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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Responds to Board Notification 84-071 issues re draft investigation/insp rept discussed at 840328 & 0402 meetings. Cross ref between issues & util responses encl.Encl info also forwards to ACRS for presentation on 840406.

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J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

April 4, 1984

PGandE Letter No.: DCL-84-131

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275 OL-DPR-76
Diablo Canyon Unit 1
Response to Board Notification 84-071

Dear Mr. Denton:

This submittal provides PGandE's responses to issues discussed in meetings on March 28 and April 2, 1984, between PGandE and the NRC Staff. These issues were described in "Draft Investigation/Inspection Report (Rev 3 March 29, 1984)" and "Draft Summary of Findings Resulting from Followup of Allegations and NRC Independent Overview (March 29, 1984)." The draft report and summary are provided in Board Notification No. 84-071, dated April 3, 1984.

Enclosure 1 provides a cross reference between the issues as identified in the "Draft Summary of Findings Resulting from Followup of Allegations and NRC Independent Overview" and PGandE's responses to these issues, which are provided in Enclosure 2 of this submittal.

The information enclosed in this submittal is also being supplied to the Advisory Committee on Reactor Safeguards (ACRS) as part of PGandE's presentation to that Committee, scheduled for April 6, 1984.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

B. Hoch

For ~~J. O.~~ Schuyler

Enclosures

cc: G. W. Knighton
J. B. Martin
J. C. McKinley (ACRS)
H. E. Schierling

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PGandE Letter No.: DCL-84-131

ENCLOSURE 1

CROSS REFERENCE LIST (INSPECTION ITEM VS PGandE RESPONSE)

INSPECTION ITEM DESCRIPTION NO.* (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.**	PAGE***
A. Against Criterion II		
1. In the area of general technical and QA training, the program permits personnel performing safety-related design work w/o training up to 30 days. (L/B and S/B)(pp. 18-22, 26)	1	1
2. No measures or program provisions established to ensure adequate special training for the working staff on matters such as procedure revisions and problem trendings. (L/B and S/B)(pp. 22-25, 26)	1	1
B. Against Criterion XVI		
1. Site design organization management was insensitive to staff concerns, and did not initiate timely corrective actions. (S/B)(pp. 27-29)	2	6
2. Lack of project timely response to PGandE QA findings. The delays were w/o justification. (S/B)(p. 92)	2	6
3. Lack of PGandE management attention to ensure timely responses to the audit findings. (S/B)(pp. 92-93)	2	6

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*As identified in the Summary of the Draft Inspection Report, provided in Board Notification 84-071, dated April 3, 1983.

**The subject number corresponds with the subject title as shown on Enclosure 2, "Table of Contents."

***As indentified in Enclosure 2 of this submittal.

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.	PAGE
4. Bechtel audit finding corrective action scheduled completion dates were delayed without documented justification. (S/B)(p. 93)	3	12
5. Lack of PGandE audit finding corrective actions to identify the cause of the problem and the measures needed to prevent recurrence. (S/B)(p. 93)	2	6
6. Project corrective action only addressed specific problem areas identified in the PGandE audit findings and did not consider generic implications of the problems. QA concurred with this apparently inadequate corrective action. (S/B) (p. 93)	3	12
7. Inadequate Bechtel QA verification of OPEG corrective actions prior to close-out of audit findings. OPEG Personnel training continued to be inadequate. (S/B)(p. 94)	2	6
8. Lack of PGandE QA program measures to evaluate the effects of program efficiencies resulting in long delay of QA finding corrections prior to IDVP and CAP actions. (L/B and S/B) (pp. 94-95)	2	6
C. Against Criterion VI		
1. Engineers were using out-of-date procedures for performing calculations. (S/B)(pp. 10-12)	4	19
2. Inter-office memorandums were issued in lieu of procedures that bypassed review and approval process. (S/B) (pp. 12-13)	4	19
3. Site Quality Engineer and Support Group Leader maintained outdated listings of the latest work procedure. (S/B)(p. 15)	4	19

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.	PAGE
4. Design personnel was performing calculations without having adequately controlled procedures for extended periods of time. (S/B)(pp. 14-15)	4	19
D. Against Criterion V.A.		
1. Lack of provision to handle and resolve field initiated design questions and requests by the PGandE home officse. (L/B and S/B) (pp. 76-79)	5	27
2. Lack of prescription of the limited conditions where piping thermal stresses could be released by installation of gaps within rigid restraints. (L/B and S/B)(pp. 63-66)	6	29
3. Inadeqaute stress walkdown inspection program to ensure freedom of interferences. Procedures did not fully incorporate IEB 79-14 requirements, and the acceptance criteria were relying on design piping movement predictions that were not always observed to be accurate. (L/B and S/B)(pp. 39-47)	7	32
4. Ways that support joint loading can be reduced at structure connection were not prescribed. Unacceptable pin joint models were observed. (S/B)(pp. 34-35)	6	29
5. Lack of "Tolerance Clarification" procedural prescription on what could be "quickly fixed" at site without major revision of the existing calculations. (L/B and S/B)(pp. 48-55)	8	37
6. Lack of sufficient references and engineering data for the site engineers to perform calculations that had resulted in personnel reliance on uncontrolled outside materials. (S/B)(pp. 12-14)	9	43

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.	PAGE
E. Against Criterion V.B.		
1. Lack of S/B support calculation checks resulted in errors unrevealed. (S/B) (pp. 57-60, 51-52, 55)	10	46
2. "Preliminary" data identification and subsequent review of the calculation against final data were not done. (S/B)(pp. 60-61)	11	57
3. Personnel Training was not requested by the supervisors in a timely manner. (S/B)(pp. 18-22, 26)	1	1
4. Stress walkdown inspections failed to identify all unintentional piping restraints. (L/B and S/B)(pp. 39-47)	7	32
F. Against Criterion III		
1. Design criteria conflict in control of pipe support structural frequencies. (L/B and S/B)(p. 56)	12	59
2. Inadequate design evaluation of as-built deviations from design. (S/B)(pp. 51-52, 55)	8	37
3. Lack of program provisions to control preliminary design data provided through telephone, and to verify the calculation against subsequent final data when made available. (S/B)(pp. 60-61)	11	57
4. There was no design consideration for synchronizing loading between closely spaced rigid/rigid restraints, and rigid restraint/anchors. (L/B and S/B)(pp. 61-62, 71)	13	61
5. Snubbers were inoperable due to placing them in close proximity with rigid restraints and anchors. (L/B and S/B)(pp. 66-76)	13	61

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.	PAGE
6. Lack of ALARA considerations associated with the use of snubbers. (L/B and S/B) (pp. 66-76)	13	61
7. Lack of documented design interface procedure for OPEG Piping Stress Group and Pipe Support Group. (S/B) (pp. 37-38)	14	74
8. Support field design change breakdown - quick acceptance and fixes of design deviations bypassed measures including prior calculations made, review, and approval. There had been thousands of supports being "fixed" this way. (L/B and S/B)(pp. 48-55)	8	37
G. Against Criterion XVIII		
1. When a QA audit item could not be evaluated due to a lack of project activities, followup of the item was not planned. (S/B)(P. 95)	15	76
2. Lack of QA audit documentation of specific materials reviewed that leads to closing out of the audit findings. (S/B)(P. 95)	16	80
3. Lack of QA documentation of materials reviewed during the conduct of the audit. (S/B)(pp. 95-96)	16	80
4. Lack of technical QA audits to independently verify that OPEG calculation inputs were checked to be in compliance with engineering procedures. (S/B)(p. 96)	15	76
5. Auditor did not take the initiative to investigate why there had not been any Discrepancy Reports issued by the site design group. (S/B) (pp. 96-97)	16	80

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)	PG&E RESPONSE SUBJECT NO.	PAGE
6. Relative to a document control audit, the auditor discovered that, since March 1983, the control of OPEG procedures was conducted at the PGandE and Bechtel San Francisco offices. There was no attempt made to revise the audit checklist to cover these activities. (S/B)(p. 98)	17	91
7. Relative to the same document control audit, the checklist was modified to cover the subject OPEG activities 10 months later, the benefit of timely audit to ensure program compliance had been compromised. (S/B)(pp. 98-99)	16	80
H. Against Criterion VII		
1. Lack of procedure to ensure effective design interface between PGandE and W. (L/B)(p. 108)	17	91
2. Lack of DCP control of procedures to be used by the contractors. (p. 108)	17	91
a. Lack of measures to ensure that contractors had received required design criteria. (L/B)		
b. Lack of justification on unrequired criteria and procedures being sent to the contractors. (L/B)		
3. Relative to DCP audit of contractors, technical audits of Imprell, Cygna, and W had not been performed. (L/B)(p. 108)	18	95
4. Design procedures and instructions utilized by Imprell, Cygna, and W had not been reviewed and approved by the PGandE and Bechtel engineering and QA departments. (L/B)(p. 109)	19	99
5. PGandE did not perform QA program type audits of W in 1983, when most of the CAP analytical work was carried out. (L/B)(p. 109)	20	101

INSPECTION ITEM DESCRIPTION NO. (Affecting L/B, S/B, or Both) (Inspection Report Reference)		PG&E RESPONSE SUBJECT NO.	PAGE
6.	The PGandE QA program audit of W, No. 20506, "Seismic Re-Verification", conducted on May 25-28, 1982, did not include a review of piping analysis and pipe support calculation to ensure implementation of procedural requirements. (L/B)(p. 109)	20	101
7.	Relative to contractor internal audits, Cygna technical review for design analysis and calculation was questionable. (L/B)(pp. 111-112)	21	107
8.	Relative to contractor internal audits, the W QA program type audit was considered to be inadequate and deficient. (L/B)(pp. 112-113)	20	101
9.	Relative to contractor internal audits, there had not been any technical audits conducted by W. (L/B)(pp. 112-113)	20	101

ENCLOSURE 2

TABLE OF CONTENTS TO PGandE RESPONSES

* As identified in the Summary of the Draft Inspection Report, provided in Board Notification 84-071, dated April 3, 1984.

1. QA Training

CRITERION II

ITEM 1:

Observation: In the area of general technical and QA training, the program permits personnel performing safety-related design work without training up to 30 days. (Draft Report pp. 18-22, 26; L/B and S/B)

ITEM 2:

Observation: No measures or program provisions established to ensure adequate special training for the working staff on matters such as procedure revisions and problem trending (Draft Report pp. 22-25, 26; L/B and S/B)

CRITERION V.B.

ITEM 3:

Observation: Personnel training was not requested by supervisors in a timely manner. (Draft Report pp. 18-22; S/B)

Summary Response:

The basic training program was adequate, but implementation was not always consistent. While not agreeing with all of the inspector's conclusions, the Project acknowledges that it did not consistently meet its requirement to provide training within the specified 30-day limit. Engineers have now received all required quality program training. To prevent recurrence, the Project has revised its policy and practices to remove the 30-day requirement. Diablo Canyon Project (DCP) engineers are now required to be trained prior to starting any safety related design work. Supervisors have been reinstructed in their responsiblity to assure that employees receive training. By review of the overall program results, lack of timely training for some individuals did not

impacted the technical adequacy of design and have no significance for low power testing or commercial operation. This assessment is based on the overall program requirements of review, checking, and approval of the acceptability of the final design.

Detailed Response:

The inspector states that "the latest training program appears to be adequate" (March 28, 1984, NRC meeting Tr. 12) but questions whether previous training was adequate since he had not reviewed earlier training material. The current training program consists of a four hour orientation to the Engineering Procedures Manual and an indoctrination in Quality Assurance. The trainee is advised of the contents of the Manual, its arrangement, and the subjects covered by individual procedures. The various forms used in the design process such as calculation cover sheets, Engineering Material Memoranda, Discrepancy Reports, are presented in the context of the applicable procedure. The content of the current training program is substantially the same as that which was in place since the inception of the Project. This training is not directed to achieving technical proficiency.

Contrary to the assertion (March 28, 1984, NRC meeting Tr. 16) that QA training was suspended from 1982 to May 1983, the present Quality Assurance training has always been included for new employees. The inspector is referring to the fact that in May 1983, an element was added for

indoctrination in the Bechtel Quality Assurance program. Prior to May 1983, PGandE Project personnel were not trained in the Bechtel Program, although PGandE personnel were trained in PGandE QA and use of the Engineering Department Manual. After May 1983, all PGandE personnel were indoctrinated in the Bechtel Qa program, and this element is now a permanent part of the training program.

The inspector has presumably drawn his conclusion that OPEG training was inadequate from interviews with project personnel. A more proper indication of familiarity with technical programs is the adequacy of design. An extensive review of small bore design conducted in response to earlier inspections has resulted in no modifications.

Because the ultimate quality of the end product cannot be the result of the procedural and QA training discussed above, the essential element is the technical competence that the new engineers bring to OPEG at the time of hiring. As stated in PGandE Letter No. DCL-84-046 dated February 7, 1984 to the NRC:

> "A review of the technical background of the engineers in the small bore pipe support group at the site shows that experienced, technically qualified engineers had been hired, with little or no need for additional instruction in small bore piping calculations other than that normally provided to familiarize them with the proper design criteria and Project calculational methodology. Of all the pipe support engineers employed at OPEG, more than 41% (36) had greater than five years of nuclear related experience. Most of the engineers had worked on two or more other nuclear power projects, with many having worked on five or more plants. All have at least a BS in Engineering or equivalent, and their minimum professional experience is one year, the maximum professional experience is 14.5 years, and the average professional experience is greater than five years."

Thus, these engineers did not need training in the technical methods of performing small bore calculations. These OPEG engineers already had the technical expertise to perform the calculations. The aforementioned training concerned non-technical aspects of the job.

Supervisors may have relied on the administrative system too much, to assure training, and did not, in some cases, track the satisfactory completion of training. Supervisors also were not required to document how employees were informed of procedure revisions. This situation is being corrected.

Especially important is the on-the-job training which takes place, both informally and by virtue of the Project engineering system. This on-the-job training comprises an initial period of employment in which the engineer is indoctrinated by his supervisor or others with project experience in office work practices. These include identification of project standards describing the work process and design criteria, and acquainting the new employee with the organization and responsibilities. A new design engineer, who works in close proximity to his associates, is given various assignments involving original design, reviewing, and checking. Problems are continuously discussed with his associates and supervisors, reference documents are readily available, and there are precedents to follow in prior design work.

As stated in the February 7, 1984 submittal:

> "While some individuals did not receive indoctrination and procedure training within the 30 day specified period, the records indicate that the discrepancies in calculations that have been observed are not related to either

indoctrination and training or professional experience, but rather are random events. Consequently, the delayed completion for the training of a few design support engineers does not appear to relate to the discrepancies detected."

As a result of the observations and earlier audit findings, DCP has recently revised its practices to incorporate formal training of Project engineers prior to their originating, checking or approving of any design documents involving Class I structures, systems or components.

The inspector has extrapolated the lack for small bore training and errors in the small bore area to technical inadequacy in large bore analysis. Since large bore analyses were performed in San Francisco, specialists were more readily available for consultation and a special experienced group reviewed all support designs and calculations.

Additionally, at the inception of the Project, a special training program was conducted and documented for engineering supervisors in the large bore effort. This training program consisted of both procedural requirements, technical requirements and sample problems. The training material used in this class was provided to engineers new to the project to familiarize themselves with the project before they started work. Generally when large groups started at the same time, training sessions were conducted but not documented. Since the sampling of small bore analyses performed by OPEG engineers did not indicate any correlation between training and frequency of these minor errors there is no basis to expect a correlation in any other engineering area especially large bore where the frequency of detected errors has been very low (2-4%).

2. PGandE Response to QA Audit Findings

CRITERION XVI

ITEM 2:

Observation: Lack of project timely response to PGandE QA findings. The delays were w/o justification. (Draft Report p. 92; S/B)

ITEM 3:

Observation: Lack of PGandE management attention to ensure timely responses to the audit findings. (Draft Report pp. 92-93; S/B)

ITEM 5:

Observation: Lack of PGandE audit finding corrective actions to identify the cause of the problem and the measures needed to prevent recurrence. (Draft Report p. 93; S/B)

ITEM 6:

Observation: Project corrective action only addressed specific problem areas identified in the PGandE audit findings and did not consider generic implication of the problems. QA concurred with this apparently inadequate corrective action. (Draft Report p. 93; S/B)

Item 8:

Observation: Lack of PGandE QA Program measures to evaluate the effects of program efficiencies resulting in long delay of QA finding corrections prior to IDVP and CAP actions. (Draft Report pp. 94-95)

Summary Response:

The observations on the responses to PGandE QA audit findings are mostly related to a lack of documentation, none of which is required by NRC regulations. Though not deviations from regulations, these issues were identified as program weaknesses by PGandE prior to identification by the inspector, and corrective action has been taken. We share the inspector's

opinion that audit findings should receive proper evaluation and be resolved in a timely manner. These observations have no significance for piping design activities or for low power testing or commercial operations.

Detailed Response (Items 2 and 3):

The NRC Inspector identified three findings from PGandE audits 20703, 20813, and 20917 as having untimely responses without documented justification for the delays. There have been some PGandE QA audit findings for which timely responses were not submitted. For some of these delayed responses, verbal extensions were requested and granted. When PGandE management became aware of this problem with audit responses in November 1982, Nonconformance Report (NCR) DCO-82-QA-N005 was issued. The NCR was addressed to the QA Department rather than to the audited organization because QA sets the policy on response time to audit findings. Part of the corrective action for this NCR was a revision to QA procedures to redefine audit response requirements, including a provison to ensure that justified delays to responses are authorized in writing. Since all audit findings are now prioritized and appropriately resolved prior to significant changes in plant operating status, there is no impact of these observations for low power testing or commercial power operation.

Detailed Response (Item 5):

All PGandE audit findings are documented on Open Item Reports (OIRs) or NCRs, and the corrective actions to those findings are evaluated by PGandE QA supervisors for identification of causes, preventive measures taken, and possible generic implications. When an audit finding is documented on an NCR, the review for generic implications is documented on the form under Corrective Action. Every NCR is investigated by a specially appointed Technical Review Group (TRG) whose responsibility, in part, is to evaluate and document the cause, resolution, and corrective actions required to prevent recurrence for each deficiency. Part of determining the "corrective actions to prevent recurrence" is the TRG's investigation into the generic implications of the deficiency.

For audit findings considered not "significant" (as indicated in 10 CFR 50, Appendix B, Criterion XVI), they are not identified on an NCR nor were these issues documented on the audit finding form. However, the evaluation for generic implications does take place and was a basic part of the review of all audit findings. A recent revision to QA procedures requires the audited organization to document their investigation into each finding to determine the cause, the measures to prevent recurrence, and the generic implications.

Detailed Response (Item 6):

PGandE Audit 20813 concerned selected calculations and drawings applicable to pipe supports that had been designed and installed prior to the initiation of

the Corrective Action Program (CAP). Several problems were identified in the audit including use of an apparently incorrect input load in the pipe support calculations and some administrative filing problems. At the time of the audit, the Corrective Action Program was in its early stages. It was known that new piping stress analysis calculations were being performed that would supercede pipe support input loads. Further, the adequacy of the prior piping design work was being verified through the ongoing CAP. Therefore, it was not necessary to further consider the generic nature of this finding, concerning work performed prior to the CAP. Additionally, the previous method used to transfer input loads to the pipe support designers that led to this problem was discontinued and not used in the CAP.

Detailed Response (Item 8):

Prior to the Independent Design Verification Program (IDVP) and Corrective Action Program, PGandE management had evaluated the effects of program deficiencies that had resulted in delays of corrective actions for QA audit findings. Those evaluations were not always documented. More recently, these evaluations have been documented as required by the QA Program.

All audit reports and findings are currently transmitted to the Executive Vice President, Facilities and Electric Resources Development, for his attention. Standard distribution is also made to all involved organizations, involved PGandE departments, and the General Office Nuclear Plant Review and Audit

Committee (GONPR&AC). A monthly status report is made to GONPR&AC. Similar distributions of audit reports and findings have always been made since the inception of the Quality Assurance Program.

As stated earlier, audit findings have always been evaluated to determine the impact of the finding on completed work and work in progress. The evaluation has always considered whether a discrepant condition needs to be corrected immediately or whether it can, without adverse impact, be corrected later. Based on the evaluation, findings were "prioritized" and actions scheduled. The "prioritization" was not a formal, documented process until 1980 but has always been a part of the process.

Organizations responsible for correcting audit findings are required to provide estimated completion dates for their corrective measures. An example of PGandE management's attention to the evaluation of audit findings and items important to quality is the GONPR&AC decision of June 14, 1983. In its June meeting, GONPR&AC directed the QA Department to not only inform GONPR&AC members of the status of QA audit findings but to also include the status of all nonconformance reports generated by all PGandE departments. By August 1983, PGandE QA audit findings and nonconformance reports were being tracked and reported to management in a single periodic report by the QA Department.

On August 19, 1983, the Executive Vice President, Facilities and Electric Resources Development, directed the Manager, Quality Assurance, to include the status of all quality problem reports generated by PGandE departments and major onsite contractors in the status reports being distributed to GONPR&AC and other members of management.

Since August 1983, about 60 quality problem status reports have been issued to management. Whenever Diablo Canyon Unit 1 approached a change in operating mode, these status reports were issued on a daily basis to ensure management attention.

3. DCP Response to Audit Findings

CRITERION XVI

ITEM 4:

Observation: Bechtel audit finding corrective action scheduled completion dates were delayed without documented justification. (Draft Report p. 93; S/B)

ITEM 7:

Observation: Inadequate Bechtel QA verification of OPEG corrective actions prior to close-out of audit findings. OPEG personnel training continued to be inadequate. (Draft Report p. 94; S/B)

Summary Response:

Documented justification for delays in response to audit findings is not required by regulation or the DCP QA program, however, the need for timely response has been re-emphasized and additional measures taken to improve follow-up. Responses to DCP audits of OPEG generally have been provided within agreed upon schedules or requested extensions. Late responses were followed up by Project QA in accordance with the DCP QA Program and were not significant with respect to on-going work. DCP audit findings against OPEG were closed only after completion of corrective action by OPEG and acceptance of corrective action by Project QA. The observations of the inspector are not hardware problems and have no implications for low power and full power operations.

Detailed Response:

There is no regulatory or DCP QA Program requirement for documented justification of the reason for extensions of time in Project Quality Audit Finding (QAF) responses by the audited group. ANSI N45.2.12-1977 (Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants) states that the audited organization shall respond as requested by the audit report but does not require "documented justification" for delays. The auditing organization is required to perform follow-up action as necessary. This Standard states that follow-up action can be accomplished through written communication, re-audit, or other appropriate means.

For each audit, Engineering agrees to respond by a certain date. If they do not so respond, verbal or written follow-up occurs. Extensions to the response date may be agreed upon where appropriate. If these actions are unsuccessful, further follow-up is taken by notifying Project Management in writing of the delinquent response. In each case cited below, responses were obtained through the use of these follow-up measures. Other follow-up actions, if required, could have included preparation of a Nonconformance Report (NCR) or directing "stop work" on affected activities.

As of the end of the first quarter of 1984, nine separate audits had been performed by DCP QA of OPEG Activities. Of these nine audits, seven resulted in issuance of Quality Audit Findings (QAFs). In three of the seven audits which resulted in QAFs, responses were received either before or within one week of the scheduled response dates for the QAFs. The remaining four audits and associated QAF's chronology are described below:

a) In Audit 28.1.1, QAF-1 response was 7 working days delinquent without documentation of a formal response extension request. The response date coincided with the 1983 Christmas/New Year holidays.

b) Audit 28.4-1 and 2 resulted in two QAFs. One QAF was answered two weeks early. For the other QAF, a formal response extension request was received prior to the scheduled completion date. The request was based upon additional time required to arrange and conduct formal training sessions. The QAF was responded to within the time frame of the extension request. This is the same audit the inspector claimed was closed prior to corrective action. The "early" closure is discussed further below.

c) Audit No. 28.1-2 resulted in four QAFs, three of which show a response signature date 10 working days late. In reality, the engineering group had provided the auditor draft QAF responses prior to the scheduled completion date. These draft responses were reviewed and investigated by the auditor and upon agreement, the QAF responses were signed and formally transmitted. These three responses were both complete and adequate and the QA closure of these QAFs was completed within the following two weeks. The fourth QAF response was received 37 working days overdue. This QAF documented deficiencies in microfilming historic design calculations and has no impact on enginering and/or design adequacy. The apparent reason for the delay in this response stems from the need to coordinate and prioritize Records Management System input for not only OPEG Engineering documents, but also documentation generated by other DCP organizations.

For all the delinquent QAF responses on this audit, management was notified of the tardy response in the "Delinquent Open Items Report," which is an attachment to the QA Monthly Activity Reports. The procedure for issuance and content of Quality Assurance Activity Reports is described in the Bechtel Quality Assurance Department Procedure No. C-9.

d) The fourth audit report (28.5-1) was issued February 23, 1984. An audit exit meeting was conducted February 6, 1984, in which QAF response schedules were determined. Extension dates were later requested and granted for the QAFs based upon additional time required to affect interdiscipline coordination and coordination between San Francisco Home Office and jobsite activities.

Project QA has re-emphasized to Engineering the need for timely response to audit findings, and is placing additional emphasis on aggressive follow-up. To add further management controls, Project Quality Assurance recently implemented, and has issued on a weekly basis, a "QA Open Items Summary." This report provides the status of each open Quality Audit Finding, including the scheduled dates for QAF response, approval, and closure, and is distributed to appropriate project management.

Contrary to the inspector's statement, the recommended corrective actions for both findings arising out of Audit 28.4-1 and 2, were completed by Engineering, accepted by Project QA, and implementation verified by Project QA prior to closing the audit findings. All corrective actions were completed by Engineering by April 20, 1983. This audit 28.4-1 and 2 was properly closed on May 10, 1983.

QAF-1 identified that several engineers had not received training in the Engineering Manual Procedures. Corrective action taken consisted of Engineering performing a review of all OPEG personnel training records, identifying those that required training, and performing the training of those identified. This action was completed March 14, 1983, less than four weeks after the audit. The action taken and implementation of that action was then accepted by Project QA. Project QA verified that the individuals identified in the finding had been trained and compared the roster of OPEG personnel to personnel training records to assure that Engineering's corrective actions had been effective. This verification was completed, and the finding was closed on May 10, 1983.

QAF-2 identified that no evidence was available to document training of supervisors to the Project Engineers Instructions (PEIs). Engineering's corrective action consisted of training all personnel who required training in the PEIs. This action was completed on April 20, 1983. Project QA's acceptance and verification of this action, was completed April 21, 1983.

Closure of the second finding followed a similar sequence of events.

Although some recurrences of OPEG training discrepancies occurred later in the project, Audit 28.4 - 1 and 2 resulted in the correction of the significant discrepancies. The later recurrence of training discrepancies does not mean that Audit 28.4-1 and 2 was improperly closed, but indicates the need for continuing audits of all program areas as required by 10 CFR 50 Appendix B and the PGandE and DCP QA programs.

In accordance with the DCP QA Audit Schedule, this Indoctrination and Training Audit was again performed in March 1984 (Audit 28.4-3). The audit revealed satisfactory implementation of the OPEG Training Program and no QAFs were issued.

All other DCP Audit findings related to OPEG have been reviewed to assure that the findings were not closed prior to corrective action taking place, and no additional problems were identified.

4. Procedure Control

CRITERION VI

ITEM 1:

Observation: Engineers were using out-of-date procedures for performing their work. (Draft Report pp. 10-12; S/B)

ITEM 2:

Observation: Inter-office memorandums were issued in lieu of procedures that bypassed review and approval process. (Draft Report pp. 12-13; S/B)

ITEM 3:

Observation: Site quality engineer and support group leader maintained outdated listings of the latest work procedure. (Draft Report p. 15; S/B)

ITEM 4:

Observation: Design personnel was performing calculations without having adequately controlled procedures for extended periods of time (Draft Report pp. 14-15; S/B)

CRITERION XVI

ITEM 1:

Observation: Site design organization management was insensitive to staff concerns and did not initiate timely corrective actions. (Draft Report pp. 27-29; S/B)

Summary Response:

The Project acknowledges that out-of-date procedures were in some controlled manuals at OPEG. We have evaluated the effect of each missing or out-of-date

document on a case-by-case basis. The evaluation has concluded there was no effect on the quality or technical adequacy of design work.

Apparently the inspector believes that each OPEG engineer required his own controlled documents. Project documentation shows that, depending on the size of the group, there were never less than three and as many as eleven sets of controlled piping procedures assigned to the OPEG Stress Group. This constituted a sufficient number of controlled procedures for use by OPEG engineers.

The identified interoffice memoranda (IOM) were not used in lieu of work procedures. One IOM was issued to provide guidance for assurance of proper interpretation of AWS codes. The other was an engineering request for revision of a contractor's procedure. Neither document formed the basis for changes in design work procedures.

The inspector's observations have no implications on low power or full power operations.

Detailed Response:

Adequate document control procedures existed on site at all times while design was conducted. This concern was covered in our submittal to the NRC dated February 7, 1984:

> The DCP QA Program requires formal control of implementing procedures. Detailed requirements are contained in Engineering Manual Procedure 5.2. Implementing procedures are required to be logged into a control system by title, date of approval and revision number. All holders of implementing procedures are required to formally acknowledge receipt of revisions by returning a signed acknowledgement.
>
> Special implementing procedures, instructions and criteria for the small bore piping design verification effort were authored by the Project Team Piping Group, and the control of their distribution was managed by the Project Administration Group using a system of signed, returned receipts.
>
> A master document distribution matrix was prepared to establish which manual holders receive specific documents in accordance with the requirements of their job assignment. A specific set of defined documents is assigned to a pipe support engineer; a different set of documents is assigned to a pipe stress engineer, and so forth.
>
> a) Out-of-date Procedures
>
> The staff identified three instances of out-of-date procedures contained within the controlled procedure manuals maintained in the OPEG. As a result, a discrepancy

report (DR 83-47-S) was issued by Project Engineering. This DR addresses corrective action, impact on final design and actions to prevent reoccurrence.

A 100% review of all control procedures, instructions and criteria assigned to OPEG personnel was completed by December 15, 1983. Sixty-three (63) manuals containing 133 criteria documents, 412 procedures and 451 instructions were reviewed. The results showed that 90% of the documents assigned to the manuals were correctly in place. The review results have been evaluated to determine the possible impact on the small bore reverification work. Most of the instances found involved documents missing from certain controlled manuals, in which case the appropriate requirements are available to the engineer through other controlled manuals in the work area. Each instance of an outdated procedure or instruction was evaluated and determined to not impact the completed design work. The documents found to be outdated were characteristically documents that the assigned manual holder would not be using in performing his specific assignments.

All 63 controlled manuals have been brought up to date. They now contain only current copies of those documents specified by the master document distribution matrix.

The Staff also expressed the concern that since Piping Procedure Manual B-075 was presumably the only controlled manual assigned to the OPEG Stress Group, there was a possibility that Stress Group engineers had been without access to up-to-date procedures for an extended period of time. However, our investigation has shown that other controlled copies of the manual had been assigned and available to members of the Stress Group since the inception of the OPEG group. For example, the October 14, 1982 Distribution List for Piping Group Procedures, Instructions and Criteria for Diablo Piping Design shows that 11 members of the Stress group were assigned controlled manuals. Although the number of manuals assigned to the Stress Group has varied, at no time were

there less than three controlled manuals assigned to this Group.

On a broader level, the Staff concern relates to Allegation 84 in SSER 21, dealing with lack of management responsiveness to an engineer's request for a copy of controlled design procedures. The allegation was discussed and resolved in SSER 21, with the Staff concluding that the "spirit of the allegation was substantiated" and that "management must improve its sensitivity in addressing safety concerns and improve communication with workers." In late 1982, there was an acknowledged shortage of copies of the manual, such that all engineers did not have individual copies. However, sufficient numbers of the controlled documents were available as discussed above and the engineers were able, and required, to use them. Additional copies have subsequently been made available, consistent with the goal of avoiding unnecessary complications in document control due to the distribution of more copies than necessary to accomplish the work.

Because the controlled design documents were, in fact, available to the alleging engineer, there was no violation of procedures or adverse affect on the small bore piping analyzed. Nevertheless, the Project has perceived the desirability of improvement in this area, and has taken several actions toward this end:

1. Document Control Procedures and practices are being reviewed with onsite Engineering personnel. They have been notified of the importance of complying with document control procedures and of their responsibility to update manuals and return acknowledgement forms.

2. Procedure P-1 was revised in Rev. 4 dated January 30, 1984 to require a monthly supervisory review of controlled manuals to assure that procedures, instructions and criteria are kept current.

3. For future revisions to design procedures, the supervisor will discuss the content of the revision with engineers under his supervision to be sure everyone is aware of changes and how they are to be implemented. Alternatively, procedure changes which are now routed to all manual holders will be formally routed to all engineers and will require an acknowledgment signature.

Also as a part of the resolution of DR 83-047-S, the possible effect of outdated design criteria documents on the final design has been reviewed. There were no instances found of out-of-date criteria in the manuals. All individuals, including those missing criteria documents, had access to current controlled copies of applicable criteria in order to correctly perform their design work.

As a separate effort, a Project QA review of configuration control of other manuals at OPEG (i.e., Engineering Manual, PEIs) has been completed. No deficiences were identified in this review.

Also, as addressed in PGandE Letter No. DCL-84-046 of February 7, 1984, to the NRC:

"The staff also noted an instance of out of date procedure listings. An occurrence was observed where a controlled manual Table of Contents dated October 28, 1983 was in the possession of the Onsite Project Engineer, while other supervisors had the previous version dated September 15, 1983.

This specific instance, ironically, resulted from management's efforts to improve the methods for distribution of revisions to controlled manuals. Distribution of the October 28, 1983 revision was held by the Onsite Project

Engineer upon receipt for two weeks while these improvements were being formulated. The revised practices have since been incorporated into Piping Procedure P-1."

The revisions involved in the October 28 Table of Contents were reviewed for content and impact. All revisions consisted of either administrative changes or minor clari- fications. Failure to apply them to design work for the two-week period had no adverse impact on the designs involved.

"The Project has in place formal procedures for requesting and approving design changes. These procedures do not permit design changes to be made on the basis of an inter-office memorandum (IOM). The NRC's concern apparently relates to two identified IOMs issued by Project Engineering. As discussed below, however, neither of the two memoranda constituted design changes.

The first IOM involved the use of the welding code (AWS) for calculation of skewed welds. The Pipe Support Group Supervisor issued an IOM dated March 21, 1983, for the purpose of providing guidance in modeling skewed welds in conformance with the code. The IOM did not change any design documents, nor did it violate either good engineering precepts or approved QA procedures or requirements.

The second IOM of concern to the Staff was an IOM issued by Engineering on October 20, 1983, to General Construction, approving a request to revise a contractor's installation procedure. The change involved installation tolerances in the contractor's procedures which had been previously approved by Project Engineering in accordance with Project procedures for approval of contractor documents. General

> Construction and the contractor formally executed the change. Neither the request nor the IOM approving the change resulted in a change in the Project's approved design drawings or specifications, thus, the issuance of a Design Change Notice was inapplicable. Project actions, including the IOM from Engineering approving the change in the contractor's procedures, were consistent with Project procedures for review, approval, and amendment of contractor documents."

To assure that procedure manuals are maintained in the current configuration, supervisors have been directed to review the manuals being held by their subordinates on a regular basis. In addition, manual configuration control is being emphasized in QA audit and surveillance activities.

5. Field-Initiated Design Questions (DPs)

CRITERION V.A.

ITEM 1:

Observation: Lack of provision to handle and resolve field initiated design questions and requests by the PG&E home office. (Draft Report pp. 76-79; L/B and S/B)

Summary Response:

Design changes, whether initiated in the field or at the home office, have always been accomplished under existing design control and as built procedures. As opposed to actual design changes, field-initiated design questions and requests by the PGandE home office are handled under the Diablo Problem (DP) system. This system is adequate for the purposes for which it was intended. The DP system is not a design control mechanism or a vehicle to provide design information to the field. Rather, the DP system provides a tracking mechanism to ensure that questions are identified to the responsible discipline and scheduled for timely resolution. Further, it provides a mechanism for the exchange of information between Engineering and Construction, including requests for design clarification. Therefore, there are no technical problems resulting from this observation, and thus there is no impact on low power testing, power ascension, or full power operation.

Detailed Response:

The one instance cited by the inspector allowed a 1/16" tolerance to be applied to the gaps specified for seismic restraints. This information was provided to the field in a letter signed in 1977 by the Senior Piping Engineer for the Supervising Piping Engineer. The inspector's concern is that this

information was provided outside the design change process and that no documentation exists for preparation, checking, and approval of this design tolerance allowed for construction. PGandE did not, and still does not, believe that allowance of a tolerance this small requires application of the formal design change process. The 1/16" allowed is a standard within the industry and is consistent with analysis requirements.

6. Gaps and Pin Joint Models

CRITERION V.A.

ITEM 2:

Observation: Lack of prescription of the limited conditions where piping thermal stresses could be released by installation of gaps within rigid restraints. (Draft Report pp. 63-66; L/B and S/B)

Summary Response:

The need to specifically address thermal gap-limiting conditions in design procedures is obviated if an acceptable alternate method is used. Such is the case on the Diablo Canyon Project. DCP Procedure P-11 requires that an as-built verification be performed whenever gaps are modeled in the piping thermal analysis. In accordance with this requirement, an experienced piping stress analyst reviews the installation of each unique configuration. This ensures that modeling of the thermal gaps is consistent with other design assumptions used in the calculation. Under these circumstances, it is neither necessary nor consistent with normal engineering practice to specify in the design procedures the limiting conditions for the use of thermal gaps. Therefore, this observation has no effect no effect on low power testing, power ascension or full power operation.

Detailed Response:

During a NRC site inspection on March 6, 1984, the 16 supports (19 piping attachment locations described in the February 7, 1984 submittal) exceeding $200^{o}F$ were reviewed in the field by the inspector. He reported that he disagreed with the application of gaps on 9 supports. The affected analyses have been rerun without gaps in these locations. The results indicate that all piping, supports and equipment remain qualified in accordance with licensing criteria.

CRITERION V.A

ITEM 4:

Observation: Ways that support joint loading can be reduced at structure connection were not prescribed. Unacceptable pin joint models were observed. (Draft Report pp. 34-35; S/B)

Summary Response:

A specific design procedure to describe the methods or limitations for modeling pin joints (joint releases) is not required. The use of joint releases is a well-accepted engineering practice that is standard in engineering evaluations of frame structures. It has not been the industry's practice to proceduralize such a well-accepted engineering technique. It can be pointed out that this well-accepted engineering technique was used very infrequently in the course of the small bore analysis. When the technique was used, it was checked in accordance with the normal review process to ensure that it was used properly. The inspector appears to express concern about the specific location where this technique was used. However, he then goes on to state (pp. 39 of his report) that the impact is "of minimal significance." Thus this observation has no effect on low power testing, power ascension, or full power operation.

Detailed Response:

This subject was discussed on page 27 of the February 7, 1984, letter to the NRC as follows:

Joint releases refers to a method of providing an accurate representation of end connections in structural members. An initial calculation of a pipe support frame might conservatively assume that welded ends at structural members are completely rigid. However, it is obvious that no joint is completely 100% rigid. The structural member may have very little moment resistance in some rotational axes, and assuming rigidity is not representative of actual behavior. An engineer may model the joint to closely represent its actual physical characteristics. In many instances, the joint is modeled so that no moment resistance is offered by the steel to which the member is attached (i.e., assume that moment loads are not transmitted). This method provides a more realistic model of the structural behavior of the frame.

The weld at the joint is still considered in the computer model and there is no intent or need to remove it since the forces transmitted by the weld and associated stresses are evaluated and verified to be acceptable. This practice is standard in structural engineering evaluations of frame structures.

In the one described instance where this technique was used, the calculation was reanalyzed with three different models in order to substantiate the validity of the original model:

1. Fixed: The joint was assigned full fixity.

2. Structure Modeled: The structure to which the pipe support was connected was modeled.

3. Member Removed: The member that attached the structure to the pipe support was completely taken out of the analysis.

In all four cases, including the joint release model, the pipe support was shown to be qualified.

7. Stress Walkdowns

CRITERION V.A

ITEM 3:

Observation: Inadequate stress walkdown inspection program to ensure freedom of interferences. Procedures did not fully incorporate IE 79-14 requirements, and the acceptance criteria were relying on design/piping movement predictions that were not always observed to be accurate. (Draft Report pp. 39-47; L/B and S/B)

Summary Response:

The stress walkdown program conducted in 1983 was a special engineering program developed by the DCP as a means to identify potential interferences before plant heat-up began. Although some of the procedures used for this walkdown effort included references to the 79-14 methodology, (in fact, the titles indicated that the procedures were based on that effort) there was no intention, nor was there a need, to incorporate all of the requirements, including documentation of the earlier effort. PGandE appreciates that the procedure titles may have confused the inspector, but the fact remains that the 1983 program was not conducted as part of the NRC Bulletin 79-14 requirement.

Detailed Response:

The walkdowns for the 79-14 requirement were performed in 1980 and 1981. The NRC Staff signed off on this effort in 1981. Project Instruction I-50 was issued to provide the necessary guidance to conduct and document the new, different 1983 program. Paragraph 1.0, "Purpose", states:

> This instruction provides guidance for the stress walkdown effort. The purpose of this effort is to review the installed condition of large bore Class I piping and confirm that they satisfy the design calculations. Since confirmation of the dimensions given on the piping isometric or pipe support drawing are within the scope of the as-building program, no detailed measurements are required as a part of the walkdown effort.

Thus, there was neither an intent nor a requirement to measure and record clearances as part of the stress walkdown program.

The inspector has stated that the penetration clearances measured by PGandE as part of the 79-14 review should have been recorded. As a result, PGandE has made a commitment to remeasure and record the clearances prior to power ascension, even though the adequacy of the clearances has been demonstrated by the performance of the three hot functional tests.

CRITERION V.B

ITEM 4:

Observation: Stress walkdown inspections failed to identify all unintentional piping restraints. (Draft Report pp. 39-47; L/B and S/B)

Summary Response:

The inspector believes that procedures were not followed because of the number of "apparent interferences" that he discovered during a tour of the plant. The specific "apparent interferences" are discussed below. Procedures for the stress walkdown require documentation of significant potential interferences, not non-interferences. Obviously, these conditions would not have been

documented and would not be available for review. Procedures for the conduct of the stress walkdown program were followed. None of the "apparent interferences" described below involved plant safety issues.

Detailed Response:

PGandE does not consider any of the six "apparent interferences" observed to be items required to have been recorded during the stress walkdown. In two cases, the interferences consisted of thick, compressible pipe insulation. The stress walkdown was conducted by experienced engineers who did not consider the insulation to comprise an interference in the context of the stress walkdown, i.e., they did not present significant thermal or seismic considerations. In the remaining cases, the "apparent interferences" simply did not exist.

The inspector observed an unintentional restraint between line 51, which has 2-1/2" of insulation, and a corner of a concrete wall. The maximum anticipated thermal movement in the direction of the unintentional restraint is 0.121". This amount of interference is easily accommodated by slight crushing of the insulation which will assure actuation of adjacent snubber 22-65SL.

The inspector observed that insulated line 51 was resting on the concrete over the top of the fuel transfer tube inside containment. The anticipated maximum downward thermal displacement along the run is 0.032". Because the line is insulated, this amount of interference is negligible and is easily accommodated by crushing of the insulation. Seismically, there is no concern because additional support is being provided for the line.

The inspector observed that the pipe elbow below rigid restraint 2152-15 on line 51 touches an adjacent wall surface. There is little thermal and dynamic piping movement at this location and therefore this apparent interference did not exist. The inspector agreed that this condition is acceptable.

The inspector observed that the operation of snubber 10-1435L could be restricted by the adjacent rigid restraint 1-32R. The inspector observed an 1/8" gap in the unrestrained direction of hanger 1-32R. The maximum anticipated thermal movement in the unrestrained direction is 0.835" which occurs at 120^{o}F. The 1/8" gap condition was observed when the system was at 120^{o}F plus. Therefore, the gap is sufficient in the unrestrained direction to allow actuation of the adjacent snubber 10-1435L. The inspector agreed that this condition is acceptable.

The inspector observed an unintentional interference between line 3089 (valve stem leakoff from valve 8074D on line 1158, the Loop 4 RTD Manifold Return to

Cold Leg 4) and a handrail. Because this line is a leakoff line, it is neither safety-related nor a code break. It requires no seismic analysis, and, as such, is classified as PGandE Design Class II Code Class E. At the time of the walkdown, snubber 339-32SL was observed to be installed on line 3089. Based on this, it was assumed that the line had been analyzed. However, the line had not been analyzed. The snubber was installed as a part of the System Interaction Program to prevent the leakoff line from impacting instrumentation tubing or conduit during a seismic event. The unintentional restraint on the leakoff line is not a concern because PGandE is only concerned with limiting the seismic motions of line 3089 in one direction at only one point as opposed to an overall stress qualification. In addition, the insulation is coped around the handrail for about 1/2" and the cope is filled with fiberglass wool. In addition, the movements of valve 8074D are DE, 0.038"; DDE, 0.076"; Hosgri 0.015"; and Thermal (100%) -0.052". These movements are so small that the handrail also does not serve as an unintentional restraint to the valve, due to the coping of the insulation. Therefore, this "unintentional restraint" is not of concern since it causes no unintentional restraint. The inspector agreed that this condition is acceptable.

The inspector observed that the snubber body of 22-61SL is in contact with the pipe insulation. The maximum anticipated thermal movement in the direction perpendicular to the pipe run is 0.268" toward north-west. This thermal movement causes the pipe to move away from the snubber body of 22-61SL.

8. Pipe Support Design Tolerance Clarification Program

CRITERION V.A

ITEM 5:

Observation: Lack of "Tolerance Clarification" procedural prescription on what could be "quickly fixed" at site without major revision of the existing calculations. (Draft Report pp. 48-55; L/B and S/B)

Summary Response:

"Tolerance Clarification" refers to the Pipe Support Design Tolerance Clarification (PSDTC) program. Adequate procedures, consistent with original design, existed to control design modifications in large bore and small bore pipe supports under the PSDTC program. All modifications implemented by the PSDTC program have been properly reviewed and dispositioned by Engineering in accordance with approved as-built acceptance procedures. However, the review and analysis activities were performed in a slightly different order. This has absolutely no impact on the adequacy of design or hardware and therefore has no impact on low power testing, power ascension, or full power operation.

Detailed Response:

This subject was discussed fully on pages 39-43 of PGandE's submittal of March 6, 1984, which responded to the motion to reopen the design quality assurance record:

> In January 1983, a special team of pipe support engineers was established within OPEG whose assignment consisted of direct engineering liaison with General Construction resident engineers and Pullman Power Products craft

personnel. The purpose of this group was to provide expeditious resolutions of minor construction difficulties in the installation of large and small bore pipe supports in order to minimize construction delays. The responsibilities and authorities of this group were originally provided in Onsite Project Engineering Guide 4.0 on January 7, 1983. This guide was superseded by Project Engineer's Instruction (PEI) 12 on March 11, 1983, which defined the PSDTC program. The practices defined by these two documents were based upon an identical philosophy and intent, and all guidance previously provided to construction under OPEG Guide 4.0 was again reviewed by engineering for compliance with the requirements of PEI 12 upon its issuance.

As provided in the procedure, field construction problems were defined as pipe support installation problems which could not be resolved using the relatively restrictive construction tolerances explicitly stated in Pullman Power Products document ESD-223, "Installation and Inspection of Pipe Supports". Construction tolerances contained in ESD-223 were those that could be applied to any pipe support in the plant without additional engineering justification. Changes beyond those tolerances may be permitted based upon the criteria contained in Diablo Canyon Design Criteria Memorandum (DCM) M-9, "Guidelines on Design of Class I Pipe Supports and Restraints." Field construction problems were referred to PSDTC team engineers who, based on their engineering judgment and knowledge of DCM M-9, would, on a case-by-case basis, determine whether use of expanded tolerance limits could be authorized to resolve the construction problem while maintaining an acceptable support design.

Where field resolutions could be made, in the judgment of the PSDTC team engineer, they were documented on individual PSDTC forms provided in Attachment A to PEI 12. Field construction problems which, in the judgment of the PSDTC engineer, could not be resolved without a design change, were returned to General Construction for formal referral to Engineering as a DP report requesting hanger redesign in accordance with other project procedures. Pre-existing pipe support configurations found to be in noncompliance with appropriate design and construction documents were referred for disposition as a Pullman Discrepancy Report or Discrepant Condition Notice in accordance with Pullman procedures.

The PSDTC engineers were selected from experienced engineers at the jobsite. It was felt that they, Mr. Stokes included, would be in the best position to know whether qualification of the supports could be demonstrated. In no case, however, was the modification made by the PSDTC engineer allowed to be the final design qualification. Notwithstanding Mr. Stokes' apparent lack of knowledge, all the PSDTC group's modifications received final engineering review and approval as part of the as-built acceptance, as required by procedures P-10, I-37 and I-40 discussed below.

When a PSDTC form was completed, a copy was attached to the pipe support design package and was treated exactly like the original design package in order to assure that standard quality control procedures were applied to all work accomplished by General Construction. Upon completion of construction of the support, the complete as-built package, including any PSDTC forms associated with that support, was forwarded by Construction to Engineering for final acceptance in accordance with project engineering procedures. These procedures are P-10, "OPEG Small Bore Piping and Hanger Review Procedure;" I-37, "Instructions for Incorporation of Field Correction Transmittals;" and I-40, "Instructions for the Disposition of As-Builts Associated with Design Change Notices." During the period of Mr. Stokes' employment, final large bore support as-built acceptance was completed by the project engineering team in San Francisco, while final small bore pipe support as-built acceptance was completed by OPEG.

The as-built acceptance process involved review of the revised support design and performance of necessary calculations for qualification of the design. Where qualification could not be shown, a new design was prepared and issued for Construction.

The PSDTC program was neither a substitute for nor a deviation from the formal design and construction quality assurance processes for pipe supports. As stated in paragraph 2.2 of PEI 12, the procedure was specifically not authorized for use in lieu of a Discrepancy Report or a Design Change Notice. The program was reviewed and approved for use by both Units 1 and 2 project engineering as well as the project quality assurance organization, all of whom signed PEI 12 when it was issued for implementation. In August 1983 an audit was conducted by the PGandE QA Department which resulted in the overall conclusion that the control of design changes by OPEG appeared to be effectively implemented. One finding was identified with respect to use of the PSDTC forms. In response to this finding, special training sessions were held in October 1983 for all PSDTC engineers to emphasize the limitations on the use of PSDTC forms and to assure that Design Change Notices would be initiated when required by DCP procedures.

Uncontrolled documents were not used to promulgate PSDTC program procedures. These procedures were defined in PEI 12 as supplemented in ESD-223, copies of which were provided to the PSDTC team. The details of the program implementation were emphasized with PSDTC engineers in periodic discussions and training sessions. The June 16, 1983 memo, referred to by Mr. Stokes as an illustration of inappropriate communication of program procedures, was, in fact, written by General Contruction to the piping contractor to reiterate construction procedural requirements already well established. Summarized, the memo states that the PSDTC program is not a corrective action program and may not be used in lieu of construction discrepancy reports (DRs and DCNs). This memo was not applicable to the PSDTC engineers and as such did not receive distribution to them.

As stated previously, a discrepancy report rather than a PSDTC form was used to document a pre-existing pipe support configuration which was found to be in noncompliance with appropriate design documents. The PSDTC form is not a discrepancy report and does not take the place of one. It may, however, be used to provide disposition for a discrepancy report written by construction. The PSDTC engineer is not, however, required to monitor writing of discrepancy reports by construction. This would explain why Mr. Stokes did not always see them. Construction discrepancy reports are produced as required by construction procedures. (Affidavit of Breismeister et al, pg. 39-43.)

CRITERION III

ITEM 2:

Observation: Inadequate design evaluation of as-built deviations from design. (Draft Report pp. 51, 52, 55; S/B)

Summary Response:

The inspector's concern emanates from his review of a field change authorized under the DCP's PSDTC program that, the inspector claims, was not subsequently reviewed and approved by Engineering. To the contrary, this instance was properly handled in accordance with the approved PSDTC procedures, which did not require that the minor change be specifically documented beyond the sign-off of the as-built drawings and the accompanying field engineering description. This matter has no impact on low power testing, power ascension or full power operation.

Detailed Response:

Under the PSDTC Program, design deviations may be authorized in the field under certain conditions, subject to subsequent Engineering evaluation. (See preceding response to Item 5 of Criterion V-A.) In this instance, the angles

of two minor braces of a particular small bore pipe hanger were changed slightly. The change was reviewed and approved by the field engineer according to PSDTC procedures and sent to Engineering for approval. The as-built drawing, accompanied by the field engineer's documentation of the specific angle changes were, in fact, signed off by Engineering, which indicates that the changes were reviewed and approved by Engineering. The changes were so minor that recalculations were not required, as Engineering's sign-off, through the use of standard forms, so indicated.

CRITERION III

ITEM 8:

Observation: Support field design change breakdown. Quick acceptance and fixes of design deviations bypassed measures including prior calculations made, reviewed, and approved. There had been thousands of supports being "fixed" this way. (Draft Report pp. 48-55; L/B and S/B)

Summary Response:

This observation also refers to the PSDTC program. All changes implemented by the PSDTC program have been properly reviewed and dispositioned by Engineering in accordance with approved as-built acceptance procedures. The changes or "fixes" received the same degree of quality assurance control as original design and therefore have no impact on low power testing, power ascension or full power operation.

Detailed Response:

The PSDTC program was neither a substitute for, nor a deviation from, the formal design and construction quality assurance processes for pipe supports. Procedures did exist to authorize and control the work under this program. It is recognized there were, in limited occasions, tolerance clarifications which exceeded the intended scope of that program. But the fact that all of them were formally reviewed and approved by Engineering, using strictly controlled procedures as a part of the as-built acceptance program, makes this concern of little consequence.

In August 1983, an audit was conducted by the PGandE QA department which resulted in the overall conclusion that the control of design changes was effectively implemented, but that the PSDTC program may have used used in situations where a Discrepancy Report (DR) or Design Change Notice (DCN) was necessary. The audit finding was closed out by providing special training sessions in October 1983 for all PSDTC engineers on the issue of program limitations.

9. Use of Outside Reference

CRITERION V

ITEM 6:

Observation: Lack of sufficient references and engineering data for the site engineers to perform calculations that had resulted in personnel reliance on uncontrolled outside material. (Draft Report pp. 12-14; S/B)

Summary Response:

It is acknowledged that this general reference material was not "controlled" in the context of 10 CFR 50 Appendix B while project-unique data was. It is not standard industry practice to control the use of general reference material, or private notes and correspondence. The Project does not believe that this observation consitutes a violation of Criterion V since control of the use of references is provided through the approval process for calculations. This observation has no impact on low power testing, power ascension, or commercial operations. However, the Project recognizes that approval prior to the use of such general reference material where standardization is applicable would strengthen its quality documentation program and has committed to a program for documenting approval of such referenced material where used.

Detailed Response:

This concern was addressed in PGandE Letter No. DCL-84-046 of February 7, 1984, to the NRC which stated that:

"The staff questioned whether references, such as the following, in the possesion of Pipe Support Engineering personnel were used in lieu of approved work procedures:

- o An IOM dated March 21, 1983 "Guidelines for Calculating Design of Skewed Welds"
- o Westinghouse Nuclear Technology Division Data for calculating double cantilever supports
- o Bechtel GPD STRUDL II Computer Program Users Manual CE-901 November 3, 1983
- o Bechtel GPD IOM dated November 11, 1980, "GPD Pipe Support Newsletter No. 5, Beta Angle"
- o Control Data Corporation (CDC) Bechtel National Support Manager to Civil/Structural Projects staff, "Baseplate II User Aids."
- o Midland "Pipe Deflection Formula"
- o UE & C Pipe Support Design Standard, August 15, 1979.

Experienced engineers commonly have general reference material as a part of their personal and professional library. This type of material includes textbooks and handbooks, and typically provides standard formulas and tables, code discussions, example calculations, rules of thumb and other simplified, conservative methods in common use in the industry. As general reference material, they are not controlled and do not constitute acceptance criteria.

Project Engineering Procedures (EMP-3.3) provide for the use of references such as textbooks, catalogs, monographs and other such accepted industry techniques in specific calculations. The reference must be documented when necessary to provide details of the design sufficient to allow independent review. In such cases, it is required that they be documented as formal references with the calculation in which they are used. Their use then is checked and approved via the calculation review and approval process. In the future, approvals of this material will be provided where general project standardization in their use is applicable. These materials will be formalized, controlled, and included in procedures manuals with appropriate instructions, qualifications and limitations.

> The above identified documents are references of the type normally found in an experienced engineer's personal library. We know of no instances where the references were improperly used. In one instance, a non-project document was referenced as the source of a double cantilever deflection formula used in a calculation. It was a standard engineering formula, not unique to any particular project, and need not have been referenced in the calculation."

Thus, adequate control of standard outside references was provided through the review and approval process for calculations. The use of such reference material is consistent with Criterion V of Appendix B of 10 CFR 50. Project-unique data are documented, approved, and issued in design criteria memoranda as required by Criterion III of Appendix B of 10 CFR 50. However, PGandE accepts the fact that the basis of design could be more clearly identified by controlling these references, and have committed to the above change in procedure as indicated in the quote above.

10. Input Checking

CRITERION V.B

ITEM 1:

Observation: Lack of S/B support calculation checks resulted in errors unrevealed. (Draft Report pp. 51, 52, 55, 57-60; S/B)

Summary Response:

PGandE concurs with the inspector's findings that errors existed in certain specific calculations. However, PGandE does not agree with his extrapolation of his observations that these errors resulted from a lack of calculation checks. The piping support calculations were checked and signed by the checkers as required by the QA program. Although their approval was inappropriate in light of later found discrepancies, none of the errors which were subsequently identified in reviewing over 30% of the small bore supports have required any hardware modifications to satisfy license requirements. To reconfirm the adequacy of the calculations, PGandE is re-reviewing all of the small bore computer analyzed pipe calculations to further ensure that no specific or generic problems exist. This process has no impact on low power testing, and the remainder of these calculations will be reviewed prior to full power operation. It is not expected that any modifications to the small bore supports will result from this review.

Detailed Response:

The inspector found two supports for which he felt that the computer model did not adequately reflect the design or as-built configuration. They are supports No. 57-15 and No. 99-20. The PGandE review of these supports is summarized below.

Support 57-15

The inspector found that changes allowed by engineering in the construction process were not incorporated in the calculation. These changes are:

1. Two members angles of interception and attachment location had been changed.

2. One 8-1/2" long angle member was not included in the computer input.

The PGandE review of this calculation shows these differences not to be significant and that the engineer used appropriate modeling techniques. Subsequent reanalysis to include these minor differences showed qualification with reduced member stresses and increased stiffnesses.

Support 57-60

The inspector found that the method used to model the load application from 3 pipes to the main support member was unacceptable. Since the same method was used at 3 locations and the model was run for 10 load cases, the inspector considers that 30 errors existed in the final calculation.

The PGandE review of the modeling technique found it to be reasonable and appropriate. Reanalysis to model the support in the manner preferred by the inspector confirmed the PGandE position as the support remained qualified in the as-built configuration.

The difference of professional opinion demonstrated in the above cases is typical of similar situations commonly encountered in the review process. These differences of opinion generally address the extent and accuracy of the simulation of the actual configuration. Such differences of opinion should not be considered "errors."

As a result of the inspector's observations and allegations addressed earlier, PGandE reviewed 104 complex supports qualified by the STRUDL analysis. Included in this sample were supports specifically identified to be discrepant by the alleger(s). A calculation error rate of 17% was reported, but all of the supports were found to acceptably perform their function in the existing as-built configuration. PGandE has further committed to reverify and reanalyze, as necessary, all calculations in this category. 38 of the remaining 301 calculations have been completed. The error rate is lower than that found earlier and indicates that the inclusion of the supports identified by the alleger had a skewing effect on the initial results. Again, no violations of the acceptance criteria have been found. PGandE remains confident that the design process, including the required checking, has been adequate and has produced installations which meet all licensing requirements. Even though the design has been found acceptable, efforts have been undertaken to further lower the encountered error rate and improve engineering performance.

The NRC staff has now reviewed a number of the most complex small bore support calculations again noting calculational errors. In conjunction with this, the

project has reviewed in greater detail approximately 25% of the most complex computer based support calculations. The result, in every case, has been to find the errors to be random in nature and, when corrected, the support is still found to be fully qualified.

This concern was addressed in PGandE Letter No. DCL-84-046 of February 7, 1984, to the NRC:

> "The broad responsibility of the checker is to assure that the calculation is sufficiently accurate and sufficiently free of errors to serve its intended purpose, i.e., to document that the support meets the design requirements. The minor nature of the errors detected and the fact that the calculations in question were corrected and still demonstrate support acceptability is a strong indication of the overall adequacy of the checking function."

Engineering Manual Procedure 3.3 requires the checking of inputs. However, as stated in our February 7 submittal:

> "Although there are discrepancies in the calculation packages, one must recognize the large number of decisions that an analyst must make, and a checker must review, in a given calculation package compared to the number of discrepancies discovered by the NRC reviewers and by our own reviewers. Small bore pipe supports are designed with adequate precision to achieve the design function. The primary reason for the acceptability of this level of precision in small bore piping design is due to conservatisms and structural redundancy in the small bore piping and supports completed with the low magnitude of loads which they experience. Nevertheless, the need for originating and checking engineers to more rigorously document acceptance of minor calculational errors is acknowledged.

Some of the pipe supports reviewed by the NRC inspectors are among the most complex small bore supports in the plant. The discrepancies found in our study of the NRC review actually represent a small percentage of the total number of decisions/actions that must be performed to arrive at a complete analysis. These analyses have been reviewed by the Project in detail and it has been determined that no modifications are required as a result of the discrepancies. This review is described below. The fact that no modifications were required confirms a conclusion that the design process and conservatisms are tolerant to minor anomalies and that the engineers responsible for the design of supports have ensured that significant errors do not exist.

a. Pipe Support Design Process

In the case of frame structure supports, the design generally consists of two phases. The first phase consists of the analysis of the frame structure and the second phase consists of the analysis of the associated base plates. Associated steps include evaluation of welds and qualification of standard components (struts, snubbers, U-bolts, etc.).

During the analysis of the frame structure, the analyst must translate a support drawing into a three-dimensional representation describing the placement, orientation, and properties of the steel members and the directions and combinations of the applied piping loads. Upon completion the analyst must perform a final check of the overall results to assure compliance with design criteria.

A moderately complex small bore pipe support at Diablo Canyon consists of, for example, approximately 10 discrete steel structural members and connections. In addition, the support has many supplementary items such as U-bolts or other small members which act to restrain the pipe. The model eventually developed by the engineer will contain approximately 30 joints and 25 elements. To develop the model, the engineer has had to specify 30 directional (x-y-z) coordinate points and define the connectivity of the elements to these joints. This means ensuring that approximately 90 numbers are correctly calculated, all digits and signs are correct, and indicating the proper numerical combinations to define member connectivity are indicated. Also, the engineer has to indicate the orientation of the strong and weak axes of the member. When the analysis is completed, the engineer applies the loads to the support model.

Typically, small bore supports are bilateral (supporting the pipe in two directions) and many are gang supports (supporting two or more pipes). For example, consider a frame that acts as a support for two pipes. Given the number of loads that must be specified (deadload, tributary mass loads, normal and accident thermal loads, and three different seismic loads), one arrives at a total of 32 individual loads that must be correctly transferred from the piping analysis, including directional sign. Also, he must specify parameters, such as unbraced length, for code checking purposes. The engineer then submits the input for computer analysis. Upon receipt of the computer analysis, the engineer reviews the ouput for appropriateness of deflections and stresses. Up to this point, the engineer has had to correctly develop and specify at a minimum approximately 300 numbers, assuring that all digits and signs are correct. In addition, he has had to review numerous pages of computer output.

After the engineer has completed his frame analysis, he must now begin the task of analyzing the base plates. For the evaluation of base plates, the analyst must similarly deal with hundreds of numbers or combinations of numbers. The engineer must choose from the many load combinations the sets of forces and moments to be input into the plate/anchor bolt analysis. The local coordinates of the baseplate model must be correlated with the local/global coordinates of the frame model. The plate size, thickness and shape, in addition to anchor bolt location, stiffness, capacity, spacing, and derated capacity edge distances, must also be reviewed and input. Taken as a package, it is not difficult to conclude that the engineer in the above discussions has had to deal with and review up to 1000 numbers.

The judgment and capability of the engineer throughout the design process helps assure a safe design. His engineering training, experience, and insight are important in visualizing the model and loading conditions, as well as deciding that the results are acceptable. The engineer is responsible for assuring that the support design is free of significant error by applying his experience from performing analyses of many pipe supports.

Additionally, the reviewing engineer provides an important function in assuring that major errors do not exist by applying his general experience in evaluating the final piping system. The small size of these components allows good visualization and a heurestic understanding of the

adequacy of a design, even without formal calculations and analyses. The engineer's understanding and experience lead to the identification of any major error by observing any obvious inconsistencies such as undersized members from that provided for other pipe supports.

The broad responsibility of the reviewing engineer is to assure that the calculation is sufficiently accurate for its intended purpose, i.e., to document how the support meets the design requirements. Therefore, minor discrepancies in areas of the calculation that would not lead to a criteria exceedence would not be expected to be documented. The fact that when the discrepancies were addressed the supports were acceptable without modification substantiates the adequacy of the design process. Nevertheless, discrepancies uncovered should have been documented.

b. Documentation of Small Bore Support Design

There are approximately 4000 small bore pipe supports which were designed and qualified in the field. Of necessity the process used to design and qualify these supports was a production-oriented process. The flow of work required a receipt of a set of loads and displacements, design of the support, preparation of design calculations, checking of the design calculations, and review and approval of the as-built drawings. Both the originator and reviewing engineer focused on the parameters of primary importance to the adequacy of the support. Although satisfactory for criterion and safety considerations, the level of rigor associated with these supports was different from that achieved in other parts of the plant. In general, this variation in rigor is clear to those familiar with design practices in power plant and industrial plant facilities throughout the country. More importantly, the rigor of design documentation varies according to (1) the importance of the system, (2) the degree to which the system design may be challenged (large loads vs. small loads), and (3) the conservatism which exists in the design.

The level of rigor of the small bore design documentation was technically consistent with the number of supports and the conservatism and structural redundancy inherent in the designs; however, compliance with quality program documentation was less than fully achieved in some instances.

c. Design Characteristics

The previous section described the design process and the conservatism inherent in small bore design. The fact that the margin is very large for this class of piping is often discussed but its importance must not be underestimated. Small bore piping is fabricated from materials with ductilities into the 30% to 40% range (resulting ductilities from the design analyses are typically less than 1%). The supporting systems provide for a highly redundant set of supports in which deflection of an individual support results in the transfer of load to adjacent supports. Additional conservatisms exist and are frequently tabulated in the methods used to calculate small bore loads on supports, especially when span tables are used for calculating stresses in the supports. The result is that the small bore piping system and supporting structures are highly conservative in design and highly insensitive to variations in the details of individual support designs.

d. Review of Supports

A significant number of small bore pipe support calculation packages have been reviewed in detail. Some were reviewed prior to the January 31, 1984 meeting and many have been reviewed since then. The IDVP reviewed a total of 19 calculation packages as documented in ITRs 60 and 61. The Project has reviewed 110 small bore pipe support analyses: 57 of the more complex (computer analyzed) safety-related small bore pipe designs; 25 of the simpler (hand calculated) small bore pipe supports; and the 28 calculations identified by the NRC during its investigation.

This Project review has been conducted to reverify the adequacy of the small bore piping design and to define the necessity for further improvement in documentation of the design adequacy. Each calculation package has been subjected to a detailed engineering review by the Project to identify all possible deficiencies or errors. This review has, of course, been far more rigorous and detailed than that performed in the original checking process.

Each of the selected calculation packages was reevaluated by a reviewer and reconfirmed by a checker. A checklist was used to aid in the review process. Results of the review were documented on the checklist and supplemental comments sheets, if required.

The reviewers verified that the structural model was adequate and complete, that the loads used in the calculations were properly applied, and that the structural model reflected the latest as-built drawing. Calculations were reviewed for required documentation, such as weld calculations, anchor bolts, base plate, spring variability, frequency, and structural analysis, to demonstrate compliance with appropriate project criteria, procedures and instructions.

The results were summarized into three categories.

The first category, "Hanger Acceptable As Is or With Minor Supplemental Calculations or Comments," is used to indicate those support calculation packages that were found to contain complete and acceptable information or to indicate those support calculation packages that were found to be acceptable, but which, for example:

(1) Lacked certain statements needed to document the conclusions reached.

(2) Did not contain documented evidence of the evaluation of certain items which the reviewer felt was prudent to include in the calculation package.

(3) Contained information from which the reviewer could not make an assessment and thus deemed it necessary to perform supplemental calculations in order to support his evaluation and conclusions.

It is not surprising that, due to the detail in the review, minor supplemental calculations or comments were required. Other engineers, rigorously looking after the fact, will generally always comment on some aspect of someone else's design calculation.

The second category, "Hanger Acceptable With Detailed Calculations," is used to indicate those support calculation packages that were found to be acceptable, but where, for example:

(1) The reviewer believed that it was advisable to perform additional analyses or modify and rerun the existing computer analyses.

The term "Hanger Acceptable" indicates acceptability to the design criteria which were originally used to qualify the supports. The methods and criteria were not modified for this evaluation. Highly sophisticated analysis, such as plasticity calculation, was not used to qualify any of these supports.

The last category, "Hanger Unacceptable," is used to indicate those support calculation packages that were found to contain errors which, upon reanalysis, showed that the hanger required modification.

There were 129 support calculations included in the review. The results are as follows:

Category	% of Supports
Acceptable with Minor Supplemental Calculations or Comments	78%
Acceptable with Detailed Calculations	17%
Unacceptable	0%

Detailed calculations for 6 supports (5%) have yet to be completed.

These results are significant. Of the 129 small bore supports, some among the most complex in the plant, the fact that no modifications were required indicates the minor impact of the anomalies noted.

It is also interesting to characterize the discrepancies themselves. The discrepancies noted in the review were tabulated into one of three categories. These categories were (1) modeling, input, or calculational error, (2) modeling or engineering judgment (verified by subsequent calculation), and (3) documentation discrepancy.

The first category includes such items as mis-modeling a beam property, having the wrong sign on an applied load, or performing a mathematical calculation incorrectly. The second category includes items which the reviewer noted as a modeling or engineering judgment, but felt that a supplemental calculation was necessary to verify the conclusion, and subsequently performed the calculation and verified the judgment. The third category includes reference to non-Project documents and a clear engineering judgment made but not explicity stated as such.

The conclusions drawn from this categorization are as follows:

Category	Percent of Discrepancies
Modeling, Input, or Calculation Error	74%
Modeling or Engineering Judgment	7%
Documentation Discrepancy	19%

The design process for small bore piping presents a large number of opportunities for the support designer to err in both the analysis and documentation of that analysis. On the other hand, the design process provides sufficient conservatism to assure that such deficiencies do not result in supports that do not meet licensing criteria. An extensive review program of the documentation for the design of pipe supports was conducted. The results of this program demonstrate that, while the level of documentation of these calculations should have been better, the small bore piping supports are adequate and met design requirements when the documentation discrepancies were corrected."

11. Telephone Information

CRITERION III

ITEM 3:

Observation: Lack of program provisions to control preliminary design data provided through telephone, and to verify the calculation against subsequent final data when made available. (Draft Report pp. 60-61; S/B)

Response:

Engineering Manual Procedure (EMP) 6.1, Section 4.4, specifically provides that all design information provided verbally must be confirmed in writing. If the data are used prior to such confirmation, the calculations must be marked "preliminary" and cannot be finally approved without such confirmation. This requirement is an additional measure to assure that preliminary data are confirmed before the calculations are reviewed for final approval.

The technical concern arising from this observation is discussed in the following response to Criterion V-B., Item 2. This observation has no impact on low power testing, power ascension or full power operation.

CRITERION V.B

ITEM 2:

Observation: "Preliminary" data identification and subsequent review of the calculation against final data were not done. (Draft Report pp. 60-61; S/B)

Summary Response:

This concern apparently arises because a single preliminary small bore support calculation (2156-200), which used input received by telephone, was not stamped "preliminary." This was clearly a deviation from the Engineering Manual Procedure (EMP). However, when written confirmation of the input loads was received and compared to the input used, the calculation was revised to reflect the minor difference, and the support design remained acceptable.

Detailed Response:

EMP 6.1, Section 4.4, specifically provides that all design information provided verbally must be confirmed in writing. If the data are used prior to such confirmation, the calculations must be marked "preliminary" and cannot be finally approved without such confirmation. This requirement is an additional measure to assure that preliminary data are confirmed before the calculations are identified as final.

The calculations for Support 2156-200 noted the use of input loads received via telephone, but the originator failed to mark the calculation "preliminary". Investigation and review of past audits show this occurrence to be an isolated case and, therefore, has no generic implications. The inspector agrees there would "probably be no effect on the adequacy of the pipe restraint." (Draft Report pp. 60) This observation has no impact on low power testing, power ascension or full power operation.

12. Design Criteria Conflict

CRITERION III

ITEM 1:

Observation: Design criteria conflict in control of pipe support structural frequencies. (Draft Report pp. 56; L/B and S/B)

Summary Response:

The inspector claims that there was inadequate design control because of the existence of two distinct procedures related to the design of pipe supports. There is no internal design criteria conflict. Contrary to the inspector's apparent understanding, the correct use of either procedure results in satisfaction of the single licensing criterion that large bore and small bore piping supports be designed to a natural frequency equivalent to 20 Hz or greater. (FSAR Amendment 56, p. 8-8). In fact, the alternate procedure results in a design which is more conservative than is required by licensing criteria. This use of a more conservative procedure than required does not affect the hardware, except to make it more conservative, and there is no impact on low power testing, power ascension and full power operation.

Detailed Response

The PGandE procedure, DCM M-9, requires that the stiffness of pipe supports be designed to a natural frequency of 20 Hz which is equivalent to a deflection limit of 0.025 inches. A Bechtel procedure requires that the stiffness of pipe supports be designed to a natural frequency of 33 Hz, with an additional requirement that deflection under pipe load conditions not exceed 0.0625 inches.

The concern of the inspector emanates from an observation of the IDVP, in its review of large bore and small bore pipe supports, that in a single instance an analysis conducted under the PGandE procedure was erroneously accepted by applying the Bechtel load deflection limit of 0.0625. Subsequent review of all of the work of the engineer who performed the analysis confirmed that this was an isolated error.

13. Snubbers, Restraints, and Anchors

CRITERION III

ITEM 4:

Observation: There was no design consideration for synchronizing loading between closely spaced rigid/rigid restraints, and rigid restraint/anchors. (Draft Report pp. 61, 62, 71; L/B and S/B)

ITEM 5:

Observation: Snubbers were inoperable due to placing them in close proximity with rigid restraints and anchors. (Draft Report pp. 66-76; L/B and S/B)

Summary Response:

The inspector's concern is that there was "no design consideration" of the potential for overstress of pipe restraints in cases where they are in close proximity to each other. In fact, all restraints were considered and modeled, including their relative proximity, in a manner consistent with state of the art accepted engineering practices. We believe the inspector's concern is that the DCP did not go beyond accepted engineering practice and model the as-built gaps between the pipes and the restraints, which are customarily ignored. In response to this concern, the DCP undertook a 100% review of all proximity restraints for snubber/rigid, snubber/anchor and rigid/anchor configurations. The results, reported on pages 16-20 of PGandE Letter DCL-84-046 to the NRC, dated February 7, 1984, showed that, in all cases where piping movement is insufficient to lock a snubber or engage a restraint, no sections of pipe would be overstressed and no support would be overloaded. The relevant portion of the February 7 letter states:

> NRC Question: The NRC raised questions about snubbers located adjacent to rigid restraints being inoperative

during dynamic loading (Allegation 88, SSER 21). This question was discussed further by Mr. Yin at the public meeting held on January 31, 1984.

Response

During a site visit, the NRC identified 16 snubbers that were located in close proximity to rigid restraints (proximity restraints). There was concern that in the event of a seismic disturbance, the rigid restraint would prohibit the snubber from actuating. The "lost motion" or "dead band", resulting from mechanical clearances in the snubber, must be overcome before the snubber will begin to restrain the piping. These clearances are typically very small and a review of the test results for the Diablo snubbers indicates an average dead band of 0.021 inches (roughly the thickness of 5 sheets of paper).

We agree that there are snubbers located in close proximity to rigid restraints at Diablo Canyon just as there are at other nuclear plants. It has been industry practice to ignore the dead band when performing seismic analysis. This was believed to be justified since the non-linearities induced by the small dead band described above are not sufficient to affect the results of the seismic analysis. Further, seismic stress is induced in a piping system only when large movements of the piping occur relative to the building structure. If the piping is allowed to move 0.021 inches, the induced stresses will be of an insignificant nature. It is recognized that loads on pipe supports may change.

Therefore, in order to address the potential changes in piping stresses and support loads and to provide assurance to the NRC that there is no safety concern, the DCP has undertaken a 100% review of all proximity restraints. This program is described in detail in Attachment 1. Attachment 2 describes the results of this program.

The results of this study demonstrate that in no case is a section of piping overstressed or a support overloaded when the piping movement is not sufficient to lock a snubber or engage a rigid restraint.

ATTACHMENT 1

(Proximity Restraints)

An issue concerning the significance of snubbers located in close proximity to other seismic restraints has been raised. In its initial form, the issue was that snubbers located close to rigid restraints may not lock up during a seismic event. The safety significance of this, if any, was unknown and it was felt that it should be reviewed. The review involved removing the identified snubber from the piping seismic analysis if actuation was not predicted, and reanalysis of the three seismic load cases: DE, DDE, and Hosgri.

Each of the 16 snubbers identified by the Staff were reviewed. A reanalysis of the DE, DDE and Hosgri seismic load cases was performed to determine the amount of movement. If actuation was not predicted for the identified snubber, the snubber was removed from the piping seismic analysis. If the seismically induced piping movement was found to be greater than the amount required for the snubber to actuate, the snubber was considered acceptable since it would function. If the movement was less than the actuation level, the snubber was assumed not to function, and additional evaluations of pipe stress, valve acceleration levels, and loading on pipe supports were performed. The results of those evaluations are presented in Attachment 2.

In this review, the actuation level, or "lock-up" movement, was taken as the average value from the test results of snubbers in use at Diablo Canyon. The actual test results for the mechanical snubbers were used to extract the "lost motion" or "dead band" movement that occurs prior to snubber actuation. This lost motion includes the effects from the minute clearances in the snubber itself as well as the ball bushing and hinge pin. These movements are typical of any snubber and are not unique to Diablo Canyon. Every plant that uses snubbers has a lost motion movement of this magnitude.

Attachment 2 shows that, independent of whether the snubber will actuate, the piping system meets all licensing criteria. This confirms the validity of the design engineer's technical judgment that specific analytical treatment of snubbers was not warranted.

Therefore, our subsequent review demonstrates that the systems are fully acceptable, with snubber actuation specifically included. To better appreciate why snubber actuation was not initially included in the calculations, several facts should be recognized. In actual installation, there are clearances (gaps) in the rigid restraint that are designed to allow thermal expansion or construction tolerances. These clearances allow the piping to move sufficient distance to actuate an adjacent snubber, even though the analysis may not predict actuation. More importantly, if a snubber cannot actuate because of a nearby rigid support, the movements of the system are so small (less than 0.021 inches) that the actual piping stress cannot be significant; i.e., the failure of the snubber to actuate will not affect the piping integrity.

In order to provide even further assurance that there is no safety concern with snubbers next to rigids and anchors, and rigids next to anchors, a thorough review was made of the locations of all seismic restraints in the plant. A screening criteria was developed to assess the proximity of:

1. snubbers next to rigids (SR)
2. snubbers next to anchors (SA)
3. rigids next to anchors (RA)

These screeening critieria considered the piping stress that would be developed as a result of the snubber "dead band". This dead band would allow movement of the pipe prior to the snubber/rigid load acceptance. An initial screening was made using a 3-diameters (3D) spacing criterion.

In order to assess the sensitivity of the 3D criterion an additional review was undertaken of all of the snubbers within 5-diameters (5D) of a rigid or anchor. Note that the 5D criterion had been previously accepted as a method for screening snubbers next to anchors on SNUPPS. The NRC both raised this question and accepted the 5D response. A summary of the results is as follows:

Proximity Restraint Type	3D	5D
SR	12	23
SA	2	6
RA	17	36

As can be seen from the above table, the number of snubber interactions is small and demonstrates that good engineering practice was employed at DCPP. These proximity restraints were reviewed using the same methodology described previously for the initial 16 snubbers.

The results of this comprehensive study of all proximity restraints demonstrate that in no case is a section of piping overstressesd when the piping movement is not sufficient to lock a snubber or engage a rigid restraint. With over one-half of the support evaluations completed, all design criteria have been met.*

The snubber and rigid interface issue raised by the Staff is a concern of recent vintage and, while it is worthy of attention from an ALARA point of view, it is not a safety concern. This issue was not part of the DCP criteria, procedures, or instructions, nor has it been an industry practice to consider the gaps in rigid restraints or the "dead band" in snubbers. As a consequence, the IDVP did not review this issue. As we have stated in several NRC meetings, PGandE will undertake a snubber optimization program.

*[Note: The evaluations have subsequently been completed with no change in the results.]

ATTACHMENT 2

HANGER NO.	ANALYSIS NO./REV.	DE DISP. w/o SNUB.	DDE DISP. w/o SNUB.	HOS DISP. w/o SNUB.	SNUBBER ACTUATION*	COMMENTS
16-47SL	2-105/2	0.090"	0.180"	0.376"	Yes	
16-49SL	2-105/2	0.063"	0.126"	0.298"	Yes	
16-28SL	4-102/4	---	---	---	---	This snubber was identified as a potential interference problem, not as a snubber actuation problem.
16-29SL	4-102/4	0.007"	0.014"	0.042"	Hosgri	Pipe Stresses OK Support Loads OK Valve Accelerations NA
16-63SL	4-102/4	0.021"	0.042"	0.169"	Yes	
16-77SL	4-102/4	0.081"	0.162"	0.253"	Yes	
4-2SL	4-135/2	0.001"	0.002"	0.013"	No	Pipe Stresses OK Support Loads OK Valve Accelerations NA
4-32SL	8-109/2	0.056"	0.112"	0.131"	Yes	
4-33SL	8-109/2	0.066"	0.132"	0.159"	Yes	
15-63SL	8-110/4	0.015"	0.030"	0.108"	DDE, Hosgri	Pipe Stresses OK Support Loads OK Valve Accelerations OK

ATTACHMENT 2

HANGER NO.	ANALYSIS NO./REV.	DE DISP. w/o SNUB.	DDE DISP. w/o SNUB.	HOS DISP. w/o SNUB.	SNUBBER ACTUATION*	COMMENTS	
15-64SL	8-110/4	0.002"	0.004"	0.007"	No	Pipe Stresses Support Loads Valve Accelerations	OK OK OK
16-79SL	8-116/2	0.004"	0.008"	0.011"	No	Pipe Stresses Support Loads Valve Accelerations	OK OK OK
16-67SL	8-117/4	0.001"	0.002"	0.099"	Hosgri	Pipe Stresses Support Loads Valve Accelerations	OK OK OK
16-68SL	8-118/2	0.001"	0.002"	0.010"	No	Pipe Stresses Support Loads Valve Accelerations	OK OK OK
22-400SL	3-313	0.132"	0.264"	0.210"	Yes		
22-401SL	3-313	0.050"	0.100"	0.054"	Yes		
	Summary	8 of 15 Lock Up	9 of 15 Lock Up	11 of 15 Lock Up			

*Test results from vendors indicate an average lock up displacement of 0.021".

With regard to rigids located in close proximity to rigids, the concern is that if two closely spaced rigid supports (spaced supports with standard construction tolerances of 1/16 to 3/16 inch) have different clearances, then the support with the smaller clearances will have to carry load previously assigned to the support with the larger clearances.

It is not necessary or desirable to shim the clearance in close proximity to rigid/rigid pipe supports.

The support configurations being evaluated are described as two rigid supports which are in close proximity to each other. The piping computer analysis from which support design loads are determined ideally assumes zero clearance between the pipe and the supports.

For close proximity supports, there are two mechanisms by which loads are transferred from the piping to the supports. The first mechanism is a simple translational shear reaction, with loads on both supports having the same direction of action. The second mechanism is one where the close proximity supports resist a moment through a force couple. The forces, in this case, act in opposite directions on the two supports. These two mechanisms are represented in Figure 1.

In the case of close proximity supports with zero clearance, the net support design forces are composed of the loads from both mechanisms, with the contribution from the force couple being the dominant component.

In the case where a clearance exists at one or both supports, the effects are twofold:

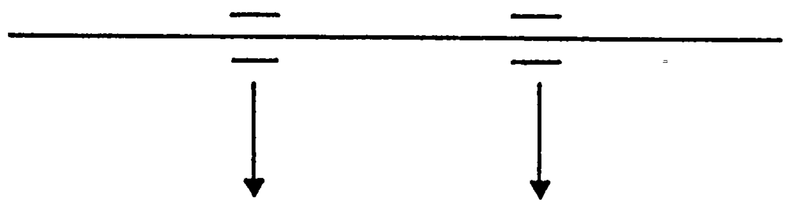
- The translational shear forces may not be evenly shared.

- The force couple decreases in magnitude as rotation of the piping is not resisted until the clearance is closed.

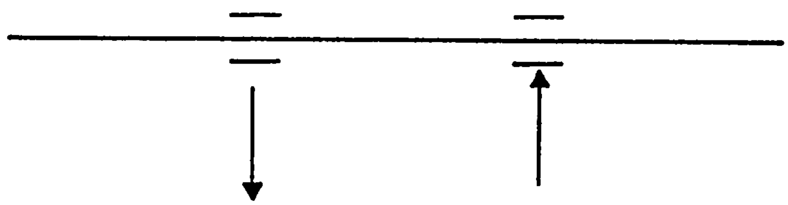
The nature of a complex piping system is such that, although forces from both translational shear and moment resistance are created, the close proximity supports are inherently sensitive to the force couple. The fundamental response of piping systems includes pivoting and rotation motion. This effect, combined with the short dimension between the close proximity supports, makes the dominant support loading the force couple. Therefore, the existence of clearances clearly decreases the force component due to the force couple (dominant load), while potentially increasing the translation shear load (subsidiary load) in the support that is first in contact with the pipe. In general, it would appear that the current basis for support load calculation, which ignores the clearance, is the most conservative basis for the stress analysis of the support.

The actual contributions of the two mechanisms to the support design loads are dependent on specific piping and support configurations. PGandE has examined all of the large bore stress isometrics and identified approximately 140

instances of close proximity rigid supports. From this group, a representative sample has been selected and is being analyzed with consideration of the actual clearances. These analyses will help quantify the actual support load changes.



TRANSLATIONAL SHEAR MECHANISM



FORCE COUPLE MECHANISM

Figure 1

MECHANISM ILLUSTRATIONS

CRITERION III

ITEM 6:

Observation: Lack of ALARA considerations associated with the use of snubbers. (Draft Report pp. 66-76; L/B and S/B)

Summary Response:

While ALARA considerations specific to snubber population optimization were not included in the piping design criteria, principles of ALARA were considered. Snubbers were located in coordination with the Operating Department to ensure accessibility.

Snubbers were added, as required by analysis, to meet seismic and thermal loading conditions. Because of the added cost of installing snubbers, as compared to rigid restraints, and because of the need for testing and maintenance of snubbers during plant operation, snubbers were installed only after it was determined that a rigid restraint would be inadequate. When snubbers were installed, the designs were developed to assure accessability for inservice inspection (ISI) of welds and maintenance of valves and other equipment. These are ALARA considerations.

Detailed Response:

Recently, the nuclear industry has recognized that a review of piping and support designs can potentially provide a reduction in the number of snubbers which provides a reduction in ISI and maintenance costs, improved ALARA design, and increased system reliability of response to thermal and seismic

inputs. Many nuclear utilities are developing revised design criteria and new methodologies to provide economic and effective snubber reduction. Included in these efforts are:

1. Special snubber optimization computer programs.
2. Revised damping and spectra broadening criteria for seismic analysis.
3. Increased allowables for seismic loading conditions.
4. Use of energy absorbers in place of snubbers.

While Diablo Canyon does not, in general, contain more snubbers than other similar nuclear plants, an integrated snubber evaluation program may well result in the ability to reduce the total number of snubbers. As a result, PGandE has committed, in a letter dated February 15, 1984, to perform a snubber reduction program with completion planned for the second refueling outage, though the majority of the snubber removal would be accomplished during the first refueling outage. This schedule will allow PGandE to benefit from industry developments now underway and to avoid duplicate design and construction efforts. PGandE sees no unacceptable impact on low power testing, power ascension or full power operation emanating from this concern.

14. OPEG Stress/Support Interface

CRITERION III

ITEM 7:

Observation: Lack of documented design interface procedure for OPEG Piping Stress Group and Pipe Support Group. (Draft Report pp. 37-38; S/B)

Summary Response:

The inspector's observation implies that there should be formal procedures to define and govern the interface between the pipe stress and pipe support groups within OPEG. (Tr. pp. 59-60). There is no requirement for such a procedure, and the lack of same does not cause a problem. There are DCP requirements for interface control of design drawings, documents, and data between engineering disciplines. However, there is no such requirement for interface control within a discipline. The pipe stress analysis group and the pipe support group are both part of the same engineering discipline and, hence, not subject to any additional procedural requirements. In any event, the small bore piping design and installation are acceptable. There is no concern for lower power testing, power ascension or full power operation.

Detailed Response:

Even though not specifically required by the Engineering Manual, the DCP nevertheless addressed proper transfer of design data between the stress and support groups in Procedure P-11 (section 4.1.8):

"The [lead piping stress analyst] or his designee is responsible for providing the Pipe Support Review Supervisor with pipe support loads and piping movements."

The method used in OPEG for accomplishing this information transfer was a three part form letter that incorporated a "return receipt" requirement.

The inspector acknowledged that the groups did satisfactorily interface, so the "end result is not really a problem." (Tr. pp. 59)

15. PGandE QA Surveillance Activities

CRITERION XVIII

ITEM 1:

Observation: When a QA audit item could not be evaluated due to a lack of project activities, follow-up of the item was not planned. (Draft Report p. 95; S/B)

ITEM 3:

Observation: Lack of QA documentation of materials reviewed during the conduct of the audit. (Draft Report p. 95-96; S/B)

Summary Response:

The observations on the failure to reschedule an audit activity not performed and a lack of audit documentation are related to PGandE activity audits. These activity audits provide a surveillance program that supplements the audit program required by NRC regulations. Activity audits are not governed by regulations but are performed in accordance with PGandE QA procedures.

Failure to reschedule an activity audit did not violate procedures or represent an omission in the QA Program. The second observation on the lack of documentation for an activity audit was apparently an oversight by the NRC inspector. The documentation was included in the body of the audit report.

These observations have no significance for piping design activities or low power testing and commercial operations.

Detailed Response (Item 1):

The PGandE program includes two types of audits. The first type are Program Audits. Program audits provide coverage of all QA Program elements as required by Regulatory Guide 1.33 and 1.144. A Program audit is a documented activity performed to verify by examination and evaluation of objective evidence that the company's, or supplier's, QA Program has been developed, documented, and effectively implemented. The second type is the Activity audit. Activity Audits are equivalent to the activities which some utilities refer to as surveillance or monitoring. PGandE documents the activity as an audit and evaluates any findings as audit findings. Activity audits provide additional monitoring of specific activities and are supplementary to the Program audits. An Activity audit is a documented activity performed to verify that a specific task conforms to the applicable requirements of the company's, or a contractor's/supplier's, QA Program.

Program audits are scheduled in accordance with a procedure for specific areas of the QA Program over a 2-year period or more frequent in accordance with regulations. Activity audits are scheduled whenever desired to cover scheduled work activities.

When a Program audit cannot be performed due to a lack of activity in the areas to be audited it must be rescheduled in order to meet our regulatory commitments.

When an Activity audit cannot be performed due to a lack of activity in the areas to be audited, it is rescheduled at the discretion of the QA supervisor. The need for rescheduling would be based on the subject area, the importance of the work activity, and the relationship of the proposed activity audit to a Program audit topic.

PGandE Audit 83087A was an activity audit scheduled and performed for the specific purpose of verifying that very specific procedures used by OPEG were in existence and were being implemented. For one of the areas to be audited, the auditor verified that procedures were provided for controlling the activity, but implementation could not be verified because the activity had not yet been performed. This is not a frequent occurrence, but happens occasionally. In this particular case the audit topic was not immediately rescheduled.

Detailed Response (Item 3):

PGandE Audit 83161A was an activity audit performed to verify the adequacy of training documentation for three specific training sessions on Engineering Manual procedures. The sessions audited were held on February 17, February 18, and March 14, 1983. The records for the three training sessions audited were documented in the audit report. The audit concluded the training was being performed, performance documented and the documents maintained as required by procedure. The audit report accurately documented the materials reviewed during the course of the audit, but in no way represented, nor was intended to represent, a comprehensive evaluation of the OPEG Training Program.

16. DCP QA Audit Program

CRITERION XVIII

ITEM 2:

Observation: Lack of QA audit documentation of specific materials reviewed that leads to closing out of the audit findings (Draft Report p. 95; S/B)

ITEM 4:

Observation: Lack of technical QA audits to independently verify that OPEG calculation inputs were checked to be in compliance with engineering procedures. (Draft Report p. 96; S/B)

ITEM 5:

Observation: Auditor did not take the initiatives to investigate why there had not been any Discrepancy Reports issued by the site design group. (Draft Report pp. 96-97; S/B).

ITEM 6:

Observation: Relative to a document control audit, the auditor discovered that, since March 1983, the control of OPEG procedures was conducted at the PGandE and Bechtel, San Francisco offices. There was no attempt made to revise the audit checklist to cover these activities. (Draft Report p. 98; S/B)

ITEM 7:

Observation: Relative to the same document control audit, checklist was modified to cover the subject OPEG activities ten months later. The benefit of timely audit to ensure program compliance had been compromised. (Draft Report pp. 98-99; S/B)

Summary Response:

Documentation of the specific materials reviewed by the auditor for the close-out of the Audit 28.1-1 and other DCP audits performed of OPEG is available and maintained as part of the QA records. In this instance, the auditor reviewed a relatively small sample but the overall corrective action taken was comprehensive and addressed the nature of the finding. Accordingly, there is no discernable adverse effect on design quality due to this item. Reviews have confirmed that documentation of materials reviewed by the auditor in closing out other OPEG audits are also available.

The second observation concerns requirements for "technical QA audits" of OPEG work. While technical QA audits are not a requirement of 10 CFR 50 Appendix B, the value of technical reviews or audits is clearly recognized. Such reviews have been performed on various aspects of the design as part of, or in addition to, design verification measures even though they are not a part of the formalized QA audit procedures. In addition to normal checking and approval, small bore pipe support design was subjected to an independent design review by the IDVP, on a sample basis, and an IDVP audit with emphasis on technical interface control.

The remaining observations concern rescheduling of two planned audits at OPEG. In both cases, procedures for rescheduling the audits were followed, but the appropriateness of these actions was questioned. In one case, the scope of the audit was not intended to cover preparation of Discrepancy Reports, the subject of the concern. Other audits were performed and reviews made by Project QA that performed this function. In the other case, an audit originally planned to evaluate OPEG activities with respect to issuance of implementing procedures could not be performed at OPEG because the control activity was in actuality located in the San Francisco office. PGandE agrees that it may have been appropriate to perform the audit in San Francisco at that time, however, the IDVP had just audited the same area in San Francisco with satisfactory results. These were unique situations not anticipated in the original audit planning. None of the inspector's observations have any impact on low power testing and full power operation.

Detailed Response (Item 2):

The DCP procedure applicable to closure of audit findings, Quality Assurance Department Procedure C-5, requires the QA Engineer to include the justification for close-out on or with the closed QAF. Actually, there were several acceptable ways this requirement was met. In the cited instance, the specific materials which were reviewed to close out the audit finding were recorded by the auditor as an attachment to his Work Plan and Log for the

period from April 25, 1983 to May 6, 1983. The Work Plan and Log documented the QA Engineer's completion of the finding close-out. In addition, the general verification method used by the auditor is recorded on the QAF form. In combination, these two documents meet the requirements of Quality Assurance Department Procedure C-5 for documentation of specific materials reviewed to close the finding. The Work Plan and Logs are retained as QA records and are readily retrievable. A second copy of the Work Plan and Log has been placed in the audit file to assure retrievability.

Other instances were found where the specific materials reviewed were recorded on the Work Plan and Logs rather than on the QAF form. In those instances copies of the Work Plan and Log have been placed in the corresponding audit file to assure retrievability.

It was stated in the March 28, 1984, transcript (Tr. 68-69) that a large number of documents should be reviewed during the close-out process. In the specific instance identified, Engineering had performed a complete review of all final OPEG calculations to correct the identified problem. In view of the complete review performed by Engineering, it was not necessary for the auditor to also review a large number of calculations. The auditor reviewed a relatively small number of calculations for the purpose of confirming the acceptability of Engineering's review. In the auditor's judgement the sample he reviewed was sufficient for that purpose.

Detailed Response (Item 4):

We interpret the observation in item 4 to be that 10 CFR 50, Appendix B, requires "technical QA audits", and that the audit procedures are faulty because they did not so require technical QA audits.

A "technical audit" would be a documented review activity with the general format of a QA audit but with an expanded scope to include a verification of the technical adequacy of the design. The auditors would include an individual or individuals having the necessary design engineering qualifications to perform the review.

Our understanding of this concern is that the inspector interprets Criterion XVIII to require as an audit function an additional design verification similar to that required by Criterion III. PGandE does not share this interpretation of Criterion XVIII.

This concern was previously addressed in PGandE Letter DCL-84-046 dated February 7, 1984, to the NRC as follows:

"In implementing Criterion XVIII of 10 CFR Part 50, Appendix B, the NRC has endorsed, with certain exceptions, ANSI N45.2 and ANSI N45.2.12. The latter document provides requirements and guidance for establishing a system of audits of quality assurance programs, and provides definition of various types of audits. Criterion XVIII mandates audits to verify compliance with the QA program and to determine its effectiveness. None of the above-cited references establish requirements for the performance of technical QA audits.

On the Diablo Canyon Project, QA audits are conducted (in fulfillment of licensing commitments) to verify compliance with the project quality assurance program requirements.

The Project audit program has been developed and implemented to comply with requirements of the Project Nuclear Quality Assurance Manual. This program, in turn, has been approved as being in compliance with Project requirements and Criterion XVIII of Appendix B. It calls for a system of audits, the scope of which has been widely accepted in the nuclear industry, to assure that the QA program is properly functioning. Relative to the OPEG group, this audit scope has included all the major areas of design activity such as control of calculations, control of design drawings, indoctrination and training, and design change control. In addition, PGandE, as the licensee, has conducted a series of Activity Audits covering OPEG activities.

Since 1982 there have been some nineteen (19) audits of OPEG to verify compliance with Project QA requirements. Closeout and corrective actions related to audits is documented in the Project audit files."

"The verification of technical requirements in design output documents is performed by Engineering as part of the design control process. The type of verification can vary from checking to independent review by the Chief Engineer or an outside agency, depending on the significance of the document."

The Independent Design Verification Program review work itself is similar to a "technical audit" and specifically included design of small bore piping. The IDVP also performed an audit of small bore piping and support design at OPEG with emphasis on technical interface control and project indoctrination. This effort was termed a Design Office Verification (DOV).

Finally, PGandE has committed to a program of "technical audits" for OPEG, as described in the February 7, 1984 submittal. Therefore, adequate technical review of the small bore piping has been accomplished.

Detailed Response (Item 5):

The third observation involves audit area 28.3, "Handling of Non-compliances" which has the following scope:

> Evaluation of On-site Engineering Group compliance to requirements for preparation and control and dispositioning of nonconformances and supplier nonconformances.

The inspector was concerned that the auditor did not audit the issuance of DRs by the OPEG group as required by the audit. However the scope of this particular audit was to audit the issuance of Nonconformance Reports (NCR) by

OPEG. A Nonconformance Report is a higher tier QA deficiency document than a DR and is used to document more significant quality problems. Since no NCRs had been issued the audit was rescheduled in accordance with Project procedures.

The inspector also questioned the number of DRs which OPEG had issued. Contrary to the inspector's findings at least three DRs had been issued by OPEG in late 1982 (DRs 82-182-S, 82-183-S, and 82-184-S) and one of these (DR 82-183-S) was specifically included in the audit sample for Audit 15.1-1, performed April 18 through 25, 1983. While not solely directed to OPEG, the generation of DRs was reviewed by Project QA in other ways. For example, Audit area 15.1 specifically addresses DRs. Audits in this area were performed to evaluate Engineering's overall compliance with the requirements for review, evaluation, disposition, and control of DRs. These audits were performed in the San Francisco office. Since DRs prepared by OPEG are logged, controlled, and finally signed off in San Francisco, they were included in these audits.

Audits of the preparation of calculations and drawings as well as DCP QA's program for design deficiency trend analysis provided additional reviews of the processing of the identification of design deficiencies.

Detailed Response (Item 6):

The planned purpose and scope of Audit 28.5 was to evaluate OPEG activities with respect to issuance and distribution of implementing procedures. It was not originally intended to cover such activities "wherever located" since activities in the San Francisco office were being audited by a separate group of auditors, using audit planning tailored to the San Francisco office.

The statement of the situation is correct in that the auditor at the site was unable to perform the audit because the control, issuance, and distribution of the implementing procedures being used by OPEG was located in the San Francisco office. The audit was rescheduled on several occasions, which is allowed by Diablo Canyon Project (DCP) procedures. The QA Program requirement is to audit applicable elements of the Quality Assurance Program at least once a year. One reason for rescheduling the audit was to review the area later on in the Project, since it was possible that OPEG could generate other implementing procedures that would be controlled at the site. However, this never took place. It may have been appropriate to restructure the audit and perform it at San Francisco, and such is our current practice.

One reason why DCP QA Management did not schedule an audit of this type in San Francisco during the March 1983 time frame is that this area had just been reviewed during the R. F. Reedy follow-up audit performed on March 17, 1983. The Reedy auditors documented the following results in their letter of March 18, 1983, to Teledyne Engineering Services:

"4. <u>Document Control (SFO)</u>

Requirement:	Engineering Manual Procedure 5.2, Rev. 0, Paragraphs 4.4 and 4.5 provide controls for the distribution of implementing procedures and further provide for the follow-up action required when the control element is violated.
Condition Noted:	P-11, Rev. 1, issued on 8/25/82 had eighteen receipt acknowledgment cards not returned by individuals on the distribution list. No follow-up action had been taken at time of audit.
Action Taken:	Objective evidence exists to prove the adequacy of current control of procedural documents. This evidence is in the form of memoranda, instructions, checklists and an audit report. The control of acknowledgments is improved and overall control has been demonstrated."

The satisfactory results of the Reedy audit in March 1983 provided DCP QA management additional assurance that there was no significant impact as a result of the rescheduling of Audit 28.5.

Detailed Response (Item 7):

The final observation is a continuation of Criterion XVIII, Item 6. It is correct that during late 1983 a decision was made to broaden the scope of Audit 28.5 so it could be performed at OPEG. The checklist was revised accordingly and the audit was performed. There was little significance to this change. The previous audit plan was approved as required and is acceptable. The Plan included all the major areas of OPEG design activity such as control of calculations, control of design drawings, indoctrination and training and design change control. This was simply an effort to broaden and strengthen the audit program at OPEG, which was a positive step. The Diablo Canyon Project (DCP) Audit program is not intended to be static and unchanging, and may be expanded or contracted when warranted. The revisions to the checklist were reviewed and approved in accordance with DCP procedures.

This change does not mean that the planned audit program had not been carried out prior to the change. It had become apparent, however, that the previous checklist was not yielding useful information at the jobsite, and a modified approach would be appropriate.

No procedural deficiency exists relative to this item. It meets the requirements of PGandE and Becthel's QA program and all ANSI and regulatory requirements.

17. Contractor Interface Control

CRITERION VII

ITEM 1:

Observation: Lack of procedure to ensure effective design interface between PGandE and W. (Draft Report p. 108; L/B)

ITEM 2:

Observation: Lack of DCP Control of Procedures to be used by contractor. (Draft Report p. 108; L/B)

a. Lack of measures to ensure that contractors had received required design criteria.

b. Lack of justification on unrequired criteria and procedures being sent to the contractors.

Summary Response:

Contrary to the observations, there were documented and proceduralized controls relative to design interface between PGandE and Westinghouse for performing reverification work. While the documentation requested by the inspector was not available during the inspection, we have since confirmed that contractors had received all required controlled procedures. Further, the contractors who performed reverification work for Diablo Canyon were competent to understand which procedures forwarded to them applied to their scope of work. Neither observation impacts low power testing, power ascension or commercial operation of DCPP.

Detailed Response (Item 1):

All design activities and documents, including criteria, methodology requirements, work scope, drawings and analyses, have been controlled as required by written procedures and all information transfer is documented. The procedures which establish interface control requirements for PGandE are contained in the Engineering Manual, Procedures EMP 3.8, "Design Documents Prepared by A/Es and Consultants", and EMP 4.6, "Contract Administration." These procedures require:

1. A discipline engineer to be assigned responsibility to assure interface control,
2. Logging and distribution of all design information transmitted to the consultant,
3. Approval of design criteria prior to transmittal to a consultant,
4. Documented acceptance of consultant work, and
5. Incorporation of consultant documents into the PGandE documentation system.

The criteria and procedures were transmitted by letters with a return receipt required from the consultant. The work scope and drawing transmittal was also accomplished by letter. All letters were assigned a unique number, logged, and distributed as required by procedure.

The Westinghouse correspondence and document control system is similar to that described for PGandE and is established in Westinghouse procedures. These procedures require systematic transmittal of correspondence and logging of correspondence. Submittals of information and results of Westinghouse design and analyses were transmitted in accordance with these controlled procedures from Westinghouse to PGandE.

The external interface between Westinghouse and PGandE, the detailed identification of the interface and definition of responsiblities, the lines of communication, and system for documentation and control were established in the following documents:

1. Request for Services Contract 5-24-82 dated 5/6/82 between PGandE and Westinghouse.

2. PGandE letter to Westinghouse WVP-46 dated 9/30/82.

3. - Westinghous-PGandE/PEG Correspondence Procedures, letter PGE (LRB) 82-1482 dated 2/22/82 and subsequent revisions.

   - PGandE Correspondence Procedure dated 11/19/82 (Chrono File No. 006925).

PGandE's interface control between PGandE and Westinghouse and was audited by the IDVP and found to be acceptable. The results of this audit were documented in Interim Technical Report 11, PGandE - Westinghouse Seismic Interface Review, TR-5511-2, Rev. 0, dated 11/2/82.

Westinghouse's interface control between Westinghouse and PGandE was reviewed in the PGandE Quality Assurance Department Audit 20506, May 25-28, 1982, and found to be acceptable.

Detailed Response (Item 2):

Procedures are issued to contractors with a return receipt. This receipt is completed by the recipient and returned to the issuer. The issuer retains the completed receipt or evidence of its return as a record of receipt. CYGNA, IMPELL and Westinghouse have received all of the controlled procedures issued to them since August 1982. While evidence to confirm receipt of a few of these documents was not available during the NRC inspections, evidence that these contractors had received all issuances was subsequently confirmed.

There is no basis for the inspector's preference of only providing contractors criteria and procedures within their initial work scope. It is common practice to provide procedures to organizations and individuals with instructions to use as applicable. The contractors (Westinghouse, CYGNA, and IMPELL) have been involved with numerous other nuclear projects for a considerable period of time. The generic requirements for piping system and piping support design are well known to these contractors. This is one reason they were selected for this work. It is a realistic expectation that when an experienced contractor is given a complete set of project procedures, he will be able to discern which procedures apply to his assigned tasks, which ones provide useful, but not essential information, and which ones do not apply.

In addition, the contractors agreed, in documented interface agreements, to employ their own approved QA programs and implementing procedures. The agreement further clarified that DCP would provide mandatory design criteria and sub-tier procedures for the contractor's information and use in achieving consistent results. Furthermore, all design documents produced by the contractors are reviewed and accepted by the Project prior to issuing them for construction.

Thus, in the design interfaces between PGand E and Westinghouse were documented and there were proceduralized controls for the transfer of design information. Contractors doing reverification work for PGandE understood which of the procedures that were forwarded to them applied to their scope of work, and evidence exists that they received all of the procedures that were forwarded to them.

18. Technical QA Audits of Contractors

CRITERION VII

Item 3:

Observation: Relative to DCP audit of contractors, technical audits of Imprell [sic], Cygna and W had not been performed. (Draft Report, p. 108; L/B)

Summary Response:

ANSI Standards N45.2 and N45.2.13, endorsed by NRC, cover control of purchased items and services and do not require technical QA audits of the supplier. The DCP has instead employed the methods of QA audit and technical review of the supplier's design output. Both of these are delineated as acceptable methods in ANSI N45.2.13. The Project performed a thorough technical review of the design output produced by Cygna and Impell. In the case of Westinghouse, technical audits of a sample of Westinghouse's piping design work have been conducted by the Project. There is no significance to this observation in that appropriate methods of technical review have been employed. In addition, the IDVP has conducted a comprehensive technical review of both seismic and non-seismic design activities for Diablo Canyon.

Detailed Response

This observation is identical in concept to that discussed in the response to Criterion XVIII, Item 4, i.e. lack of technical QA audits. The only difference is in application. Whereas the former observation addressed the lack of internal project technical audits, the present observation addresses lack of technical audits of speciality design subcontractors.

The fact that there is no requirement for technical QA audits was addressed generically in response to Criterion XVIII, Item 4, and is not repeated here. The reason why the concern is invalid differs, however, for this application.

Criterion VII of Appendix B to 10 CFR 50 requires that measures be established to assure that purchased items and services conform to procurement documents. In implementation of Criterion VII of Appendix B to 10CFR50, the NRC has endorsed, with certain exceptions not relevant here, ANSI N45.2 and N45.2.13. The latter document provides requirements and guidance for establishing controls over activities during procurement of such services and for acceptance of the services.

In compliance with ANSI N45.2.13, it is normal industry practice to specify QA program requirements to be implemented by the supplier; to review and accept the supplier's QA program as meeting the specified requirements; and to conduct QA audits, in accordance with ANSI N45.2.12, to verify conformance of the supplier to his program. These referenced documents do not contain any requirement for technical QA audits of the supplier.

ANSI N45.2.13, Section 10.3 delineates numerous methods the purchaser may use to accept an item or service of a supplier. Specifically, ANSI N45.2.13, Section 10.3.5 states that the purchaser may accept the service by any or all of the following:

a. Technical verification of data produced,

b. Surveillance and/or audit of the activity, and

c. Review of objective evidence for conformance to the procurement document requirements such as certification, stress reports, etc.

The technical adequacy of the supplier's design work, although ultimately the responsibility of the licensee, is first the responsibility of the supplier. Accordingly, QA program controls are specified and are audited to provide adequate confidence that the technical adequacy is achieved.

Beyond that there is technical verification of the supplier's design output by technical review by the purchaser. This technical review is aside from and totally separate from audits to evaluate the supplier's QA program compliance audits.

On the Diablo Canyon Project, the output of Cygna and Impell, engineering service contractors, is individually reviewed by the Project. Acceptability for Project use is documented as a result of that review. This activity provides a continuous overview of the design output of the contractor and an effective control of the contracted service. The review activity is performed in accordance with Engineering Manual Procedure 3.8, "Design Documents Prepared by A/E's and Consultants", which is subject to audit by Project QA.

These technical reviews are more extensive than anything that could be accomplished through a periodic "technical QA audit." Further, the technical review fully complies with ANSI N45.2.13, Section 10.3.5 requirements.

With respect to Westinghouse (a PGandE contractor for engineering services), audits for compliance with Criterion III of Appendix B to 10 CFR 50 have been performed by PGandE, as discussed in the response to Criterion VII, Items 8(a) and 9. In addition, technical audits of a sample of Westinghouse's piping design work have been conducted by the Diablo Canyon Project.

19. Contractor Internal Procedures

CRITERION VII

ITEM 4:

Observation: Design procedures and instructions utilized by Imprel (sic), Cygna, and W had not been reviewed and approved by the PGandE and Bechtel engineering and QA departments. (Draft Report p. 109; L/B)

Summary Response:

Although specific reviews of contractors' detailed design control procedures were not performed, acceptability of their design process was confirmed by PGandE through review, approval and audit of the QA programs of the individual contractors. Technical reviews of the adequacy of design output of the contractors have been performed by PGandE to further confirm that contractor design control procedures were sufficient to provide an acceptable design product. These actions met the requirements of 10CFR50 Appendix B and the DCP QA Program, and, therefore, the observation has no impact on low power testing, power ascension, or commercial operation.

Detailed Response:

Upon entering into a Technical Services Agreement (TSA) with Cygna and Impell, the contractors' QA manuals were reviewed by Bechtel to ensure that their QA program incorporated the essential elements of 10CFR50 Appendix B, based upon the scope of work of the TSA. This review included assurance that the contractors' QA program contained sufficient requirements to demonstrate compliance with Criterion III of Appendix B to 10CFR50, "Design Control" and

other quality assurance requirements imposed by the TSA. The review also verified that the contractors' QA program contained adequate provisions for the preparation and control of procedures that implement the QA program. The implementing procedures themselves are not reviewed, unless the QA Program Manual does not include sufficient information to demonstrate its compliance with the requirements of the TSA. This QA Manual review fulfilled the requirements of Appendix B to 10CFR50 and DCP QA Program requirements. There is no regulatory requirement for additional engineering review of the contractors' detailed design control procedures, and such a review was not necessary in order to approve the Cygna and Impell QA Programs.

In addition, Bechtel audits were performed of Cygna and Impell in June of 1983, which included a review of "Instructions, procedures and drawings" to verify the preparation and use of appropriate implementing procedures. No QA findings were generated in these areas. Finally, Cygna and Impell piping design work was reviewed by DCP as discussed in the response to "Criterion VII, Item 3." This technical review confirmed that the contractors' implementing design control procedures were sufficient to provide an acceptable design product.

Similarly, PGandE has qualified Westinghouse to supply engineering services under the quality assurance requirements of the PGandE contract with Westinghouse. Sufficient QA and technical audits were conducted by PGandE, NRC and others to ensure that the appropriate procedures were sufficient and were followed in performing the program analytical work.

20. Westinghouse-PGandE Quality Assurance Audits

CRITERION VII

ITEM 5:

Observation: PGandE did not perform QA program type audits of W in 1983, when most of the CAP analytical work was carried out. (Draft Report p. 109; L/B)

ITEM 6:

Observation: The PGandE QA program audit of W, No. 20506 "Seismic Re-verification," conducted on May 25-28, 1982, did not include a review of piping analysis and pipe support calculation to ensure implementation of procedural requirements. (Draft Report p. 109; L/B)

ITEM 8:

Observation: Relative to contractor internal audits, the W QA program type audit was considered to be inadequate and deficient. (Draft Report pp. 112-113; L/B)

ITEM 9:

Observation: Relative to contractor internal audits, there had not been any technical audits conducted by W. (Draft Report pp. 112-113; L/B)

Summary Response:

Contrary to the inspector's opinion, PGandE has audited Westinghouse more frequently than required to confirm the adequacy of its QA program. The PGandE Quality Assurance Department Audit 20506, May 25-28, 1982, which was done early in the reverification program to ensure timely implementation of Westinghouse's QA program, included a review of large bore piping. PGandE verified that Westinghouse meets the requirements for performing internal audits, including the requirements for record retention. Technical QA audits

are not required by the QA program and there is no indication that Westinghouse work is, in any way, deficient. Thus, there is no impact on low power testing, power ascension, or commercial operation of Diablo Canyon Power Plant.

Detailed Response (Item 5):

A comprehensive audit of Westinghouse's Monroeville facility was performed early in the life of the IDVP Project by PGandE Quality Assurance Department auditors on May 25-28, 1982, to ensure timely implementation of quality assurance requirements. This schedule is also consistent with the auditing requirements of ANSI N45-2.12-1977, which requires work to be audited as early in the life of the activity as is practicable. This audit found the Westinghouse Quality Assurance Program to be implemented satisfactorily. Previously, in late 1981 PGandE performed a review of the Westinghouse Quality Assurance program. The results of that review, which are summarized in the PGandE Look Back Review Summary Report of November 22, 1982, found satisfactory implementation of their program. This confirmed previous PGandE audits of Westinghouse which had found that program to have been satisfactorily implemented.

Based on PGandE's 1982 audit results, the 1981 Look Back review results, and the results of PGandE's previous audits of Westinghouse, PGandE had planned its next regularly scheduled audit of Westinghouse for May 1984. This schedule is well within the triennial audit schedule recommended by the NRC approved CASE Topical Report, September 1983, and Regulatory Guide 1.144.

Furthermore, NRC Docket 99900404, April 30, 1981, releases licensees and applicants who invoke Westinghouse's Quality Assurance Program as described in their Topical Report WCAP 8370, Revision 9A, from the requirements to perform initial source evaluation/selection audits and subsequent periodic audits to assess the quality assurance program implementation. PGandE contractually required Westinghouse to perform their work on the seismic reverification program for PGandE to the requirements of the Westinghouse Topical Report 8370, Revision 9A.

Detailed Response (Item 6):

PGandE's QA Audit 20506, May 25-28, 1982, included a review of large bore piping. The audit of Westinghouse listed the analysis packages and calculations that were reviewed to ensure implementation of procedural requirements during the audit. The titles of these analysis packages and calculations were documented in the audit checklist, but the details of those analysis packages and calculations were not delineated. When the inspector asked the PGandE auditors if work on small or large bore piping was checked during the audit, the auditors explained that they could not remember all the details of what was reviewed two years ago. They requested the opportunity to contact Westinghouse to verify which of the analysis packages and calculations were related to small or large bore piping. The inspector agreed to this request, which was then submitted to Westinghouse on February 27, 1984. Westinghouse's response of March 14, 1984, confirmed that all of the analysis packages reviewed in Audit 20506 were related to large bore piping. Small bore piping was not a part of Westinghouse's effort for PGandE.

Detailed Response (Item 8):

The Westinghouse Quality Assurance Program as described in Topical Report WCAP-8370, Rev. 9A, Amendment 1, provides for documentation of audit activities in accordance with the regulations. ANSI N45.2.12-1977 "Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants," endorsed by Regulatory Guide 1.144, January 1979, requires in Section 4.4.4 and 4.4.5 that the audit report include:

- A summary of audit results, including an evaluation statement regarding the effectiveness of the quality assurance program elements which were audited

- Description of each quality assurance program deficiency in sufficient detail to assure that corrective action can be effectively carried out by the audited organization

Westinghouse internal audits contain a summary of audit results including a statement of effectiveness and a description of activities audited. The Westinghouse internal audits also contain descriptions of any deficiencies identified in accordance with the above quoted requirements. Westinghouse Internal Audit Report IA 83-03 contained a summary of audit results including a description of PGandE Unit 1 work audited. The report identified one nonconformance related to delegation of authority on the PGandE project. Immediate corrective action was effected during the audit and close-out documented in the report. There were no other nonconformances identified on

PGandE work reviewed during the conduct of the subject audit. Furthermore, PGandE's Quality Assurance Departments review of Westinghouse's internal audits during PGandE's Audit 20506, May 25-28, 1982, found them to satisfactorily meet existing requirements for conducting and documenting audits.

The requirements for the retention of audit records to which PGandE committed are noted in Regulatory Guide 1.144, January 1979, and ANSI N45.2.12-1977. The requirements are to prepare a written audit plan that identifies a written checklist or procedure used to conduct the audit. The records to be retained include the audit plan, audit report, written replies, and the record of completion of corrective actions. These requirements do not include the retention of completed audit checklists or auditor notes. There is no requirement to maintain these records, nor is PGandE required to have its suppliers retain completed audit checklists or auditor notes. PGandE Audit 20506, May 25-28, 1982, verified that Westinghouse prepared and retained the required records.

Westinghouse does <u>not</u> have policies calling for the systematic destruction of documents but rather has a policy for the systematic retention of documents. Documents may be discarded if there is no longer any requirement that they be kept. Audit records required by regulation to be maintained are included in those records required to be maintained by Westinghouse policy. Audit checklists are not included in such records required to be retained by regulatory requirements and guidance applicable to the Diablo Canyon Project.

Detailed Response (Item 9):

Technical QA audits by Westinghouse of Westinghouse Engineering Services are not required by regulations. Technical Design Verification performed by Westinghouse was sufficient to satisfy regulatory requirements. However, in addition, PGandE independently performed a technical review of the work.

PGandE's position that technical QA audits are not required was addressed generically in response to Criterion XVIII, Item 4, and is not repeated here.

Design verification required by Criterion 3 of 10CFR50 Appendix B, was performed per the Westinghouse QA Program for design control. PGandE has performed audits of the Westinghouse design process to verify that they followed their Quality Assurance procedures in accordance with the requirements of 10CFR50, Appendix B, Criterion III. The Westinghouse Quality Assurance Program covering design verifications has been reviewed and found satisfactory by PGandE's Quality Assurance Department.

The Quality Assurance Programs that were applied to the reverification effort by Westinghouse and PGandE were appropriate for the work done and were implemented satisfactorily.

21. Contractor Audits

CRITERION VII

ITEM 7:

Observation: Relative to contractor internal audits, Cygna technical review for design analysis and calculation was questionable. (Draft Report, pp. 111, 112; (L/B)

Summary Response:

There are no NRC or code requirements, or industry standards which require internal technical audits to be conducted. The DCP has controlled and checked all work done by CYGNA for Diablo Canyon. CYGNA's work satisfies required quality levels in all respects and has been verified by both the DCP and the IDVP. There is no impact on low power testing, power ascension or full power operation.

Detailed Response:

The Project QA program, coupled with technical review of all CYGNA calculations by DCP, has provided a higher level of confidence in technical adequacy than would be provided by intermittent spot check technical reviews conducted as a part of internal auditing. Refer to responses to Criterion XVIII, Item 4, and Criterion VII, Item 3, for further details on the project position on internal technical auditing. The process of calculation preparation, checking, and approval by different individuals, coupled with appropriate design verification reviews, assures proper quality of technical work.

Careful review of the IDVP findings and resultant corrective actions does not indicate any concern for the quality of CYGNA-performed analyses.

The IDVP reviewed three analyses that were performed by CYGNA. The results of these reviews are reported in ITR #59 Revision 1. The DCP analysis numbers and the type of IDVP review are as follows:

1. DCP #4 -113 Revision 0, Overall/Full Review
2. DCP #2-114 Revision 1, Specific Review
3. DCP #17-100 Revision 4, Completion Review

The types and frequency of occurance of items that were noted and resolved during the course of the IDVP reviews were similar to those found in analyses performed by the DCP or other consultants.

The items found in the IDVP reviews were as follows:

- Application of Stress Intensification Factors (SIFs), 6 cases
- Valve Modeling, 1 case
- Valve Qualification, 1 case
- Support Modeling, 1 case

It is noted that all of the above items were evaluated by the IDVP according to the approved IDVP procedures and it was found that no licensing criteria were violated.

The application of SIFs was identified as a generic concern and a generic Error or Open Item (EOI) report was issued by the IDVP. As a result of this action, the DCP reviewed the application of SIFs in all IMPELL, CYGNA, and DCP analyses as part of the DCP Final Review checklist.

This generic item on valve modeling was included in the DCP review of all IMPELL and DCP analyses as part of the DCP Final Review Checklist.

The item on valve qualification was the result of a calculation error in which the gravity effect (1g) was not included in the acceleration qualification for a specific valve. The IDVP determined that the valve acceleration allowable was met with the addition of the gravity term. This omission was found to be an isolated case, and the issuance of an EOI was not necessary.

The item on support modeling resulted from the timing associated with IDVP field verification. The DCP modification to make the specific support consistent with the analysis was in progress but had not been completed in the field at the time of the IDVP field verification. Therefore, no deficiency existed.

In summary, the items regarding SIF application and valve modeling were identified by the IDVP as generic concerns, and as a result, all IMPELL, CYGNA, and DCP piping analyses were reviewed for these design considerations. To ensure that issues found during IDVP reviews, including the ones noted above for the CYGNA analyses, were appropriately resolved and did not lead to

generic problems, the IDVP expanded its sample and performed completion reviews. The IDVP verified the satisfactory resolution of all generic concerns and the analysis finalization process for the plant.

CYGNA analyses were not considered to contain an abnormal number of findings. The eight minor input deficiencies found are small compared to the approximately two thousand separate inputs of calculations in the three analyses under discussion.