/82
- PG&E Specification CO Rev. C, dated 11/10/81 - Teledyne "Specification for Consultants Quality Assurance Program"
- EP-1-013, Rev. 0, dated 4/5/82, "DCNPP Individual, Design Verification Program - Program Management Plan"
- EP-1-014, Rev. 0, dated 3/18/82 "TES Review and Evaluation Team Activities for DCNPP Design Verification Program"
- Special QA Procedure, SQAP-81-01, Rev. 0 "Control of Drawings, Specifications, Procedures and Instructions"
- TEP-1-001, Rev. 2, dated 9/2/81 "Initiation Approval, Implementation, Revision, and Control of TES Procedures and Engineering Instructions"
- TEP-1-002, Rev. 2, dated 3/23/81 "Guidelines for Writing TES Engineering Procedures"

TEP-1-004, Rev. 0, dated 9/8/81 "Reporting of 10 CFR 21 Offenses"
TES QA Audit Summary for 5/17-18/1982 "Audit of Document Control upon
Completion of Phase 0"
PG&E letter to TES, dated 1/8/82, Agreement with TES for Design Reverification
Program, Contract No. 5-2-82
April 20, 1982 TES visit to RLCA offices - Trip Report
PG&E letter to TES, dated 5/3/82, Approval of TES QA Program

The inspectors also conducted interviews with TES personnel and discussed the application of TES procedures to the IDVP.

A) Independence of Teledyne Engineering Services

The inspectors reviewed the independence of the design verification contractor Teledyne Engineering Services (TES). The objective of the review was to ascertain whether the contractor could be expected to provide an objective, dispassionate technical judgment, provided solely on the basis of technical merit. The following factors were considered in this determination:

- a. The extent of the previous or current involvement of TES and the TES reviewers with Pacific Gas and Electric Company or Diablo Canyon.
- b. Whether the TES reviewers or members of his or her immediate family own any beneficial interest in PG&E.
- c. Whether members of the immediate family of the TES reviewers are employed by PG&E.

Information provided by TES to the NRC demonstrated that recent contracts between TES and PG&E account for only a small amount of TES revenue. The inspectors consider the value low enough to assure corporate financial independence.

The inspectors consider that the TES individuals involved in the IDVP demonstrate sufficient independence. This conclusion was based on review of twenty-four of the reviewers "Conflict of Interest" statements and confidential interviews with nine TES individuals. In all cases it was found that the individuals met the independence criteria established by the contractor.

In summary, for the reasons given above, the inspectors conclude that the selected contractor, TES, has adequately demonstrated both corporate and individual independence.

B) Implementation and Adequacy of Procedures

The inspectors observed that the TES letter 5511-26, dated 4/14/82, made a minor revision to the NRC approved IDVP Plan. The inspectors stated that the NRC must be kept informed of all changes to the plan and that NRC concurrence must be obtained prior to implementing procedures less conservative than the NRC approved IDVP. TES representatives explained that the only change that they had made was to distribute copies of "Potential Program Resolution Reports" and "Potential Error Reports" to PG&E. TES representatives stated that they would include this item in their next "Semi-Monthly Status Report" to document the change. The NRC inspectors stated that this was acceptable.

The inspectors were informed by PG&E personnel present at TES offices that Paragraph 10.3 of the approved IDVP had been interpreted to allow calculations of frequencies and made shapes of the Diablo Auxiliary Building to be transmitted to PG&E. The inspectors stated that PG&E and the IDVP members are free to discuss findings sufficiently to understand them, and that PG&E (or any party) could send the IDVP members as much information as they wished. However, the inspectors stated, it was not appropriate to send copies of calculations, results of calculations, results of the IDVP or conclusions of the IDVP to PG&E prior to sending them to the NRC. The inspectors cautioned TES Personnel that even an appearance of influence must be avoided and that the exchange of data which PG&E personnel brought up should not be repeated. During discussions to allow PG&E to understand the nature of IDVP findings a record should be kept (telephone memo, meeting minutes, etc.) to document the exchange. TES representatives acknowledged the inspector's observations and stated that they would submit an interpretation of paragraph 10.3 of the IDVP plan as soon as possible, keeping in mind the inspector's statements and the necessity of good communications. TES representatives also stated that they were in the process of accumulating copies of all the RLCA files to support the TES file item findings and dispositions.

6. Pacific Gas & Electric Offices

One inspector visited the PG&E offices in San Francisco during the period May 25-28, 1982 to examine the findings of the Blume Internal Review Committee and to check the status of ongoing civil/structural work. The inspector discussed these items with PG&E and Bechtel personnel assigned to the Diablo Canyon Project.

The inspector observed that there is no simple way to cross a specific spectra to items for which it is relevant. The inspector also observed that equations 3 and 4 of the Civil Design Criteria Memo (DCM) require clarifications and that item TBO01 (Turbine Building Ductibility" may be required for submittal to the NRC. PG&E representatives acknowledged the inspectors observations and stated that equations 3 and 4 of the DCM would be changed to clarify the use of an absolute sum.

7. Exit Interview

At the conclusion of each segment (by dates and locations) of the inspection the inspectors met with appropriate representatives of the entities inspected to explain the scope and findings of the inspection.

OCT 14 1982

TE HQ FILE COPY

Docket Nos. 50-275
 50-323

Pacific Gas and Electric Company
 P. O. Box 7442
 San Francisco, California 94106

Attention: Mr. Philip A. Crane, Jr.
 Assistant General Counsel

Gentlemen:

This refers to the inspection activities conducted by Messrs. P. J. Morrill and J. H. Eckhardt of this office during the period September 14-16, 1982, of activities authorized by NRC License No. DPR-76 and Construction Permit No. 69 related to the Diablo Canyon Independent Verification Program (IDVP). Mr. Morrill and Mr. Eckhardt of our staff discussed our findings with Mr. F. Sestak, of Stone and Webster Engineering Corporation on September 15, 1982 with Mr. W. E. Cooper of Teledyne Engineering Services on September 16, 1982.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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1E01

OFFICE	RV						
SURNAME	P. Morrill; dh	J. Eckhardt	T. Bishop				
DATE	10/7/82	10/7/82	10/8/82				

Pacific Gas and Electric Company - 2 -

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

/s/

T. W. Bishop, Chief
Reactor Project Branch No. 2

Enclosure:

IE Inspection Report

Nos. 50-275/82-30
50-323/82-14

cc w/o enclosure:

J. L. Schuyler, PG&E
J. D. Shiffer, PG&E
W. A. Raymond, PG&E

cc w/enclosure:

R. C. Thornberry, PG&E (Diablo Canyon)
W. F. Cooper, Teledyne
F. Sestak, Stone and Webster

bcc: DMB/Document Control Desk (RIDS)

Distributed by RV:

State of CA (Johnson)
Sandra Silver (Report only)
RHE (w/o enclosure)
Resident Inspector

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No., 50-275/82-30 and 50-323/82-14

TE HQ FILE COPY

Docket No. 50-275 and 50-323 License No. DPR-76 and CPPR-69 Safeguards Group _____

Licensee: Pacific Gas and Electric Company

P. O. Box 7442

San Francisco, California 94120

Facility Name: Diablo Canyon Nuclear Power Plant

Inspection Location
and Date(s):

(1) Stone and Webster Engineering Corporation
Boston, Massachusetts September 14-15, 1982

(2) Teledyne Engineering Services, Waltham, Massachusetts -
September 15-16, 1982

Report by:

P. J. Morrill
P. J. Morrill, Reactor Inspector

October 7, 1982
Date Signed

P. J. Morrill Jr
J. H. Eckhardt, Reactor Inspector

October 7, 1982
Date Signed

Approved by:

T. W. Bishop
T. W. Bishop, Chief, Reactor Projects Branch, No. 2

October 8, 1982
Date Signed

Date Signed

Summary:

Inspection during period of September 14-16, 1982 (Report Nos. 50-275/82-30 and 50-323/82-14)

The inspectors examined implementation of the Independent Verification Program including independence and qualifications of personnel, implementation of Quality Assurance programs and Project Procedures, and work in progress as well as conducting discussions with personnel. This inspection effort involved 48 inspections by two NRC inspectors.

DETAILS

1. Persons Contacted

Stone and Webster Engineering Corporation

- *F. Sestak, Jr., Project Manager, Diablo Canyon Project and
Chief Engineer, Power Engineering
- *C. Richardson, Assistant Engineering Manager
- D. Shelton, Chief Engineer, Engineering Assurance
- J. E. Krechting, Lead Power Engineer
- *J. Webb, Lead Engineering Assurance Engineer
- J. J. Jacques, Principal Engineer, AFW & CRVP Systems
- S. LaRiccia, Principal Engineer, Engineering Mechanical Division
- E. Henebeny, Lead Electrical Engineer
- *J. Kelley, Quality Assurance Engineer

* Denotes those present at the exit meeting on September 15, 1982.

Teledyne Engineering Services (TES)

- **W. E. Cooper, Project Manager
- **R. Wray, Assistant Project Manager, Seismic
- W. S. Moonan, Controller
- **J. A. Cragin, Manager Project Administration
- C. G. Sprangers, Assistant Project Manager, QA
- R. D. Foti, Manager, Projects
- R. D. Ciatto, Civil/Structural, Team Leader
- **L. C. Noriega, Assistant Project Manager, Stone and Webster
- J. H. Malohson, TES Quality Assurance
- J. M. Cantalupo, Project Administrator

** Denotes those present at the exit meeting on September 16, 1982.

2. Verification of Independence for Technical Reviewers

Region V inspectors continued to evaluate the independence of IDVP technical reviewers. The purpose of this program is to assure that the individuals performing the IDVP will provide an objective, dispassionate technical judgement, based solely on technical merit. The following factors were considered in evaluating the question of independence:

- 1) Whether the individuals involved had been previously hired by PG&E or Bechtel Power Corporation (BPC) to do similar design work.

- 2) Whether any individual involved had been previously employed by PG&E or BPC (and the nature of the employment).
- 3) Whether the individual owns or controls significant amounts of PG&E or BPC stock.
- 4) Whether members of the present household of individuals involved are employed by PG&E or BPC.
- 5) Whether any relatives are employed by PG&E or BPC in a management capacity.

To verify that the individual participants meet the established independence criteria the staff has reviewed conflict of interest statements, reviewed resumes, and confidentially interviewed participants. The following is a summary of that effort.

a. Conflict of Interest Statements

The Region V inspectors reviewed conflict of interest statements of TES participants (20 statements) who have been assigned to the program since June 1, 1982. The conflict of interest statements of participants assigned prior to June 1, 1982 were evaluated previously. These 20 statements included statements of six individuals employed by consultants to TES. The organizations that these individuals represent are: J. W. Wheaton Technology; Hanse, Holley, Biggs, Inc.; Alexander Kusko, Inc.; and Foster-Miller Associates. The conflict of interest statements signed by these individuals indicated that none of the individuals have any significant past or present involvement with PG&E or Diablo Canyon. The conflict of interest statements did not include Bechtel Power Corporation. TES plans to revise the statements, adding Bechtel, and have the participants sign the revised statements.

In addition to the conflict of interest statements of the TES individuals, the Region V inspectors reviewed the conflict of interest statements of the Stone & Webster participants in the IDVP. Sixty-six conflict of interest statements were reviewed which included all of the Stone & Webster participants with the exception of two individuals whose statements were not available at the time of the review. The conflict of interest statements signed by these individuals indicated that none of the individuals have any significant past or present involvement with PG&E or Diablo Canyon. Similar to the TES conflict of interest statements, the Stone & Webster statements did not include Bechtel; the statements will be revised to include Bechtel and will be resigned by the Stone & Webster participants.

b. Resumes

The professional resumes of key TES and Stone & Webster participants have been reviewed to give additional information regarding the question of independence. This effort included 14 resumes of TES personnel assigned to the program since June 1, 1982 (including consultants) and 36 resumes of Stone & Webster personnel. The resumes indicated no employment history with either PG&E or Bechtel.

Additionally, the resumes were used to evaluate the professional experience and competence of the participants. The inspectors concluded that the TES and Stone & Webster individuals involved in the IDVP are competent and experienced in the matters under review.

c. Confidential Interviews

To further evaluate the question of independence, the inspectors selected key participants in the IDVP and conducted confidential interviews with them. This effort included interviews with four TES personnel assigned to the program since June 1, 1982 and nine Stone & Webster personnel. In addition, twelve TES personnel assigned prior to June 1, 1982 were interviewed as discussed in paragraph 3.a of this report. In addition to the question of independence, the line of questioning included the possibility of pressure being applied to suppress findings. Based on these interviews, the staff concluded that there is no conflict of interest between the participants in the IDVP and PG&E and Bechtel, and the participants feel no pressure to suppress possible findings.

3. Examination of Corporate Financial Independence

a. Teledyne Engineering Services (TES)

At the request of the NRR staff, the inspector questioned Teledyne personnel regarding potential conflict of interest regarding Bechtel Power Corporation and examined related Teledyne contractual documentation to verify the independence of Teledyne from Bechtel.

The inspector interviewed twelve lead personnel of the IDVP at Teledyne. All of these personnel stated that they perceived no problem for them in signing a "statement regarding potential or apparent conflicts of interest" which included Bechtel as well as PG&E. However, some of the individuals also stated that they had worked on Bechtel contracts in the past or were currently involved in one or more Bechtel contracts although none of this other work was related to PG&E. Based on these discussions the inspector determined that four Teledyne personnel were currently working on other Bechtel projects. These projects are described below:

<u>Project</u>	<u>Scope and Contracting Office</u>
3831	IE Bulletin 79-14 Pipe reanalysis for Davis-Besse - Bechtel, Gaithersberg
5282	Control rod drive design analysis for Limerick - Bechtel, San Francisco
5504	Das Island LNG tank failure anlysis - Bechtel, Great Britain Ltd.
5534	Acceptance criteria development for high strenght bolts for Palo Verde - Bechtel, Los Angeles
5571	Testing of concrete anchor bolts, generic - Bechtel, San Francisco

The inspectors discussed these projects and the extent of TES Bechtel business with the TES IDVP Project Manager and TES Controller. This disucssion and review of the TES computer print-out of current projects confirmed that TES is currently involved only in the five projects listed above with Bechtel. The inspectors also observed that at this time TES has 254 projects of which approximately, 244 are active. In FY 1981 TES had a total of 261 projects of which five were with Bechtel while in FY 1980 TES had seven Bechtel projects. The TES billing to Bechtel for these projects was \$1,824,000 in FY 1980 and \$1,234,000 in FY 1981. The total Teledyne Corporation business for FY 1981 was \$3,237,600,000.. Although the company has a policy to not reveal division totals the inspectors estimate that the TES total annual business is between \$20,000,000 and \$40,000,000.

b. Stone and Webster Engineering Corporation

Similiar inspector interviews with the Stone and Webster Project Manager and Assistant Engineering Manager indicated that there were no contracts or financial connection between Stone & Webster Engineering Corporation and Bechtel.

4. IDVP procedures and implementation

The inspector examined Stone and Webster IDVP related procedures in conjection with the Phase II program plan, reviewed work in progress, and interviewed Stone and Webster personnel to verify that appropriate procedures were developed and implemented consistent with regulatory requirements, and that the procedures were being followed. The following procedures were examined.

Project Procedures:

1-1-2 dated 9/9/82 "Identification of Project Procedures"
4-1-2 dated 8/26/82 "Project Quality Assurance Plan"
5-1-2 dated 9/9/82 "Preparation and Control of Project Calculations"
5-2-0 dated 8/2/82 "System Design Verification Program"
5-3-2 dated 9/9/82 "Independent Design Verification Procedure"
5-4-1 dated 9/10/82 "Field Verification"
5-5-0 dated 8/23/82 "Sketches"
6-2-2 dated 7/14/82 "Outgoing Correspondence"
6-3-2 dated 7/16/82 "Incoming Correspondence"
6-4-1 dated 5/14/82 "Conferences"
6-6-3 dated 8/23/82 "Document Control"
6-7-0 dated 7/26/82 "Reports"
7-1-1 dated 9/9/82 "Project files"

The inspector also examined the items listed below:

Appendix D of the Phase II Program Management Plan Dated June 18, 1982 (Rev. 0) and Section 2.4 of the Phase II Program management plan.

Stone and Webster working drawings (Mark-ups) for the reevaluation of the pipe break outside containment sources and targets.

Stone and Webster working drawings (Mark-ups) for the reevaluation of cable tray separation.

Stone and Webster computer runs for assessment of electrical circuit/circuit breaker adequacy.

Stone and Webster field walk down data/verification results.

The inspector also examined the Stone and Webster file system for the Diablo Project and discussed the documentation and work in progress with the engineers and supervisors actually doing the work. Based on these examinations and discussions, the inspector concluded that Stone and Webster personnel had prepared adequate procedures consistent with the Phase II program plan and that these procedures were being followed.

While at Teledyne Engineering Services, the inspector also examined the TES QA audit summary of Stone and Webster conducted July 30, 1982. The inspector verified that the audit was in accordance with the TES QA program and that the findings resulted in appropriate corrective action.

5. Exit Interview

At the conclusion of each segment (by dates and locations) of the inspection the inspectors met with appropriate representatives of the entities inspected to explain the scope and findings of the inspection.

FEB 11 1983

TE HQ FILE COPY

Docket Nos. 50-275
50-323

Pacific Gas and Electric Company
 P. O. Box 7442
 San Francisco, California 94106

Attention: Mr. Philip A. Crane, Jr.
 Assistant General Counsel

Gentlemen:

Subject: NRC Inspection

This refers to the inspection activities conducted by Messrs. P. J. Morrill and J. H. Eckhardt of this office during the period January 25-27, 1983, of activities authorized by NRC License No. DPR-76 and Construction Permit No. 69 related to the Diablo Canyon Independent Verification Program (IDVP). Mr. Morrill and Mr. Eckhardt of our staff discussed our findings with Mr. C. Beaulieu of R. L. Cloud and Associates on January 25, 1983, Mr. F. Sestak of Stone and Webster Engineering Corporation on January 26, 1983 and with Mr. W. E. Cooper of Teledyne Engineering Services on January 27, 1983.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope of this inspection.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

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 PDR ADOCK 05000275
 PDR


LED 1

OFFICE	RV. <i>PM</i>	<i>PM</i>	<i>PK</i>	<i>P</i>			
SURNAME	MORRILL/dot	ECKHARDT	KIRSCH	BISHOP			
DATE	2/11/83	2/11/83	2/11/83	2/11/83			

FEB 11 1983

If you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,


T. W. Bishop, Chief
Reactor Project Branch No. 2

Enclosure:
Inspection Report
s. 50-275/83-04
50-323/83-03

w/o enclosure:
L. Schuyler, PG&E
D. Shiffer, PG&E
A. Raymond, PG&E

w/enclosure:
C. Thornberry, PG&E (Diablo Canyon)
F. Cooper, Teledyne
Sestak, Stone and Webster
L. Cloud, R. L. Cloud and Associates

cc: RSB/Document Control Desk (RIDS)

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Sandra Silver (Report only)
Assistant Inspector

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/83-04 and 50-323/83-03

Docket Nos. 50-275 and 50-323 License Nos. DPR-76 and CPPR-69

Licensee: Pacific Gas and Electric Company
P. O. Box 7442
San Francisco, California 94120

FILE COPY

Facility Name: Diablo Canyon Nuclear Power Plant

Inspection Location

and Dates:

- (1) R. L. Cloud and Associates
Cotuit, Massachusetts (January 25, 1983)
- (2) Stone and Webster Engineering Corporation
Boston, Massachusetts (January 26, 1983)
- (3) Teledyne Engineering Services, Waltham, Massachusetts
(January 27, 1983)

Report by:

P. J. Morrill
P. J. Morrill
Reactor Inspector

2/11/83
Date Signed

P. J. Morrill Jr
J. M. Eckhardt
Reactor Inspector

2/11/83
Date Signed

Approved by:

D. F. Kirsch
D. F. Kirsch, Chief
Reactor Projects Section No. 3

2/11/83
Date Signed

Summary:

Inspection during period of January 25-27, 1983 (Report Nos. 50-275/83-04 and 50-323/83-03)

The inspectors examined implementation of the Independent Verification Program including independence and qualifications of personnel, implementation of Quality Assurance programs and Project Procedures, and work in progress as well as conducting discussions with personnel. This inspection effort involved 48 inspector-hours by two NRC inspectors.

DETAILS

1. Persons Contacted

R. L. Cloud and Associates

- *C. Beaulieu, Project Engineer, East Coast
- *P. Beazley, Engineer
- *D. Peelle, Project Administrator, West Coast
- R. Felton, Office Manager, East Coast

*Denotes those present at the exit meeting on January 25, 1983.

Stone and Webster Engineering Corporation

- **F. Sestak, Jr., Project Manager, Diablo Canyon Project and Chief Engineer, Power Engineering
- K. Swenson, Lead Power Engineer
- D. Shelton, Chief Engineer, Engineering Assurance
- S. Baranow, Quality Assurance Program Administrator
- **J. Webb, Lead Engineering Assurance Engineer
- C. Lundin, Chief, Engineering Quality Systems Division
- **J. Kelley, Quality Assurance Engineer

**Denotes those present at the exit meeting on January 26, 1983.

Teledyne Engineering Services (TES)

- ***W. E. Cooper, Project Manager
- ***J. A. Cragin, Manager, Project Administration
- ***J. H. Malohson, TES Quality Assurance
- J. M. Cantalupo, Project Administrator

***Denotes those present at the exit meeting on January 27, 1983.

2. Verification of Independence for Technical Reviewers

Region V inspectors continued to evaluate the independence of IDVP technical reviewers. The purpose of this program is to assure that the individuals performing the IDVP will provide an objective, dispassionate technical judgement, based solely on technical merit.

In September, 1982 the conflict of interest statements were modified to include Bechtel Power Corporation in addition to PG&E, due to Bechtel becoming significantly involved in the Diablo Canyon project. The Region V inspectors reviewed the revised conflict of interest statements of TES, Stone & Webster, and the RLCA east coast personnel involved in the IDVP. These included signed statements from 58 TES, 108 Stone & Webster, and five RLCA personnel. The only exceptions indicated on the statements were:

- a. One RLCA contract person had worked for Bechtel from 1972 to 1977 on the Midland and FFTF projects.
- b. One TES person has a brother who works for Bechtel in Connecticut.

- c. One TES person owns stock in a mutual fund which may or may not own PG&E stock.
- d. Certain TES personnel worked on an IE Bulletin 79-02 (Anchor Bolt Testing) contract for PG&E.

The inspectors consider that these exceptions do not constitute a conflict of interest.

3. IDVP Procedures and Implementation

The inspectors examined IDVP related procedures in conjunction with the Phase I and II program plans, reviewed work in progress, and interviewed personnel to verify that appropriate procedures were developed consistent with regulatory requirements, and that the procedures were being followed. These activities are described below:

(a) R. L. Cloud Offices (January 25, 1983)

Documents Examined

"Technical Criteria Manual" P105-4-200-2 Rev. 2, 7/6/82
"Pipe Supports Technical Criteria" P105-4-200-3 Rev. 2, 11/22/82
"General Procedure Manual" P105-4-230-1 Rev. 2, 5/28/82
"Project Specific Instructions" P105-4-221-1 Rev. 2, 12/23/82
Six Calculations for Pipe Support Frequency, file P105-4-522-4
Six Calculations for Stress Analysis of Supports, file P105-4-522-5
Field Notes for the on-site examination of fourteen pipe supports
Telephone calls, file P105-4-593
Interoffice Memos, file P105-4-594
R. L. Cloud, Associates, Inc., "Quality Assurance Manual," Rev. 2
Individual non-conflict of interest forms
Training Completion Records

Based on the examination of these records and discussions with the R. L. Cloud personnel, the inspectors concluded that the personnel had a good working knowledge of their procedures, had been trained in accordance with the Quality Assurance Manual, and had used adequate controls for the exchange of information.

(b) Stone and Webster Offices (January 26, 1983)

Documents Examined

"Project Quality Assurance Plan", procedure 4-1-5, EA-1019 dated December 14, 1982
"Stone and Webster Standard Quality Assurance Program", SWSQAP 1-74A, (Corporate Q.A. Program)

- "Construction Quality Assurance Evaluation", procedure 4-2-2, dated October 28, 1982
- "Evaluation of Construction Quality Assurance - Guy F. Atkinson Co." Assessment Plan DC-19.01 dated 11/9/82
- "Evaluation of Construction Quality Assurance - Wismer & Becker" Assessment Plan DC-19.02 dated 11/9/82
- "NSSS Piping Installation Verification" Checklist Plan DCP-001 dated 11/9/82
- "Civil/Structural Work, Containment Building" Checklist Plan DCP-002 dated 11/9/82
- Task Packages for tasks E-3-1 thru E-3-34
- Open item report files for EOI-8001 thru EOI-8063

The inspectors observed that the construction Q.A. audit by Stone & Webster was based upon verification checklists for each contractor and each system or portion of systems verified. Each checklist consisted of (approximately) 50 to 100 "attributes" which were selected individual requirements established by (1) PG&E specification for doing the work, (2) PG&E design drawings, (3) the Contractors approved Q.A. manual or procedures and (4) regulatory requirements (identified by Stone & Webster personnel) at the time the work was done. The audit consisted of an audit of records for completeness and adequacy and an examination of the actual installation to verify conformance to requirements ("attributes") and accuracy of documentation.

The inspectors asked Stone & Webster personnel why the PSAR and/or FSAR had not been used as a reference document in completing the Construction QA audit. Stone & Webster personnel explained that such an approach would not have added much to the IDVP since the translation of PSAR/FSAR/licensing commitments to engineering documents (specifications and drawings) was a project engineering function, whose inadequacies had already been dealt with by other portions of the IDVP and by the PG&E internal technical programs. They went on to explain that they had used 10 CFR 50, Appendix B as a benchmark appropriate for the guidance (regulatory guides, standards etc.) available at the time the work was done (containment concrete 1969-73, NSSS piping 1973-74). This was supplemented by the Wismer & Becker, and Guy F. Atkinson approved (by PG&E) Procedures and QA program as well as the design drawings and specifications furnished by PG&E. The audit team consisted of ten Stone & Webster personnel who worked at the Diablo Canyon site for eight weeks. This team was divided into program evaluation (which verified documentation was complete and then sampled this documentation) and physical verification (which verified the as-built condition of the plant for 100% of the areas examined). The 33 findings of the team were then examined by a "Findings Review Committee" consisting of five senior Stone & Webster personnel.

The Findings Review Committee invalidated four findings and issued the remaining 29 as open item reports for the IDVP. Stone and Webster personnel stated that 18 of the 29 had been responded to as of the current inspection and that they expected a response to 8 more by January 28, 1983. Of the 18 responded to, 14 became "C" observations (no consequences or changes contemplated) and 4 were finally judged to be invalid.

Stone and Webster personnel showed the inspectors the two draft Interim Technical Reports dealing with the Construction QA Audit which were reportedly being reviewed by Teledyne. It is expected that these reports will be issued as soon as Teledyne comments are incorporated. Unresolved open item reports (if any) will result in another revision after they are resolved.

(c) Teledyne Engineering Offices (January 29, 1983)

Documents Examined

EOI files 6001, 7001 thru 7006, 8039 thru 8063, and 9001 thru 9029
QA audit of Stone and Webster Construction QA audit at site November 9 & 10, 1982, report dated November 16, 1982
Nuclear Services QA audit of Teledyne Contract No. E-0835 of General Dynamics Electric Boat Division - Radiation Consulting for Diablo Canyon Design Verification Program, Report dated December 23, 1982
Teledyne audit of R. L. Cloud and Associates, Implementation of QA Program for IDVP and follow-up, conducted January 19 & 20, 1983
Teledyne audit of Teledyne Phase I EOIs and project procedures, report dated September 8, 1982

During discussions with Teledyne personnel the inspector asked why the Construction Q.A. audit by Stone and Webster did not utilize the PSAR or FSAR as audit material. Teledyne personnel stated that this specific program had been volunteered in response to the March 1982 NRC Region 5 memo and that this adjunct program was committed to in the September 1, 1982 transcript. Teledyne personnel also stated that little would be gained by reviewing the PSAR or FSAR at the time the work was actually done, since the regulatory requirements of 10 CFR were governing.

Subsequently, the inspector examined the transcript of the September 1, 1982 meeting and the associated commitments regarding the construction QA audit program, to verify the completion of the licensee's commitments. The inspector observed that the aforementioned audit appeared consistent with the commitments made during the September 1, 1982 meeting.

4. Exit Interview

At the conclusion of each segment (by dates and locations) of the inspection the inspectors met with appropriate representatives of the organizations inspected to explain the scope and findings of the inspection.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of)
PACIFIC GAS AND ELECTRIC COMPANY) Docket Nos. 50-275 OL
(Diablo Canyon Nuclear Power Plant) 50-323 OL
Units 1 and 2))

CERTIFICATE OF SERVICE

I hereby certify that copies of "SAFETY EVALUATION REPORT RELATED TO THE OPERATION OF DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2, NUREG-0675, SUPPLEMENT NO. 19" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, as indicated by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, by double asterisk special messenger service, this 17th day of October 1983:

Dr. John H. Buck
Atomic Safety and Licensing Appeal
Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555*

Dr. Jerry Kline
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555 *

Dr. W. Reed Johnson
Atomic Safety and Licensing Appeal
Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555*

Philip A. Crane, Jr., Esq.
Pacific Gas and Electric Company
P.O. Box 7442
San Francisco, CA 94120**

Thomas S. Moore, Esq., Chairman
Atomic Safety and Licensing Appeal
Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555*

Mr. Frederick Eissler
Scenic Shoreline Preservation
Conference, Inc.
4623 More Mesa Drive
Santa Barbara, CA 93105

John F. Wolf, Esq.
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555 *

Mrs. Raye Fleming
1920 Mattie Road
Shell Beach, CA 93449

Mr. Glenn O. Bright
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555 *

Richard E. Blankenburg, Co-publisher
Wayne A. Soroyan, News Reporter
South County Publishing Company
P.O. Box 460
Arroyo Grande, CA 93420

Elizabeth Apfelberg
1415 Cozadero
San Luis Obispo, CA 93401

Michael J. Strumwasser, Esq.
Susan L. Durbin, Esq.
Peter H. Kaufman, Esq.
3580 Wilshire Blvd., Suite 600
Los Angeles, CA 90010**

DESIGNATED ORIGINAL

Certified By

Barbara J. [Signature]
PSOT

Mr. Gordon Silver
Mrs. Sandra A. Silver
1760 Alisal Street
San Luis Obispo, CA 93401

Joel R. Reynolds, Esq.
John R. Phillips, Esq.
Center for Law in the Public
Interest
10951 West Pico Boulevard
Third Floor
Los Angeles, CA 90064**

Arthur C. Gehr, Esq.
Snell & Wilmer
3100 Valley Center
Phoenix, AR 85073

Mark Gottlieb
California Energy Commission
MS-18
1111 Howe Avenue
Sacramento, CA 95825

Bruce Norton, Esq.
Norton, Burke, Berry & French, P.C.
2002 E. Osborn Road
P. O. Box 10569
Phoenix, AZ 85064**

David S. Fleischaker, Esq.
P.O. Box 1178
Oklahoma City, OK 73101

Richard B. Hubbard
MHB Technical Associates
1723 Hamilton Avenue - Suite K
San Jose, CA 95125

Mr. Thomas H. Harris, Energy Writer
San Jose Mercury News
750 Ridder Park Drive
San Jose, CA 95190

Harry M. Willis
Seymour & Willis
601 California St., Suite 2100
San Francisco, CA 94108

Janice E. Kerr, Esq.
Lawrence Q. Garcia, Esq.
350 McAllister Street
San Francisco, CA 94102

Mr. James O. Schuyler
Nuclear Projects Engineer
Pacific Gas and Electric Company
77 Beale Street
San Francisco, CA 94106

Paul C. Valentine, Esq.
321 Lytton Avenue
Palo Alto, CA 94302

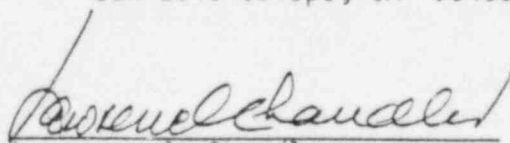
Atomic Safety and Licensing Appeal
Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555 *

Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555 *

Docketing and Service Section
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555 *

Maurice Axelrad, Esq.
Lowenstein, Newman, Reis and Axelrad
1025 Connecticut Ave., N.W.
Washington, D.C. 20036 **

John Marrs, Managing Editor
San Luis Obispo County
Telegram-Tribune
1321 Johnson Avenue
P.O. Box 112
San Luis Obispo, CA 93406



Lawrence J. Chandler
Deputy Assistant Chief Hearing Counsel

NUREG-0675
Supplement No. 19

Safety Evaluation Report

related to the operation of
Diablo Canyon Nuclear Power Plant,
Units 1 and 2

Docket Nos. 50-275 and 50-323

Pacific Gas and Electric Company

Supplement No. 19

**U.S. Nuclear Regulatory
Commission**

Office of Nuclear Reactor Regulation

October 1983



ABSTRACT

Supplement 19 to the Safety Evaluation Report for Pacific Gas and Electric Company's application for licenses to operate Diablo Canyon Nuclear Power Plants, Units 1 and 2 (Docket Nos. 50-275 and 50-323), has been prepared by the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission. This supplement reports on the verification effort for Diablo Canyon Unit 1 that was performed between November 1981 and the present in response to Commission Order CLI-81-30 and an NRC letter to the licensee. Specifically, Supplement 19 addresses those issues and other matters identified in Supplement 18 that must be resolved prior to commencement of fuel loading operations.

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ABBREVIATIONS

ACI	American Concrete Institute
AFW	auxiliary feedwater
AFWS	auxiliary feedwater system
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASLAB	Atomic Safety and Licensing Appeal Board
ASLB	Atomic Safety Licensing Board
ASME	American Society of Mechanical Engineers
BNL	Brookhaven National Laboratory
CAP	Corrective Action Program
CCW	component cooling water
CCWS	component cooling water system
CRVPS	control room ventilation and pressurization system
DCNPP	Diablo Canyon Nuclear Power Plant
DCP	Diablo Canyon Project
DDE	double design earthquake
EOI	Error or Open Item
FSAR	Final Safety Analysis Report
GDC	General Design Criteri(on) (a)
HVAC	heating, ventilation, and air conditioning
IDVP	Independent Design Verification Program
ITP	Internal Technical Program
ITR	Interim Technical Report
LOCA	loss-of-coolant accident
NRC	U.S. Nuclear Regulatory Commission
OIR	Open Item Report
PG&E	Pacific Gas and Electric Company
QA	quality assurance
RFR	R. F. Reedy, Inc.
RLCA	Robert L. Cloud and Associates

SER Safety Evaluation Report
SRSS square root of the sum of the squares
SSE safe shutdown earthquake
SSI soil-structure interaction
SWEC Stone & Webster Engineering Corporation

TES Teledyne Engineering Services

ZPA zero period acceleration

1 INTRODUCTION

The staff of the U.S. Nuclear Regulatory Commission (NRC) issued on October 16, 1974, its Safety Evaluation Report (SER) in matters of the application of the Pacific Gas and Electric Company (PG&E) to operate Diablo Canyon Nuclear Power Plant, Units 1 and 2. The SER has since been supplemented by Supplement Nos. 1 through 16 and No. 18 (Supplement 17 has not yet been issued. It is not related to the design verification effort). SER supplement No. 18 (SSER 18) presented the staff's safety evaluation on matters related to a verification effort for Diablo Canyon Unit 1 that was the result of Commission Order CLI-81-30 and an NRC letter to PG&E of November 19, 1981. This is SER Supplement No. 19 (SSER 19) and presents the staff's safety evaluation of those unresolved matters identified in SSER 18 which must be satisfactorily resolved prior to commencement of fuel loading operations at Diablo Canyon Unit 1. The verification effort relates only to Unit 1 of the Diablo Canyon Nuclear Power Plant; therefore, this supplement applies only to Unit 1 unless otherwise stated.

This supplement is based on information available to the staff as of October 13, 1983. Verification efforts required for fuel load have been completed. Confirmatory documentation will be provided by the licensee on certain items. The staff has not completed its safety evaluation of all the information that became available after the SSER 18 information cutoff date of June 30, 1983 and which relates to unresolved matters which need not be resolved prior to the commencement of fuel load operations. The staff will prepare its safety evaluation on these matters after completing its evaluation.

The verification effort covers a wide range of subjects that cannot be presented effectively in the normal format of an SER and its supplements. Therefore, the safety evaluation of the verification effort in SSER 18 was reported in Appendix C to that supplement.

Appendix A to an SER supplement is normally used for an update of the chronology for all Diablo Canyon Nuclear Power Plant related matters. The latest chronology was included in SER Supplement 16 dated August 1983. As in SSER 18, Appendix A has been omitted from this supplement. However, the continuation of the chronology for the Diablo Canyon Unit 1 verification effort has been included in Appendix C.

Appendix B to an SER supplement is normally for the bibliography to that supplement. In this supplement the bibliography has been included in Appendix C. Appendix D to this SER supplement includes the list of contributors and consultants.

The NRC Project Manager for the Diablo Canyon Nuclear Power Plant is Mr. H. Schierling. Mr. Schierling may be contacted by calling (301) 492-7100 or by writing to the following address:

Mr. H. Schierling
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Copies of this Supplement are available for public inspection at the Commission's Public Document Room at 1717 H Street; N.W., Washington, D.C. and at the California Polytechnic State University Library, Documents and Maps Department, San Luis Obispo, CA 93407. Availability of all material cited is described on the inside front cover of this report.

APPENDIX C

STAFF EVALUATION OF VERIFICATION EFFORT FOR
DIABLO CANYON NUCLEAR POWER PLANT - UNIT 1

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*Not addressed in SSER 19.

1 BACKGROUND AND INTRODUCTION

On August 5, 1983, the NRC staff issued SER Supplement No. 18 (SSER 18) which presented the staff evaluation of a design verification effort for Diablo Canyon Unit 1. The basis for this effort and a description of the process of this effort are described in detail in SSER 18. In summary, the Commission Memorandum and Order CLI-81-30 (November 19, 1981) suspended the authorization to load fuel and perform low power testing granted by the Diablo Canyon Unit 1 Operating License No. DPR-76 because serious weaknesses had been identified in the implementation of the quality assurance programs of PG&E and its seismic, service related contractors. The Commission Order required that an independent design verification program (IDVP) of seismic, service related contract activities (pre-1978) be completed to the satisfaction of the NRC prior to lifting the suspension. In addition, the NRC staff issued a letter (November 19, 1981) which required an IDVP with respect to non-seismic, service related contract activities, PG&E internal design activities, and post-1978 seismic, service related contract activities, which must be satisfactorily completed prior to an NRC decision regarding a full power license. The activities associated with the Commission Order and the NRC letter have become known as Phase I and Phase II of the design verification, respectively.

The Diablo Canyon Unit 1 design verification effort consists of two separate efforts. One is the IDVP as discussed above. It is conducted by organizations and individuals not associated with PG&E under the program management of Teledyne Engineering Services (TES). The other effort is the PG&E internal technical program (ITP) which is performed by PG&E's Diablo Canyon Project (DCP) which is a combined PG&E/Bechtel organization.

As stated in SSER 18, by the fall of 1982 it became evident that the earlier distinction between the pre-1978 and post-1978 effectiveness of design controls was no longer valid and thus the timing for completion of Phase I and Phase II activities was no longer necessary. PG&E proposed and the Commission approved a three-step process for reinstatement of the suspended low power license and issuance of the full power license as follows:

- Step 1: fuel load authorization
- Step 2: criticality and low power authorization
- Step 3: full power license

The specific activities that must be completed for each of the three steps were delineated in the PG&E submittal of December 3, 1982. In SSER 18 the staff presented its safety evaluation of the design verification effort, both IDVP and ITP, without specifically focusing on the requirements for the three-step concept.

The staff safety evaluation of the design verification effort in SSER 18 was based on information that had been submitted by the IDVP and PG&E as of June 30, 1983. At that time the effort had not been completed. Further analyses and verification effort by the IDVP and the DCP (including modifications by the DCP) were still in progress. The purpose of this supplement, SSER 19, is to

update the staff safety evaluation of those matters that were identified as unresolved in SSER 18 and which must be satisfactorily resolved prior to fuel load authorization, i.e., Step 1. It is based on information that had been provided to the staff as of October 13, 1983. The submittals also include information with respect to Step 2 and Step 3, and SSER 19 addresses some of these matters. However, the staff has not completed its evaluation and resolution in this regard and intends to issue further SER supplements with respect to Step 2 and Step 3, as necessary. A chronology of events and information exchanges is provided in Section 7 of this report.

Throughout SSER 18 the staff identified a number of items that require further action by the IDVP, PG&E, or the staff. They consist of (1) open items, (2) incomplete PG&E and IDVP effort and staff review, and (3) need for future documentation or verification. With respect to open items, the staff identified 30 specific open items in its memorandum of September 6, 1983 to the Commission (SECY-83-366). These items are listed in Table C.8.1 of this supplement. One additional item (Item 31) has since been added to the list. As shown in the table, 14 items require resolution for Step 1, 14 for Step 2, and 3 for Step 3. These open items are issues that were identified by the staff during its evaluation of the design verification effort that had been completed at that time by the IDVP or PG&E. They require further information, confirmation of data, additional justification or bases for an analysis, or additional analyses or modifications, as appropriate.

The safety evaluation presented in SSER 18 was incomplete in a number of areas because at that time the IDVP had not completed its verification effort and the necessary ITRs had not been issued. Table C.8.2 is a list of these areas in SSER 18. Finally, there were identified in SSER 18 certain requirements for further documentation or verification. This includes commitments by the licensee to update the Final Safety Analysis Report (FSAR) and the need for verification by the staff of certain PG&E actions. These items are listed in Table C.8.3. Resolution of these items is not required prior to fuel load authorization.

Since the issuance of SSER 18, PG&E, the IDVP, and the staff have pursued the completion of the design verification effort and the resolution of issues identified in that supplement, in particular with respect to matters that require resolution prior to fuel load authorization. This included an NRC meeting with PG&E and the IDVP on September 1, 1983 and a plant tour by the staff on September 6, 1983. All meetings since June 30, 1983 are listed in Table C.8.5. The IDVP has since submitted all ITRs and their revisions. They are listed in Table C.8.4. All substantive information is provided in the ITRs. The IDVP has updated its Final Report to incorporate that information. The licensee has addressed the issues in SSER 18 in a number of submittals to the staff. Certain items that require resolution prior to fuel load were discussed in an NRC meeting on September 28, 1983, with the licensee. Much of the information has been provided to the staff after September 1983.

This supplement presents the staff review and evaluation of IDVP and PG&E information on those matters in SSER 18 that need to be resolved prior to fuel load authorization. The staff evaluation is presented in the same section format of SSER 18 where the issues were identified.

3 SEISMIC DESIGN VERIFICATION EFFORT

3.2 Structures

3.2.1 Containment Annulus Structure

Spectrum Averaging (Table C.8.1, Item 1 - Step 1)

In Section 3.2.1.6 of SSER 18 the staff evaluated the containment annulus response, and specifically the free-hand averaging technique of spectra. In Section 3.2.1.6 it is stated:

"Based on the insights gained through the BNL analysis of the structure as well as the review of the mathematical models, calculations, and drawings in addition to the staff field observations, the staff finds that the IDVP for the containment annulus structure was effective in ensuring that the dynamic response of the structure and attached and supported equipment will be adequately defined. It is noted, however, that while the use of free-hand averaging of peaks and valleys in the spectra previously has been accepted by the staff, the smoothed curve should be a reasonable average but not a lower bound. Also, its use should be limited to frequencies away from structural frequencies (peaks of the curve). The staff review is not yet complete. However, the staff will review the future ITRs before reaching a conclusion."

PG&E responded to the staff concern above in letters, including a letter of October 6, 1983, and in a meeting on September 28, 1983, as discussed in Section 1 of this Supplement regarding the implementation of the smoothing criteria of the floor response spectra in accordance with the FSAR commitment. PG&E furnished 3 sets of floor response spectra for the annulus steel frame number 1 at nodal point 111. One set shows the raw response spectra for 2, 3 and 7 percent equipment damping; the second set shows the smoothed response spectra for the same damping; and the third set shows the broadened response spectra for the same damping. A comparison of curves in these three sets shows the FSAR requirements regarding spectrum smoothing have been met. PG&E further indicated that free-hand averaging of response spectra was only applied to the frequency range below 5 Hz and that there were no equipment or piping systems with frequencies in that range. For frequencies greater than 5 Hz, the response spectra were enveloped and broadened. In addition, the IDVP has stated in ITR-51 Rev. 1 that the spectra smoothing and enveloping techniques used by the DCP satisfy the appropriate licensing criteria. On the basis of its review and evaluation of the information provided, the staff considers this concern resolved. PG&E has committed to provide additional spectra and other appropriate information to confirm the spectra provided to date.

Cutoff Frequency for Floor Response Spectra (Table C.8.1, Item 2 - Step 1)

In Sections 3.2.1.6 and 3.2.1.7 of SSER 18 the staff evaluation of the DCP verification expressed a concern about the use of 20 Hz as the frequency where structural members were considered rigid in the Hosgri event. The SSER stated:

"It is noted, however, that a frequency of 20 Hz should not be considered as a frequency in the rigid range without verification. The Newmark Hosgri spectra approach ZPA at 33 Hz. It is the staff's position that the use of the 20-Hz cutoff frequency for generation of floor response spectra should be verified and/or justified."

The Diablo Canyon Project responded to the staff concern above in letters, including a letter of October 12, 1983, and in the meeting with the staff on September 28, 1983. Based on the staff review and evaluation of the information provided the staff considers this concern resolved. PG&E has committed to provide additional analyses to confirm the results provided to date.

3.2.3 Containment Exterior Shell

Applicability of AISC Code vs ASME Code (Table C.8.1, Item 3 - Step 1)

In Section 3.2.3.4 of SSER 18 the staff questioned the use of the AISC Code instead of Section III of the ASME Code. SSER 18 stated:

"It is noted, however, that instead of the AISC Code used by the DCP, the design code for containment penetrations accepted in the original licensing documents was Section III of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code as indicated in Table 3.2-4 of the FSAR."

PG&E responded and addressed this concern by letters and in a meeting as discussed in Section 1. PG&E stated that the containment penetrations were initially qualified to the AISC Code. The evaluation of the penetrations based on the ASME Code were in preparation at the time of the SSER 18 information cutoff date of June 30, 1983. The PG&E response states the penetrations have now been shown to meet the requirements of both the AISC and ASME Codes. Therefore, since the licensing commitments have been satisfied, the staff considers this item resolved.

Yielding of Steel Plates at Openings in Containment (Table C.8.1, Item 4 - Step 1)

In Section 3.2.3.4 of SSER 18 the staff evaluation of the DCP reverification expressed a concern about the stress levels in the reinforcing plate around the equipment hatch. SSER 18 stated:

"In addition, the IDVP should evaluate the justification for the local yielding of the steel plates around the opening."

The equipment hatch opening is surrounded by a hexagonal plate that is used to terminate the reinforcing steel in the containment shell where it is discontinuous due to the equipment hatch opening. The plate is near the outside of

the wall and is not connected to the steel liner sleeve of the hatch nor to the closure plate anchorage steel.

PG&E responded to this concern by letters and in a meeting as discussed in Section 1. This response indicated that the yielding was local in nature and permitted by the provisions of the ASME Code. In the meeting PG&E stated that the yield stress exceedance existed in only one element of the plate finite element model. This stress level was in the range of 10 percent exceedance of the actual material yield strength. ITR-54 Rev. 1 indicates the computed stress was 3 percent over the ASME allowable. The staff considers the plate acceptable based on the code provisions which allow for exceeding yield, the limited extent of the area where yield stress is exceeded and only one load combination equation is involved. This concern is resolved.

3.2.4 Auxiliary Building

Soil Spring Influence on Seismic Response (Table C.8.1, Item 7 - Step 1)

In Section 3.2.4.4 of SSER 18 the staff evaluation of the DCP reverification expressed a concern over the difference between the IDVP calculated values for the soilsprings for the auxiliary building at elevation 100 feet and the values calculated by the DCP. SSER 18 stated:

"The discrepancy between the IDVP and the DCP sensitivity study of the soil spring influence on the seismic response should be reconciled. Also the values of the soil properties should be resolved."

PG&E responded by letters and addressed the concern in a meeting with the staff as discussed in Section 1. The response indicated that sensitivity studies were done by the DCP and the effects on the structure of variations in the soil springs are not significant. The DCP used soil properties based on soil information that was not available at that time to the IDVP for the soil spring calculation. This information was made available to the IDVP for its use.

The IDVP addressed the staff concern in a letter dated September 27, 1983. The IDVP has reviewed the DCP study and accepted the results. ITR-55 Rev. 1 provides more detailed information on the range of values the DCP considered and the effects on the response of the structure to these variations. It has been shown that the effects of large variations in the soil springs resulted in very small changes in the response of the structure. The staff finds acceptable the values used by the DCP as verified by the IDVP and considers the soil spring discrepancy resolved.

3.2.8 Turbine Building

Load Combination Criteria (Table C.8.1, Item 10 - Step 1)

In Section 3.2.8.4 of SSER 18 the staff evaluation of the DCP verification expressed a concern over the load combination equation used to determine the force and capacity shown in Table 2.1.4-13 of the PG&E Phase I Final Report. The staff concern was that the other loads required by the load combination equations were not considered in the evaluation of the members. SSER 18 stated:

"Although the design criteria stipulate that the strength requirement for the structural members is based on combined dead, live, and earthquake forces, the summary tables showing the member forces do not indicate clearly such combination. If the member forces are due to earthquake alone, then a discrepancy exists."

PG&E responded to the staff concern in letters and addressed the concern in a meeting as discussed in Section 1. The response stated that the design forces given in Table 2.1.4-13 of the Phase I Final Report included the loading combinations given in the design criteria, and the members were evaluated for a combination of dead, live, and earthquake forces. The staff considers the concerns resolved.

3.3 Piping and Piping Supports

3.3.1 Large-Bore Piping and Supports

Large-Bore Piping Support Analysis Verification (Table C.8.1, Item 16 - Step 1)

The staff stated in Section 3.3.1.4 of SSER 18 that Table 2.2.1-3 did not report the maximum stress or load ratios for the large bore piping supports and that this was considered a deficiency. PG&E addressed this deficiency in letters and in a meeting as discussed in Section 1. The response stated that due to the considerable number of supports per piping system and the large number of Design Class I piping systems it would be practical to provide the requested information for all supports. The Diablo Canyon Project (DCP), however, provided the support stress ratio summary for two small piping systems, which showed that all stress ratios for these supports and their components were less than 1.0, the highest being .99 in an anchor bolt. In addition, the DCP also provided a computerized status of the DCP review to the IDVP for their review and verification. The IDVP reported the completed verification of the DCP corrective actions on large bore pipe supports in ITR-60, Rev. 1, "Large and Small Bore Pipe Supports." The IDVP stated that the methodology used by the DCP adequately addressed the scope of large bore supports in the plant. The IDVP verified on a sample basis that all licensing criteria were met and concluded that the large bore piping supports were designed in conformity with applicable licensing requirements. The staff has reviewed the response by the DCP and the IDVP verification effort reported in ITR-60, Rev. 1, and finds these acceptable. This issue is therefore considered resolved.

Buckling Criteria for Linear Supports (Table C.8.1, Item 17 - Step 1)

The staff recommended in Section 3.3.1.4 of SSER 18 that the IDVP should evaluate and justify the buckling criterion specified for linear supports, specifically the use of the Euler buckling equation for calculating the critical buckling load for all slenderness ratios. The IDVP stated that it is outside its scope to evaluate these criteria. However, the IDVP also questioned the use of the Euler equation without regard to the slenderness ratio on the IDVP Final Report, 10th submittal. The DCP responded to the staff concern in letters, including a letter of October 6, 1983, and in the meeting on September 28, 1983. The DCP has stated, and the IDVP has verified, that the buckling criterion in the Diablo Canyon Design Control Manual (DCM) M-9 was supplemented with an additional buckling criterion. This criterion was reviewed by the staff and found

unacceptable. The staff has proposed an alternate supplementary buckling criterion. The DCP has also submitted the results of a study of 24 typical cases of standard components with small slenderness ratios. The results of this study indicate that the compressive loads in these members are considerably lower than the buckling values determined according to the staff criterion. Based on the staff review and evaluation of the information provided the staff considers this concern resolved. The licensee has committed to provide additional analyses and information to confirm the results provided to date.

Analysis of Piping Systems with Revised Supports and Current Loadings
(Table C.8.1, Item 18 - Step 1)

The staff stated in Section 3.3.1.4 of SSER 18 that selected piping systems analyzed previously by the IDVP and reported in ITR-12 Rev. 0, "Piping," and ITR-17 Rev. 0, "Piping - Additional Samples," be reanalyzed independently with revised support configuration and current loadings to verify that piping and supports satisfy corresponding design criteria. This reanalysis should include a case where the thermal loads govern the acceptance of the analysis. The DCP responded to the staff concern in letters, including a letter dated October 6, 1983, and in the meeting on September 28, 1983. The DCP has stated that the IDVP has reviewed and verified the DCP Corrective Action Program for large bore piping. The IDVP review was reported in ITR-59, Rev. 1, "Large Bore Piping," which provided assurance, through comprehensive reviews of DCP procedures and sample analyses, that all previous concerns as identified in ITR-12 and ITR-17 were incorporated into the DCP Corrective Action Program, and that the large bore piping analyses met the licensing criteria. The IDVP review sample included the piping systems previously reviewed in ITR-12 and ITR-17. The staff reviewed ITR-59, Rev. 1, and found it acceptable. However, since the IDVP included the same problems which had previously been analyzed, the staff selected different piping problems, which have not been reviewed by the IDVP. Two piping problems were selected, which the staff considers adequate to provide final confirmation of the piping design process. Based on the results provided to date and the fact that no significant plant modifications are likely to be required, the staff finds the DCP commitment acceptable and considers this issue resolved for fuel loading.

3.3.2 Small-Bore Piping and Supports

Scope of Small-Bore Piping (Table C.8.1, Item 19 - Step 1)

The staff indicated in Section 3.3.2.4 of SSER 18 that additional clarification was needed to determine the actual extent of the DCP review of small bore piping. In letters and in the meeting on September 28, 1983 as discussed in Section 1 the DCP has provided this clarification and stated that all small bore piping was reviewed and requalified for conformance with the original design criteria, on a sample basis. However, all small bore piping was also reviewed and reanalyzed as necessary for certain design considerations as described in the DCP Phase I Final Report. This review program resulted in review and reanalysis of approximately 63 percent of the piping and 75 percent of the supports. The staff finds the DCP response acceptable and considers this issue resolved.

3.4 Equipment and Support

3.4.3 Electrical Equipment and Instrumentation and Supports

Qualification of Cable Trays (Table C.8.1, Item 23 - Step 1)

In Section 3.4.3.4 of SSER 18 the staff evaluation of the DCP verification expressed a concern over the qualification of the cable tray system. The staff's concern was that the trays and supports were analyzed separately and not as a system and the trays themselves did not appear to be qualified. SSER 18 stated:

"The report, as filed, does not address the qualifications of the cable trays themselves or how the flexibility of the cable trays interact with the supports. This subject should be addressed."

PG&E responded to the staff concern by letter and addressed the concern in a meeting as discussed in Section 1. The response stated the cable trays themselves were qualified for the DDE and Hosgri events generically. Where the trays could not be qualified generally, then the as-built condition was analyzed. A field walkdown was carried out to determine the as-built conditions.

The supports were evaluated using two separate analyses. The first analysis was based on the support itself and using the tributary weights of the cable trays. The approved criteria damping value of 7 percent was used to determine the acceleration values used in the analysis. The second analysis used a coupled system and response was determined using 15 percent damping. The 15 percent damping was based on a series of tests conducted by Bechtel several years ago. The staff does not accept the 15 percent damping and the results of this test for the Diablo Canyon Plant. The test results have been accepted for other plants but with very stringent restrictions. The original licensing basis for the cable trays was the first analysis. PG&E considers the second analysis to be confirmatory and not a basis for the license. In ITR-63 Rev. 1, "HVAC Ducts, Electrical Raceways, Instrument Tubing and Associated Supports," the IDVP has evaluated the cable tray and support system qualification and found it to be acceptable. The staff considers the concern resolved based on the DCP qualification of the trays and supports to the original licensing criteria.

Qualification of Superstrut Welds (Table C.8.1, Item 24 - Step 1)

In Section 3.4.3.4 of the SSER 18, the staff evaluation of the DCP verification expressed a concern over the incorporation of the allowable shear values for spot welds in the tray support members determined from testing of field samples. SSER 18 stated:

"In addition, the DCP in a separate effort established through testing of field samples the allowable limits for welds used in superstrut construction. These limits should be used in the qualification of the cable trays supported by superstrut material."

PG&E responded by letters and addressed this concern in a meeting as discussed in Section 1. The response stated that the DCP determined the 35 support

types out of 420 support types that had the lowest margin of safety (less than 1.1) in flexure. The DCP selected an additional 13 types that were judged to be susceptible to direct shear in the spot welds. Based on these analyses using the allowable weld values determined from the tests the lowest margin of safety of shear in the spot welds was 1.27.

Based on the information provided, the staff finds the results of the analysis acceptable and considers the concern resolved.

4 NONSEISMIC DESIGN VERIFICATION EFFORT

4.2 Initial Sample

4.2.3 Instrumentation and Control Design

Classification of Valves FCV-37 and FCV-38 (Table C.8.1, Item 27 - Step 1)

In Section 4.2.3.1 of SSER 18, the staff evaluated the IDVP review of the Auxiliary Feedwater (AFW) system as addressed in the IDVP Final Report and in Interim Technical Report 27, Rev. 1. As noted in SSER 18, the staff requires that the valve operators and control circuits for the isolation valves (FCV-37 & FCV-38), which provide the steam supply to the turbine-driven AFW pump, to be classified by PG&E as safety-related. This is consistent with the Diablo Canyon FSAR commitment to General Design Criterion GDC 57 for these valves. The classification of these valves were the subject of the IDVP EOI File 8018. By letter dated August 10, 1983, the licensee noted that the subject valves were procured and installed as Class 1E components and the valve operators have been reclassified as Instrument Class 1A (safety-related). This change in the instrument classification for the valve operators involves revising appropriate documentation and qualification files to reflect this change and confirming that the related reviews are not affected. Further, by letter dated October 6, 1983, the licensee noted that the control circuits for the valves are now classified as safety-related. Based on this action, the staff considers this matter closed.

Single Relay Used to Terminate Steam Generator Blowdown (Table C.8.1, Item 28 - Step 3)

In Section 4.2.3.1 of SSER 18, the staff evaluated the IDVP review of the use of a single, nonsafety-related relay used to terminate steam generator blowdown on starting of an AFW pump. The IDVP had identified this aspect of the design as a potential concern with regard to the capability of the AFW system to satisfy the minimum design flow requirements for events which may not result in a safety injection signal. This concern was identified in EOI File 8047 and was addressed in ITR 27. The staff concurred with the conclusions of the IDVP that the AFW system satisfied the minimum design flow requirement without reliance on termination of steam generator blowdown. However, the use of a single nonsafety grade relay was not consistent with the design described on FSAR Figure 7.1-2, Sheet 15. The staff noted that this was a matter it would pursue with the licensee.

By letters dated September 9, and October 6, 1983, the licensee committed to install a redundant relay consistent with the logic as shown on Sheet 15 of FSAR Figure 7.2-1 and to classify the circuits used to terminate steam generator blowdown on start of an AFW pump as safety-related. These actions are to be completed prior to full power operation. In addition, in the review of this matter the staff had identified other areas of the FSAR in which inconsistencies existed. By letter dated October 6, 1983, the licensee provided a commitment to correct the identified inconsistencies in the FSAR in the next

FSAR update. The staff finds that the licensee's commitments to modify and reclassify as safety-related the steam generator blowdown circuits, as noted above, resolve the conflict between the existing design and the logic shown on FSAR Figure 7.2-1, Sheet 15. Further, the licensee's commitment to complete these modifications prior to full power operation is acceptable since they do not involve protection which is essential to plant safety nor would they have any safety significance during low power testing. Finally, the licensee's commitment to correct the discrepancies in the FSAR which were identified during this review, is acceptable since in no instance were any problems found that were contrary to any licensing criteria or requirements. Therefore, based on these actions, the staff considers this matter closed.

4.3 Additional Verification

4.3.5 Jet Impingement Effects on Postulated Pipe Ruptures Inside Containment

Jet Impingement Loads on Piping Inside Containment (Table C.8.1, Item 29 - Step 2)

The staff stated in Section 4.3.5.3 of SSER 18 that the DCP had not as yet demonstrated nor had the IDVP verified, that possible jet impingement loads were considered in the design and qualification of all safety-related piping and equipment inside containment. The IDVP reported the results of its verification in ITR-48, Rev. 0, "Additional Verification of Jet Impingement Effects of Postulated Pipe Rupture Inside Containment." The report provides a description of the work done, summary and evaluation of the results, and conclusions of the IDVP with respect to the concern of the jet impingement effects inside containment. The DCP responded to the staff concern by letters, including a letter of October 12, 1983, and in the meeting on September 28, 1983. Based on the review and evaluation of the information provided the staff concludes that the licensing commitment in the FSAR regarding the consideration of jet impingement loads have been met and therefore this concern is resolved with respect to fuel load considerations. The staff will continue its evaluation to assure that the licensee has given appropriate considerations to the more stringent current requirements. The staff will complete this effort prior to full power authorization. The staff does not consider it likely that significant modifications are likely to be required.

4.3.6 Rupture Restraints

Rupture Restraints Inside and Outside Containment (Table C.8.1, Item 30 - Step 1)

The staff reported in Section 4.3.6.2 of SSER 18 that the DCP had not as yet satisfactorily reviewed, nor the IDVP verified, that the rupture restraints outside and inside containment were properly designed and installed to provide protection against postulated ruptures in high pressure piping. The DCP responded to this concern by letters, including a letter of October 11, 1983, and in the meeting on September 28, 1983. The DCP response stated that rupture restraints, both inside and outside containment, were evaluated and their acceptability verified by utilizing a common review program. This applies to all restraints except those which use crushable energy absorbing materials, and which are located inside containment only. Except for these crushable bumpers, restraint configurations and design principles used outside containment include all those inside containment.

The IDVP verification of rupture restraints was reported in ITR-65, Rev. 1, "Rupture Restraints." However, this report addresses restraints outside containment only. The IDVP review did not include any restraints inside containment because of a potential conflict of interest by the IDVP, in that a member of the IDVP had previously reviewed some of these restraints in his capacity as a consultant to PG&E. The IDVP review consisted of examining the DCP qualification of rupture restraint designs outside containment for pipe rupture loading. It also included field inspection on a sample basis to ensure conformance of design drawings to as-built conditions, and a verification that the DCP methodology and criteria satisfy the licensing requirements. Based on the verification of the DCP corrective action program, the IDVP concluded that there is reasonable assurance that rupture restraints outside containment were designed in conformity with PG&E licensing criteria and are, therefore, acceptable. This IDVP conclusion is based on the assumption that the final phase of DCP rupture restraint review will be completed correctly. This final phase consists of determining and setting the final cold and hot gaps between the rupture restraints and the pipes during startup.

Although the IDVP did not verify the design and installation of rupture restraints inside containment, the staff considers these designs acceptable, except for crushable bumpers, since these restraints were evaluated under a common review program by the DCP and the same methodology and design criteria were applied to the restraints inside and outside containment.

The staff has received additional information regarding the DCP design of the crushable bumpers. The DCP stated that these restraints were designed based on criteria documented in DCP Design Criteria Memorandum DCM-64, "Design of Rupture Restraints Inside Containment." These criteria are based on results of tests which were performed in 1977. These tests results and calculation were stated to be available in the DCP files. The final design of these bumpers have been verified against new piping loads, but some modifications may be necessary to accommodate piping hot movements during startup. The design of these crushable bumpers will be audited by the staff prior to criticality/low power (Step 2). Based on the staff review and evaluation of the information provided the staff considers this concern resolved.

5 SUMMARY AND CONCLUSIONS

The purpose of SSER 19 is to present the staff safety evaluation of those concerns in SSER 18 that must be satisfactorily resolved prior to the commencement of fuel load operations at Diablo Canyon Unit 1 (i.e., Step 1 of the three-step process). In Section 1 of this supplement, the staff concerns in SSER 18 have been categorized in three groups:

- (1) Open Items (Table C.8.1)
- (2) Incomplete Efforts (Table C.8.2)
- (3) Followup Items (Table C.8.3)

The IDVP and the Diablo Canyon Project of PG&E have provided extensive additional information after the June 30, 1983 information cutoff date regarding their continuing efforts and have responded to the staff's concerns, in particular with respect to fuel load items. The IDVP has submitted all Interim Technical Reports (ITRs) and their revisions. The IDVP also submitted the last installment to its Final Report, including an Executive Summary. PG&E has responded in a number of letters to most of the staff concerns in SSER 18, in particular those that relate to fuel load requirements. In addition, PG&E has provided information that updates the Phase I and Phase II Final Reports. Much of the information from PG&E and the IDVP was submitted to the staff during the two weeks prior to the issuance of this supplement. The staff has concentrated its efforts on those matters that relate to fuel load. The staff is continuing its review and evaluation of all other matters and will provide the results in a future supplement.

As stated in Section 1, the staff requires that 14 of the Open Items in Table C.8.1 be satisfactorily resolved prior to fuel load (Step 1). During the course of the review the staff determined that Item 29 - Jet Impingement Loads, also be resolved at Step 1. In its review the staff relied on information provided by PG&E, and on selected information provided in the IDVP Interim Technical Reports. The staff has not completed its evaluation of all matters covered in these ITRs and will present its conclusions in a future supplement with respect to all incomplete efforts listed in Table C.8.2. As stated in Section 1, the followup activities listed in Table C.8.3 need not be accomplished prior to fuel load.

Based on the review and evaluation of the information provided the staff considers that the concerns expressed in all 15 Open Items that are required to be resolved prior to the commencement of fuel load operations have satisfactorily been resolved. PG&E has committed to provide additional analyses and information to confirm the results provided to date for three Open Items (1, 2 and 17); the requirement for complete resolution has been changed for two Open Items (18 and 29) and one Open Item (30) requires a staff audit. A complete listing of all fuel load Open Items is presented below.

Step 1 Open Items (Table C.3.1)

	<u>Status</u>
1. Spectrum averaging for containment annulus	resolved; confirmation required
2. 20 Hz cutoff frequency for floor response spectra	resolved; confirmation required
3. Code for containment penetrations	resolved
4. Yielding of steel plates at opening in containment	resolved
7. Soil spring influence on seismic response	resolved
10. Load combinations for turbine building	resolved
16. Large-bore piping support analysis	resolved
17. Buckling criteria for linear supports	resolved; confirmation required
18. Analysis of piping systems as modified	resolved; completion at Step 3
19. Scope of DCP small-bore piping review	resolved
23. Qualification of cable trays	resolved
24. Allowable limits for welds in superstrut	resolved
27. Control circuits safety classification	resolved
*29. Jet impingement loads	resolved; completion at Step 3
30. Rupture restraint design and installation	resolved; audit required

*Item not listed in Table C.8.1.

The staff believes that all matters required for fuel loading have been acceptably resolved.

7 CHRONOLOGY PERTAINING TO DIABLO CANYON UNIT 1 VERIFICATION EFFORTS

SSER 18 provided a chronology for the Diablo Canyon Unit verification efforts from September 22, 1981 through June 30, 1983. The following is the continuation of the chronology:

- July 1, 1983 Letter from licensee transmitting "Final Report on Evaluation of Spot-Welded Materials Used in Support Systems for Electrical Conduit & Cable Trays at Diablo Canyon Power Plant."
- July 1, 1983 Board Notification 83-91 transmitting Teledyne June 24th letter and Stone & Webster June 24th letter.
- July 1, 1983 Letter from licensee advising that fuel building modifications are complete.
- July 1, 1983 Letter from licensee regarding, anonymous allegations discussed in letter from D. Fleischaker dated March 28, 1983.
- July 5, 1983 Memo to Commission, Status of Diablo Canyon Unit 1 Design Verification Program.
- July 5, 1983 Letter to Teledyne requesting assessment of circumstances reported in June 23rd letter from J. Reynolds.
- July 6, 1983 Meeting with licensee to discuss seismic analysis of buried tanks.
- July 7, 1983 Board Notification 83-92 transmitting Teledyne June 28th and June 30th letters.
- July 8, 1983 Letter from Stone & Webster advising of no open item reports for July semimonthly report.
- July 8, 1983 Letter from Teledyne regarding J. Reynolds June 23rd letter and NRC July 5th letter.
- July 8, 1983 Letter from licensee transmitting 41st semimonthly status report.
- July 8, 1983 Letter from R. L. Cloud transmitting Open Item reports.
- July 8, 1983 Letter from Teledyne transmitting semimonthly report.
- July 14, 1983 Board Notification 83-98 transmitting trip report for May 12th meeting and transcript of July 6th meeting.

July 14, 1983 Letter from licensee advising that Joint Intervenors' statements regarding IDVP independence are incorrect.

July 15, 1983 Letter from Commission Office of the Secretary providing schedule for remainder of Commission review.

July 15, 1983 Letter from Teledyne transmitting Errata Package No. 3 and schedule for IDVP Final Report.

July 22, 1983 Letter from Teledyne transmitting semimonthly status report.

July 22, 1983 Letter from licensee transmitting 42nd semimonthly status report.

July 22, 1983 Letter from Teledyne forwarding list of effective pages and "Table of Contents" for Final Report.

July 22, 1983 Letter from Teledyne transmitting ITR 50, Rev 0.

July 26, 1983 Board Notification 83-103 transmitting R. L. Cloud July 8th letter, Teledyne July 8th letter, and Stone & Webster July 8th letter.

July 26, 1983 Letter from Teledyne regarding review of IDVP resolution to EOI File 8018 and 8047 (flow control valves and non-safety relay device).

July 26, 1983 Letter from licensee providing additional information on containment spray timing.

July 27, 1983 Letter from Stone & Webster transmitting ITR 20, Rev 2; ITR 22, Rev 2; and ITR 27, Rev 2.

July 27, 1983 Letter from licensee transmitting information on classification of instrumentation and control for containment isolation valves.

July 28, 1983 Letter from Stone & Webster transmitting ITR 14, Rev 2, and ITR 28, Rev 2.

July 28, 1983 Board Notification 83-77A - Allegation Concerning Release of an NRC Draft Report.

July 29, 1983 Letter from Stone & Webster transmitting ITR 48, Rev 0.

July 29, 1983 Letter from Teledyne transmitting Errata Package No. 4 of IDVP Final Report.

August 1, 1983 Letter from licensee regarding pending submittal on buried diesel fuel oil tanks.

August 2, 1983 Letter from R. L. Cloud transmitting ITR 57, Rev. 0.

August 5, 1983 Board Notification 83-113 transmitting Teledyne July 25 letter.

August 5, 1983 Issuance of Supplement 18 to SER.

August 5, 1983 Letter from R. L. Cloud transmitting ITR 31, Rev. 1.

August 9, 1983 Letter from R. L. Cloud transmitting ITR 58, Rev 0.

August 10, 1983 Letter from licensee transmitting "Operational Readiness," concerning actions taken or to be taken to be ready for fuel loading and low-power testing.

August 10, 1983 Letter from licensee in response to concerns discussed in SER Supplement 18 concerning classification of instrumentation for auxiliary feedwater turbine shutoff valves.

August 10, 1983 Letter from Joel Reynolds regarding independence of IDVP.

August 10, 1983 Letter from R. L. Cloud transmitting Open Item Reports 1138, 1139, 1140, 1141 and 1142.

August 12, 1983 Letter from Teledyne transmitting 2nd Friday semimonthly report.

August 12, 1983 Letter from licensee transmitting 43rd semimonthly status report.

August 12, 1983 Letter from Stone & Webster, reporting for August semi-monthly report no Open Item reports.

August 15, 1983 Letter from R. L. Cloud transmitting ITR 66, Rev 0.

August 16, 1983 Board Notification 83-120 transmitting Teledyne letters of July 22nd (3 letters), Stone & Webster letters of July 27th (2 letters) and July 28th, Teledyne letter of July 29th and Stone & Webster letter of July 29th.

August 18, 1983 Letter from R. L. Cloud transmitting report ITR 60, Rev 0.

August 19, 1983 Letter from licensee transmitting Harding & Lawson Associates report, "Geotechnical Studies, Diesel Fuel Oil Storage Tanks."

August 19, 1983 Letter from R. L. Cloud transmitting report ITR 59, Rev 0.

August 19, 1983 Letter from Teledyne transmitting 8th Text Submittal of IDVP Final Report.

August 19, 1983 Letter from licensee transmitting proposed changes to post-fuel loading initial test program.

August 22, 1983 Letter from Teledyne transmitting Errata Package No. 5 for IDVP.

August 23, 1983 Letter from R. L. Cloud transmitting report ITR 63, Rev. 0.

August 23, 1983 Board Notification 83-124 - NRC Region V Inspection Report 50-275/83-26 relating to apparent less than minimum piping wall thickness.

August 23, 1983 Letter from licensee requesting exemption from requirements of 10 CFR 50.71(e)(3)(i) until after completion of design verification program.

August 25, 1983 Letter to licensee transmitting SER Supplement No. 16.

August 26, 1983 Board Notification 83-130 - transmitting R. L. Cloud letters of August 10th, August 19th, August 18th, August 15th, Stone & Webster letter of August 12th, Teledyne letters of August 12th, August 19th, and August 22th.

August 26, 1983 Letter from licensee transmitting 44th semimonthly status report.

August 26, 1983 Letter from Teledyne transmitting semimonthly status report for August.

August 29, 1983 Board Notification 83-127 transmitting R. L. Cloud letters of August 5th, August 2th, August 9th, and August 10th and J. P. Knight memo of August 8th regarding Brookhaven report on buried diesel fuel oil tank seismic analysis.

August 30, 1983 Letter from Teledyne discussing soil springs for auxiliary building model.

August 30, 1983 Letter from licensee transmitting response to unresolved items in SER Supplement 18.

August 31, 1983 Letter from licensee regarding status of compliance with certain license conditions.

September 1, 1983 Letter from J. Reynolds commenting on IDVP Final Report and SER Supplement No. 18.

September 2, 1983 Letter to licensee requesting review of draft working paper regarding QA case studies.

September 2, 1983 Letter from Teledyne transmitting ITR 51, Rev. 0.

September 2, 1983 Letter to NRC Office of the Secretary from State of California Attorney General regarding verification program.

September 2, 1983 Board Notification 83-135 - Diablo Canyon Quality Assurance Case Study.

September 6, 1983 Letter from licensee regarding unresolved item in SER Supplement 18.

September 6, 1983 Board Notification 83-134 advising of issuance of Supplement No. 16 to SER.

September 6, 1983 Board Notification 83-136 transmitting R. L. Cloud August 23rd letter and Teledyne August 26th letter.

September 6, 1983 Plant tour to view modifications made as a result of the verification program.

September 8, 1983 Letter from R. L. Cloud transmitting ITR 55, Rev. 0.

September 8, 1983 Letter from R. L. Cloud transmitting ITR 57, Rev. 1.

September 9, 1983 Letter to licensee transmitting Federal Register reprint for Sholly notices reported in August monthly report.

September 9, 1983 Letter from R. L. Cloud transmitting Open Item reports 1143 and 1144, Rev. 0.

September 9, 1983 Letter from licensee transmitting 45th semimonthly status report.

September 9, 1983 Letter from licensee providing requested information concerning seismic design of diesel generator intake/exhaust piping, silencers and filters.

September 9, 1983 Letter from Teledyne transmitting second Friday semi-monthly report.

September 9, 1983 Letter from Teledyne transmitting 9th text submittal of IDVP Final Report.

September 9, 1983 Letter from licensee regarding unresolved items identified in SER Supplement 18.

September 10, 1983 Letter from licensee regarding post-fuel loading modifications.

September 12, 1983 Letter from NRC Office of Secretary regarding changes in meeting scheduled for September 13, 1983.

September 13, 1983 Letter from R. L. Cloud transmitting report ITR 67, Rev. 1.

September 14, 1983 Letter from R. L. Cloud transmitting ITR 54, Rev. 0.

September 14, 1983 Letter from Battelle transmitting "Independent Calculation for the Diablo Canyon Project of the Temperature and Pressure Distribution Resulting from a Split Break Located in Area GE/GW of the Auxiliary Building."

September 15, 1983 Letter from D. S. Fleischaker to Commission requesting that meeting be held in California to hear views of parties on reinstatement of low power test license.

September 15, 1983 Letter from D. S. Fleischaker regarding role of Joint Intervenor's role as intermediary between NRC staff and author of eight allegations.

September 15, 1983 Board Notification 83-143 transmitting October 1 meeting transcript, Cloud letters of October 2nd, October 8th (two letters), and October 9th, and Teledyne letter of October 9th.

September 19, 1983 Letter to J. R. Reynolds in response to August 10th letter regarding independence of IDVP.

September 19, 1983 Letter from R. L. Cloud transmitting ITR 65, Rev. 0.

September 20, 1983 Letter from R. L. Cloud transmitting ITR 56, Rev. 0.

September 21, 1983 Board Notification 83-145 transmitting Teledyne letter of October 9th and R. L. Cloud letters of October 13th and October 14th.

September 21, 1983 Letter from licensee transmitting comments on draft working paper on QA.

September 22, 1983 Letter from R. L. Cloud transmitting ITR 68, Rev. 0.

September 23, 1983 Letter from Teledyne transmitting September semimonthly status report.

September 23, 1983 Letter from Teledyne transmitting errata page for ITR 51, Rev. 1.

September 23, 1983 Letter from licensee transmitting 46th semimonthly status report.

September 26, 1983 Board Notification 83-148 - Diablo Canyon QA Case Study.

September 26, 1983 Letter from R. L. Cloud transmitting ITR 59, Rev. 1.

September 27, 1983 Letter from licensee requesting license restoration at earliest possible time.

September 27, 1983 Letter from Teledyne providing first IDVP response to SER Supplement 18 open times.

September 28, 1983 Letter from State of California Attorney General transmitting information received by R. B. Hubbard from anonymous source regarding electrical construction work.

September 30, 1983 Letter from NRC Office of the Secretary advising of October 28th meeting to receive comments from utility, Joint Intervenors and Governor of California regarding IDVP completion and NRC analysis and recommendation to reinstate license.

September 30, 1983 Board Notification transmitting Teledyne letters of September 21st, 23rd, and 25th and R. L. Cloud letters of September 14th, 19th, 20th, and 22nd, 1983.

October 1, 1983 Letter from R. L. Cloud transmitting report ITR 58, Rev. 1.

October 1, 1983 Letter for R. L. Cloud transmitting report ITR 55.

October 2, 1983 Letter from R. L. Cloud transmitting report ITR 61 Rev. 1.

October 2, 1983 Letter from R. L. Cloud transmitting report ITR 63, Rev. 1.

October 4, 1983 Letter from R. L. Cloud transmitting report ITR 54, Rev. 1.

October 4, 1983 Letter from R. L. Cloud transmitting report ITR 60, Rev. 1.

October 4, 1983 Letter from R. L. Cloud forwarding diagram of forces & stresses at OWST foundation.

October 5, 1983 Letter from R. L. Cloud transmitting report ITR 68, Rev. 1.

October 6, 1983 Letter from licensee regarding unresolved Item 28 in SER Supplement 18.

October 6, 1983 Letter from licensee regarding Diablo Canyon Unit 2 design review.

October 6, 1983 Letter from licensee regarding unresolved items in SER Supplement 18.

October 7, 1983 Letter from licensee regarding unresolved item on flow control valves in SER Supplement 18.

October 7, 1983	Letter from licensee regarding superstrut raceway supports.
October 7, 1983	Letter from licensee regarding Generic Letter 83-28 (reactor trip breakers).
October 10, 1983	Letter from Teledyne transmitting IDVP Final Report 10th Submittal.
October 10, 1983	Letter from Teledyne transmitting IDVP Executive Summary.
October 11, 1983	Letter from R. L. Cloud transmitting report IIR-65, Rev. 1.
October 11, 1983	Letter from licensee regarding unresolved Item 30 in SER Supplement 18.
October 11, 1983	Letter from licensee transmitting update information on PG&E Phase I and Phase II Final Reports.
October 11, 1983	Letter from licensee regarding additional information on turbine building tornado loads.
October 12, 1983	Letter from licensee regarding operational readiness with respect to containment integrity.
October 12, 1983	Letter from licensee regarding Item 29 in SER Supplement 18.
October 12, 1983	Letter from licensee regarding Item 2 in SER Supplement 18.

8 TABLES

Table C.8.1 Open Items in Diablo Canyon SER Supplement 18

The following open items had been identified in SSER 18. Page reference and resolution requirement are listed in parentheses.

1. Free-hand averaging of spectra for containment annulus structure should be in accordance with staff approved technique. (C.3-9; Step 1)
2. Cutoff frequency of 20 Hz for generation of floor response spectra in containment annulus structure should be justified. (C.3-9; Step 1)
3. Use of AISC Code for design of containment penetrations should be justified. (C.3-17; Step 1)
4. Local yielding of steel plates around opening in containment should be justified. (C.3-17; Step 1)
5. Assumptions in model for auxiliary building floor slab qualification regarding rigidity/flexibility should be clarified and justified, including documentation of parametric studies. (C.3-22; Step 2)
6. Use of different versions of ACI code in FSAR and in design verification effort of auxiliary building should be justified. (C.3-22; Step 2)
7. Discrepancy between IDVP and DCP sensitivity of soil spring influence on seismic response of auxiliary building should be reconciled, including resolution of soil properties and documentation of parametric studies. (C.3-22; Step 1)
8. Use of translational and torsional response of auxiliary building as input to base of fuel handling building should be documented, including parametric studies. (C.3-26; Step 2)
9. Selection of set of degrees of freedom in dynamic model for fuel handling building should be justified. (C.3-26; Step 2)
10. Load combinations in analysis of turbine building should be clarified. (C.3-36; Step 1)
11. Modeling of roof trusses in turbine building should be clarified and justified. (C.3-36; Step 3)

12. Effect of one continuous exterior wall in analysis of turbine building should be evaluated. (C.3-37; Step 2)
13. Differences in turbine building modeling of steel frame and roof truss for two vertical models should be clarified. (C.3-37; Step 3)
14. The use of alternative procedures for model combinations by SRSS method should be explained and clarified. (C.3-37; Step 2)
15. Use of increased allowable stresses in accordance with AISC Code 8th Edition should be justified with respect to criteria delineated in FSAR. (C.3-37; Step 2)
16. Results of analysis of large bore piping supports should be verified. (C.3-48; Step 1).
17. Buckling criteria for linear supports, specifically the Euler buckling equation for calculating critical buckling loads for all slenderness ratios, should be evaluated and justified. (C.3-48; Step 1)
18. Calculations for selected piping systems analyzed previously in ITR 12 and ITR 17 should be repeated with revised support configurations and current loadings to verify that piping and supports satisfy corresponding design criteria. Results of piping system reevaluation with high thermal load should be verified. (C.3-48; Step 1)
19. The scope of the DCP small bore piping review should be clarified. (C.3-57; Step 1)
20. All equipment listed in Table 2.3.1-1 of DCP Phase I Final Report should be seismically qualified for nozzle loads and component configurations should be verified. (C.3-59 and C.3-70; Step 2)
21. Stresses in extreme fibers at interface between valve nozzle and pipe should be evaluated and results be documented. (C.3-66; Step 2)
22. Stresses in pump flanges should be verified to be within allowable limits. (C.3-69; Step 2)
23. Qualification of cable trays and interaction of trays with supports should be addressed. (C.3-80; Step 1)
24. Allowable limits for welds based on field samples should be used in qualification of trays supported by superstrut. (C.3-80; Step 1)

25. Total lateral forces, total resistance to sliding and factor of safety against sliding of intake structure should be fully evaluated. (C.3-86; Step 2)
26. Additional analyses of buried diesel fuel oil tanks should be performed (analyses with refined mesh and without deconvolution, partially filled tank, examination of properties). (C.3-99; Step 2)
27. Control circuits for isolation valves in steam supply line for turbine driven auxiliary feedwater pump should be classified as safety-related. (C.4-11; Step 1)
28. Auxiliary relay for automatic closure of redundant steam generator blowdown isolation valves should meet Westinghouse requirements. (C.4-12; Step 3)
29. Consideration of jet impingement loads in design and qualification of all safety-related piping and equipment should be clearly demonstrated. (C.4-29; Step 2)
30. It should be clearly indicated that rupture restraints inside and outside containment have been properly designed and installed. (C.4-31; Step 1)
31. The combination of codirectional responses to three components of earthquake for the turbine building should be explained. (C.3-37; Step 2)

Table C.8.2 Diablo Canyon SER Supplement 18
Incomplete Effort

1.	Containment Annulus Structure	C.3-9
2.	Containment Interior Structure	C.3-13
3.	Containment Exterior Shell	C.3-17
4.	Auxiliary Building	C.3-22
5.	Fuel Handling Building	C.3-26
6.	Intake Structure	C-3-28
7.	Turbine Building	C-3-37
8.	Large Bore Piping	C-3.48
9.	Large Bore Piping Supports	C-3-48
10.	Small Bore Piping	C.3-58
11.	Small Bore Piping Supports	C.3-58
12.	Mechanical Equipment and Supports	C-3-70
13.	HVAC Equipment	C.3-73
14.	Raceways, Tubing & Supports	C.3-76/77, C.3-80
15.	Soils Intake Structure	C.3-83
16.	Soils Intake Structure Boring Capacity	C.3-85
17.	Shake Table Testing	C.3-89
18.	Main Control Board	C.3-91

Table C.8.3 Diablo Canyon SER Supplement 18
Followup Items

1. PG&E will perform a startup test of AFWS runout control system to confirm dynamic stability. (C.4-3)
2. PG&E will delete from design drawing steam trap in steam supply line for turbine driven pump of AFWS. (C.4-5)
3. PG&E will revise FSAR to reflect acceptability of as-built conditions regarding separation and color coding of electrical circuits for AFWS. (C.4-8)
4. PG&E will correct table in environmental qualification report with respect to flow transmitters and flow control valves in AFWS. (C.4-12)
5. PG&E will conduct analyses to determine qualified life of motor capacitor for steam generator control valves. (C.4-12)
6. PG&E will amend FSAR to indicate that pipe breaks are not postulated in steam supply line to turbine driven pump of AFWS. (C.4-16)
7. PG&E will amend FSAR to include all changes for equipment qualification (CRVPS and AFWS) that resulted from reanalysis of pipe break environments outside containment. (C.4-16)
8. PG&E will revise FSAR licensing commitment regarding need for protective shields for AFWS components (valves) against effects of moderate energy line breaks. (C.4-17)
9. Staff will confirm that any modifications required in safety-related systems with respect to pressure/temperature rating and power-operated valve operability are implemented. (C.4-26)
10. PG&E will verify assumptions regarding closing/opening of doors and operation of ventilation systems in their continuing pressure-temperature environmental reanalysis. (C.4-27)
11. PG&E will make modifications and provide revised documentation as necessary based on results of pressure-temperature environmental reanalysis (C.4-27).
12. Staff will evaluate PG&E results of reanalysis with respect to assuring environmental qualification of equipment. (C.4-27)
13. PG&E will revise FSAR to incorporate use of ANS 58.2 jet impingement temperature calculational method where applicable. (C.4-14 & 16)

14. PG&E will revise equipment qualification documentation to include qualified AFWS cable/wire other than that previously identified. (C.4-16)
15. PG&E will revise FSAR to incorporate results of moderate energy line break analyses on the CRVPS. (C.4-17)

Table C.8.4 Interim Technical Reports (ITRs) and Other Reports
Issued by IDVP

Number	Title, IDVP organization, revision, and date
ITR-1:	Additional Verification and Additional Sampling (Phase I) (RLCA). Revision 0, June 10, 1982 Revision 1, October 22, 1982
ITR-2:	Comments on R. F. Reedy, Inc., Quality Assurance Audit Report on Safety Related Activities Performed by Pacific Gas and Electric Prior to June 1978 (TES). Revision 0, June 23, 1982
ITR-3:	Tanks (RLCA). Revision 0, July 16, 1982
ITR-4:	Shake Table Testing (RLCA). Revision 0, July 23, 1982
ITR-5:	Design Chain (RLCA). Revision 0, August 19, 1982
ITR-6:	Auxiliary Building (RLCA). Revision 0, September 10, 1982
ITR-7:	Electrical Raceway Supports (RLCA). Revision 0, September 17, 1982
ITR-8:	Independent Design Verification Program for Verification of Pacific Gas and Electric Company Corrective Action (Phase I) (RLCA). Revision 0, October 7, 1982
ITR-9:	Development of the Service-Related Contractor List for Non-Seismic Design Work Performed for Diablo Canyon Nuclear Power Plant - Unit 1 Prior to June 1, 1978 (RFR). Revision 0, October 16, 1982
ITR-10:	Verification of Design Analysis Hosgri Spectra (RLCA). Revision 0, October 18, 1982
ITR-11:	Pacific Gas and Electric - Westinghouse Interface Review (TES). Revision 0, June 23, 1982
ITR-12:	Piping (RLCA). Revision 0, November 5, 1982
ITR-13:	Soils-Intake Structure (RLCA). Revision 0, November 5, 1982
ITR-14:	Verification of the Pressure, Temperature, Humidity, and Submergence Environments Used for Safety-Related Equipment Specifications Out- side Containment for Auxiliary Feedwater System and Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 6, 1982 Revision 1, May 9, 1983 Revision 2, July 25, 1983
*	
ITR-15:	HVAC Duct and Supports Report (RLCA). Revision 0, December 10, 1982

Table C.8.4 (Continued)

Number	Title, IDVP organization, revision, and date
ITR-16:	Soils - Outdoor Water Storage Tanks (RLCA). Revision 0, December 8, 1982
ITR-17:	Piping - Additional Samples (RLCA). Revision 0, December 14, 1982
ITR-18:	Verification of the Fire Protection Provided for Auxiliary Feedwater System, Control Room Ventilation and Pressurization System Safety-Related Portion of the 4160 V Electric System (SWEC). Revision 0, December 13, 1982 Revision 1, May 24, 1983
ITR-19:	Verification of the Post-LOCA Portion of the Radiation Environments Used for Safety-Related Equipment Specification Outside Containment for Auxiliary Feedwater System and Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 16, 1982
ITR-20:	Verification of the Mechanical/Nuclear Design of the Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 16, 1982 Revision 1, April 26, 1983 * Revision 2, July 25, 1983
ITR-21:	Verification of the Effects of High Energy Line Cracks and Moderate Energy Line Breaks for Auxiliary Feedwater System and Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 15, 1982 Revision 1, May 3, 1983
ITR-22:	Verification of the Mechanical/Nuclear Portion of the Auxiliary Feedwater System (SWEC). Revision 0, December 17, 1982 Revision 1, April 26, 1983 * Revision 2, July 25, 1983
ITR-23:	Verification of High Energy Line Break and Internally Generated Missile Review Outside Containment for Auxiliary Feedwater System and Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 20, 1982 Revision 1, May 27, 1983
ITR-24:	Verification of the 4160 V Safety-Related Electrical Distribution System (SWEC). Revision 0, December 21, 1982 Revision 1, May 4, 1983
ITR-25:	Verification of the Auxiliary Feedwater System Electrical Design (SWEC). Revision 0, December 21, 1982 Revision 1, April 29, 1983
ITR-26:	Verification of the Control Room Ventilation and Pressurization System Electrical Design (SWEC). Revision 0, December 21, 1982 Revision 1, May 2, 1983

Table C.8.4 (Continued)

Number	Title, IDVP organization, revision, and date
ITR-27:	Verification of the Instrument and Control Design of the Auxiliary Feedwater System (SWEC). Revision 0, December 23, 1982 Revision 1, May 13, 1983 * Revision 2, July 25, 1983
ITR-28:	Verification of the Instrument and Control Design of the Control Room Ventilation and Pressurization System (SWEC). Revision 0, December 23, 1982 Revision 1, May 13, 1983 * Revision 2, July 25, 1983
ITR-29:	Design Chain - Initial Sample (SWEC). Revision 0, January 17, 1983
ITR-30:	Small Bore Piping Report (RLCA). Revision 0, January 12, 1983
ITR-31:	HVAC Components (RLCA). Revision 0, January 14, 1983 * Revision 1, August 4, 1983
ITR-32:	Pumps (RLCA). Revision 0, February 17, 1983 Revision 1, April 1, 1983
ITR-33:	Electrical Equipment Analysis (RLCA). Revision 0, February 18, 1983 Revision 1, April 28, 1983
ITR-34:	Verification of DCP Effort by Stone & Webster Engineering Corporation (SWEC). Revision 0, February 4, 1983 Revision 1, March 24, 1983
ITR-35:	Independent Design Verification Program Verification Plan for Diablo Canyon Project Activities (RLCA). Revision 0, April 1, 1983
ITR-36:	Final Report on Construction Quality Assurance Evaluation of G. F. Atkinson (SWEC). Revision 0, February 25, 1983 Revision 1, June 20, 1983
ITR-37:	Valves (RLCA). Revision 0, February 23, 1983
ITR-38:	Final Report on Construction Quality Assurance Evaluation of Wismer & Becker (SWEC). Revision 0, March 1, 1983 Revision 1, March 16, 1983 Revision 2, June 20, 1983
ITR-39:	Soils - Intake Structure Bearing Capacity and Lateral Earth Pressure (RLCA). Revision 0, February 25, 1983

Table C.8.4 (Continued)

Number	Title, IDVP organization, revision, and date
ITR-40:	Soils Report - Intake Sliding Resistance (RLCA). Revision 0, March 9, 1983
ITR-41:	Corrective Action Program and Design Office Verification (RFR). Revision 0, April 19, 1983
ITR-42:	R. F. Reedy, Inc., Independent Design Verification Program Phase II Review and Audit of Pacific Gas and Electric Company and Design Consultants for Diablo Canyon Unit 1 (RFR). Revision 0, April 15, 1983
ITR-43:	Heat Exchangers (RLCA). Revision 0, April 14, 1983
ITR-44:	Shake Table Test Mounting Class 1E Electrical Equipment (RLCA). Revision 0, April 15, 1983
ITR-45:	Additional Verification of Redundancy of Equipment and Power Supplies in Shared Safety-Related Systems (SWEC). Revision 0, May 17, 1983
ITR-46:	Additional Verification of Selection of System Design Pressure and Temperature and Differential Pressure Across Power-Operated Valves (SWEC). Revision 0, June 27, 1983
ITR-47:	Additional Verification of Environmental Consequences of Postulated Pipe Ruptures Outside of Containment (SWEC). Revision 0, June 27, 1983
*ITR-48:	Additional Verification of Jet Impingement Effects on Postulated Pipe Ruptures Inside Containment Revision 0, July 27, 1983
*ITR-49:	Additional Verification of Circuit Separation and Single Failure Review of Safety-Related Electrical Equipment (SWEC). Revision 0, June 23, 1983
*ITR-50:	Containment Annulus Structure Vertical Seismic Evaluation (TES). Revision 0, July 22, 1983
*ITR-51:	Containment Annulus Structure Seismic Evaluation (TES). Revision 0, September 2, 1983 Revision 1, September 21, 1983
*ITR-52:	Combined with ITR 68-
*ITR-53:	Combined with ITR 68
*ITR-54:	Containment Building - Corrective Action (RLCA) Revision 0, September 11, 1983 Revision 1, October 3, 1983
*ITR-55:	Auxiliary Building - Corrective Action (RLCA). Revision 0, September 8, 1983 Revision 1, October 1, 1983

Table C.8.4 (Continued)

Number	Title, IDVP organization, revision, and date
*ITR-56:	Turbine Building - Corrective Action (RLCA). Revision 0, September 9, 1983 Revision 1, September 24, 1983
*ITR-57:	Fuel Handling Building - Review of DCP Activities (RLCA). Revision 0, August 1, 1983 Revision 1, September 8, 1983
*ITR-58:	Intake Structure - Verification of DCP Activities (RLCA). Revision 0, August 8, 1983 Revision 1, October 1, 1983
*ITR-59:	Large Bore Piping - IDVP Verification of Correction Action (RLCA). Revision 0, August 18, 1983 Revision 1, September 24, 1983
*ITR-60:	Large and Small Bore Pipe Supports - IDVP Review of Corrective Action (RLCA). Revision 0, August 17, 1983 Revision 1, October 3, 1983
*ITR-61:	Small Bore Piping - IDVP Review of Corrective Action (RLCA). Revision 0, September 10, 1983 Revision 1, October 2, 1983
*ITR-62:	Combined with ITR-60
*ITR-63:	HVAC Ducts, Electrical Raceways, Instrument Tubing and Associated Supports - IDVP Verification of Corrective Action (RLCA). Revision 0, August 22, 1983 Revision 1, October 2, 1983
*ITR-64:	Combined with ITR-63
*ITR-65:	Rupture Restraints - IDVP Verification of DCP Activities (RLCA). Revision 0, September 16, 1983 Revision 1, October 11, 1983
*ITR-66:	Combined with ITR 63
*ITR-67:	Equipment - IDVP Verification of Corrective Action (RLCA). Revision 0, August 12, 1982 Revision 1, September 9, 1983
*ITR-68:	Verification of HLA Soils Work Revision 0, September 20, 1983 Revision 1, October 4, 1983

NOTE: The following reports were issued by RFR before the establishment of the ITR concept:

- 1: Review of ANCO Engineers, March 1, 1982.
- 2: Review of Cygna Energy Services, March 1, 1982.
- 3: Review of EDS Nuclear Inc., January 20, 1982.

Table C.8.4 (Continued)

Number	Title, IDVP organization, revision, and date
4:	Review of Harding Lawson Associates, January 26, 1982.
5:	Review of Pacific Gas and Electric Company, March 5, 1982.
6:	Review of URS/Blume and Associates, Engineers, March 5, 1982.
7:	Review of Wyle Laboratories, March 1, 1982.

*Indicates reports dated after SSER 18 information cut off date of June 30, 1983.

Table C.8.5 Meetings on Diablo Canyon Unit 1 Verification Effort

The following is a listing of NRC meetings that have been held since June 30, 1983. It is a continuation of Table C.1.2 in SSER 18.

Date	Participants/attendants/location
(30) July 6, 1983	NRC, BNL, PG&E (DCP) Bethesda, Md.
(31) September 1, 1983	NRC, PG&E (DCP), IDVP, Gov. of California, Joint Intervenors Bethesda, Md.
(32) September 6, 1983	NRC Plant Tour-Diablo Canyon Site
(33) September 7, 1983	NRC, PG&E (DCP), Gov. of California San Luis Obispo, Calif.
(34) September 13, 1983	NRC Commission Meeting Washington D.C.
(35) September 27, 1983	NRC Commission Meeting Washington, D.C.
(36) September 28, 1983	NRC, PG&E (DCP) Bethesda, Md.

APPENDIX D

LIST OF CONTRIBUTORS

NRC Staff

T. Dunning	Instrumentation and Control Systems
M. Hartzman	Mechanical Engineering
P. Kuo	Structural Engineering
H. Polk	Structural Engineering
H. Schierling	Licensing