UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Dockets Nos. 50-275 O.L. 50-323 O.L.
(Diablo Canyon Nuclear Power Plant, Unit Nos. 1 and 2)	)	

DECLARATION OF RICHARD B. HUBBARD

ON BREAKDOWNS IN CONSTRUCTION

QUALITY ASSURANCE AT DIABLO CANYON

I, RICHARD B. HUBBARD, declare as follows:

I. INTRODUCTION

My name is Richard B. Hubbard. My professional qualifications and experience have been submitted to this Board as part of my May 24, 1982 affidavit concerning breakdowns in the Diablo Canyon Quality Assurance Program.

The purpose of this declaration is two-fold. First, it is to set forth the events which have occurred since my March 26, 1983 supplemental affidavit which further demonstrate that the Pacific Gas and Electric Company (PG&E) did not have a Quality Assurance/Quality Control (QA/QC) Program for construction which:

(a) met the requirements of General Design Criterion-1 (GDC-1) of Appendix A to 10 C.F.R. Part 50 and the specific quality assurance criteria set forth in Appendix B to 10 C.F.R. Part 50; and

(b) could assure that PG&E had met the license commitments set forth in its Final Safety Analysis Report (FSAR) for the Diablo Canyon Nuclear Power Plant Unit 1 (Diablo Canyon).

Second, it is to describe the reports made by the limited Independent Design Verification Program (IDVP) for construction just prior to my March 26, 1983 supplemental affidavit and why the result of those reports do not assure:

(a) that Diablo Canyon as actually constructed will be consistent with the FSAR prepared for it; and

(b) that the safety related and other important to safety structures, systems, and components (SS&C's)

contained within the plant meet the technical requirements of the regulatory standards which have been set for them.

The facts and conclusions set forth in this declaration are based upon the information I have received and reviewed since March 1983 in my continuing role as technical consultant to counsel for the Governor of California in the ongoing Diablo Canyon licensing proceedings.

In general, I believe the intervening events have provided further new evidence of a pattern of significant breakdowns in the implementation at Diablo Canyon of QA/QC requirements for construction which are consistent with the fact and conclusions discussed in my prior affidavits. The new evidence cited herein confirms the testimony I previously gave this Board that PG&E's quality assurance program for Diablo Canyon did not contain an adequate policy for construction QA/QC, that it did not contain in a timely fashion the procedures adequate to carry out the policy it did have, and that it did not have a system capable of ensuring that even these procedures would be properly implemented.

It also supports my testimony that the often times generic nature of the discrepancies between what actually was and what should have been with respect to both the construction of the plant and the documents supporting that construction have led and will continue to lead to the disclosure of errors in construction which if uncorrected could threaten the public's safety.

Finally, this new evidence substantiates my earlier affidavits that given the demonstrated lack of an adequate construction QA/QC program and the number and nature of the errors disclosed, there is an extreme likelihood that further major errors exist in the construction of the plant which can only be uncovered by a rigorous and thorough construction verification program.

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II. STATEMENTS OF TENNYSON AND ROAM PROVIDE SIGNIFICANT INSIGHTS INTO SITE QA/QC ACTIVITIES

The April 5, 1983 Sworn Statements of Virgil H. Tennyson and Richard E. Roam ("Statements of Tennyson and Roam") identify a number of examples for site construction

activities where PG&E and the Howard P. Foley Construction Company ("H. P. Foley") have failed to develop and implement the QA/QC measures required by the 18 criteria of Appendix B and GDC-1 of Appendix A. Further, rather than applying to a limited period of time, the deficiencies identified by Mr. Tennyson and Mr. Roam cover the period from July or August of 1973 to the end of February of 1983 1/ during which major construction activities have occurred including the Hosgri modifications and the recent Bechtel/PG&E modifications.

Up until approximately the end of 1977, H. P. Foley was the responsible electrical contractor. However, beginning in 1978 the scope of H. P. Foley's work was expanded to include the remaining work in the structural steel, instrumentation, and mechanical areas 2/ as well as plant modifications and design changes. 3/ Thus, the statements by the QA manager and his assistant for the construction contractor with the major site responsibilities for the past six years appear to provide significant insights into the compliance of the site QA/QC program and its implementation. A number of areas of non-compliance with NRC QA/QC requirements identified in the

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1/ Statement of Tennyson and Roam, pp. 4 and 5.
2/ Ibid 1, p. 6 and p. 10.
3/ Ibid 1, p. 8.

Statements of Tennyson and Roam are briefly set forth in the following paragraphs of this declaration.

II.A: CRITERION 1 - LACK OF INDEPENDENCE FROM COST AND SCHEDULE - QA/QC MANAGEMENT

Criterion 1 of Appendix B requires that persons and organizations performing quality assurance functions shall be provided with independence from cost and schedule as opposed to safety considerations. While a number of organizational approaches can satisfy the independence requirement, clearly two measures of the actual independence achieved at Diablo Canyon site are the freedom of the quality assurance organization from the pressures of production and the freedom of the quality assurance personnel from harrassment by production personnel. The Statements of Tennyson and Roam indicate that independence requirements were not achieved during the recent construction activities conducted by H. P. Foley as follows: 4/

"MS. DURBIN: Did you feel your department of quality control was truly independent there?
MR. TENNYSON: Not in any way.
MS. DURBIN: Did you feel that production was very much in control of your department or slightly in control?

4/ Ibid 1, p. 50.

MR. TENNYSON: I feel that production's influence on the project manager determined pretty much the pressures that were put on the quality control department."

Further, Mr. Roam stated his belief that the production pressures originated from PG&E as follows: 5/

"MS. DURBIN: Where did the pressure from production come? Was it from Foley internally or did PG&E exercise any influence?
MR. TENNYSON: Rick, what do you think?
MR. ROAM: Well, I think a lot of it had to come from PG&E because every morning at 7:30 sitting there is Forrest Russell. He's badgering me, how come I'm still hanging tags? How come I haven't removed any red tags? How much did I remove?
MS. DURBIN: Who was Forrest Russell, by the way?
MR. ROAM: PG&E's civil resident engineer who was evidently hounding production and hounding me so that they can get the work done, production can get the work done.
MS. DURBIN: How often did that happen that he put pressure on you to not hang so many tags?
MR. ROAM: 7:30 every morning.
MS. DURBIN: Every morning?
MR. ROAM: Yes."

Mr. Tennyson also acknowledged that he received unusual production pressure from PG&E as follows: 6/

MS. DURBIN: ....Was there any pressure put on you or any dissatisfaction indicated to you about your performance in that you were being too careful?
MR. TENNYSON: Yes, many times.
MS. DURBIN: By whom?
MR. TENNYSON: By Mr. Don Rockwell of Pacific Gas & Electric.
MS. DURBIN: What was his position?

5/ Ibid 1, pp. 50-51.
6/ Ibid 1, pp. 49-50.

MR. TENNYSON: Electrical resident engineer and contract administration to Howard P. Foley.
MS. DURBIN: Anyone else?
MR. TENNYSON: Mr. Forrest Russel.
MS. DURBIN: Who was he and what position did he hold.
MR. TENNYSON: Civil resident engineer of PG&E, Pacific Gas & Electric.
Then I have to name a Mr. Vick Smart who I dealt with quite extensively for the last nine years.
He was under pressure to get the job done and, in turn, did cause me to be under a lot of pressure and my department.
MS. DURBIN: How much pressure did you feel you were under? Can you compare it with other jobs you have held?
MR. TENNYSON: I feel that the pressure was more -- much more than any job I've ever been on before.

In particular, Mr. Tennyson and Mr. Roam felt pressured by Mr. Moses, the H. P. Foley production manager to whom Mr. Tennyson reported, to increase production of the quality assurance organization by reducing the number of non-conformances written up, as follows: 7/

MS. DURBIN: Did Mr. Moses ever tell you you should write up fewer non-conforming reports?
MR. TENNYSON: He indicated this very strongly. I don't know if he told us directly.
MS. DURBIN: How did he indicate it?
MR. ROAM: "You're holding up the job, man. We got to perform. We got to get it done. We got to get it done."
MS. DURBIN: You repeated those phrases several times. Does that mean it was repeated to you over again on many occasions?
MR. TENNYSON: Yes.
MR. ROAM: Yes.

7/ Ibid 1, p. 47.

Thus, contrary to the explicit independence requirements of Criterion 1, the H. P. Foley QA/QC manager and his assistant were not provided with the required organizational freedom including sufficient independence from cost and schedule considerations.

II.B: CRITERION 1 - LACK OF INDEPENDENCE FROM COST AND SCHEDULE - QC INSPECTIONS

In addition to identifying the production pressures from PG&E and H. P. Foley which were experienced by the QA/QC organization management, Mr. Tennyson and Mr. Roam also identified two recent examples where quality control inspectors were harassed by construction workers. Such harassment of QA inspectors by product personnel appears to be contrary to the independence requirements of Criterion 1 of Appendix B. First, a welding inspector was harassed because of his inspection intensity as follows: 8/

MR. KAUFMAN: Let me go on to a slightly different topic. Have you or any of the people working for you been harassed by workers at the production end of the Foley Construction Company?
MR. ROAM: Yes.
MR. KAUFMAN: Could you give us some examples of that harassment?

8/ Ibid 1, pp. 69-70.

MR. ROAM: One was of the new Cataract people that came in -- well, Richard Spencer, a welding inspector that I had on ther mechanical side, was harassed quite a bit by construction at first.
He was inforcing them to try to meet code and the procedure and they didn't want to because it was costing them X amount of rework.

MR. KAUFMAN: When you say "them", who?

MR. ROAM: Construction.

MR. KAUFMAN: Who specifically?

MR. ROAM: You mean the construction foreman?

MS. DURBIN: Either that or a company name?

MR. ROAM: Well, it's Foley. We were all Foley people there.

Mr. Tennyson also described the harassment an inspector in the welding and structural areas received as follows: 9/

MR. TENNYSON: He was a quality control inspector for civil at that time inspecting on welding and structural.
He had been in the field numerous times and been harassed by a production person, unknown to me.

MR. KAUFMAN: Could you indicate what type of harassment that was being done to him?

MR. TENNYSON: Roger -- it's kind of touchy. I think they were playing with him.
There was an iron worker out there evidently that would go around patting him and calling him "fat boy" and threatening to kiss him on the cheek and things of that nature.
Roger tried to avoid him and he finally told him that if he didn't leave him alone, he was going to have to tell his foreman.
He finally did have to go to the foreman and tell him that the man was harassing him or bothering him.

9/ Ibid 1, pp. 70-71.

Roger had many inspections to perform out there and he was limited in the time that he had to do them.
Anyhow, the production man was quite upset, I guess, because Roger Meek had gone to the foreman on him and he told him if he ever went to the foreman he was going to whip him or something, threatened him in some way. Well, he kept grabbing him or holding onto him and Roger kept trying to get away. Finally he did get away from the man and he come into the office to explain it to me. So I, in turn, took the situation up to Mr. Moses. Moses, as far as I know, did absolutely nothing about it.

Further, the harassment of QC inspectors was not a new problem. Rather, the problem had existed for a number of years as stated by Mr. Roam as follows: 10/

MR. KAUFMAN: Was harassment a problem for your people in preventing them from doing their job?
MR. ROAM: We just found ways of getting around it.
MS. DURBIN: It was a problem, though?
MR. ROAM: Oh, yes. Basically with the new people coming in it was.
The old-timers that had been there for years, they understood the situation in some aspects. They didn't like it but they knew they had to live with certain things."

II.C: CRITERION 2 - FAILURE TO ESTABLISH QA/QC PROGRAM AT EARLIEST PRACTICABLE TIME

Criterion 2 requires that H. P. Foley establish a QA/QC program which complies with the Appendix B requirements at the

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10/ Ibid 1, p. 71.

earliest practicable time consistent with the schedule for accomplishing the activities. Further, the QA/QC program must be documented by written policies, procedures, or instructions. Contrary to the Criterion 2 requirement, H. P. Foley did not establish the required detailed QA/QC instructions and procedures until approximately August of 1974, 11/ nearly five years after Appendix B was published for comment and four years after its adoption by the AEC. Mr. Roam described the lack of the required QA/QC program elements in the 1973/1974 time period as follows: 12/

> MR. ROAM: Material receiving, there was no control on that. No control on the material itself coming into the plant to be used for installation.
> Rail (weld) rod control, welding procedures, welding applications, all that we didn't do. In fact, that's what we set up in '74 as one of the first three projects I put Virgil on was welding procedures: rod control, terminal blocks.

Thus, according to Mr. Roam, there was no effective quality program at Diablo Canyon in the electrical area until mid 1974. Moreover, during the time preceding H. P. Foley's development of a QA/QC program, between two and three hundred

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11/ Ibid 1, p. 28. Also see p. 5.
12/ Ibid 1, p. 27.

electricians of Foley's were at work at Diablo Canyon. 13/ Thus, it appears that safety-related construction activities occurred prior to the development and implementation of the required QA/QC control measures outlined in Appendix B and GDC-1 of Appendix A.

II.D: CRITERIA 2 AND 5 - LACK OF QUALIFICATION AND TRAINING OF QC PERSONNEL

Criterion 2 requires that the Diablo Canyon QA program provide for indoctrination and training, as necessary, of personnel performing activities affecting quality to assure that suitable proficiency is achieved and maintained. Specifically, Criterion 2 requires that an organization providing a QA/QC function, such as H. P. Foley, designate those activities that require qualified inspection, test, and examination personnel and the minimum requirements for such personnel. Further, H. P. Foley is required by Criterion 5 to establish written procedures for the qualification of inspection, test, and examination personnel and for the assurance that only those personnel who meet the stated requirements are permitted to perform inspection, test and audit activities. The qualification requirements for test,

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13/ Ibid 1, p. 23.

inspection, and examination personnel are set forth in detail in American National Standard Institute (ANSI) standard N.45.2.6 entitled "Qualification of Inspection, Examination, and Testing Personnel" which was issued in 1973. In addition, the ANSI Standard was also adopted in 1973 by the NRC in Regulatory Guide 1.58.

Contrary to the preceding requirements, Mr. Tennyson and Mr. Roam stated that the H. P. Foley QA/QC program until as recently as 1982 failed to address the requirements for inspection, test, and examination personnel prescribed in the ANSI standard. For example, Mr. Tennyson stated as follows: 14/

"MR. KAUFMAN: What were the qualifications for an inspector?
MR. TENNYSON: There were no written procedures as to what qualifications had to be.
I was told numerous times that we were not trying to hire the insdpectors in accordance with the ANSI 4526 (N.45.2.6) document or in accordance with 10 CFR 50 because we were not obligated, evidently, to those documents at that time.
MR. KAUFMAN: That was at what time?
MR. TENNYSON: Well, that was during, I would say, hiring up until the last year and a half or so.
MS. DURBIN: Until 1982?
MR. TENNYSON: Up until approximately that time, yes."

14/ Ibid 1, pp. 14-15.

Further, the fact that Foley was not complying with the N45.2.6 requirement was known to PG&E according to Mr. Tennyson as follows: 15/

> MR. TENNYSON: ....Well, we were really not complying with the ANSI 26 (N45.2.6) requirements because we were told by Pacific Gas & Electric that we didn't have to.
> MS. DURBIN: Who told you that?
> MR. TENNYSON: Well, this was numerous times from the beginning since I went to work in '74. Every time it would come up through the QA department, "Should we level our people?" Well, we would mention ANSI 26 (N45.2.6) and we would mention Appendix B of 10 CFR 50. Well, it was either by PG&E inspectors or by their resident engineer up there, who was a coordinator with us between PG&E and the Foley Company.
> It was by word of mouth that we were not subject to all of those rules and regulations and that PG&E would tell us what portions of it we had complied with and they had the option to comply with the rest of it.

PG&E's failure to assure that H. P. Foley implemented the requirements of N45.2.6 is directly contrary to the assurances offered by PG&E witness Mr. Wischow during the October, 1977 ASLB hearings. For example, at page 7 of Mr. Wischow's

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15/ Ibid 1, pp. 56-16.

prefiled testimony he implies that construction activities were accomplished in accordance with WASH-1309 "Guidance on Quality Assurance Requirements During the Construction Phase of Nuclear Power Plants". Both Regulatory Guide 1.58 and ANSI Standard N45.2.6 are among the documents listed by the NRC in WASH-1309 as applicable during the construction phase.

In addition, Mr. Tennyson stated that since 1974 inspectors were hired without his review of their background and qualifications as follows: 16/

MR. KAUFMAN: What kind of background did you look for in hiring a trainee or in undertaking to train someone?

MR. TENNYSON: In some cases we really didn't have we didn't have any background search on it. Numerous times someone was just brought into the office and they said, "This is going to be a new inspector for you."
I would put them to work after a little questioning to find out where they were best fitted and I tried to work them into the areas that I could work them into, as best I could.

MR. KAUFMAN: Who would bring these people into the office for you?

MR. TENNYSON: That would be my project manager who was my boss, Skip Moses.

MR. KAUFMAN: These were other workers within the Foley Construction company?

MR. TENNYSON: No. They would be new hires from various places.
Foley did bring in some of their own people:

16/ Ibid 1, pp. 13-14.

Sons, daughters, things of that nature, from the Martinez office and they would be brought in and used in various positions.

MR. KAUFMAN: Did some of these people have no previous construction background?

MR. TENNYSON: It would be hard for me to say at this point. Sometimes I didn't even see their application or resume or whatever, if they had one.
That went straight to the front office file and they were given to me to train and make an inspector out of.

Finally, Mr. Tennyson stated that during the rapid expansion of the number of construction personnel since August 1982, the H. P. Foley QA/QC inspection organization grew from forty to one hundred and forty personnel. 17/ However, even with extensive overtime including 60 hour weeks, 18/ problems were experienced in hiring enough qualified inspectors according to Tennyson, as follows: 19/

MR. TENNYSON: .....during the time the big push on the modifications came out there, we could not hire inspectors or make supervisors fast enough to cover the influx of welding personnel, iron workers and other craftsmen that were in the field.
The quality department was so small at that time. They were hiring a hundred, like a hundred or a hundred and fifty a day of iron workers alone and in trying to put a program together to get the quality -- well, the quality control department was responsible for qualifying these particular welders.

17/ Ibid 1, p. 25.
18/ Ibid 1, p. 81-82.
19/ Ibid 1, pp. 20-21.

> In trying to get enough people in the field to do all of these functions plus cover the everyday work that we had already been saddled with, well, you had a lot of inexperienced people out there, inasmuch as inspectors. I mean they were just not used to that kind of pressure and push and the enormous amount of people that were calling them for inspections.

Thus, according to Mr. Tennyson, inspectors during the recent "big push" were put into the plant after a very brief indoctrination period and were expected to start inspecting iron workers' weldments and other various functions. 20/

In summary, the preceding indicates that the requirements for a systematic program regarding the qualification and training of inspection, test, and examination personnel has not been achieved by H. P. Foley. The lack of such a documented program is contrary to the requirements of Criterion 2 and 5 of Appendix B.

II.E: CRITERIA 3, 5, 6 - LACK OF SPECIFICITY AND CONTROL OF DESIGN INFORMATION AND DESIGN CHANGES

Criterion 5 requires, in part, that activities affecting quality shall be prescribed on documented instruction,

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20/ Ibid 1, p. 21. Also, see NRC I&E Report 83-08 enclosed as Attachment A which addresses a deficiency in the H. P. Foley training program for welding QC inspectors.

procedures, or drawings. Further, such drawings or other documents shall include or reference appropriate quantitative or qualitative acceptance criteria in order to enable the inspector, tester, or design reviewer to determine that the activities have been satisfactorily accomplished. Changes to such drawings, as prescribed by Criteria 3 and 6, must be controlled and reviewed for adequacy.

Contrary to the requirements of Criterion 5, the design drawings did not unambiguously present the design requirements according to Mr. Roam: 21/

> MS. DURBIN: How could you possibly inspect work when you had no sketch to compare it to?
> MR. ROAM: They had like a similar type isometric drawing but it doesn't really show you much. It was just for typical installation of equipment which is: "Put this equipment on a wall and install it this way." That's the typical installation.
> Now, not each installation is the same or was it shown as to how it is. It was just typicals. Everything was typically done.

Roam also stated that drawing requirements for instrumentation in some cases were not specified: 22/

21/ Ibid 1, pp. 61-62.
22/ Ibid 1, pp. 55-56.

MR. KAUFMAN: What kinds of NCR's were you finding in instrumentation?

MR. ROAM: Very little because there was really not anything to go by. You had a standard set of details and if it didn't meet the detail you just tell engineering and engineering would draw up some new details.
So you never had anything wrong.

MR. KAUFMAN: Could you give me an example of that?

MR. ROAM: Supports for tubing, instrumentation tubing. There was never any type of a layout or sketch to say how you're going to get from Point A to Point B.
You just go from Point A to Point B. How you get there, I don't give darn. Just put it in.

MS. DURBIN: How long did that go on? Was it a standard operating procedure since -- well, since when?

MR. ROAM: Yes, since '73-74 until recently.

Indeed, even where drawing requirements were specified, the number of design changes necessary to implement the current plant modifications, while maintaining the production schedule, necessitated the development of a "quick fix design change" system in lieu of the normal QA/QC procedures. Mr. Tennyson and Roam described the "quick fix" system for processing nonconforming designs in the field as follows: 23/

23/ Ibid 1, pp. 55-56.

MR. ROAM: ....PG&E had me write a procedure called a "quick fix design change" because the designs were so bad in a lot of cases and what was supposed to be there was not there and what wasn't supposed to be there was there.

MR. KAUFMAN: What time frame are we talking about?

MR. ROAM: At the end. In fact, the EDR (engineering disposition request) -- you signed it, didn't you?
Well, the day before we got fired was the fact that they was going to put a resident engineer in the field with our QC people which he would then give it the magic wand.

MS. DURBIN: What does that mean?

MR. ROAM: Magic signature. PG&E accepting responsibility, relieve Foley of any responsibility of any design changes or modifications that have to be made in the field to get the iron job done.

MS. DURBIN: That was not a normal procedure, was it?

MR. ROAM: No.
What it did then was exempt the implementation of QCP3 which was the NCR-type (nonconformance report) process.*

Another potential problem with the "quick fix design changes" is the need to assure that the "as-built" drawings are modified to incorporate all the field changes. Thus, the H. P. Foley QA department left a clause in its procedures to ensure that the inspection drawing records are consistent with the as-built drawings. 24/ In short, the Tennyson and Roam statement clearly demonstrates that one aspect of the

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*/ NCR is defined on page 26, while the EDR is described on page 32 of the Statements of Tennyson and Roam.

24/ Ibid 1, p. 58.

construction QA program was to reconcile the as-designed and as-built drawings. Correspondingly, the differences between the as-built and as-designed drawings cited in my previous two affidavits indicates a breakdown in the construction QA/QC program.

II.F: CRITERIA 14 AND 15 - LACK OF CONTROL OF TAGS IDENTIFYING NONCONFORMING ITEMS

Criterion 14 requires that the status of inspections and tests performed upon individual plant items be indicated by the use of markings such as stamps and tags. Further, Criterion 15 requires that measures including identification be established to control items which do not conform to requirements in order to prevent their inadvertent use or installation. Contrary to these requirements, the production manager for H. P. Foley recently directed the QA/QC manager to deviate from the required tagging procedures as follows: 25/

MR. KAUFMAN: Have you ever received any instructions from anyone to deviate from the written or adopted procedures?
MR. TENNYSON: Yes.
Skip Moses directed me to pull some red tags on structural steel work that was in the

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25/ Ibid 1, p. 31.

field which were the result of a non-conformance or many non-conformances written regarding various non-conformances with weldments or maybe modification plate installations, things of that nature.

Mr. Tennyson further explained the directive as follows: 26/

MR. TENNYSON: ....We were told to pull the red tags down and don't write red tags on anything that we could possibly have answered from Pacific Gas & Electric engineering department through another method like an engineering disposition - request -- EDR -- or writing up a certain problem you had run onto and could possibly be answered by PG&E through their engineering division, evidently in San Francisco.
These things were easier and much quicker to process than a non-conformance was because of the signatures that had to be applied to it and the agreement between the two companies.

MR. KAUFMAN: Let me see if I understand this correctly. You were told by Mr. Moses to remove red tags that were placed on otherwise non-conforming work because it would slow down the work of --

MR. TENNYSON: Production.

In short, because of the pressures of production, the normal H. P. Foley system for tagging and controlling nonconforming items was scuttled contrary to the QA/QC program requirements of Criteria 14 and 15 of Appendix B.

26/ Ibid 1, p. 32.

II.G: GDC-1 - LACK OF QA/QC CONTROLS FOR CLASS II ITEMS

General Design Criterion 1 (GDC-1) of Appendix A requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Further, GDC-1 requires that a quality assurance problem be established and implemented for these structures, systems, and components important to safety. In the Diablo Canyon FSAR, PG&E defines those items that are important to safety, but not safety-related as follows: 27/

> "Those items important to the reactor operation but not essential to safe shutdown and isolation of the reactor or control of the release of substantial amounts of radioactivity are designated Class II."

Contrary to the QA/QC requirements of GDC-1, it appears that the H. P. Foley QA/QC program did not address these Class II items. For instance, Mr. Roam stated as follows: 28/

> MS. DURBIN: Any distinction made between Class 1 and Class 2 equipment in regard to --
> MR. ROAM: For Class 2 we did no inspection. On Class 1 we did an inspection.
> On Class 2 I should take that back except for Class 2 raceways.
> MS. DURBIN: Electrical raceways?
> MR. ROAM: We'd only check those if they crossed over a Class 1 raceway or piece of equipment and then we would just walk it down and if there was no Class 1 under it we forgot about it.

27/ Diablo Canyon FSAR, p. 3.1-4. No QA/QC program for Class II items is presented in Section 3.1 of the FSAR.
28/ Ibid 1, p. 53.

Thus, based on the preceding, there appears to be a significant gap in the items covered by the H. P. Foley QA/QC program.

II.H. QA/QC PROGRAM LACKS MANAGEMENT SUPPORT

While not specifically addressed in the 18 criteria of Appendix B and GDC-1 of Appendix A, the NRC has recognized that the effectiveness of a QA/QC program depends in a large extent on management attitude. For example, at the November 19, 1981 hearing before the U. S. House of Representatives, Chairman Palladino of the NRC stated as follows: 29/

29/ In addition, at the November 19, 1981 Hearing, the NRC's Executive Director for Operations in looking at the Marble Hill, Midland, Zimmer, South Texas, and Diablo Canyon QA/QC problems observed that:

"In analyzing the identified problems areas, one can come up with a list of immediate causes -- such as unqualified workers or QC inspectors, falsified records, intimidation of quality control inspectors, lack of authority, lack of communication, inadequate staffing levels, inadequate corrective action systems, lack of supervision, poor to nonexistent procedures, poor design and change control, design errors, inadequate analyses, poor quality components, and so on. Most of these can be traced to failure of quality assurance due to ineffective management control of the QA program. There are a myriad of excuses and reasons why management fails. Some are explicit failures of performance or lack of attention. Other failures arising from poor attitudes and perceptions are difficult to identify."

"To be effective, a QA program must have the full support and attention of the nuclear industry managers responsible for design and construction."

In the Statement of Tennyson and Roam, Mr. Tennyson indicates his judgment that the QA/QC program was not valued by H. P. Foley management, as follows: 30/

MS. DURBIN: Did you get the feeling in your own company that your work was being valued, that your work was a value and appreciated?
MR. TENNYSON: No. I never did have that feeling.
MS. DURBIN: What feeling did you get?
MR. TENNYSON: I've always had the feeling that the only reason the whole quality department was there was merely because it was a contractual obligation on Foley's behalf to have, I guess, a quality department. The contract required Foley to establish a quality program. That's the way it was. I felt the only reason we were there in the first place was to fulfill those obligations.

The recent NRC inspection of H. P. Foley's structural steel welding activities conducted between February 28 and March 4, 1983 graphically illustrate the product deficiencies which can exist, and remain undetected where there is the lack of attention to QA/QC measures described by Mr. Tennyson and

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30/ Ibid 1, p. 59.

Mr. Roam. The NRC inspection report, included herein as Attachment A, documents a number of recent instances where H. P. Foley personnel failed to perform safety-related welding activities in accordance with quality procedures. Indeed, the NRC report documents a number of weld discrepancies contrary to Code and procedure requirements. Further, the discrepant welds had been examined and accepted by H. P. Foley's QC inspectors on or before February 7, 1983.

In my opinion, the discrepancies in the QA/QC process described by Mr. Tennyson and Mr. Roam, and the discrepancies in the product of the H. P. Foley construction control program documented in Attachment A, taken together provide clear evidence that H. P. Foley has failed to develop and implement a construction QA/QC program in compliance with the 18 criteria of Appendix B and GDC-1 of Appendix A.

III. IDVP CONSTRUCTION REVIEW DISCLOSES QA/QC PROCESS AND PROGRAM IMPLEMENTATION DISCREPANCIES

The numerous significant deficiencies in the PG&E QA/QC program and its implementation identified by the IDVP during its Phase I audit of design activities raised serious generic

questions concerning the past compliance of the PG&E QA/QC program with the regulatory requirements and FSAR commitments for other activities including construction. Such questions appear reasonable since the same PG&E top management were responsible for the development and implementation of both the design and construction QA/QC programs. Indeed, the NRC identified the generic QA/QC question in a letter from Mr. Engelken of Region V to Mr. Denton of NRR in which the Region recommended that a construction QA/QC audit be initiated. Subsequently, according to information provided by the NRC attorney during the Appeal Board's oral argument on April 14, the NRR had decided to order such an independent construction QA/QC audit. However, prior to the NRC issuing such an order, PG&E requested the IDVP to perform a limited construction QA/QC review.

PG&E now asserts that the limited IDVP construction QA/QC reviews, as set forth in ITR #36, Rev. 0 and ITR #38, Rev. 1, document and support the conclusion that (a) PG&E adequately controlled construction contractors to asure the quality of construction; (b) the as-constructed physical installation conformed to the requirements of design drawings and

specifications; and (c) the required inspections were performed and appropriately documented. 31/

In my opinion, the information provided in the two ITR's fails to support the preceding conclusions. Rather, I believe the information in the ITR's would support the opposite three conclusions. Thus, in my opinion, the 23 Class C errors 32/ and one Class A error identified by the IDVP document numerous instances where the required construction inspections were not properly performed and documented and where the items as-constructed failed to conform to the design requirements. As discussed further herein, such non-compliances are directly contrary to the QA/QC requirements of Appendix B, Criteria 5, 7, 9, 10, 11, and 17. Further, the corrective and preventative actions initiated by PG&E fail to address either the symptoms or the root causes of the identified QA/QC deficiencies as

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31/ PG&E's Response to March 29, 1983 Affidavit of Richard B. Hubbard, April 8, 1983, p. 4.

32/ Class C Errors are defined by the IDVP as follows:

> Class C - An Error is considered Class C if incorrect engineering or installation of safety related equipment is found, but no design criteria or operating limits are exceeded. No physical modifications are required, but if any are applied they are subject to verification by the IDVP. (IDVP Phase II Proposal)

required by Criteria 16 and 18 of Appendix B. Finally, the cursory and conclusionary information provided in the two ITR's is inadequate to support, and in my opinion contradicts, any finding that PG&E and its construction subcontractors implemented the required management control systems necessary to adequately control the construction QA/QC process.

Five major aspects in which the IDVP construction QA/QC review was improperly limited or restricted were identified in my March 1983 affidavit as follows: number of contractors, QA/QC program adequacy, QA/QC process implementation, overemphasis on paper, and vendor quality. In addition, my March 1983 affidavit concluded that (a) items important to safety, but not safety-related were not addressed by the IDVP and (b) sampling programs relied on subjective engineering judgments rather than objective statistically valid sampling techniques. A further description of preceding deficiencies in the PG&E construction QA/QC program and its review by the IDVP will not be repeated in this declaration in the interest of brevity. (See pp. 24 to 34 of my March 26 Supplemental Affidavit, which is attached hereto as Attachment B.)

In the following portions of this declaration, three additional significant deficiencies in construction QA/QC activities disclosed by the IDVP are presented as follows:

violations of QA/QC requirements disclosed by construction review; failure to adequately control activities of construction contractors; and lack of agressive corrective and preventative actions. Also, major weaknesses are identified in the two construction ITR's, with particular emphasis on the almost total lack of underlying technical data or analyses, which result in the IDVP's conclusions being in the main cursory, and hence inscrutable.

III.A: NUMEROUS VIOLATIONS OF QA/QC REQUIREMENTS DISCLOSED BY IDVP REVIEW OF CONSTRUCTION

The IDVP review of Wismer and Becker and Guy F. Atkinson safety-related activities revealed numerous instances where the as-constructed physical installation of items failed to conform to the requirements of design drawings and specifications. Moreover, the construction discrepancies disclosed by the IDVP indicate that the required inspections were in a number of cases not properly performed and appropriately documented.

While rework may not be absolutely required to bring the individual discrepancies identified by the IDVP into full accord with the original requirements, even if acceptable-as-is the discrepancies both singularly and cumulatively demonstrate a failure to implement a number of measures required by the 18

criteria of Appendix B. Further, neither PG&E nor the IDVP has published any detailed engineering evaluation which logically present either the safety significance of the identified discrepancies or, more importantly, the safety significance of the root cause of the errors in the Diablo Canyon construction QA/QC program that allowed the discrepancy to fail to be detected during the normal QA/QC activities including the audits and surveillances conducted in accordance with Criterion 18 of Appendix B. Indeed, the technical basis or any analysis regarding the safety significance of the identified discrepancies is totally missing from ITR's 36 and 38. Instead, conclusionary and cursory summary statements are provided for each discrepancy in a form which cannot be evaluated. Likewise, the IDVP failed to include in the ITR's the underlying checklists used by the IDVP in its review, as well as a detailed comparison of attributes examined as compared to attributes deficient. Thus, any basis for drawing numerical conclusions are not provided in the ITR's.

The hardware and documentation discrepancies disclosed during the IDVP's construction QA/QC review indicate in my opinion that the original errors were not detected by the QA/QC program due to failures to properly implement QA/QC measures required by Criteria 5, 9, 10, 11, and 17 of Appendix B.

Examples of such deficiencies in QA/QC program implementation revealed by the IDVP are briefly summarized and categorized in the following paragraphs.

III.A.1: Criteria 10 and 11 - Inpsections and Tests Fail To Assure Conformance With Requirements

Criterion 10 requires that inspections of activities affecting quality to verify compliance of an item or activity to specified requirements shall be planned and executed. Further, Criterion 11 requires that any tests necessary to verify conformance of an item to specified requirements shall also be identified and performed. In addition, the inspection and test results shall be documented.

Contrary to the preceding requirements of Criteria 10 and 11 of Appendix B, deficiencies in the inspection and testing of equipment were identified by the IDVP as follows:

(a) The majority of welds on supports 9, 10, and 11 exhibited incomplete fillet, short weld length, undercut weld, spatter, arc strikes, slag, and poor workmanship (EOI 9001 and ITR-38).

(b) The geometry of the welds covering bottom mounted instrumentation (BMI) tubing supports did not comply

with the PG&E drawing requirements (EOI 9002 and ITR-38).

(c) The geometry of the welds covering BMI tubing did not comply with the requirements of the Wismer & Becker (W&B) weld procedure (EOI 9003 and ITR-38).

(d) The geometry of the welds at BMI couplings did not comply with Westinghouse drawing or W&B weld procedure (EOI 9007 and ITR 38).

(e) The PG&E specification requirements for exposed concrete surfaces were not met (EOI 9008 and ITR 36).

(f) The BMI supports exhibited various discrepancies between the installation and the drawing requirements (EOI 9013 and ITR-38).

(g) Lock washers were lacking on bolted joints in the reactor coolant system contrary to the design requirements (EOI 9017 and ITR 38).

(h) Concrete surface conditions on interior walls do not meet specification requirements (EOI 9021 and ITR-36).

(i) Drilled holes in one BMI tubing support did not appear on drawings (EOI 9025 and ITR-38).

(j) Several instances of arc strikes, weld splatter, rusting, pitting, overgrinding, and paint splatter were discovered on reactor coolant system loops and surge lines (EOI 9029 and ITR-38).

The preceding hardware discrepancies indicate, both individually and collectively, that the inspections and tests conducted at Diablo Canyon during construction have failed to assure that the hardware is constructed in accordance with the design requirements.

III.A.2: Criterion 9 - Special Processes Lack Controls

Criterion 9 of Appendix B requires that special processes that control or verify quality, such as those used in welding and nondestructive examination, shall be performed by qualified personnel using qualified procedures in accordance with specified requirements.

Contrary to the requirements for the control of special processes defined in Criterion 9 of Appendix B, the following deficiencies were identified by the IDVP:

(a) Weld procedures in NSSS do not have method and materials used in monitoring the interpass temperature specified as required by the PG&E specification. (EOI 9012 and ITR-38)

(b) PG&E specification requirements for compressive strength of concrete not met. Concrete batch plant utilized prior to state certification (EOI 9015 and ITR-36).

(c) PG&E specification prohibits the use of aluminum grout in the Containment Structures, but the field records show otherwise (EOI 9015 and ITR-36).

(d) Welding documentation including the process travelers for BMI supports did not comply with the PG&E specification (EOI 9019 and ITR-38).

(e) Records on material thickness, source distance, and geometric unsharpness on radiographic inspections may not be accurate (EOI 9020 and ITR-38).

(f) The voltage/amperage requirements of the weld procedure for BMI tubing application were not met (EOI 9022 and ITR-38).

(g) The voltage/amperage requirements of the weld procedure regarding the reactor coolant system were not met (EOI 9023 and ITR-38).

(h) Ferrite readings for welds in the reactor coolant system and associated piping were not recorded as required (EOI 9024 and ITR-38).

The preceding deficiencies involving special processes indicate, both singularly and collectively, that such processes were not conducted and verified in the disciplined manner prescribed by Criterion 9.

III.A.3: Criterion 7 - Purchased Materials and Services Failed to Meet Requirements

Criterion 7 of Appendix B requires that QA/QC measures be implemented to assure that procured items and services received at Diablo Canyon site conform with the specified design requirements set forth in procurement documents. Inspection of items upoon receipt at the construction site can in part provide this control measure.

Contrary to the requirements of Criterion 7 of Appendix B, deficiencies in the control of purchased equipment and services were discovered by the IDVP as follows:

(a) Certified material test reports (CMTRs) for thimble guide tubes did not comply with the requirements specified in a Westinghouse drawing with regard to UT tests in the longitudinal mode (EOI 9004 and ITR-38).

(b) CMTRs for seal leak detection tubing did not comply with the PG&E specification requirements. (EOI 9006 and ITR-38)

(c) Bolt material requirements were not met (EOI 9017 and ITR-38).

(d) Manufacturer's record of welder performance did not meet ASME Section IX requirements (EOI 9018 and ITR-38).

Thus, the IDVP findings indicate that the QA/QC measures for the inspection of items upon delivery were not adequate to assure that all such items conformed to the requirements of the procurement documents.

III.A.4: Criterion 5 and 17 - QA/QC Records Required By Procedures Not Maintained

Criterion 17 of Appendix B requires that records that furnish documentary evidence of quality shall be specified, prepared, and maintained. Further, the QA/QC records shall be legible, identifiable, and retreivable. In addition, Criterion 5 requires that all activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures, or drawings.

Contrary to the requirements of Criterion 5 and 17 of Appendix B, the IDVP discovered that the QA/QC records required by procedures, instructions, and drawings were not readily

identifiable, accurate, and retrievable as exemplified by the following:

(a) The records indicating that reactor coolant system weld procedures were reviewed were not initially available (EOI 9005 and ITR-38) and (EOI 9010 and ITR-38).

(b) Welding records did not show compliance with the PG&E specification (EOI 9011 and ITR-38).

(c) Records certifying the halogen content of penetrant as meeting the PG&E specification requirements were not readily retrievable (EOI 9014 and ITR-38).

(d) No documentation was available of nondestructive examinations performed on the areas of removal of some temporary attachments to RCS piping (EOI 9016 and ITR-38).

(e) No records of nondestructive examinations performed on tube-to-seal table welds as required by PG&E were available (EOI 9027 and ITR-38).

Thus, there can be little confidence, based on the preceding, that the prescribed QA/QC records for construction activities are maintained in accordance with the requirements of Criteria 5 and 17 of Appendix B.

III.B: FAILURE TO ADEQUATELY CONTROL ACTIVITIES OF CONSTRUCTION CONTRACTORS

The construction deficiencies set forth in Section III.A of this declaration in many instances have the potential to cause a reduction in the Diablo Canyon safety margins or to even result in potential damage to safety equipment. For example, incorrect material or substandard welding may result in or contribute to damage to significant safety equipment. While I do not suggest that each of the IDVP identified construction discrepancies may have the potential to cause significant damage, a number of the requirements when violated do have the potential to impact plant safety. Further, when one considers potential damage, it is important to recognize that damage is not always readily detectable. For instance, premature aging of a component is not always readily observable, even assuming proper inspections and tests. Thus, to avoid reductions in safety margins or potential damage, it is important that the required QA/QC measures be systematically followed.

Such compliance and discipline were not evidenced in the IDVP review of the process by which W&B conducted construction activities. For example, the IDVP found that W&B was not in compliance with its own requirements for nearly 20 percent (15 out of 80) of the construction QA program attributes evaluated

(see ITR-38 at p. 4-1). In short, such a lack of compliance, in my opinion, in both the QA/QC process and the product of that process is indicative of a management failure to ensure full implementation of the Diablo Canyon QA program. Under a QA/QC management control program, the degree of QA activities and QA controls varies depending upon the need for such controls. Appendix B, Criterion 2, recognizes this fact:

> The quality assurance program shall provide control over activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety.

A QA/QC program, when established by management, also should reflect a degree of control which can be achieved if the program is properly implemented. It makes no sense to prescribe one set of QA/QC requirements (measures) when, in fact, these measures cannot be satisfied. Moreover, repeated failure to achieve an unrealistic goal may condition personnel to believe that it is unimportant to comply fully with other QA/QC program requirements.

Accordingly, an important aspect of a good QA/QC program is to prescribe a set of clear, understandable and achievable policies/procedures and then, with full support from top management, vigorously to enforce adherence to those measures.

Such vigorous enforcement and management commitment are essential if the necessary discipline is to be achieved. Once a level of QA control is defined and the program is implemented, any deviation from that defined control level must generally be viewed as significant in terms of management failure to ensure that its policy and procedures are carried out.

As noted earlier, the IDVP in a number of instances indicated a view that a problem was not significant in a particular installation because it had not resulted in any damage to or otherwise affected any structure, system, or component. I cannot agree. The Diablo Canyon QA/QC measures presumably were drawn up in accordance with the parameters I described: (a) the QA/QC measures were designed to achieve a necessary objective; and (b) if implemented properly, the QA/QC measures would have achieved the objective. In fact, however, the necessary implementation was not achieved. Instead, over a number of years, there were recurring observations of lack of necessary QA/QC attention.

The failure to implement the construction control measures represents a serious concern primarily because it reflects a lack of discipline in and mangement attention to the QA/QC program. The QA/QC management program required specified

standards be reliably and repeatably achieved and that program objective was not obtained. In QA/QC, such lack of attention to prescribed measures cannot be tolerated. Each QA/QC measure, once issued by responsible management, must be assumed to be important. The fact that PG&E and the IDVP now in hindsight apparently find the repeated instances of non-compliance to be acceptable (or at least not a significant concern) represents a lack of attention to the necessary discipline and detail which constitute a basic ingredient of a successful construction QA/QC program.

III.C: LACK OF AGRESSIVE CORRECTIVE AND PREVENTATIVE ACTIONS

Criterion 18 of Appendix B requires that PG&E and its principal construction subcontractors perform planned and scheduled audits to verify compliance with all aspects of the quality assurance program and to determine its effectiveness. Follow-up action is intended to be initiated to address the identified discrepancies. Guidance for such follow-up action is provided by Criterion 16 which requires that appropriate corrective action be initiated to correct the identified and any similar discrepancy, to determine the cause of the discrepancy, and to preclude recurrence of further similar discrepancies.

Therefore, in ITR 36 and 38 one would expect to see a corrective action proposal from PG&E regarding the construction discrepancies identified by the IDVP. Surprisingly, no corrective action measures or plan are set forth in the two ITRs. The lack of identified corrective action measures indicates an incomplete review of the discrepant conditions. For example, PG&E should provide for an investigation beyond the immediate discrepant condition to determine the cause, the underlying reason for the cause, why the condition had not been detected by the QA/QC program, and where else the condition could exist.

In short, the PG&E corrective action proposal should have at least indicated:

(a) When and where these discrepant conditions developed;

(b) What lapses in QA/QC control permitted these conditions to develop;

(c) Why QA/QC inspections and audits had not detected these conditions earlier;

(d) What other equipment important to safety has possibly been subjected to these lapses in control;

(e) What has been done to verify the acceptability of the equipment identified in Item d, above.

Further, in my opinion, the fact that the IDVP did not even address the need for corrective action, let alone the adequacy of any follow-up actions and its implementation proposed by PG&E, is a serious weakness in the thoroughness of the IDVP's construction QA/QC review. Indeed, even though the IDVP carefully limited its conclusions in ITR's 36 and 38 to "the areas reviewed" and "to the extent reviewed", even these limited conclusions concerning activities are in doubt absent the implementation and review of the appropriate corrective and preventative actions.

I declare under penalty of perjury that the foregoing is true and correct and that if called to testify in this matter, I could and would competently testify thereto.

Executed this 6 day of May 1983 at San Jose, California.

Richard B. Hubbard

RICHARD B. HUBBARD

ATTACHMENT A

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

MAR 29 1983

Docket Nos. 50-275, 50-323

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

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

Gentlemen:

Subject: NRC Inspection of Diablo Canyon Units Nos. 1 and 2

This refers to the routine inspection, conducted by Messrs. G. H. Hernandez and W. J. Wagner of this office on February 28-March 4, 1983, of activities authorized by NRC License No. DPR-76 and Construction Permit No. CPPR-69 and to the discussion of our findings with Mr. R. D. Etzler and other members of your staff at the conclusion of the inspection.

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

Based on the results of this inspection, it appears that one of your activities was not conducted in full compliance with NRC requirements, as set forth in the Notice of Violation, enclosed herewith as Appendix A.

Your response to this Notice is to be submitted in accordance with the provisions of 10 CFR 2.201 as stated in Appendix A, Notice of Violation.

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

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

The responses directed by this letter and the accompanying Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Sincerely,

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

Enclosures:
A. Notice of Violation
B. Inspection Report
Nos. 50-275/83-08
50-323/83-07

cc w/o enclosure B:
W. A. Raymond, PG&E
R. C. Thornberry, PG&E (Diablo Canyon)

APPENDIX A

NOTICE OF VIOLATION

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

Docket No. 50-275
License No. DPR-76

As a result of the inspection conducted on February 28 - March 4, 1983, and in accordance with the NRC Enforcement Policy (10 CFR Part 2, Appendix C), 47 FR 9887 (March 9, 1982), the following violation was identified:

10 CFR 50, Appendix B, Criterion V, as implemented by Section 17.1.5 of the FSAR and the PG&E Quality Assurance Manual Section V states in part that, "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings...and shall be accomplished in accordance with these instructions, procedures, or drawings..."

The Howard P. Foley Quality Control Procedure for AWS D1.1 Welding, QCP-5A, Revision 8, references in paragraph 2.0 the latest edition of AWS D1.1 (the Structural Welding Code) as the applicable code for structural steel welding.

AWS D1.1-1982 in paragraph 3.6.1 states that, "The faces of fillet welds maybe slightly convex, flat, or slightly concave as shown in Figures 3.6(A) and (B) with none of the unacceptable profiles shown in Figures 3.6(C)", and in paragraph 8.15.1.3 that, "All craters are filled to the full cross section of the weld."

AWS D1.1-1982, "Commentary on Structural Welding-Steel", paragraph 6.5, "Inspection of Work and Records", states in part that, "Die stamping of welds is not recommended since die stamp marks may form sites for crack initiation."

The Howard P. Foley Quality Control Procedure for AWS D1.1 Welding, QCP-5A, Revision 8, states as follows:

- paragraph 5.2, "Each welder shall be assigned a unique numbered and lettered identification stamp".

- paragraph 5.2.1, "Each welder shall stamp his identification number in the proximity of his weld, in sufficient quantity to effectively identify his work."

- paragraph 9.1, "Welds shall conform as closely as practical to design requirements and exposed faces of welds shall be reasonably smooth and regular."

- paragraph 11.1, "Each welding inspector shall be assigned a unique I.D. stamp."

- paragraph 11.1.1, "Each welding inspector will stamp in sufficient quantity to identify the accepted work."

- paragraph 11.5.1.4, "Fillet welds may be 1/16 inch undersized, providing that the undersized portion does not exceed 10% of the total length of the weld."

- paragraph 11.5.1.7, "The weld shall be clean and free of slag."

Contrary to the above on March 2 and 3, 1983 the inspector found the following procedural violations at the 182' elevation of the Unit 1 Fuel Handling Building:

Connection No. G at Column No. 14-7

Plate No.	Weld Nos.	Discrepancy
D005-2	45	No welder's stamp
	52	No welder's stamp/ no inspector's stamp
	54	Weld profile not in accordance with AWS D1.1 figure 3.6(C) - Insufficient throat
	60	No welder's stamp/ no inspector's stamp
D005-4	56	Welder's stamp on weld/ no inspector's stamp
	58	No welder's stamp
	46	Welder's stamp on weld
	62	Slag covering one-half of weld/no welder's and inspector's stamp
	47	No welder's stamp
	63	Welder's stamp on weld

Connection No. H at Column 15-3

Plate No.	Weld Nos.	Discrepancy
A005-2	13A	Undersize by 1/8"
C005-2	33	Weld profile not in accordance with AWS D1.1 figure 3.6(C) -Insufficient throat/ Crater at weld termination
	35	Weld profile not in accordance with AWS D1.1 figure 3.6(C) -Insufficient throat/ Crater at weld termination
D005-2	54	Weld profile not in accordance with AWS D1.1 figure 3.6(C) -Insufficient throat
D005-3	57	Welder's stamp on weld

All of the above welds had been examined and accepted by H. P. Foley's Quality Control Inspectors on or before February 7, 1983.

This is a Severity Level IV violation (Supplement II).

Pursuant to the provisions of 10 CFR 2.201, Pacific Gas and Electric Company is hereby required to submit to this office within thirty days of the date of this notice, a written statement or explanation in reply, including: (1) the corrective steps which have been taken and the results achieved; (2) corrective steps which will be taken to avoid further items of noncompliance; and (3) the date when full compliance will be achieved. Consideration may be given to extending your response time for good cause shown.

MAR 29 1983
Date

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

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/83-08
50-323/83-07

Docket Nos. 50-275 and 50-323 License No. DPR-76 Construction Permit No. CPPR-69

Licensee: Pacific Gas and Electric Company

P. O. Box 7442

San Francisco, California 94120

Facility Name: Diablo Canyon Units Nos. 1 and 2

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

Inspection conducted: February 28-March 4, 1983

Inspectors: G. H. Hernandez
G. H. Hernandez, Reactor Inspector — 3/24/83 Dated

W. J. Wagner
W. J. Wagner, Reactor Inspector — 3/24/83 Dated

Approved by: D. F. Kirsch
D. F. Kirsch, Chief, Reactor Projects Section No. 3 — 3/25/83 Dated

Summary:

Inspection during the period of February 28 - March 4, 1983 (Report Nos. 50-275/83-08 and 50-323/83-07)

Areas Inspected: Unannounced inspection by regional inspectors of construction and modification activities including preservice inspection, safety related pipe support and restraint systems, and steel structure and supports welding activities.

The inspection involved 64 inspection-hours by two NRC inspectors.

Results: Of the three areas inspected one item of noncompliance was identified in the area of structural steel welding activities (failure to perform safety related welding activities in accordance with quality procedures, paragraph 3.)

DETAILS

1. Individuals Contacted

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

*R. D. Etzler, Project Superintendent
*D. A. Rockwell, Assistant Project Superintendent
*W. A. Cooley, Resident Electrical Engineer
*J. Arnold, Resident Mechanical Engineer
*F. M. Russell, Resident Civil Engineer
*J. R. Bratton, Lead Quality Control Engineer
*E. J. Macias, Resident Engineer
*R. R. Lieber, Resident Engineer
*C. M. Seward, Quality Assurance Engineer
D. R. Bell, Quality Control Inspector
J. J. Nystrom, Quality Control Inspector
T. E. Pierce, Quality Control Inspector
D. A. Gonzalez, Quality Control Inspector
H. R. Zimmerman, Manager Inspector

b. Bechtel Corporation (Bechtel)

*J. W. Shryock, Site Completion Manager
*L. A. Dreisbach, Onsite Project Engineering Group/ Quality Assurance

c. H. P. Foley Company (Foley)

*P. J. Bourque, Project Director
*A. E. Moses, Project Manager

d. Pullman Power Products Corporation (Pullman)

H. W. Karner, Quality Assurance/Quality Control Manager
J. P. Watson, Welding Supervisor
M. S. MacCrae, Training Officer
J. Cunningham, Quality Control Inspector

*Denotes personnel attending the exit management meeting of March 4, 1983.

2. Plant Status

On March 2, 1983 the licensee announced a delay of fuel load for Unit 1. Fuel load had originally been schedule for March 31, 1983 and has now been rescheduled for June 30, 1983. The licensee has revised the schedule due to structural analysis work requiring more time than originally estimated, increased scope of work, lower than expected production rates and an increase in modifications to the Unit 1 annulus steel. This increased work load has resulted in a corresponding increase in the total construction force. The total work force is estimated at about 4,000 employees.

3. Structural Steel Modifications - Unit 1 Fuel Handling Building

Visual Examination of Welds

As a result of plant changes initiated by the verification program the licensee is currently in the process of making modifications to the Fuel Handling Building structural steel. A part of these modifications provide for the adding of stiffener plates at structural steel connections located along the S-9 (westside) and V-1 (eastside) lines of the Fuel Handling Building. During this inspection the inspector examined completed field welds on two connections to ascertain whether the welds met specified visual standards established by the current edition of the Structural Welding Code, AWS D1.1 and the applicable contractor procedure and specification requirements. The following connections at the 182' elevation of the Fuel Handling Building were examined and the following discrepancies noted.

a. Connection No. G at Column No. 14-7

	Plate Nos.	Weld Nos.	Discrepancies
(1)	A005-2	11,12,13A,13B, 15,16,17,19,21 68	None
(2)	A005-1	5,6,7A,7B,9,10 18,20,22,69	None
(3)	C005-2	30,33,35,41	None
(4)	C005-4	31,37,39,43	None
(5)	D005-2	44,45,52,54, 60,61	45-no welder's stamp 52-no welder's stamp/no inspector's stamp 54-weld profile not in accordance with AWS D1.1 figure 3.6(C) - Insufficient throat 60-no welder's stamp/no inspector's stamp

(6) D005-4	46,47,56 58,62,63	56-Welder's stamp "B-6" on weld/ No inspector's stamp 58-No welder's stamp 46-Welder's stamp "B-6" on weld 62-Slag covering one-half of weld/ No welder's stamp/No inspector's stamp 47-No welder's stamp 63-Welder's stamp "B-6" on weld

b. Connection No. H at Column No. 15-3

Plate Nos.	Weld Nos.	Discrepancy
(1) A005-2	11,12,13A,13B 15,16,17,19, 21,68	13A-Undersized 1/8"
(2) A005-1	5,6,7A,7B,9, 10,18,20,22,69	None
(3) C005-1	28,32,34,40	None
(4) C006-3	29,36,38,42	None
(5) C005-2	30,33,35,41	33-Weld profile not in accordance with AWS D1.1 figure 3.6(C) - Insufficient throat/Crater at weld termination 35-Weld profile not in accordance with AWS D1.1 figure 3.6(C) - Insufficient throat/Crater at weld termination
(6) C005-4	31,37,39,43	None

(7) D005-2	44,45,52,54, 60,61	54-Weld profile not in accordance with AWS D1.1 figure 3.6(C) - Insufficient throat
(8) D005-4	46,47,56,58, 62,63	None
(9) D005-1	50,51,53,55, 66,67	None
(10) D005-3	48,49,57,59, 64,65	57-Welder's stamp "G3" on weld

All welds examined had been inspected and accepted by H. P. Foley Quality Control Inspectors on or before February 7, 1983.

The above noted discrepancies are contrary to code and procedure requirements as follows:

The Howard P. Foley Quality Control Procedure for AWS D1.1 Welding, QCP-5A, Revision 8, references in paragarph 2.0 the latest edition of AWS D1.1 (the Structural Welding Code) as the applicable code for structural steel welding.

AWS D1.1-1982 in paragraph 3.6.1 states that. "The faces of fillet welds maybe slightly convex, flat, or slightly concave as shown in figures 3.6(A) and (B) with one of the unacceptable profiles shown in Figure 3.6(C), and in paragraph 8.15.1.3 that, "All craters are filled to the full cross section of the weld."

AWS D1.1-1982, "Commentary on Structural Welding-Steel, paragraph 6.5, "Inspection of Work and Records", states in part that, "Die stamping of welds is not recommended since die stamp marks may form sites for crack initiation."

The Howard P. Foley Quality Control Procedure for AWS D1.1 Welding, QCP-5A, Revision 8, states the following:

- paragraph 5.2, "Each welder shall be assigned a unique numbered and lettered identification stamp".
- paragraph 5.2.1, "Each welder shall stamp his identification number in the proximity of his weld, in sufficient quantity to effectively identify his work."
- paragraph 9.1, "Welds shall conform as closely as practical to design requirements and exposed faces of welds shall be reasonably smooth and regular."
- paragraph 11.1, "Each welding inspector shall be assigned a unique I.D. stamp."
- paragraph 11.1.1, "Each welding inspector will stamp in sufficient quantity to identify the accepted work."

- paragraph 11.5.1.4, "Fillet welds may be 1/16 inch undersized, providing that the undersized portion does not exceed 10% of the total length of the weld."

- paragraph 11.5.1.7, "The weld shall be clean and free of slag."

The failure to perform work in accordance with procedural or code requirements is considered an apparent item of noncompliance with 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings". (50-275/83-08/01)

In addition, the inspector noted that this item, when coupled with the weld stamp problem (see paragraph 4), appears to indicate a deficiency in the training program for welders and welding Quality Control Inspectors. The licensee acknowledged the inspector's concern.

4. Review of Quality Records

The inspector reviewed quality documentation, related to completed welds examined and identified in paragraph 3, for conformance to the applicable contractor procedure and specification requirements. During this review the licensee informed the inspector that a number of retired welder stamps were inadvertently issued to new welders. The issuance of retired welder stamps is contrary to QCP-5A which states in paragraph 5.2.2 that, "If a welder is no longer welding, his assigned stamp shall be placed in a dead file and shall not be reassigned to another welder." On March 3, 1983 the inspector found that a retired weld stamp had been reissued to a new welder on February 22, 1983. Discussions with contractor personnel indicated that they are aware of the magnitude of the welder stamp problem and have documented a number of cases related to misuse of assigned welder stamps, as well as issuance of retired stamps. Contractor personnel have been assigned to identify, document, and resolve the weld stamp situation. The licensee's results will be examined during a future inspection. This is a followup item. (50-275/323/83-08/02)

5. Welding Procedure Specifications - H. P. Foley

The inspector reviewed the Welding Procedure Specifications (WPS) referenced in H. P. Foley's QCP-5A, Revision 8, for conformance with the prequalified joint details specified in AWS D1.1-1982. This review determined that a number of the joint details were not in conformance with the joint details specified in the 1982 edition of the code. Discussions with PG&E personnel determined that a new revision to QCP-5A is currently under review and that the new revision will incorporate the changes to the joint details as specified in the 1982 edition of the code.

No items of noncompliance or deviations were identified.

6. Safety-Related Pipe Support and Restraint System-Pullman

a. Observation of Welding Activities

The inspector observed in-process welding on three pipe supports (hanger numbers 55S-91A, 56S-71V and 235/145R) and on containment spray ring hanger 176/47R. Fit-up, cleanliness, weld identification, weld quality, proper use of a "traveler", and correct issue and use of welding electrodes were in compliance with applicable procedures and standards. Welders interviewed were knowledgeable of the joint detail and essential variables specified by the welding procedure specifications.

No items of noncompliance or deviations were identified.

b. Welder Qualification

The inspector reviewed the contractor's procedure for qualification of welders and welding operators for compliance with applicable code requirements. This procedure, ESD 516, provides a system for maintaining a continuous record of the qualification status of all welders. The welder's maintenance of qualification records were up-to-date and effectively utilized. The inspector reviewed the performance qualification records for those welders associated with the in-process welds examined during this inspection. The welders were qualified to weld under the applicable weld procedure specification (WPS). These weld procedures, WPS-7/8 and 15/16, and procedure qualifications records were examined by the inspector for compliance with ASME Section IX requirements.

No items of noncompliance or deviations were identified.

c. Visual Examination of Welds

The inspector visually examined completed welds on the following hangers to determine whether the welded structures conform to applicable code and project specifications.

Hanger No.	Hanger No.
1049/15-SL	2156-169
176-27R	2190-19
176-28R	41-25R

Characteristics examined at the weld joint were weld location, fillet weld size, appearance, and presence of surface defects. Visually, these welds appeared satisfactory.

No items of noncompliance or deviations were identified.

d. Welding Inspector Qualifications

The inspector reviewed the qualification records of four welding quality control inspectors authorized by the contractor to sign-off on process sheets. The inspectors' approval signifies that code and procedural requirements have been complied with, thus assuring a sound weld joint. The following qualifications were reviewed: education and training, knowledge of welding, inspection experience, and good vision. The welding inspectors appeared to be competent and have the necessary qualifications to make the inspections for the type of structures to be inspected.

No items of noncompliance or deviations were identified.

7. Management Meeting

On March 4, 1983, the inspectors met with licensee representatives denoted in paragraph 1. The scope of the inspection, the observations, and the findings of the inspectors were discussed. The licensee acknowledged the concerns and the apparent item of noncompliance identified in this report.

ATTACHMENT B

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Dockets Nos. 50-275 O.L. 50-323 O.L.
(Diablo Canyon Nuclear Power Plant, Unit Nos. 1 and 2)	)	

SUPPLEMENTAL AFFIDAVIT OF RICHARD B. HUBBARD

CONCERNING

BREAKDOWNS IN THE DIABLO CANYON QUALITY ASSURANCE PROGRAM

STATE OF CALIFORNIA)
) ss.
COUNTY OF SANTA CLARA)

I, RICHARD B. HUBBARD, being of legal age and duly sworn, depose and say as follows:

I

INTRODUCTION

1. My name is Richard B. Hubbard. My professional qualifications and experience have been submitted to this Board as part of my May 24, 1982 affidavit concerning breakdowns in the Diablo Canyon Quality Assurance Program.

2. The purpose of this supplemental affidavit is two-fold. First it is to set forth the events which have occurred since my May 24, 1982 affidavit which further

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demonstrate that the Pacific Gas and Electric Company (PG&E) did not have a Quality Assurance/Quality Control (QA/QC) Program which:

(a) met the requirements of General Design Criterion-1 (GDC-1) of Appendix A to 10 C.F.R. Part 50 and the specific quality assurance criteria set forth in Appendix B to 10 C.F.R. Part 50; and

(b) which could assure that PG&E had met the license commitments set forth in its Final Safety Analysis Report (FSAR) for the Diablo Canyon Nuclear Power Plant Unit 1 (Diablo Canyon).

Second, it is to describe the modifications which have occurred in the Independent Design Verification Program (IDVP) since my May 24, 1982 affidavit and why those modifications, even if adequately undertaken and completed, cannot assure:

(a) that Diablo Canyon as actually constructed will be consistent with the FSAR prepared for it; and

(b) that the safety related and other important to safety structures, systems, and components (SS&C's) contained within the plant meet the technical requirements of the regulatory standards which have been set for them.

3. The facts and conclusions set forth in this declaration are based upon the information I have received and reviewed during the period between June 1982 and March 1983 in my continuing role as technical consultant to counsel for the

Governor of California in the ongoing Diablo Canyon licensing proceedings. I have reviewed the semi-monthly status reports provided by PG&E and Teledyne Engineering Services (TES) concerning the IDVP. Further, I have reviewed the interim technical reports issued by TES. I have prepared and submitted to the NRC detailed comments concerning inadequacies in the proposed scope and methodology of the Phase I and Phase II verification programs. I have discussed these technical comments at the meeting between Mr. Denton of the NRC Staff and the intervenors in the Diablo Canyon proceedings in San Francisco on February 17, 1982, and September 9, 1982. In addition, I attended and made a presentation on these matters to the NRC at a meeting in Washington, D.C., on November 10, 1982. Finally, since June of 1982 I have continued to attend and participate at a number of meetings between the various participants in the Diablo Canyon QA/QC investigations, including meetings with personnel from PG&E, TES, NRC, Bechtel, Stone and Webster Engineering (S&W), Robert L. Cloud Associates (RLCA), Roger Reedy Incorporated (Reedy), and Brookhaven National Laboratory (BNL). However, despite the fact that I have continued to see the above-mentioned reports and to attend various meetings discussing them, I have not had access to the underlying technical data being developed by PG&E/Bechtel or to the data provided to the IDVP participants.

4. In general, I believe the intervening events have provided further new evidence of a pattern of significant

breakdowns in the implementation at Diablo Canyon of QA/QC requirements which are consistent with the facts and conclusions discussed in my prior affidavit. The new evidence cited herein confirms the testimony I previously gave this Board that PG&E's quality assurance program for Diablo Canyon did not contain an adequate policy for QA/QC, that it did not contain in a timely fashion the procedures adequate to carry out the policy it did have, and that it did not have a system capable of ensuring that even these procedures would be properly implemented.

It also supports my testimony that the often times generic nature of the discrepancies between what actually was and what should have been with respect to both the construction of the plant and the documents supporting that construction have led and will continue to lead to the disclosure of errors in design and construction which if uncorrected could threaten the public's safety.

Finally, this new evidence substantiates my earlier affidavit that given the demonstrated lack of an adequate QA/QC program and the number and nature of the errors disclosed, there is an extreme likelihood that further major errors exist in the design and construction of the plant which can only be uncovered by a rigorous and thorough design and construction verification program.

* * * * * * *

II

SERIOUS QUESTIONS ABOUT THE SEISMIC DESIGN ARE NOT YET RESOLVED

5. A widespread pattern of significant breakdowns in the required management control systems regarding the QA/QC process for design and site activities for both seismic and non-seismic safety features has been disclosed since the Diablo Canyon license was suspended. Despite an ostensibly complete reevaluation of the seismic design of the plant, serious questions about that design product remain and may not be resolved even upon completion of the IDVP because: symptoms rather than QA/QC root causes have been addressed; results have differed between those presented by PG&E/Bechtel and Brookhaven National Laboratory; and Teledyne's role has changed due to the PG&E/Bechtel seismic reevaluation.

A. The Discovery of Seismic Design Errors Make Imperative an Expansion of the IDVP

6. By the date of my initial affidavit 195 design and construction discrepancies between what was and what should have been had been disclosed. At that time, 24 of these discrepancies, in my opinion, had turned out to be errors with significant implications regarding PG&E's failure to establish and implement the required QA/QC measures.

7. As indicated in my prior affidavit, in response to the initial disclosure of 14 of these errors, the Nuclear Regulatory Commission (NRC) ordered the suspension of PG&E's low power license, and the creation of the IDVP.

8. The IDVP at the time of my initial affidavit, covered a limited audit of the seismic safety-related service contractors who performed design work on Diablo Canyon prior to June 1, 1978 (Phase I), and a further limited review of non-seismic and seismic safety-related design activities performed after 1978 by PG&E and its service contractors (Phase II).

9. As this limited IDVP was going forward, I advised the NRC staff (February 17, 1982, and September 9, 1982) and the NRC itself (November 10, 1982) that there was no rational distinction between Phase I and Phase II, that the scope of the seismic safety related design and non-seismic safety related design reviews was too narrow, that a thorough review of important to safety SS&C's should be included in the IDVP, that objective statistically valid sampling techniques were necessary to enable extrapolations from a sample to the entire plant population and that added to the design review should be an audit of the construction of the plant and PG&E's material suppliers.

10. While the IDVP was going forward, the NRC staff was also receiving information from the Brookhaven National Laboratory (BNL). BNL had conducted an independent review and development of the vertical floor seismic response spectra for the Diablo Canyon containment annulus structures. The developed response spectra were then utilized by BNL for evaluations of two selected piping systems. A report (BNL Report) summarizing the BNL findings was issued in July 1982. In a July 1, 1982, letter

to Dr. William Cooper of TES, Mr. Denton noted the following seven aspects of the design process utilized by PG&E and its principal seismic subcontractor, URS/Blume, which, as a result of the BNL Report, required further exploration and assessment as to their generic implications for the Diablo Canyon design process:

(a) The distributed masses of the steel members comprising the annulus structure apparently were not included in the mathematical model used in the original seismic analysis.

(b) The mathematical model used in the original analysis apparently considered the joints between the beams and columns to be rigid, whereas the Brookhaven interpretation of the drawing indicates these joints are more appropriately considered flexible (shear carrying only).

(c) Statement on page 11 of the URS/Blume May, 1979 report "Diablo Canyon Nuclear Plant Unit 1 Containment Structure, Dynamic Seismic Analysis for 7.5 M Hosgri Earthquake," May, 1979, concerning the structural connections may not be consistent with the mathematical model used in the original analysis.

(d) The response spectrum smoothing techniques employed in the original analysis appeared inconsistent with the FSAR commitments.

(e) Design dimensions were apparently used instead of the as-built dimensions in the two piping problems samples.

(f) The 5D bends in the piping analysis were apparently modelled as long radius bends. This has the effect of softening the model and reducing the natural frequencies.

(g) The piping support forces computed by the BNL model are much larger than those computed by the PG&E model.

11. As a result of these described breakdowns in the PG&E/Blume design process, BNL recommended that "given the magnitude of the support force increases, a reevaluation of all (pipe) support designs would seem warranted."

12. As BNL's analysis was going on, PG&E was developing new response spectra for the errors which had been disclosed early in the IDVP. (PG&E's "New Hosgri - 5 Mass Spectra".) However, BNL has also concluded that its results still differed from even these new PG&E figures. Indeed, in response to a question from Mr. David Fleischaker during the July 27, 1982 meeting among PG&E, TES, BNL and the NRC, the BNL personnel confirmed the following two BNL conclusions with regard to PG&E's "New Hosgri - 5 Mass Spectra."

(a) BNL support force values obtained using BNL models and PG&E supplied spectra do not match. The differences are probably due to the differences in modeling. (BNL Report, p. 11.)

(b) Support forces calculated using BNL piping models and BNL 3-D Model B envelope or independent

spectra substantially exceed PG&E calculated values. The major cause for this is that Model B spectra greatly exceed the spectra used by PG&E. (BNL Report, p. 12.) Similar findings by BNL of differences between the BNL and PG&E horizontal response spectra for the containment annulus structure were discussed at an NRC meeting in Bethesda on February 15, 1983. BNL noted differences in both the frequency and magnitude at which the peak horizontal accelerations would occur. Thus, even the PG&E seismic reanalysis in important aspects appeared to be less conservative than the BNL analysis and therefore may provide an inadequate level of safety. Moreover, the BNL results to date raise serious questions about the adequacy of the Diablo Canyon seismic design since discrepancies continue to be identified between BNL's seismic models of the parts of the plant it was asked to review and PG&E's newest seismic models for those portions of the plant. Further, not all of the differences presented by BNL had been identified by the IDVP participants, which raise doubts about the thoroughness of the IDVP reviews.

13. Based on the nature of the seismic design errors which were being disclosed in the seismic design product by TES's limited design verification program, based on the discrepancies disclosed in the BNL seismic design review, and based on the

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implications of the findings resulting from the Reedy review of PG&E's QA/QC process implementation,[1/] it became clear that the IDVP would have to be expanded significantly.

14. In summary, these reviews disclosed that:

(a) The PG&E seismic design breakdowns and the deficiencies in the QA/QC process were not limited to the period prior to June 1, 1978. Rather, the breakdowns were evident in the URS/Blume 1979 report and continue to some degree in the New Hosgri - 5 Mass Spectra. Further, the seismic design process breakdowns appeared generic, thus requiring a complete remodeling and reevaluation of seismic safety features.

(b) The Phase I/Phase II dichotomy in the reverification program, as originally contemplated by the NRC, was no longer technically justified. Thus, the

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1. In a report first issued in March, 1982, as part of the Phase I verification program, Reedy stated the following three conclusions concerning the PG&E quality assurance program:

(a) The PG&E Quality Assurance Program for design work was not adequate in areas of policy, procedures and implementation. The Quality Assurance organization had insufficient program responsibility.

(b) A general weakness existed in internal and external interface and document controls. This questions whether appropriate design information was being exchanged and utilized by design groups and consultants. One concern is if the latest Hosgri seismic data were input for design analysis.

(c) The design verification program was not formalized and was inconsistently implemented and documented. This included major gaps in design overviews of the design approach to mechnical and other equipment.

Phase I/Phase II dichotomy should have been and was essentially abandoned.

(c) The conclusions of the Reedy QA/QC audit raised serious questions as to the adequacy of the PG&E QA/QC program and its implementation in other than design activities. Thus, the TES reverification program needed to encompass all PG&E QA/QC activities, including site construction activities. Subsequently, in a letter from Mr. Engelken of Region V to Mr. Denton of the NRC, the Region recommended that a limited construction QA/QC reverification program be initiated.

B. PG&E Responds to TES and NRC Findings and Initiates a Seismic Corrective Action Program

15. PG&E substantiated the existence of a widespread breakdown of the QA/QC process and product for seismic design disclosed by TES, Reedy and BNL in two internal programs initiated by PG&E. First, the Blume Internal Review (BIR) of the seismic design disclosed approximately 150 potential discrepancies in the design product of which approximately one-third could be significant non-compliances with the seismic design criteria provided in the FSAR. Second, PG&E's QA Lookback Review identified failures to comply with Appendix B QA/QC criteria with regard to the development, distribution, use, and control of design information.

16. Further, in late spring of 1982 PG&E announced that Bechtel had contracted to replace PG&E as the

engineering/construction manager for the work remaining to complete and license the two Diablo Canyon units. Additionally, in August 1982 PG&E announced that a seismic review and redesign of Diablo Canyon safety features had been initiated. Finally, in September 1982 PG&E requested that TES initiate a limited construction QA/QC review.

17. While efforts were initiated to correct the identified discrepancies (the symptoms of the problem), PG&E did not initiate efforts to identify and address the root causes within the QA/QC process which allowed the discrepancies to occur and, more importantly, to remain undetected throughout the time prior to the issuance of an operating license. The failure of PG&E to identify and address the root causes of the QA/QC breakdowns precludes a finding that the depth and extent of the QA/QC breakdowns at Diablo Canyon has been enveloped with any degree of confidence. Thus, as further reviews of non-seismic safety design, equipment procurement, construction, and operating QA/QC are conducted, I continue to believe that more errors, including non-compliance with the operating license application, will be revealed. Section III of this affidavit sets forth significant information concerning the further reviews.

C. Seismic Reanalysis Results in Significant Plant Modifications and Changes to TES Review Role

18. Approximately 800 technical personnnel have been involved in the PG&E/Bechtel seismic reanalysis of the Diablo Canyon safety features. The plant modifications identified to

date are extensive. For example, at the January 13, 1983, meeting PG&E disclosed the following numbers of modifications being made to critical seismic safety items.

(a) 2400 out of 4000 large-bore pipe supports.[2/]

(b) 750 out of 3500 small-bore pipe supports.[3/]

(c) 900 out of first 12,000 of a total of 23,000 electrical conduit and cable tray supports.[4/]

(d) 13 modifications to piping systems.

19. In addition, design of structural modifications are still being developed for a number of areas including the containment annulus structure and the fuel handling building. The construction work force required to implement the design changes is massive. For Unit 1, a completed plant, 1300 construction workers were on-site in January, and PG&E estimated that the work force for the Unit would eventually approach 1600.[5/] In my opinion, a continuing need for a large number of construction personnel will be required once the necessary changes resulting from the Phase II design-review of non-seismic safety features, as well as the construction QA/QC review are finally identified. In the following section of this affidavit,

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2. Transcript of Diablo Canyon Design Verification Status Meeting, January 13, 1983, p. 68.

3. Ibid. 2, p. 74.

4. Ibid. 2, p. 75.

5. Ibid. 2, p. 136.

I will address the scope and findings to date of the Phase II program.

20. Finally, it is important to recognize that the TES role for Phase I has changed significantly. The original Commission Order contemplated a sample verification of the Diablo seismic design. However, because of the significance of the errors disclosed, and PG&E's decision to conduct a seismic review and redesign, TES and the NRC are now faced with reviewing in many cases a new seismic design, with new models and new model parameters, and a reconstructed plant. Thus, the verification program, at least with regard to seismic features, has now expanded into a redesign, reconstruct, and reverification program. This is a significant change in the scope and magnitude of the original program contemplated by TES and the NRC.

Moreover, this change raises serious questions about the adequacy of the present seismic design since discrepancies still appear to exist between BNL's seismic models of the parts of the plant it was asked to review and PG&E's newest seismic models for those portions of the plant.

A complete and detailed assessment of PG&E's seismic redesign and TES's reverification program is impossible at this time because the affiant and other technical advisors to the State of California have not been granted access to the Diablo Canyon seismic design data developed by PG&E, Bechtel, and Westinghouse. In addition, the affiant has not had access to the plant site to review the adequacy of the QA/QC measures and their

implementation during the ongoing modifications to SS&C's. Indeed, such a final review of seismic design data and plant modifications is not possible at this time since the design and modifications are not yet complete for all SS&C's. Likewise, the TES reviews, and resulting reports, are not yet complete.

III

LIMITED PHASE II VERIFICATION PROGRAM DISCLOSES CONTINUING PATTERN OF QA/QC BREAKDOWNS

21. The limited Phase II reverification program has revealed a continuing pattern of breakdowns in the Diablo Canyon QA/QC process and of errors in the product resulting from that process. Thus, if major surprises after license reinstatement are to be avoided, then the Phase II program will need to be substantially revised to address in a statistically valid methodology the adequacy of all design and construction activities at Diablo Canyon which are "important to safety," as required by GDC-1 of Appendix A to 10 CFR Part 50 and Appendix B to 10 C.F.R., Part 50.

A. Non-Seismic Safety Design Flawed

22. S&W, a subcontractor to TES, has reviewed portions of three safety-related systems (one system each with regard to fluids, air, and electrical) to verify the compliance of the non-seismic safety design with the regulations and the Diablo Canyon operating license application commitments. To date, approximately 70 deficiencies have been reported. While the number of deficiencies for Phase II is less than for Phase I

(195), I believe that the Phase II results to date are at the very least equally significant to the Phase I findings which led to PG&E's decision to initiate a complete seismic review and redesign.

23. Indeed, Dr. Cooper of TES at a meeting on October 19, 1982, acknowledged the equivalence in safety significance between the design errors discovered during Phase I and Phase II in his comment that (October 19 Tr. at p. 36):

> ". . . we would anticipate a total Phase II EOI someplace in the mid to high 50s. Now, that is a much smaller number than the 200 (for Phase I). . . . But also, I think you will find that a much higher percentage of these are significant than the large number on Phase I. . . . So I would expect a bigger percentage of these would be as significant as those dozen or so we said were significant for Phase I. My present guess is that something like the same number perhaps even a little larger, perhaps even 15, of these would be of significance. . . . What we are saying is in the very broad look on Phase II we are coming up with about the same number of significant items as on Phase I. . . ."

Furthermore, Mr. Maneatis of PG&E, in an exchange with Mr. Eisenhut of the NRC, concluded that there was no distinction between the PG&E QA/QC process for seismic and non-seismic design in the pre-1978 period as follows (September 1, 1982, Meeting Tr. at p. 24):

> "MR. EISENHUT: Okay. So really, not to belabor the point, I guess the other piece of the question is, is there any distinction pre-1978, is there any distinction that can be drawn between seismic service related and non-seismic service related from the standpoint of what PG&E required in the way of a seismic -- I mean in the way of a programmatic QA needs and reequirements? Any distinction between seismic and non-seismic?
>
> "MR. MANEATIS: In what time frame again?
>
> "MR. EISENHUT: Pre-1978.

"MR. MANEATIS: No, there was no distinction.

"MR. EISENHUT: No distinction.

"MR. MANEATIS: Like I said in my remarks, there is really no distinction in the programmatic requirements between non-seismic and seismic contract, there's no reason to have a distinction."

In addition, Mr. Maneatis and Mr. Friend of Bechtel agreed with Mr. Eisenhut that the majority of the non-seismic safety design was accomplished during the time frame in which Reedy's Phase I review had identified deficiencies in the PG&E QAQC program and its implementation. The time period for non-seismic safety design was established as follows (September 1, 1982, Meeting Tr. at pp. 24-25):

"MR. EISENHUT: That's right, now of the fractions of work performed, was there an equal amount of the non-seismic work that was performed prior to 1978? I mean, was the majority of the -- let me put it another way. The majority of the seismic service related contract work was performed prior to 1978. Does that also hold for the non-seismic service related contract work?

"MR. FRIEND: I think that's correct.

"MR. MANEATIS: Essentially the plant was completed by 1979 and so I think the answer to your question was yes."

24. Finally, unlike a Safe Shutdown Earthquake (SSE) which is thought to be a low probability event, the non-seismic safety designs are in large part provided to deal with events which will happen, and in some cases happen often, during the operating life of Diablo Canyon. Thus, there must be valid assurances that these features important to safety will operate properly during and following all design basis conditions. Implementation of a disciplined QA/QC process is intended to result in this assurance. However, as the Reedy Report revealed,

there can be no assurance that the Diablo Canyon design QA/QC process has been effectively implemented. Rather, the evidence indicates that PG&E and its design contractors in important instances failed to implement the required QA/QC measures.

25. The S&W reviews to date of the product (the design documents) resulting from the QA/QC process as part of the TES Phase II program confirmed that design discrepancies do in fact exist in the normal and accident modes of the Diablo Canyon non-seismic safety design. Moreover, even prior to the initiation of the Phase II review, discrepancies in the non-seismic safety design were disclosed by PG&E and TES including the items as follows: improper piping thermal analysis; misapplication of circuit breakers; and failure to satisfy single failure criterion for the control room power supply. In addition, during its Phase II review, S&W has established that generic concerns may exist with regard to the following:

(1) Redundancy of Equipment and Power Supplies in Shared (Units 1 and 2) Safety-Related Systems

The S&W review of the Mechanical/Nuclear design of the Control Room Ventilation and Pressurization System (CRVP) identified generic concerns for the emergency electrical power supplied to shared safety-related systems. The FSAR, Page 8.3-4, states that for a postulated LOCA in one unit and a shutdown in the other unit, each unit can withstand an assumed single failure of a vital bus. Since it must be assumed that a loss of offsite

power occurs coincident with the postulated LOCA, three vital buses (one in the LOCA unit and two in the shutdown unit) will not have power available, as the swing diesel would be aligned with the LOCA unit. Portions of the Class I components of the CRVP System are shared between Units 1 and 2, and as such are provided with safety-related power from Units 1 and 2. Based on the assumed single failure in both units identified above, adequate electrical power redundancy is not supplied to the shared CRVP System to meet the single failure criterion. Therefore, a single failure could result in failure of the control room to isolate, pressurize, and/or select pressurization air from the least contaminated intake, or to provide adequate air conditioning to remove heat generated from the vital electrical equipment located in the safeguards room.[6/]

(2) Selection of Design Pressure, Temperature, and Differential Pressure Across Control Valves

The S&W review of the Mechanical/Nuclear design of the Auxiliary Feedwater (AFW) System disclosed that the intent of the ANSI B31.7 piping code was not complied with and a nonconservative design pressure was selected. Also, the addition of a valve in a low pressure portion of the AFW System resulted in

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6. ITR 34, Rev. 0, Verification of Diablo Canyon Project Efforts by Stone & Webster Corporation, pp. 3-1 to 3-3. See also PG&E's Phase II Status Report dated March 11, 1983; Letter, Dr. Cooper to Mr. Maneatis, et al., dated January 18, 1983; TES's Semimonthly Status Report for February 1983; and Draft ITR, Phase II - Additional Sample and Additional Verification, December 23, 1982. Also, see EOI's 8012 and 8016.

noncompliance with the ANSI B31.1 code regarding protection of low pressure piping and components from higher pressure. Either of these conditions could result in overpressurizing piping and components. The selection of a nonconservative design pressure affects the stress analysis of piping because longitudinal stresses caused by internal pressure are combined with stresses from other loads. Control valve specifications were reviewed by S&W to determine the maximum differential pressure specified for actuator sizing. Valves FCV 37, 38 and 95 were specified with a maximum differential pressure that is lower than the valves are expected to operate against. The selection of low design pressures can affect the code acceptability of a system and the stress analysis. The selection of low differential pressures across valves can affect their ability to operate against expected higher differential pressures.[7/]

(3) Environmental Consequences of Pipe Ruptures Outside of Containment

The S&W review of the calculational methods used to evaluate the environmental parameters outside the containment has identified that safety-related equipment located outside containment will be exposed to higher temperature and pressure environments than reported in licensing documents. This conclusion is based on the inapplicability of the CONTEMPT computer program used by Nuclear Services Corporation (NSC) to

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7. Ibid. 6, pp. 4-1 to 4-3. See EOI's 8009, 8010, and 8062.

calculate environments outside containment and on the other analytical errors.[8]

(4) Jet Impingement Effects of Postulated Pipe Ruptures Inside Containment

The Reedy review for Phase II documented the concern that PG&E had no formal program supporting commitments in FSAR Section 3.6, addressing the effects of High Energy Line Break (HELB) jet impingement on safety-related components inside the containment building.[9]

26. While the Phase II review is ongoing, and thus not complete, TES and its subcontractors have also identified other generic aspects of the non-seismic safety design which may be deficient, including the following:

(a) Power/Control Separation

The S&W review of the Fire Protection System provided for the AFW System, CRVP System and the safety-related portions of the 4160 V Electric System concerning the power control circuit separation, identified the concern that the cable separation analysis performed by PG&E does not completely address all circuits required for operation of safety-related components required to effect a cold safe shutdown and maintain control room habitability. The significance of this concern is that a single fire could jeopardize the safe shutdown function

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8. Ibid. 6, pp. 5-1 to 5-3. See EOI's 8001, 8002, 8003, 8004, 8033, and 8034.

9. Ibid. 6, pp. 6-1 to 6-3. See EOI 7002.

of a system if circuitry for redundant portions of the system are not adequately separated.[10]/

(b) Moderate Energy Line Break (MELB) Protection

PG&E's September 14, 1978 and December 28, 1978, submittals to the NRC committed to evaluating the Diablo Canyon design for the effects of MELB on all equipment required for cold safe shutdown. The CRVP System is required to maintain control room habitability during cold safe shutdown, but was not included in the PG&E evaluation. The exclusion of the CRVP System from the analysis could indicate that other systems or equipment which are required for cold safe shutdown may also have been excluded.[11]/

(c) Motor Start Capability

The S&W review of the documentation for the safety-related motors in the AFW and CRVP Systems identified in ITR No. 26, Rev. 0, did not indicate the capability for all motors to start and accelerate to full speed at 80 percent rated voltage.[12]/

(d) Voltage Profiles

The review of voltage conditions on 4160 V and 480 V systems by S&W identified the concern that continuous low voltage could happen during periods of low voltage on the 500 kV and 230 kV systems which will result in overheating of safety-related

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10. Ibid. 6, see EOI's 8019, 8020, 8021 and 8032.

11. Ibid. 6, see EOI 8050.

motors. Also, transient low voltage conditions due to starting large motors may drop out 480 V safety-related motor starter contacts, resulting in loss of electrical equipment controlled from these starters.[13]

(e) Short Circuit Availability

The review of available short circuits currents by S&W identified the concern that the available short circuit currents calculated on 4160 V safety-related buses F, G and H are greater than the interrupting capacity of the 4 kV circuit breakers. A short circuit can cause failure of a circuit breaker and damage to main buses and power supply cables. The resulting outage might involve one or all of the 4160 V safety-related buses.[14]

(f) Cable Separation Within Enclosures

S&W identified the concern that redundant Class IE cables/wires are installed within enclosures without the required separation to meet the separation criteria in the FSAR.[15]

(g) Independence of Power Distribution

S&W also identified the concern that two colored vital trains are located within one transfer switch or control

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12. Ibid. 6, see EOI 8061.

13. Ibid. 6, see EOI's 8023, 8024, 8025, 8026.

14. Ibid. 6, see EOI 8022.

15. Ibid. 6, see EOI's 8042, 8043, and 8057. EOI 8057 has been identified as an Error A.

circuit. Failure in a single switch or circuit could result in the loss of redundant equipment.[16/]

27. Since the Reedy Report indicates that the design QA/QC process is deficient, and the Phase II review to date indicates that the sample of non-seismic safety design output reviewed, which was a result of the QA/QC process, is also deficient, I conclude that there can be no confidence that the non-seismic safety design has been adequately implemented for normal and accident modes of reactor operation in accordance with the requirements of the NRC regulations and the operating license application commitments in the Diablo Canyon FSAR. The Phase II sampling has served its intended purpose. Now, similar to the seismic redesign, it is imperative that the design of all safety features for all important safety systems be reviewed and reverified in a statiscally valid manner since judgment sampling is no longer warranted or appropriate.

B. Limitations of Construction QA/QC Review

28. In September 1982, PG&E proposed that S&W, under the direction of TES, conduct a limited construction QA/QC review of two site contractors - the civil and piping contractors. To date, 29 potential deficiences have been documented in the construction review. Of the 29, 23 have been classified as Class C errors, while 1 has been classified as a

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16. Ibid. 6, see EOI's 8017, 8041, and 8045. EOI 8017 has been identified as an Error A.

Class A error. However, the reports which have been issued fail to provide the requisite information which would enable an independent observer to evaluate what the identified deficiencies mean with regard to implementation of the QA/QC process. While the limited construction review should ultimately provide some useful information, in my opinion, the construction QA/QC review was improperly limited or restricted in five major aspects: numbers of contractors, QA/QC Program adequacy, QA/QC process implementation, overemphasis on paper, and vendor quality.

29. First, the number of contractors selected was inadequate to provide an overall assessment of the quality of the Diablo Canyon construction. Important site activities including those of the electrical contractor and the heating, ventilating, and air conditioning (HVAC) contractor were not reviewed. These are significant omissions. Further, there is no basis for assuming a correlation between the quality of concrete and the quality of electrical terminations. Also, HVAC and electrical contractor efforts are both complex and occur late in the plant cycle when there is greater schedule pressure. In my opinion, the construction QA/QC review should address a statistically valid random sample of the activities of all major site contractors in order to yield meaningful results that can be extrapolated to all construction.

30. Second, no review of the two selected contractors' QA/QC programs was conducted to compare the programs with the regulatory requirements of Appendix B to 10 CFR Part 50, GDC-1

of Appendix A and the ANSI QA/QC standards cited in the Diablo Canyon FSAR. Thus, the construction QA/QC review was not the type of program review conducted by Reedy for design activities which began with a review of the QA/QC program as compared to the regulatory requirements and PG&E commitments. Rather, PG&E and Bechtel personnel indicated that TES and S&W simply accepted as satisfactory the contractor's QA/QC programs and then attempted to confirm that aspects of the program had been implemented.[17] In my opinion, the contractor's QA/QC program should be demonstrated to be in compliance with the regulations and license application. Any areas of non-compliance or of omission should be addressed as appropriate as part of the implementation audit to determine if adequate compensating measures have been instituted.

31. Third, in reviewing the deficiencies, S&W apparently focused on the "safety significance" of the findings rather than focusing on what the deficiency may generically mean with regard to the overall QA/QC program implementation.[18] Such reliance on safety significance is misplaced in a QA/QC review, for it may only be fortuitous that the identified discrepancies resulted in no or a minor safety problem. Thus, in my opinion,

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17. Ibid. 2, pp. 102-104.

18. For example, see TES Semi-Monthly Report, February 11, 1983, File No. 9015, Rev. 2, File No. 9016, Rev. 2, File No. 9017, Rev. 2, File No. 9018, Rev. 2, File No. 9020, Rev. 2.

all discrepancies should first be evaluated with respect to to the QA/QC process implementation.

32. Fourth, the construction QA/QC review placed its major emphasis on reviewing installation QA/QC records or conducting visual inspections as compared to repeating actual installation tests or physical inspections of hardware items. In my opinion, the construction QA/QC verification program should verify, to the maximum extent possible with non-destructive examination, the proper installation of Diablo Canyon safety features in the as-built configuration. In addition, as discussed in detail in Section IV of this affidavit, a statistically valid sampling methodology should be utilized by TES and S&W. There is no evidence that such statistically based random sampling techniques were utilized in the construction QA/QC review.

33. Finally, no attempt was made by S&W to verify the adequacy of the QA/QC process implementation at the vendors of safety items or to confirm the quality of the received safety items. For example, there are approximately 24,000 Midland-Ross Company cable tray and conduit supports installed at each Diablo Canyon Unit. The supports were classified as safety-related, but were purchased as catalog (commercial grade) items. In December 1982, the NRC determined that the Midland-Ross QA/QC program and its implementation was deficient as follows:[19]/

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19. Letter, Crews to Eisenhut of the NRC, December 16, 1982.

"(1) there was no formal Quality Assurance (QA) program prior to 1979, (2) there were no records of the qualification of welding operators or welding procedures, (3) prior to 1980, spot welds were not sample tested and not controlled by procedures, (4) there was no traceability of material, (5) there were no quality records before 1980, and (6) generally, the current QA program did not meet the intent of 10 CFR 50, Appendix B criteria."

The actual quality of the installed equipment is still indeterminate. However, the NRC findings indicate that PG&E failed to properly document and control the quality of vendor supplied equipment as required by Criteria 4 and 7 of Appendix B. Further, the failure appears similar to PG&E's failure to properly control its seismic service related contractors. In addition, the Midland-Ross finding indicates that PG&E may not have properly identified all safety-related items or have completely listed such items in Section 3.2 of the FSAR. The potential generic implications of the two preceding deficiencies, as well as questions regarding PG&E's QA/QC measures for commercial grade items should be determined.

C. Verification Program Fails to Address SS&C's Important to Safety

34. The NRC in its order suspending the Diablo Canyon operating license found that[20/]

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20. CLI-81-30, p. 3.

". . . contrary to statements made in PG&E's operating license application, certain structures, systems, and components important to safety at the plant may not be properly designed to withstand the effects of earthquakes, and further indicates that violations of NRC's regulations in 10 CFR Part 50, Appendix B have occurred. Had this information been known to the Commission on or prior to September 22, 1981, Facility License No. DPR-76 would not have been issued until the questions raised had been resolved." (Emphasis added.)

Further in drafting the order, the Commission found that[21/]

". . . it is now uncertain as to the extent which structures, systems, and components important to safety of fuel loading and testing at up to 5% of rated power will in fact withstand the effects of earthquakes, . . ." (Emphasis added)

and thus the Commission made the order effective immediately.

35. However, despite the "Order Suspending License," both TES and the NRC have limited the reverification program to "safety-related" rather than "important to safety" items. There are important distinctions between the two lists of SS&C's, and the QA/QC requirements for such items.

36. The Commission has recently reiterated the important distinction between the terms "important to safety" and "safety-related." This distinction was explained in a November 20,

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21. Ibid. 20.

1981, memorandum from Harold Denton, Director of the Office of Nuclear Reactor Regulation, to all NRR personnel. "Important to safety" SS&C's, systems and components are defined as those which provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. "Safety-related" is defined with reference to 10 CFR Part 100, Appendix A as describing those SS&C's which are necessary to assure: (1) the integrity of the reactor coolant pressure boundary; (2) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the guideline exposures of Part 100. The Denton memorandum explains that safety-related is a subset of the class of important to safety items.

37. The Diablo Canyon FSAR used the term "important to safety" interchangeably with the term "safety-related" and in Section 3.2 of the FSAR defines "important to safety" using the Part 100 definition. Thus, there is a lack of evidence that PG&E has implemented a systematic QA/QC program, including a detailed equipment list, for all SS&C's "important to safety" as required by GDC-1 of Appendix A and Criterion 2 of Appendix B to 10 CFR Part 50. The S&W Phase II findings also indicate that even the list of safety-related equipment may not be complete. Further, the Bechtel topical report filed in the Diablo Canyon docket also only addresses a QA/QC program for "safety-related" SS&C's.

38. Two recent events underscore the potential safety importance of items important to safety but not safety-related being provided the proper classification, maintenance, and QA/QC treatment commensurate with their safety importance. The events were the failures to scram at the Salem plant, a Westinghouse PWR, on February 22 and February 25, 1983. The scram breakers as a single component were classified as safety-related. However, neither the under voltage nor the shunt trip coil which are subcomponents of the scram breaker and essential to its function were properly classified as safety equipment. As a result, they did not receive the required maintenance.

39. At a recent Commission briefing on the Salem events, Mr. Denton described the problem as a total breakdown. He found it difficult to see how the assistant plant manager had failed to recognize these scram breaker subcomponents as safety significant or to consider them safety grade for procurement or maintenance purposes.[22/] The Salem examples are directly relevant because they clearly show why Diablo Canyon must have a list of equipment and its classification consistent with its safety significance. Moreover, the Salem failures demonstrate that the NRC Staff must be assured that Diablo Canyon has implemented a systematic, quality program that provides the necessary care for the equipment according to its safety significance. For example, the Salem plant had a list (Master Equipment List) but the scram

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22. Transcript of March 15, 1983, Commission Briefing on Salem Events, p. 22.

breaker's shunt relay (which is important to safety) was not included on the safety-related list. Thus, for years the relay was given no maintenance. When it failed the first time (February 22, 1983), it was given ordinary commercial treatment.[23/] The result was that the breakers again failed on February 25, 1983.

40. The Salem event has a close parallel in Diablo Canyon's lack of recognition of items important-to-safety but not safety-related, and in the absence of a clearly defined systematic program of QA/QC for such items. In the interest of preventing failures such as occurred at Salem which may impact the safety of Diablo Canyon's operation, a retrospective review of the sfety classification and quality program should be promptly initiated.

41. Any of the preceding deficiencies in the PG&E and Bechtel QA/QC program relative to SS&C's important to safety are exacerbated by the NRC Staff's recent admission during my participation in the Shoreham operating license proceeding that:

> "The Staff does not review the quality assurance program for items important to safety but not safety-related, nor does it inspect for compliance with such a program." Speis

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23. Tr. Commission March 15, 1983, briefing on Salem event, p. 41.

et al., ff. Tr. 6357, at 8-9; Tr. 7063, 7480 (Haass); Tr. 16961, 17288-91 (Higgins).[24/]

Thus, neither the past nor current NRC Staff reviews or Inspection and Enforcement audits can be relied upon to provide a demonstration of conformance with the requirements of GDC-1 in Appendix A to 10 CFR Part 50.

42. In view of the fact that the same QA/QC program which was found to be inadequate for the design of safety-related systems in the plant may not even have been systematically applied to SS&C's important to safety, it is my opinion that in the absence of thorough verification of these items, there can be no assurance that these SS&C's have been designed or constructed in accord with the technical requirements of the NRC's regulations and PG&E's license application commitment.

IV

SAMPLING TECHNIQUES ARE BASED ON JUDGMENT RATHER THAN STATISTICAL METHODS

43. Sampling is being utilized in the ongoing Diablo Canyon reviews by PG&E/Bechtel, the NRC, and by TES and its subcontractors. These sampling programs rely on subjective engineering judgments rather than objective statistically valid sampling techniques. Thus, there is a question whether the conclusions of TES, or eventually the NRC, that are based on sampling data are justified, given the sampling methodology

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24. NRC Staff Proposed Opinion, Findings of Fact, and Conclusions of Law, Shoreham, Docket No. 50-322, Finding 7B:82, p. 85.

which was used. This is true where the samples taken were obtained in a non-random fashion and do not lend themselves to extrapolation to the populations of items and documents under study. In such an instance, it is my opinion that the substantive findings of TES and the NRC are unjustified.

44. An integral element of TES's verification program is sampling of structures, systems, and components to determine that they are in fact designed or constructed in accordance with applicable requirements. However, TES's program does not adequately describe the statistical basis for the criteria to be used for the selection of a suitable number and type of samples to be reviewed under the program or for the selection of items for additional verification. In short, TES has proposed to use sampling extensively without providing adequate guidelines or criteria for evaluation of that sampling. Thus, the TES program should be altered as follows:

(a) Define the confidence level which the auditors desire to achieve for each sampling effort and provide the basis for selection of that confidence level.

(b) Provide the statistical basis for the relative size of sample utilized in each case. If the sample is stratified, the basis and justification for the stratification should be given.

(c) For each sample selected, demonstrate factually that the sample is representative of the total population of the item being sampled.

(d) Define precisely the acceptance criteria for each sampling effort, together with the factual basis for those criteria.

(e) Specify precisely in advance the criteria to be used for expanding a sample based on the results of the initial sample.

(f) In addition, TES should specify in detail the scope of work proposed for the statistician who will conduct the Phase I program review of statistics.

VI

CONCLUSIONS

45. Based on the foregoing, I conclude that the significant new information set forth herein and in my May 24, 1982, affidavit demonstrates that PG&E and its major subcontractors failed to develop and implement a QA/QC program during the design and construction of Diablo Canyon which complied with the NRC's regulatory requirements. The examples given here document PG&E's failure to provide a QA/QC program for design and site activities in a timely fashion in compliance wth the license application and the regulations for activities conducted prior and subsequent to the 1977 Board hearings. We now know that significant errors resulted from the flawed Diablo Canyon QA/QC process.

46. The result of the mistaken assurances concerning the comprehensiveness of the Diablo Canyon QA program from PG&E and the NRC Staff is that the Board issued a seriously flawed

decision. The magnitude of significant design and construction discrepancies disclosed to date, and the widespread serious breakdown in management of the QA/QC program by PG&E and its major subcontractors, vividly illustrate the substantial uncertainty in the actual quality level achieved in design, construction, and installation of all important to safety structures, systems, and components at Diablo Canyon. A complete, statistically valid, design verification and physical inspection of all Diablo Canyon structures, systems, components, and other important safety features, as outlined in the preceding, is now both necessary and prudent. The results and underlying data, resulting from such a design review and site inspection, should be subject to the scrutiny of the Board and all parties in the ongoing Diablo Canyon licensing proceeding.

I declare under penalty of perjury that the foregoing is true and corect in all respects and that if called as a witness I could and would competently testify thereto.

Richard B. Hubbard

RICHARD B. HUBBARD

Subscribed and sworn to before me this 27th day of March, 1983.

Raymond A. Proctor

Notary Public In and For Said County and State

OFFICIAL SEAL
RAYMOND A. PROCTOR
NOTARY PUBLIC - CALIFORNIA
COUNTY OF SANTA CLARA
Comm. Exp. Dec. 20, 1985

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that on this date I caused copies of the foregoing "Supplemental Affidavit of Richard B. Hubbard" served on the following by U.S. Mail, first class, postage prepaid.

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DATED: March 29, 1983

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By _____

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EXHIBIT A

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

MAY 2 1983

Docket No.: 50-275

Dr. W. E. Cooper
130 Second Avenue
Waltham, Massachusetts 02254

Dear Dr. Cooper:

We have reviewed ITR 36 Rev. 0 and ITR 38 Rev. 1 which provide the evaluation and conclusions of the Stone & Webster audit of the QA that was applied to the Diablo Canyon Unit 1 construction activities under G. F. Atkinson and Wismer & Becker, respectively. Based on our review we have the following comments:

We find that the information for closing out EOI's is inadequate. The statement that an EOI was reviewed and analyzed, including additional information provided by PG&E, and that a completion report was issued is too general. In addition, the summary and evaluation of the review results do not address the corrective action or other resolution of the deficiencies identified during the audit. We request that you provide additional information in both reports such that they are sufficiently self-contained to allow a determination of the adequacy of the bases for closing out each EOI.

Secondly, we find that the review results do not appear to be entirely consistent with specific EOI findings. For example, ITR 38 Rev. 1 states that "...the contractor performed his work in compliance with PG&E Specification 8752...". However, many EOI's in the report identify specific noncompliances with the specification. We request that you clarify how the EOI findings agree with the conclusions.

We request that you revise both reports in accordance with the above two comments.

Sincerely,

Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

cc: See next page

MAY 5 1983

8305200723

EXHIBIT B

COPY

SWORN STATEMENTS

of

VIRGIL H. TENNYSON and RICHARD E. ROAM

Taken before BONNIE L. WAGNER

CSR License No. 5881

A Duly Qualified Notary Public

State of California

April 5, 1983

---oOo---

~~8304190488~~

A P P E A R A N C E S

YALE I. JONES, Attorney at Law, representing the law offices of JONES, BROWN, CLIFFORD & McDEVITT, 100 Van Ness Avenue, 19th Floor, San Francisco, California 94102.

SUSAN L. DURBIN, Deputy Attorney General, representing the office of the ATTORNEY GENERAL, 3580 Wilshire Boulevard, Los Angeles, California 90010.

PETER H. KAUFMAN, Deputy Attorney General, representing the office of the ATTORNEY GENERAL, 3580 Wilshire Boulevard, Los Angeles, California 90010.

---oOo---

VIRGIL H. TENNYSON and RICHARD E. ROAM,

having been first duly sworn by the Notary Public to testify the truth, the whole truth, and nothing but the truth, testified as follows:

MR. KAUFMAN: On the record. My name is Peter Kaufman and I'm a Deputy Attorney General with the State of California.

I have with me today Susan Durbin from the Attorney General's Office as well. We're here on behalf of Governor George Deukmejian as part of our role in representing him and the State of California in the ongoing Diablo Canyon

licensing proceedings.

One of the principal issues involved in those proceedings is quality assurance in the construction of the Diablo Canyon plant. In reading press accounts of the construction of Diablo Canyon we became aware that you gentlemen had a role in quality assurance at the plant.

We would like to ask you some questions today about your job with The Howard P. Foley Construction Company.

Why don't you state your names for the record, first.

MR. TENNYSON: Virgil H. Tennyson.

MR. ROAM: Richard E. Roam.

MR. KAUFMAN: Both Susan and myself will be asking you questions.

I think I will take the lead in asking these questions and Susan may step in from time to time where I falter.

The questions I ask I will ask of both of you and you can decide amongst you whether you want to answer each question separately or you can come to a consensus answer or you can elaborate on an answer that either one of you gives.

MR. JONES: Why don't we, as a matter of procedure, have Virgil answer primarily since he was the senior person there both in terms of position and years of service and then if Mr. Roam has anything to add, he can go ahead and indicate to you that he wants to indicate something.

Also, if you have direct information or direct perceptions that Virgil didn't have, then you pipe in.

MR. ROAM: Okay.

MR. KAUFMAN: Mr. Tennyson, let me ask you first,

as a preliminary matter, what is your occupation?

MR. TENNYSON: I was the quality manager, both quality control and quality assurance for a few years at Diablo.

MR. KAUFMAN: How many years was that?

MR. TENNYSON: A total of nine years that I was with the company and eight of those years was as quality control and quality assurance.

MR. KAUFMAN: So you began working at Diablo at what time?

MR. TENNYSON: February 4th, 1974.

MR. KAUFMAN: At that time what was your position?

MR. TENNYSON: I was hired as a quality engineer.

MR. KAUFMAN: And you advanced to the position you last held?

MR. TENNYSON: Yes. I advanced to chief inspector and then to quality manager which was quality control manager at that time.

MR. KAUFMAN: Before I ask you what each of those entails, what positions have you held prior to that time, prior to your working with Diablo?

MR. TENNYSON: I worked with Litton Industries in the ship building portion of the company as sort of a quality engineering coordinator which encompassed reviewing all the purchase documents that were to go out for bids prior to them being let out to a company to insure that they had all the quality requirements within them. It was in coordination with engineering quality assurance and all of that.

MR. KAUFMAN: How long were you employed with Litton?

MR. TENNYSON: A total of about a year.

MR. KAUFMAN: And before that?

MR. TENNYSON: I was with Todd Shipyard for about 13 years, approximately.

I went to Todd as an electrician and then advanced to management over the electric shop and fabrication and did some engineering and was awarded a quality control stamp from the Quality Control Department at that time to stamp and inspect material through the shop going to the ships to be built which was on Navy vessels and civilian.

MR. KAUFMAN: Thank you.

Mr. Roam, can I ask you the same series of questions.

When did you first start working at Diablo?

MR. ROAM: First started working there in July or August of '73. Then I left in August of '74 after I brought Virgil Tennyson.

In between I spent several years at different jobs. You want them too?

You know, I worked at Diablo twice.

MR. KAUFMAN: So you left in '74 and when did you come back again?

MR. ROAM: Come back about August 24th of '82.

MR. KAUFMAN: Why did you come back?

MR. ROAM: Why?

MR. JONES: I don't think that is relevant.

MR. KAUFMAN: All right. I'm just curious.

You were in a senior position in '74?

MR. ROAM: Yes.

MR. KAUFMAN: What was your position at that time?

MR. ROAM: Assistant manager.

MR. JONES: Quality?

MR. ROAM: (Witness nodding.)

MR. JONES: She cannot take down nods of the head. You have to use words.

MR. ROAM: Oh. Assistant manager quality control, yes.

MS. DURBIN: What was your position at Diablo just until recently?

MR. ROAM: Well, until recently it was assistant manager quality control working under Virgil Tennyson.

MR. KAUFMAN: What are the Foley Construction responsibilities at the Diablo Canyon plant?

MR. TENNYSON: They are subcontracted by PG&E as the general contractor.

They were up until, I would say, around '77 or something like that, they were just an electrical contractor.

Since that time they have acquired the tail ends of contracts of Guy F. Atkinson which is a structural steel builder out there and S&Q Corporation which was the instrumentation group. Also from W. Becker which was mechanical, you know, pumps and things of that nature.

MR. KAUFMAN: So from '78 on the Foley Company was doing the electrical work at the plant for some or all of instrumentation?

MR. TENNYSON: All of the instrumentation.

MR. KAUFMAN: All of the instrumentation?

MR. TENNYSON: With the exception of what PG&E might do on its own out there and their operations group.

I guess Foley was exempted from some of the work and it depended on management deciding what was to be put or let out to the Foley Company to work on.

MR. KAUFMAN: Well, can you give me an example of some of the instrumentation that Foley was responsible for?

MR. TENNYSON: Can you, Rick, name anything right off the top of your head?

MR. ROAM: What we was working on when we left was the rivulet system for Unit 1 and Unit 2.

MR. KAUFMAN: Can you tell me what that is?

MR. ROAM: No, I couldn't, to tell you the truth.

MR. TENNYSON: It was a little hard for the quality control and quality assurance department to determine certain systems out there due to the fact that we had procedures which told us how to inspect a certain joint or configuration, things of that nature.

We did not file our documents or we did not document things per a system. So it was a little hard to tell exactly what system you were working on at all times because the paper-work that the engineers -- well, the engineering section would be able to take you and lead you right into a system and tell you when they would complete a system but Foley QC department could not do this.

Like I said, it was because of the nature of the

documentation being separate in the file and we didn't put it together as a system.

MS. DURBIN: You were working to inspect various components or various systems without really understanding the working of the system you inspected?

MR. TENNYSON: Yes.

MR. KAUFMAN: All right.

MR. ROAM: Well, if you're through with that I was just going to say the other system we were working on.

MR. KAUFMAN: Why don't you.

MR. ROAM: The other system was our modifications and design changes that were created due to safety changes from other plants.

MS. DURBIN: In other words, you were kept updated and if something didn't work over at one plant you would change that so you wouldn't have that same problem at Diablo?

MR. ROAM: That was basically it.

MR. KAUFMAN: That was for instrumentation?

MR. ROAM: Yes.

MR. KAUFMAN: So the Foley Company was doing the work mandated by the Nuclear Regulatory Commission, the correction work mandated by the Nuclear Regulatory Commission, as far as instrumentation was concerned?

Would that be a fair characterization?

MR. TENNYSON: Through PG&E. We didn't work with NRC or anybody else. They might have communicated that to PG&E and PG&E would redesign something or say, "Change this."

I couldn't tell you about the other part. We just

took our directions from PG&E.

MR. KAUFMAN: You were working on change orders then?

MR. TENNYSON: Right.

MR. KAUFMAN: There was an instrumentation system there and Foley was going in and changing an existing system?

MR. TENNYSON: Correct.

MR. KAUFMAN: Is that correct?

MR. TENNYSON: Yes.

Also the installation of new systems too, such as the rivulets. Some of them were changes. Some of them were for new systems.

MS. DURBIN: I'd like to ask a couple questions.

I'm interested in what you said about taking over the tail ends of various people's contracts.

What did you mean by that?

MR. TENNYSON: Well, it was like Guy F. Atkinson more or less completed the big portion of their work but there may have been outstanding smaller portions of work to pick up like a few minor modifications or just anything that would have to be done.

It would be impossible for a company to kind of close out their books and their records and not have something outstanding.

What I mean by that is there may have been little platform changes or things that PG&E maybe had not gotten any design or engineering done on it prior to the contractor moving out of his position and someone would have to pick

this up.

I don't know how this came about but our company, evidently, was awarded what we call the "cleanup contract" to clean up the tail ends of other various types of work.

MS. DURBIN: I see.

Had Foley had much experience in the past in doing work on structural steel contracts?

MR. TENNYSON: That I really could not tell you.

MS. DURBIN: How about instrumentation contracts?

MR. TENNYSON: I know nothing about Foley other than being connected with them at Diablo Canyon.

MS. DURBIN: I see.

MR. TENNYSON: So I couldn't really say what they were involved in or capable of prior to that.

MS. DURBIN: Let me ask you something else. It sounds like to me that most of your prior past experience has been in the electronics field for --

MR. TENNYSON: No.

MS. DURBIN: That is not correct?

MR. TENNYSON: No.

MS. DURBIN: I'm sorry.

MR. TENNYSON: I did work electronics, electrical shipboard and in the aircraft company.

Also I worked structural with Todd Shipyard for many years in designing and engineering the installation of equipment, foundations, inspecting, welding, things of this nature.

I have had numerous years of structural steel, you

might say, because on ships there is quite a bit of it and also with structural aircraft. I worked for Douglas.

MS. DURBIN: And I assume the same would be true of pump systems that Foley was working on in Diablo. Had you worked with pumps before?

MR. TENNYSON: Yes, installation of pumps, valves, piping, small tubing.

Yes, I think I was very familiar with that.

MS. DURBIN: Were you inspecting anything at Diablo, any types of systems with which you had not worked before?

MR. TENNYSON: I would say no, that I had been familiarized with most of the things that I was involved in due to the --

Well, I was in the Air Force for four years and I had an extensive training course in A&E which covers all that.

MS. DURBIN: You'll have to tell us what A&E is.

MR. TENNYSON: Aircraft and engineering mechanics. I completed the school during the four years in the service which covered hydraulics, pneumatics, instrumentation, electrical and skin, you know, fabrication of the plane.

So I was familiar with it even though maybe I hadn't had "hands-on" in some areas.

MS. DURBIN: Your experience seems very broad.

Were the other inspectors, the people who worked for you at Diablo, similarly qualified or were people inspecting things with which they had no previous experience or familiarity with?

MR. TENNYSON: Well, I would say that there must have been some situations where people were involved in their inspection that had no prior experience in it other than the training period we might have put them through.

MS. DURBIN: Is that your experience? Did you ever have that experience that you were working on a system you had no previous familiarity with or types of equipment with which you had no familiarity about?

MR. ROAM: Me?

No, most everything I've touched at one time or another.

MR. KAUFMAN: Now, you indicated earlier that you had three positions as engineer, chief inspector and quality manager.

What's the full hierarchy of that, if you understand my question, starting from the bottom to the top?

MR. TENNYSON: Rick, why don't you start. You started in the very beginning of '73 and take it through that portion as to who you were working for, what you did.

MR. JONES: Do you want to go off the record for a second? Maybe I can save some time here.

MR. KAUFMAN: Yes.

Off the record.

(Discussion off the record.)

MR. KAUFMAN: What is the entry level position in your department?

MR. TENNYSON: You mean, as far as qualification or requirement to become an inspector?

MR. KAUFMAN: Well, is an inspector the -- I guess, for want of a better term -- the lowest position in the quality control department?

MR. TENNYSON: Well, we tried very hard to set up a program and did have it set up to have a trainee inspector trained.

When I would bring a trainee in we would put them with a qualified inspector, one that had been in the field enough times where we felt that they could handle their job properly out there and do the procedure well enough.

We always tried to indoctrinate a new inspector or a trainee, you might say, with the proper procedures and procedures that you would expect and put them with a qualified person in the field until we felt they were ready to go on their own in the inspection field.

MR. KAUFMAN: What kind of background did you look for in hiring a trainee or in undertaking to train someone?

MR. TENNYSON: In some cases we really didn't have -- we didn't have any background search on it.

Numerous times someone was just brought into the office and they said, "This is going to be a new inspector for you."

I would put them to work after a little questioning to find out where they were best fitted and I tried to ~~work~~ them into the areas that I could work them into, as best I could.

MR. KAUFMAN: Who would bring these people into the office for you?

MR. TENNYSON: That would be my project manager who was my boss, Skip Moses.

MR. KAUFMAN: These were other workers within the Foley Construction Company?

MR. TENNYSON: No. They would be new hires from various places.

Foley did bring in some of their own people: Sons, daughters, things of that nature, from the Martinez office and they would be brought in and used in various positions.

MR. KAUFMAN: Did some of these people have no previous construction background?

MR. TENNYSON: It would be hard for me to say at this point. Sometimes I didn't even see their application or resume or whatever, if they had one.

That went straight to the front office file and they were given to me to train and make an inspector out of.

MR. KAUFMAN: What were the qualifications for an inspector?

MR. TENNYSON: There were no written procedures as to what qualifications had to be.

I was told numerous times that we were not trying to hire the inspectors in accordance with the ANSI 4526 document or in accordance with 10 CFR 50 because we were not obligated, evidently, to those documents at that time.

MR. KAUFMAN: That was at what time?

MR. TENNYSON: Well, that was during, I would say, hiring up until the last year and a half or so.

MS. DURBIN: Until 1982?

MR. TENNYSON: Up until approximately that time, yes.

MS. DURBIN: You'll have to forgive us for our ignorance.

What is that ANSI document, whatever, that you referred to?

MR. TENNYSON: Your ANSI documents are the more pronounced versions of the 10 CFR 50 which is your 18-point criteria for building of a nuclear plant.

MS. DURBIN: So the ANSI requirements are published by the Nuclear Regulatory Commission?

MR. TENNYSON: I'm sure it is.

The plant inspectors were to be qualified to certain levels or degree of levels by ANSI 4526 and your audit team, which is an audit of your quality assurance group, were to be qualified to ANSI 45223.

Wasn't it, Rick?

MR. ROAM: Yes.

MR. KAUFMAN: What is your understanding of the specifics of those requirements?

MR. TENNYSON: Well, up until, like I say, approximately the last year and a half, until we started getting audits from Pacific Gas & Electric's QA team who, at that time, Mr. Dick Twitty was in charge.

Well, we were really not complying with the ANSI 26 requirements because we were told by Pacific Gas & Electric that we didn't have to.

MS. DURBIN: Who told you that?

MR. TENNYSON: Well, this was numerous times from the beginning since I went to work in '74.

Every time it would come up through the QA department, "Should we level our people?" Well, we would mention ANSI 26 and we would mention Appendix B of 10 CFR 50.

Well, it was either by PG&E inspectors or by their resident engineer up there, who was a coordinator with us between PG&E and the Foley Company.

It was by word of mouth that we were not subject to all of those rules and regulations and that PG&E would tell us what portions of it we had complied with and they had the option to comply with the rest of it.

MS. DURBIN: Who was the most recent resident engineer who told you something about that? Do you have a name?

MR. TENNYSON: That would be Mr. Don Rockwell.

MR. JONES: Do you want to add something, Rick?

MR. ROAM: I was just going to say that in 1974 when we first started the program Virg and I and the others tried leveling people, ABC-type inspectors.

MS. DURBIN: Could you explain to us a bit more what "leveling" means?

MR. ROAM: In other words, more qualified inspectors. In other words, you got a trainee like a D or an E inspector and after a certain amount of time, testing and checking out then we can level him to A, B or C or D-type inspector.

In other words, he's qualified to do certain types of inspections and only those. After a certain period of

time, he can go to another step.

We started that and what it was, if PG&E -- well, we wrote it into a procedure and if they didn't like it they would take it out of the procedure.

This was one of the ways of telling us what we will and will not have to do.

See, like Virg said, sometimes in the process of saying, "Well, we don't want you to do something."

Instead of coming out and telling us they would write a new procedure. That's one way how they did some of that.

MS. DURBIN: Were you ever dissatisfied, Mr. Tennyson, with the performance of any of the employees that were presented to you as opposed to the ones that you had hired yourself, the ones whose qualifications you really couldn't check on?

MR. TENNYSON: I don't think I could honestly answer that.

MS. DURBIN: Okay.

MR. TENNYSON: No more so than any of some of the others I might have brought in myself.

But that's kind of a general thing.

MR. KAUFMAN: Off the record for a second.

(Discussion off the record.)

MR. KAUFMAN: Back on the record.

You indicated that until recently you were not qualifying inspectors to the standards set forth in Appendix B of the Nuclear Regulatory Commission's regulations for quality

assurance.

What standards were you using prior to 1982?

MR. TENNYSON: If I may correct you on that.

Really, other than 10 CFR 50, Appendix B requirements, it would have been ANSI 4526 which would be your leveling of your personnel. 26 for quality control people and 223 for quality assurance auditors, lead auditor and so on.

MR. JONES: I think what he's asking you though, before that point in time where you started in the last year and a half complying with those regulations, what standard did you use to guage the experience of new hires?

Is that correct?

MR. KAUFMAN: Correct.

MR. JONES: Or did someone else do that for you?

MR. TENNYSON: I had to more or less base, I guess, my opinion based on the supervision that I had over those personnel to keep me filled in as to whether they were qualifying properly or not, if they could handle the position that we had put them in.

There was no written procedure or basic steps that you had to qualify to other than your documentation was to be filled out properly and you knew your procedure, you inspected to your procedures.

MR. KAUFMAN: Would it be fair to say then you based it on your judgment?

MR. TENNYSON: Yes.

MR. JONES: And I think you said the judgment of

the supervisory people working for you?

MR. TENNYSON: Right.

MR. KAUFMAN: The next position above inspector is what?

MR. TENNYSON: Supervisor.

MR. KAUFMAN: And let me ask the same question about that: Did you apply similar judgment standards as to the qualifications for supervisors?

MS. DURBIN: Before 1982?

MR. TENNYSON: Yes. It was pretty much the same as qualifying inspectors.

MR. KAUFMAN: How many years' experience did supervisors have as a rule, if you can answer?

MR. TENNYSON: Some not too many.

MR. ROAM: A lot of it deals with the fact that you only get what you pay for.

If you give a guy seven, eight dollars an hour you ain't going to get anybody with any experience. The person with experience is going to go down the road and get fifteen, twenty dollars an hour.

That was one of the handicaps we had. There was no judgment really on salaries.

We had a maximum of -- what did I hire in at?

Well, I think it was $9.83.

MR. TENNYSON: $9.86, I think.

MR. ROAM: Yes. That was top wages.

MR. KAUFMAN: How much were the people whose work you were inspecting, how much were they making?

MR. JONES: You mean like welders and craftsmen?

MR. KAUFMAN: Correct.

MR. TENNYSON: With benefits some, on an average of $20 an hour or more.

MR. ROAM: Better than twenty plus a per diem.

MS. DURBIN: You indicated that salaries you were hiring people in at were not up to some other companies' salaries.

Were they up to an industry average based on your experience?

MR. ROAM: Everybody wanted to switch and go to work for Pullman. They were making about $15.45 an hour or so.

MS. DURBIN: And Pullman was working where?

MR. ROAM: At Diablo.

MS. DURBIN: At Diablo?

MR. ROAM: Yes.

MR. TENNYSON: During this time, speaking on this salary range here, during the time the big push on the modifications came out there, we could not hire inspectors nor make supervisors fast enough to cover the influx of welding personnel, iron workers and other craftsmen that were in the field.

The quality department was so small at that time. They were hiring a hundred, like a hundred or a hundred and fifty a day of iron workers alone and in trying to put a program together to get the quality -- well, the quality control department was responsible for qualifying these

particular welders.

In trying to get enough people in the field to do all of these functions plus cover the everyday work that we had already been saddled with, well, you had a lot of inexperienced people out there, inasmuch as inspectors. I mean, they were just not used to that kind of pressure and push and the enormous amount of people that were calling them for inspections.

We had to call in a subcontractor by the name of Cataract.

Cataract started sending in --

MR. KAUFMAN: Excuse me. Is that spelled like the eye cataract?

MR. TENNYSON: Yes.

Cataract started sending in people to us.

I know nothing of the contract negotiations or anything or how this came about. This was all taken care of by Skip Moses.

But the people started coming in to me with a certification paper that qualified them, leveled them to an ANSI 4526 level.

These people were put into the field with a very brief indoctrination period and were to start inspecting iron workers' weldments and other various functions out there.

MS. DURBIN: We'd like to really ask in detail about that period.

When did the "big push," as you described it, begin?

MR. TENNYSON: Let me finish first about what Rick

was talking about concerning wages and it may explain a little bit about the disgruntled personnel out there.

I was sitting there myself making $21.80 an hour. Rick, as a supervisor, was making 15.

MR. ROAM: 15.50.

MR. TENNYSON: 15.50 an hour and we had this Cataract Corporation sending in inspectors to us who were relatively new people.

They had to be broke in, indoctrinated and so on. They came in with a rate of 15.50 an hour paid by our company.

MR. ROAM: Plus 27.50 per diem.

MR. TENNYSON: Was it 27.50 a day per diem?

MR. ROAM: Something like that.

MR. TENNYSON: These men came in new. We had to put them with an experienced inspector that had been in the field prior to them coming in.

It wasn't long until the word got around the tremendous amount of wages that Cataract was making versus the wages that our own Foley people were making.

We had quite a problem with that in trying to deal with it because the people were very upset.

MR. KAUFMAN: I can imagine.

MR. ROAM: Same way with me. Here's a guy that's an inspector and I'm supervising him, telling him what I need to have done.

He's making more than me and I'm the one getting chewed up every time something goes wrong.

After a while you just say, "Well, what's the use,"

you know.

MR. KAUFMAN: What kind of ratio of inspectors to workers did you have in 1973? Do you recall?

MR. ROAM: 1973 when I went there, I think, I was the fourth person.

There was a manager, assistant manager, two or three inspectors, something like that in 1973.

MS. DURBIN: Inspecting how many people's work?

MR. ROAM: Well, at that time all we had was electrical. It must have been two or three hundred electricians.

MR. KAUFMAN: And that ratio continued for how long?

MR. ROAM: Until 1974, first part of '74 when the AEC performed their first audit on Diablo Canyon.

As I understand it, they told PG&E to shape up. Basically it was the fact that there was no real effective quality program at Diablo Canyon in the electrical aspect.

I understand, as was told to me, that they gave supposedly Foley 30 days to write a quality program, develop a quality control program, implement some program or they'd be removed from the site. That was the first part of '74.

That's when I called Virgil and a few of the other guys I knew of and we sat down and started developing a quality control program.

MR. KAUFMAN: At that point, Virgil, when you came on how many people did you bring with you?

MR. TENNYSON: No. I didn't bring anyone with me.

MR. KAUFMAN: How many did you bring in?

MR. JONES: How many came on with him, would be a better question.

MR. ROAM: I hired him.

MR. KAUFMAN: All right.

MS. DURBIN: How much did the staff expand at that point?

MR. KAUFMAN: I knew he left in '74.

MR. ROAM: I left about the end of '74.

MS. DURBIN: How much did the staff expand at that time? An estimate is fine.

MR. TENNYSON: Some of those records that you have there might show.

Was there an old organizational chart with them?

MR. JONES: No.

MR. TENNYSON: None that old? Well, I don't think my department ever was over 45 people.

MS. DURBIN: So it increased perhaps tenfold?

MR. TENNYSON: Yes.

MR. JONES: No. That's not right. That would be up to 400 when you left.

MR. KAUFMAN: Well, prior to 1974 there were four people in the quality control department and now we're at --

MR. JONES: You got up to 45. When did you jump from 40 or 45 to over a hundred that they were when you left?

MR. TENNYSON: That was in '82. December, October, November it started.

MR. ROAM: What was it when I came in there? I was only about the sixth or eighth inspector of electrical.

So your department when I came in was about 30 some people?

MR. TENNYSON: Close to 40, I think.

MR. ROAM: Really?

MS. DURBIN: What year was that?

MR. TENNYSON: 1982.

MR. ROAM: I came on in August 24th so somewhere around that period.

MR. TENNYSON: From August it started increasing and when we left in March '83 it was probably standing at --

Well, I don't know if the totals are on there or not but a hundred and forty or a little better.

MR. ROAM: There's quite a few on there that does not show which was more documentation control and record systems.

All I was interested in was the inspectors.

MR. KAUFMAN: All right.

Now, let me go back to 1973. What kind of program did you have for quality assurance?

MR. ROAM: Well, one day I'm sitting there in the office and Virg comes up to me and says he had a phone call.

He says, "There's a guy here from PG&E who wants to talk about NCR's."

Well, he's talking to Virg and Virg says, "Well, why don't you talk to the man who was there. Maybe he can explain why."

Anyway, his question was, "How come there was no NCR's prior to 1974?"

MS. DURBIN: Could you tell us what an NCR is?

MR. TENNYSON: Non-conformance report.

The only thing we ever wrote is against a vendor if a piece of equipment came in damaged. So that will give you an idea of what kind of program it was.

MR. KAUFMAN: Okay.

I take it there were inspectors out there who were checking the work. Is it that there are no records kept for non-conforming work or what?

MR. JONES: Well, maybe you should answer first whether his assumption is correct that prior to 1974 there were inspectors out there inspecting the work.

MR. ROAM: Yes. We did certain types of inspections.

MS. DURBIN: What types of inspections did you do?

MR. ROAM: Just cable pulls, cable pulling wire, some foundations and stuff.

That was about it. Very general.

MR. TENNYSON: Electrical equipment, foundations.

MS. DURBIN: What proportion of the work that was done, would you say, was inspected at that time in 1973?

Did you inspect ten percent of the work, 20 percent, a hundred percent?

MR. ROAM: Some percentage but I couldn't tell you now what it was.

MS. DURBIN: Less than a hundred percent?

MR. ROAM: Oh, yes.

MS. DURBIN: Less than 50 percent, would you say?

MR. ROAM: Yes. We didn't even have calibrations

set up, did we?

MR. TENNYSON: You set it up when I came in.

MR. ROAM: So it was less than that.

MR. KAUFMAN: Can you give us an example of the kinds of things you did not inspect?

MR. JONES: In 1973?

MR. KAUFMAN: In 1973.

MR. ROAM: Tool calibrations, probably a hundred percent of the raceway installation.

MR. TENNYSON: You might clarify and say electrical raceways.

MR. ROAM: Material receiving, there was no control on that. No control on the material itself coming into the plant to be used for installation.

Rail rod control, welding procedures, welding applications, all that we didn't do.

In fact, that's what we set up in '74 as one of the first three projects I put Virgil on was welding procedures: rod control, terminal blocks.

MR. KAUFMAN: After 1974 when you were required to adopt a detailed quality control program, what kind of a program did you adopt?

MR. TENNYSON: Well, in the beginning, right at the beginning we started establishing procedures in accordance with the specifications, the PG&E specifications for building the plant.

MR. ROAM: And 10 CFR 50.

MR. KAUFMAN: All right.

MR. TENNYSON: And in doing this the specifications called out certain codes and standards to be followed which we had to research and develop the procedures based on, you know, the codes and standards, too.

So as procedures were established, I think, there was --

Well, we had an interim period of time that we had a strike, a labor strike out there which put us off six months.

I say "put us off," it put the production forces off.

The quality control department, not being in the union, crossed the line and came on in and performed their functions and research and evaluation and procedures and so on, as the procedures were written, to cover all aspects of the job that we were told to write.

They were submitted to Pacific Gas & Electric and Pacific Gas & Electric would approve them or tell us how they wanted them changed, you know, certain portions of them.

By the time the production forces came back to work we pretty much had all our procedures established and inspection criteria set up.

We had probably enough inspectors at that time, I'd say, to --

Rick, you were still there after the strike, weren't you?

MR. ROAM: Yes, I think just a few days after that I quit.

MR. KAUFMAN: The program that you eventually

adopted did not meet the requirements of 10 CFR 50 Part B, did it?

MS. DURBIN: You mean his understanding of it?

MR. KAUFMAN: Okay.

Your understanding -- if I can testify here for a second -- the way I understood you to say it was you started with an attempt to meet the requirements of 10 CFR 50 and PG&E specifications for the plant and during the course of your attempt to adopt this program you had discussions with Pacific Gas & Electric Company and they made modifications to the program that you had proposed to them?

MR. TENNYSON: Yes.

MR. KAUFMAN: My question then is: Did those modifications result in a program which required less than 10 CFR 50 Part B?

MR. TENNYSON: The reason I hesitate to answer this is because of not knowing or never seeing a contract between Foley Company and PG&E as to what our contractual obligations were to PG&E.

PG&E claims that they could appoint the contractor for a certain portion of 10 CFR 50 and they could absorb or be responsible for other portions through their monitoring of The Howard P. Foley Company with their own people.

MS. DURBIN: You weren't sure if your program had to meet all of the requirements independently or if PG&E could satisfy some of those requirements apart from what Foley did?

MR. TENNYSON: Right.

MR. ROAM: Right.

MS. DURBIN: You mentioned before that PG&E instructed you to write quality control programs for certain portions of the work.

I assume that means they instructed you not to write quality control programs for other portions of the work?

Am I stating that correctly?

MR. TENNYSON: No. I didn't mean it that way.

Anything that The Howard P. Foley Company was awarded to work on did require a procedure and procedures were established and inspection forms were drawn up and put with these procedures and documentation was required upon the completion of an inspection of a certain item.

For instance, a termination procedure was written and there were various forms within this procedure which -- depending on the portion. That's what I meant by the portion of work you were doing to the procedure because it did cover many portions of work within the electrical termination.

If you were terminating a wire to a terminal block you would use one particular form or if you were installing a jumper you would use another form because there may have been six, eight forms.

MR. ROAM: At that time, right.

MR. TENNYSON: That would cover different portions of the work.

MS. DURBIN: Thank you.

MR. KAUFMAN: Has that procedure been changed, the procedure you were utilizing after 1974?

Is that procedure still being utilized now?

MR. TENNYSON: Yes.

That procedure is being utilized. It's been changed many times and all of the changes are on record, in most cases, as to who requested the change and in some cases why.

Those would be found in the procedure files along with the most current one.

MR. KAUFMAN: Have you ever received any instructions from anyone to deviate from the written or adopted procedures?

MR. TENNYSON: Yes.

Skip Moses directed me to pull some red tags on structural steel work that was in the field which were the result of a non-conformance or many non-conformances written regarding various non-conformances with weldments or maybe modification plate installations, things of that nature.

The red tags were written by the inspector and hung on a particular area which was considered by the quality control department to be non-conforming at that time either to design or to procedural requirements.

These red tags, in essence, did slow down the work because maybe the red tag would cover only one weld out of maybe ten, fifteen welds or would restrict a person from installing a plate possibly closer to that or in relation to it.

The new personnel had not enough field work to know the procedures well enough to work on or through a red tag and this would cause a lot of confusion in the field and was possibly slowing the work down.

We were told to pull the red tags down and don't write red tags on anything that we could possibly have answered from Pacific Gas & Electric engineering department through another method like an engineering disposition request -- EDR -- or writing up a certain problem you had run onto and could possibly be answered by PG&E through their engineering division, evidently in San Francisco.

These things were easier and much quicker to process than a non-conformance was because of the signatures that had to be applied to it and the agreement between the two companies.

So, in essence, the red tag was accused of slowing the work down.

MR. KAUFMAN: Let me see if I understand this correctly. You were told by Mr. Moses to remove red tags that were placed on otherwise non-conforming work because it would slow down the work of --

MR. TENNYSON: Production.

MR. KAUFMAN: The construction people who were not experienced enough to be able to work around the red tag?

MR. TENNYSON: Yes.

MR. KAUFMAN: You were still, however, to report the --

MR. TENNYSON: Non-conforming items?

MR. KAUFMAN: Yes, to PG&E's engineering department for them to determine whether they could correct it in some other fashion?

MR. JONES: You've got two things confused here

actually because, I think, what he's saying -- correct me if I'm wrong in my understanding -- what you're saying is with respect to those particular non-conformances that the red tags related to they were still taken care of, isn't that right?

MR. TENNYSON: Yes.

MR. JONES: And it was also said to you by Mr. Moses that if it was possible not to write red tags or NCR's at all but to go directly to PG&E's engineering department he would prefer that?

MR. TENNYSON: Yes.

MR. JONES: So those were two separate things.

MS. DURBIN: So when you hung a red tag the work actually was fixed?

MR. JONES: You want to ask him about the work that related to that particular set of red tags that were pulled?

MS. DURBIN: That's what I'm trying to ask about.

If you hung a particular red tag, was that work fixed later?

MR. TENNYSON: Yes. The work was fixed.

MS. DURBIN: Just a difference in how you were going to get the work fixed?

MR. TENNYSON: A matter of procedure when the red tag was to be removed and that was after the work had been reworked and the inspector had inspected or approved the situation.

New documentation would be made showing the results of this inspection and this rework and the non-conformance

would be signed off and at that time be ready to put in the file and the red tag could be pulled off of the item which would clear the non-conforming item.

MS. DURBIN: What happened when you reported it to PG&E's engineering department instead?

MR. JONES: That assumes that he followed that procedure.

I don't know if his department ever did that.

MS. DURBIN: Thank you for that correction.

Did you, in fact, stop hanging red tags and contact PG&E's department instead on some items?

MR. TENNYSON: I didn't personally. Our engineering department did which was within The Howard P. Foley Company.

We had a group of engineers who were working in the field on problems between production and quality control and they, in turn, would write up a problem on an EDR -- we called them that -- and they would be taken to PG&E for quick disposition as to how they wanted to accomplish this situation.

MR. JONES: Those people didn't work for you?

MR. TENNYSON: No. They were working strictly under Mr. Moses and Mr. Ray Lathrum who, at that time, was the assistant project manager.

MS. DURBIN: However, people continued to hang red tags, didn't they?

MR. TENNYSON: Yes.

MR. KAUFMAN: How did you make a determination that -- I'm sorry to be slow about this. This is a significant item. I just want to make sure we're all clear on this.

You received instructions from Mr. Moses to deviate from the program and to, in fact, establish another program or parallel program for certain types of discrepancies.

A separate unit was established for dealing and reporting these kinds of discrepancies to PG&E's engineering department; is that correct?

MR. TENNYSON: Yes.

MR. KAUFMAN: And these people were not under your control, they were under Mr. Moses' control?

MR. TENNYSON: The engineering group that wrote the EDR's you're speaking of?

MR. KAUFMAN: Yes. The group that reported these types of errors to PG&E's engineering department?

MR. TENNYSON: Yes.

I don't think you wrote any, did you, Rick?

MR. ROAM: No.

Strictly an engineering function.

MR. KAUFMAN: How were these decisions made to not red tag but do an EDR?

MR. JONES: Again you're assuming he made that decision or anyone that worked for him did.

MR. KAUFMAN: I'm sorry about the question. Let me try it again.

Were all these requests made by Mr. Moses? Was he the one who made this determination?

MR. JONES: I'm not trying to be difficult but --

MS. DURBIN: Let's go off the record for just a moment.

(Discussion off the record.)

MR. KAUFMAN: Back on the record.

And the question is: Did you follow the procedure that Mr. Moses asked you to follow?

MR. TENNYSON: Yes, I think I did.

No, no. I'm sorry.

Not the one Mr. Moses asked me to follow. I followed the procedure which was established and is a QCP3 reporting of non-conforming conditions.

MR. KAUFMAN: So your department continued to red tag everything that was non-conforming?

MR. TENNYSON: Yes.

MS. DURBIN: And Mr. Moses' department apparently carried on a parallel program at the same time?

MR. TENNYSON: Mr. Moses was over -- he is the project manager of The Howard P. Foley Company.

MS. DURBIN: Well, other people who reported to Mr. Moses who did not report to you engaged in other procedures that Mr. Moses had suggested of reporting certain items as engineering deviation rather than as non-conforming work?

How was it decided who would evaluate which work or certain types of work assigned to you or certain work assigned to other staff?

MR. TENNYSON: I think that could be determined by -- well, if the quality control department were to be called out on a particular installation and found something non-conforming we would write a non-conformance on it, if it warranted it.

Now, if the quality control department had not been called out on that particular function yet and it maybe was reported to PG&E or to one of our engineering staff the decision was made somewhere other than in the quality control department to make that an engineering disposition request.

MS. DURBIN: So, in other words, you red tagged everything that was not conforming that you saw but there were many items of work your department did not see and the decision as to what you would see and what you would not see was not made by you?

MR. TENNYSON: No. It is strictly determined by the procedure as to when you would be called for a particular type of inspection.

MR. ROAM: You'd be called in by production, "We finished X amount of work. Come look at it."

MS. DURBIN: So they decided when to call you in?

MR. ROAM: By procedures, yes.

In other words, you can't go from Point A to Point B without somebody in there looking at it.

MS. DURBIN: What I'm trying to get at is: When did the engineering staff go out and write up an EDR and who decided that they would look at the work rather than you looking at the work?

MR. ROAM: Well, their looking at the work would not buy-off that work. We had to buy-off the work whether right or wrong.

In other words, we had final say. Engineering might be there and say, "Oh, we got a problem. Write an EDR and

clear it."

When our people come out they might show us this EDR which accepted the change and we just attach it together with our paperwork and put it in the file.

MR. KAUFMAN: In other words, nobody in the construction end deviated from the procedures of calling you in. You saw everything. It's just that there was an EDR going on independently as well?

MS. DURBIN: Before you got there?

MR. JONES: As far as you know?

MR. TENNYSON: We think that's the situation.

Now, we had no way of knowing what we weren't called in on.

MR. ROAM: Correct.

MS. DURBIN: Obviously.

MR. ROAM: Because we don't know the whole scope of what all is going on because --

MR. TENNYSON: Our procedures governed us. That's why --

MR. ROAM: Like you asked me: "What's the rivulet system? What does the rivulet system totally contain?"

Do you see?

MR. KAUFMAN: Well, my next question on that is: For this program what percentage of the work are you looking at when production calls you in? Are you examining 100 percent of the work or are you examining a portion of that work?

MS. DURBIN: I've gotten a little lost here.

What point in time are we talking about? Pre-'82

or post-'82?

MR. KAUFMAN: 1974.

MR. ROAM: 1974.

MR. KAUFMAN: Yes and on until the present you're using the same program up until -- well, my understanding is that you're using the same procedures as in 1974?

MR. ROAM: Not the same procedures. The same philosophy possibly but the procedures change like the first procedure I wrote was writing inspections of raceways.

We're now on 11 or 12 revision, somewhere in that area and since the time we wrote it there have been many, many changes.

To say that we're inspecting the same way then and now or now as then, no.

MR. JONES: I think what Mr. Kaufman's question went to though is what percentage of the production work was inspected once these procedures and philosophies were established?

MR. ROAM: Oh.

MR. JONES: If you know.

MR. TENNYSON: In some cases like weldments, welding on Class 1 installations a hundred percent of the installations were inspected that we were called on.

We have no idea whether we were called on all of them or not because of, like I say, we did not work to a system.

Production triggered us as to when they had completed something or by the procedure it required an inspection

and then they would notify us that they were ready for an inspection in the field.

MS. DURBIN: Could you tell us who in production we might talk to to find out when you were called and when you were not called?

MR. TENNYSON: I can give you superintendents' names.

MS. DURBIN: That would be nice.

MR. TENNYSON: Mr. Harold Roland.

MS. DURBIN: For whom does he work?

MR. TENNYSON: Howard P. Foley Company, electrical superintendent. He works for Howard P. Foley Company, Skip Moses.

MR. JONES: Would this be a good time to break for lunch?

MS. DURBIN: Yes. Fine.

(The luncheon recess was held from 12:30 until 1:45.)

MR. KAUFMAN: Back on the record.

What I'd like to explore now are the circumstances in which you were asked to deviate from the described procedures for quality assurance.

Now, you've already indicated the instance where Skip Moses asked you to stop putting tags on work. You've indicated that you did not comply with that request and continued to follow the QA procedures and tag the work.

Are there any other instances where you were asked to deviate from procedures?

MS. DURBIN: Could I stop you for a moment.

Off the record for a second.

(Discussion off the record.)

MR. KAUFMAN: On the record.

Let me strike the last question and start over.

Were there any other circumstances in which red tags were pulled, any other circumstances?

MR. TENNYSON: Yes.

There was a situation where Skip Moses asked me to pull some red tags down so that production could work on those non-conforming items.

I refused to pull the red tags until the conformance or disposition was to the point of where corrective action could be taken.

Later, I don't know if it was a day or two later, my night assistant quality manager -- they called him night shift -- was evidently called into Mr. Moses' office and informed that he was to go out and pull the red tags so that production could perform work on them, on the non-conforming items.

Can we go off the record?

MR. JONES: Yes.

(Discussion off the record.)

MR. KAUFMAN: We're going to go back and start from the beginning with this thing because I'm confused now.

MR. JONES: I got confused there, too.

MR. KAUFMAN: Let's start where we were, I believe, before we adjourned for lunch.

Sometime before that the question was asked: Were

you ever asked to deviate from the established procedures? And you answered initially that Skip Moses had asked you to pull red tags from non-conforming work because the production workers were too inexperienced to be able to work around those red tags.

Now, I'm going to ask you on what date was this conversation with Skip Moses, approximately?

MR. TENNYSON: It couldn't have been over three weeks before we left, could it?

MR. ROAM: No. It was recent, within three weeks.

MR. JONES: February?

MR. ROAM: Yes.

MR. TENNYSON: Had to be in February.

MR. KAUFMAN: 1983?

MR. TENNYSON: Mid-February 1983.

MR. KAUFMAN: All right.

What was the result of that conversation with Mr. Moses?

MR. TENNYSON: Well, I refused to pull the red tags until they were at proper -- or by procedure at the proper point of corrective action.

Then just shortly after that, a day or two, I found the stack of red tags in my office where my assistant manager, Bob Carter, who was the night man, found the stack of red tags in his shelf.

I asked him what they were and he said that Skip Moses had called him in the office and told him to pull all those red tags down and keep them in the shelf back there so

that production could work on the non-conforming items out there.

MR. KAUFMAN: What did you do after that?

MR. TENNYSON: There wasn't a lot I could do at that point.

I knew I was treading on thin ice. My full intention was -- and there was no way to avoid it in any way --

Well, the fact the red tags were pulled was a procedure violation but the non-conformances could not be closed out and accepted by me until the corrective action had been performed.

MR. KAUFMAN: Am I correct in assuming that when a tag is placed on work a record is made of the fact that the tag has been placed on the work?

MR. TENNYSON: Yes. The non-conformance procedure establishes the fact that you are to hang a red tag on a non-conforming item when possible.

That red tag is to remain on that item until a proposed disposition is made either by the customer or agreed to by the customer.

When the non-conformance is written the proposed disposition is typed in and a work copy sent to production. That's their authority to work on that particular item with the red tag on it to perform corrective action.

When the corrective action has been performed they are to notify quality control department. Quality control will then go out inspect to the proposed disposition and the work in accordance with the procedures and at that time either

accept it or reject it.

If it is accepted the non-conformance is sent back into the quality control department or quality assurance department, whomever is in charge of the non-conformances at that time, and they will type it up and officially the corrective action will be signed off by various people.

When the last signature is on it PG&E signs off the non-conformance and then the red tag can come down.

The non-conformance is filed in its official place.

MS. DURBIN: May I interrupt?

MR. KAUFMAN: Yes.

MS. DURBIN: How long does all that usually take?

MR. TENNYSON: It could go through -- I've seen them go through in a day's time on an item.

In fact, the one that we were -- the reason Rick and I was terminated -- well, it went through in one day's time, didn't it?

MR. ROAM: Yes.

MS. DURBIN: What was the average time for such an item to be handled?

MR. TENNYSON: Depends on Pacific Gas & Electric and their agreement with the proposed disposition that we put on it to correct the situation.

In most cases we would negotiate with them before we put the proposed disposition on it so that there may be no delay in getting it processed.

Sometimes when it got to PG&E for their acceptance of the proposed disposition it might stay up there for a

month. It could stay up there for two months or it could come back down that day.

It depended on whether they had to go to San Francisco to acquire the information they needed or the approval to accept it.

MR. KAUFMAN: With respect to these red tagged items, what corrective action, if any, was taken with respect to them?

MR. TENNYSON: The particular ones that were found?

MR. KAUFMAN: The ones that were pulled, the pulled red tagged items?

MR. TENNYSON: We have no way of knowing that at this point.

That happened and just a few days later we were terminated.

MR. KAUFMAN: And what were the portions of the plant -- what systems were those that the red tags were hanged on?

MR. ROAM: It basically looked like tags from the fuel-handling building.

MR. KAUFMAN: Do you recall what systems?

MR. ROAM: It would be probably the structural steel.

I just looked at the tags and wondered why they was there.

Virg told me and I put them back on the desk. It's not my problem. I got enough of my own. That's his'n.

MR. KAUFMAN: If the tags were on structural steel what could that involve? What kind of --

MR. TENNYSON: That was modification.

MR. ROAM: Modification, seismic support.

MR. KAUFMAN: Strictly welding?

MR. ROAM: And probably material, too. Welds, reinforcing gussets, plates, could have been any one of the things that the modification involved and what they called the modification, the big push on this last annulus steel modification.

MR. KAUFMAN: Subsequent to this first instance in which Mr. Moses asked you to deviate from procedures, was there another instance in which he came to you and asked you to deviate from procedures?

MS. DURBIN: Do you really want to ask subsequently?

MR. KAUFMAN: Off the record.

(Discussion off the record.)

MR. KAUFMAN: Back on the record.

Did Mr. Moses' request to you about the red tags reflect standing orders from him with respect to the way the quality assurance operation should be conducted at Diablo?

MR. TENNYSON: No, it didn't.

MR. KAUFMAN: Let me ask the question another way, then.

Did --

MS. DURBIN: Let me try it.

MR. KAUFMAN: All right.

MS. DURBIN: Mr. Tennyson, did Mr. Moses ever express to you any desire that you work faster or that you find fewer errors?

MR. TENNYSON: Well, generally the subject of most of the meetings that we had in his office was over the fact that the quality control department was slowing down the job.

MS. DURBIN: What would be the substance of a typical meeting of that type? What would usually be discussed?

MR. TENNYSON: Normally it was due to a non-conformance that had been written which had possibly slowed the job down or someone in production disagreed with the subject and at that time it would be discussed more heavier that they wanted non-conformances lightened up on.

You know, less things written up on non-conformances and more problems covered on EDR's.

MS. DURBIN: Did Mr. Moses ever tell you you should write up fewer non-conforming reports?

MR. TENNYSON: He indicated this very strongly. I don't know if he told us directly.

MS. DURBIN: How did he indicate it?

MR. ROAM: "You're holding up the job, man. We got to perform. We got to get it done. We got to get it done."

MS. DURBIN: You repeated those phrases several times. Does that mean it was repeated to you over again on many occasions?

MR. TENNYSON: Yes.

MR. ROAM: Yes.

MS. DURBIN: Did Mr. Moses ever indicate to you that your job might depend on how quickly production moved or how much the NCR's slowed it down?

MR. ROAM: How much my job depended?

MS. DURBIN: Did he ever indicate to you that his job might depend on how quickly production moved?

MR. ROAM: I can't think of any.

MR. TENNYSON: I was told numerous times that if we slowed down the job, if we didn't -- that is, The Howard P. Foley Company -- didn't perform as PG&E thought we should there was a good chance we were all out and down the road.

MS. DURBIN: Does "down the road" mean out of a job?

MR. TENNYSON: Yes.

I was told by Mr. Moses that if the chances were that he was going down the road that I was going down about ten minutes before he did.

MS. DURBIN: Which you took to mean he would fire you first?

MR. TENNYSON: Very definitely.

MS. DURBIN: How much control did you feel that the production department or how much influence did you feel that the production had over Mr. Moses and the directions he gave you?

MR. JONES: You've got it backwards. He was head of production.

MS. DURBIN: He was your boss and head of the production department?

MR. TENNYSON: Yes.

MS. DURBIN: He put pressure on you to help him speed up production by writing fewer NCR's or being a little

less careful than you felt you should be, is that true?

MR. TENNYSON: My feeling it is, yes.

MR. KAUFMAN: Did you feel --

MS. DURBIN: Wait a minute. I have one other question.

Did you ever get that feeling from any person other than Mr. Moses? Was there any pressure put on you or any dissatisfaction indicated to you about your performance in that you were being too careful?

MR. TENNYSON: Yes, many times.

MS. DURBIN: By whom?

MR. TENNYSON: By Mr. Don Rockwell of Pacific Gas & Electric.

MS. DURBIN: What was his position?

MR. TENNYSON: Electrical resident engineer and contract administration to Howard P. Foley.

MS. DURBIN: Anyone else?

MR. TENNYSON: Mr. Forrest Russell.

MS. DURBIN: Who was he and what position did he hold?

MR. TENNYSON: Civil resident engineer of PG&E, Pacific Gas & Electric.

Then I have to name a Mr. Vick Smart who I dealt with quite extensively for the last nine years.

He was under pressure to get the job done and, in turn, did cause me to be under a lot of pressure and my department.

MS. DURBIN: How much pressure did you feel you

were under? Can you compare it with other jobs you have held?

MR. TENNYSON: I feel that the pressure was more -- much more than any job I've ever been on before.

MS. DURBIN: Have you ever been on jobs where you were under intense pressure other than Diablo?

MR. TENNYSON: Yes.

MS. DURBIN: What type of job would that be?

MR. TENNYSON: Would have been aircraft, Douglas Aircraft Company in meeting production schedules.

Also Todd Shipyard, working on ships for commercial and military vessels.

MS. DURBIN: How would you compare the degree of pressure to get the job finished that you experienced at Diablo with your other situations?

Would you say it was as intense, more intense, much more intense? I realize this is qualitative.

MR. TENNYSON: Much more intense.

MR. JONES: At Diablo?

MR. TENNYSON: At Diablo.

MS. DURBIN: Did you feel your department of quality control was truly independent there?

MR. TENNYSON: Not in any way.

MS. DURBIN: Did you feel that production was very much in control of your department or slightly in control?

MR. TENNYSON: I feel that production's influence on the project manager determined pretty much the pressures that were put on the quality control department.

MS. DURBIN: Where did the pressure from production

come? Was it from Foley internally or did PG&E exercise any influence?

MR. JONES: If you know.

MS. DURBIN: Yes, if you know.

What was your impression?

MR. TENNYSON: Rick, what do you think?

MR. ROAM: Well, I think a lot of it had to come from PG&E because every morning at 7:30 sitting there is Forrest Russell.

He's badgering me, how come I'm still hanging tags? How come I haven't removed any red tags? How much did I remove?

MS. DURBIN: Who was Forrest Russell, by the way?

MR. ROAM: PG&E's civil resident engineer who was evidently hounding production and hounding me so that they can get the work done, production can get the work done.

MS. DURBIN: How often did that happen that he put pressure on you to not hang so many tags?

MR. ROAM: 7:30 every morning.

MS. DURBIN: Every morning?

MR. ROAM: Yes.

MS. DURBIN: What a lovely way to start your morning.

MR. ROAM: You bet and I'd come down and cry on Virg's shoulders.

MS. DURBIN: What time period was this that this was happening? Was it on an extremely regular basis?

MR. ROAM: Whenever I made assistant.

MR. TENNYSON: Had to be two months after Christmas

or before.

MR. ROAM: After Christmas.

MS. DURBIN: Christmas of 1982?

MR. TENNYSON: Yes.

MS. DURBIN: So this is the beginning of 1983 when you experienced this intense pressure?

MR. ROAM: After Christmas is when they started the build-up.

MS. DURBIN: What was it like during 1982? Did you experience much pressure in that year?

MR. ROAM: Me?

MS. DURBIN: Either of you.

MR. JONES: Rick only started in August of '82, isn't that right?

MR. TENNYSON: He came in under pressure though.

MS. DURBIN: During the last half of 1982?

MR. ROAM: In the last half of '82, yes, pressure was starting to build as I was going to Virg explaining to him, "We need the people. We know what is happening and we need the people now to get them prepared and ready for the influx."

Virg said, "Hey, my hands are tied. I can't do anything. Do the best you can."

So the first thing we did was start trying to train the people, upgrading them, keeping them familiar with procedure changes, philosophies of inspection as to how it was to be done.

MR. KAUFMAN: Did either Skip Moses or the people

from PG&E, who you talked to about the red tags, attempt to distinguish between the kinds of items that you were red tagging?

Was there one particular kind of NCR that they didn't want you to hang a tag on whereas others they would allow you to hang a tag on?

MR. ROAM: No. Just red tags in general.

MS. DURBIN: Any distinction made between Class 1 and Class 2 equipment in regard to --

MR. ROAM: For Class 2 we did no inspection. On Class 1 we did an inspection.

On Class 2 I should take that back except for Class 2 raceways.

MS. DURBIN: Electrical raceways?

MR. ROAM: We'd only check those if they crossed over a Class 1 raceway or piece of equipment and then we would just walk it down and if there was no Class 1 under it we forgot about it.

MR. KAUFMAN: Let's get to the types of NCR's that you were finding.

Where did you find the majority of NCR's?

MR. ROAM: Structural steel welding.

MR. KAUFMAN: Could you assign a percentage to that, say, 50 percent of your errors, 60 percent of your errors?

MR. ROAM: I would say about 65 percent.

MR. TENNYSON: Probably was.

MS. DURBIN: What kind of errors were you seeing there?

MR. ROAM: In fact, I'd say it was about 80 percent. We didn't have that much administration when --

MR. TENNYSON: Yes, that's when the big influx of non-conformances started during the big push and the heavy push on the structural annulus steel modifications.

MS. DURBIN: Which started when?

MR. TENNYSON: Actually it started before Christmas but the build-up got bigger and the influx of new people that we're talking about -- when it went to like, I think, they said 700, 800 iron workers and the company went up to somewhere around close to 1900 people in just a matter of a couple of months there.

MR. KAUFMAN: From the time that big push started to the time just before you left the site, had the error rate changed in any way?

MR. TENNYSON: Not to my estimation.

MR. ROAM: Well, not until the last couple of days. They was trying to change it.

We was trying to get the foreman to do his job, inspect the work before he called QC.

In other words, you're the foreman and you got a welder. You should be sure that your welder did the work right then call QC.

QC would inspect it and if he was satisfied with it, accept it or if not, reject it.

But the foremen would not check the work. They called QC so QC would come up and no choice; it's either right or wrong.

If it's wrong, you write it up. If it's right, we had to write it up also but accept the work and then go to the next stage of work.

MR. KAUFMAN: How many times had you approached the foremen on the job?

MR. ROAM: To do that?

MR. KAUFMAN: Yes.

MR. ROAM: We didn't approach the foremen. We approached management which was Skip Moses and get their people to do their side of the work first.

Then when they were satisfied call us and that would cut down your red tag situation.

In other words, until it's turned over to us it's in process and, therefore, they didn't do virtually anything with it to make it right.

If the guy has burned through, undercut or whatever, he can go ahead and repair that but once we have looked at it it's out of the process. It's now into the final stage of that portion of the work.

At that time it's either right or wrong.

MR. KAUFMAN: What was their reaction to your request?

MR. ROAM: "Yes, that's what we're going to do."

MS. DURBIN: And did they do it?

MR. ROAM: No.

Therefore, it stayed the same and the other thing was PG&E had me write a procedure called a "quick fix design change" because the designs were so bad in a lot of cases and

what was supposed to be there was not there and what wasn't supposed to be there was there.

MR. KAUFMAN: What time frame are we talking about?

MR. ROAM: At the end. In fact, the EDR -- you signed it, didn't you?

Well, the day before we got fired was the fact that they was going to put a resident engineer in the field with our QC people which he would then give it the magic wand.

MS. DURBIN: What does that mean?

MR. ROAM: Magic signature. PG&E accepting responsibility, relieve Foley of any responsibility of any design changes or modifications that have to be made in the field to get the iron job done.

MS. DURBIN: That was not a normal procedure, was it?

MR. ROAM: No.

What it did then was exempt the implementation of QCP3 which was the NCR-type process.

As long as my inspector had that change and they worked with that change, you put it with his report and it went in our file.

MS. DURBIN: How many of those were you seeing on an average day?

MR. ROAM: We hadn't seen any because we got fired the day after.

MS. DURBIN: The day after this started?

MR. ROAM: Right.

So I don't know what they're doing now but I talked

to -- well, just what people have told me.

MS. DURBIN: Off the record for a moment, please.

(Discussion off the record.)

MS. DURBIN: What was occurring right before you left? What happened the day before you left?

MR. KAUFMAN: Could you explain the procedure that was being used just before you left with respect to NCR's?

MR. ROAM: To eliminate writing an NCR they used a couple different memos.

One of them was the "quick fix design change" method.

MS. DURBIN: Was that what it was actually called, the quick fix?

MR. ROAM: Yes.

What it is, it is a process used by PG&E to expedite field design changes required to get the job done on schedule.

This was versus waiting to send the information back up to San Francisco so they said, "We're going to as-built the job here because what you showed us on the drawing don't match. We cannot do it."

MS. DURBIN: What does "as-built the job" mean?

MR. ROAM: Well, it's like you design that door there to be six foot tall but along the way you find you got an eight-foot door. So you put in an eight-foot door.

I'm going to make up another sketch now showing an eight-foot door instead of a six-foot door.

MS. DURBIN: So you change the drawing to conform to what's physically there?

MR. ROAM: Right.

You see, this is an as-built situation.

MS. DURBIN: So just before you left the resident engineer would, when he saw something that would otherwise be a non-conformance, write up a new design, okay that design and you would then inspect the work on that new design rather than the original design?

MR. ROAM: Correct.

MS. DURBIN: Thank you.

MR. KAUFMAN: Do you know what PG&E's procedure was for sending the new drawing back to its headquarters?

MR. ROAM: This is part of what we put into the procedure, that it would be done onsite this way.

Whatever way they had drawn up was sent up to PG&E in San Francisco and incorporated into the drawing and they had supposedly gone through their calculations and then their final as-built drawing was made and then sent back down to Diablo Canyon.

At that time to assure ourselves I talked with Virgil about it. I said, "We got to assure ourselves somewhere that it is done."

So we left a clause in the procedure that we will check our records against these as-built drawings to assure ourselves that that's what we really got.

In other words, that as-built sheet did not get left out of the master drawings.

MS. DURBIN: You were obviously taking great pains to make sure this was done correctly.

Did you get the feeling within the company that your work as quality control and quality assurance people was valued?

MR. TENNYSON: Pardon me?

MS. DURBIN: Did you get the feeling in your own company that your work was being valued, that your work was a value and appreciated?

MR. TENNYSON: No. I never did have that feeling.

MS. DURBIN: What feeling did you get?

MR. TENNYSON: I've always had the feeling that the only reason the whole quality department was there was merely because it was a contractual obligation on Foley's behalf to have, I guess, a quality department.

The contract required Foley to establish a quality program. That's the way it was.

I felt the only reason we were there in the first place was to fulfill those obligations.

MR. KAUFMAN: What kind of errors were you finding in the instrumentation work that you were looking at?

MR. ROAM: Errors?

MS. DURBIN: We use that term generically.

MR. KAUFMAN: What kinds of NCR's were you finding in instrumentation?

MR. ROAM: Very little because there was really not anything to go by. You had a standard set of details and if it didn't meet the detail you just tell engineering and engineering would draw up some new details.

So you never had anything wrong.

MR. KAUFMAN: Could you give me an example of that?

MR. ROAM: Supports for tubing, instrumentation tubing. There was never any type of a layout or sketch to say how you're going to get from Point A to Point B.

You just go from Point A to Point B. How you get there, I don't give a darn. Just put it in.

MS. DURBIN: How long did that go on? Was it a standard operating procedure since -- well, since when?

MR. ROAM: Yes, since '73-74 until recently. Vance Parker, who I put in charge of our welders' certification program for a while and --

You won't see him on that work chart there. I switched him over to instrumentation engineering because that was his major background was hangar supports.

With his aid and me constantly trying to pressure construction they were starting to come up with sketches to show not only construction but our inspectors what they're doing.

You know, a detail, a sketch to go by of what you need to do, what they intended to do and where we're going to put in a new tubing or change things.

Prior to that there was no sketches.

MS. DURBIN: How could you possibly inspect work when you had no sketch to compare it to?

MR. ROAM: They had like a similar type isometric drawing but it doesn't really show you much.

It was just for typical installation of equipment which is: "Put this equipment on a wall and install it this

way." That's the typical installation.

Now, not each installation is the same or was it shown as to how it is. It was just typicals. Everything was typically done.

MR. KAUFMAN: Did you use the same procedure that you used with the structural design changes?

Did you wait to determine whether these design changes had been incorporated into the master design for the plant before you signed off on the NCR?

MR. ROAM: Well, we never had any real NCR's in the instrumentation that I knew of while I was there in charge of it.

Most everything in that case was -- well, we was working with production engineering and if we saw a problem or a problem coming up we would inform them before we'd get there to get the situation corrected or something to cover the situation.

In other words, we had a little more lax time in instrumentation to look farther ahead than we did in the civil or structural steel work.

Therefore, we could sort of try to see what was happening a little bit ahead of time instead of hindsight.

MR. KAUFMAN: Mechanical; what kind of errors were you finding, what kind of NCR's were you finding in mechanical work?

MR. ROAM: Well, mechanical, there again we didn't have too many NCR's that I knew of because if we would come to a situation where there was anything wrong we would just

hold up inspection until they corrected it.

If it's right or wrong we're not going to buy it. Therefore, if we're not going to buy it they can't sell it and they have to rework it to make it satisfactory.

So then they would either rework it, scrap whatever they're doing and start over or seek PG&E engineering waiver of whatever it is saying, "Yes, that's okay. We'll buy that."

So if we buy it that's fine. We put it with our report and we put it in the files and say, "Here it is. It's yours."

MS. DURBIN: How often did that occur?

MR. ROAM: I don't know. Maybe 20 percent of the time.

MS. DURBIN: Again, what time period are we talking about?

MR. ROAM: I can't give you the date. Whatever the date was that Virg put me over in instrumentation.

MS. DURBIN: That's fine.

MR. ROAM: I can't tell you that exact date.

MS. DURBIN: But in the latter part of 1982?

MR. ROAM: Latter part around Christmas time.

MR. KAUFMAN: Let me ask you the same question about the pumps. Same things?

MR. ROAM: Well, rotating equipment was a little bit different. See, we had rotating equipment which was mainly just torques and modifications or maintenance.

There was more on the maintenance side. Remember, everything was virtually at Diablo Canyon already. That was

about the most smoothest running deal we had in rotating equipment.

MR. KAUFMAN: How about strictly electrical work?

MR. ROAM: Strictly electrical, well, electrical, all we did was installation. We did nothing on checking, testing operations or anything like that.

In other words, any of the megor tests.

MS. DURBIN: What does that mean?

MR. ROAM: You test continuity or test the insulation in your wire.

MS. DURBIN: And that's so you don't --

MR. ROAM: To make sure you don't go to ground or have a fault in your system.

That was done by PG&E directly themselves. They were responsible for that.

MR. KAUFMAN: So the result of all the work you were inspecting at the plant, the principal area in which you were writing NCR's was in welding?

MR. ROAM: Correct.

MS. DURBIN: But often that was because that was the only area where you had an objective standard or objective drawing to which to compare work you were seeing, isn't that true?

MR. ROAM: Well, no. We had standards for raceway supports.

And in electrical we'd have a raceway support and they'd put a detail on it and it would say Detail S-269.

We would try to look at the sketch and yes, that's

an S-269.

It's bolted and it looks okay and doesn't look like it's going to fall down.

Then we'd complete the documentation and that was it basically on electrical. The conduit was there. It was the right size and right color code and went from Point A to Point B.

MR. TENNYSON: I think the reason it was smoother in electrical is because everyone was more familiar with it because we started there as the electrical contractor and the electrical details were much clearer as to how the raceway under the -- the notes and so on were clearer as to how the raceway was to be laid out, what sequence of events was to take place and procedure was clearly defined, more clearly defined than tne others as to what you were looking for.

Also the people were more familiar with it because they had worked longer with it.

So consequently it did go a little smoother in that respect.

MS. DURBIN: Do you think your people were more able to use their own judgment and experience in evaluating electrical rather than going purely by drawings and so forth?

MR. TENNYSON: Yes.

Well, not so much, no. I'm sorry.

It did go strictly by the drawing but the drawings and details were clearly defined to us as to what each individual support was to consist of, how many bolts, how many cross-members, what size the cross-member was, exactly what

it was to look like.

I mean, they were drawn on a book that was like six inches thick and had 634 pictures in it of various types and each picture was clearly defined with notes on it of substance and so on, type of material, the whole works.

MR. KAUFMAN: Am I correct in understanding that the design work was better for electrical, therefore, it made your job and the job of those people who were installing electrical work easier?

MR. TENNYSON: Yes.

MR. KAUFMAN: And you would not say that for the structural steel aspects of the job?

MR. ROAM: They were good drawings probably but they still tried to use the mirror image.

MR. KAUFMAN: They were still using the old drawings?

MR. ROAM: You had a left and right power plant.

MR. KAUFMAN: At what time were they using the mirror image drawings?

MR. ROAM: At what time?

MR. KAUFMAN: Were they using it in 1982? Did they ever stop using the mirror image drawings that you knew of?

MR. ROAM: They continued.

MS. DURBIN: They were still using the mirror image drawings when you left?

MR. ROAM: That's what it appeared to me, a left and right.

They used -- maybe I'm using the wrong terminology.

They make up a typical and this typical could be

used seven different places within that plant or within this building.

- Now, you take that typical to this installation and you could be looking at it from the inside or looking at it from the outside, in which case if we found the whole thing wrong getting ready to put the whole thing together we'd say, "Darn, we did it on the wrong side. We were supposed to be standing inside the building looking out when actually we were on the outside of the building looking in."

Anyhow, we'd rip it out and redo it.

MR. KAUFMAN: Whose responsibility is it for applying the drawings to the jobsite?

MR. ROAM: Well --

MS. DURBIN: If you know.

MR. ROAM: I really don't know.

I know we got drawings from PG&E but they come to our engineers and what our engineering department did, I could not tell you.

MS. DURBIN: Who was responsible for furnishing you with the drawings against which you compared the work that you inspected, the standards against which you compared the work you inspected?

MR. TENNYSON: The customer, which would be PG&E, was responsible for all design to us.

MS. DURBIN: And up to the time you left they were still furnishing you drawings which were not absolutely clear as to whether they were left-hand or right-hand Unit 1 or Unit 2?

MR. TENNYSON: I'm not familiar with that portion of it because of the fact that, I think, the situation that Rick is talking about -- and I did overhear a certain conversation out there when we called the engineer over to ask him for clarification on it.

Anyway, Rick Brun is the engineer who is the civil engineer at The Howard P. Foley Company. He was called over for discussion on a drawing that Bob Carter found.

MR. ROAM: I think it was Bob.

MR. TENNYSON: Bob Carter found it along with one or two other people and they had gone out to inspect it.

It was found to be not like the installation or it was the wrong drawing and that's about all I know about it.

MR. ROAM: We fabbed up some T-braces.

MS. DURBIN: Can you answer my question, Mr. Roam?

MR. ROAM: What?

MS. DURBIN: Were you ever supplied with drawings that were consistently right-handed or left-handed for the appropriate units that you were inspecting or were you constantly working with mirror image drawings up until the time you left?

MR. ROAM: I can't really say because I think I got it confused with a typical detail installation.

MR. TENNYSON: Could we go off the record for a second here?

MS. DURBIN: Of course.

(Recess taken.)

MR. KAUFMAN: Back on the record.

During the break Mr. Roam wanted to clarify about the mirror image drawings so let me see if we can clear this up.

When we're talking about the design sketch and the errors coming from the design sketch where are those errors occurring?

MR. ROAM: Where? Well, in some cases the structural steel members that were not of a configuration engineering thought they were for these modifications.

MS. DURBIN: Is it sometimes unclear from the design sketch whether you should be looking straight at the member from the inside or whether you should be looking at the member from the outside of the building?

MR. ROAM: True.

MS. DURBIN: I think we got that clarified.

Let's go on.

MR. KAUFMAN: Let me go on to a slightly different topic.

Have you or any of the people working for you been harassed by workers at the production end of the Foley Construction Company?

MR. ROAM: Yes.

MR. KAUFMAN: Could you give us some examples of that harassment?

MR. ROAM: One was of the new Cataract people that came in -- well, Richard Spencer, a welding inspector that I had on the mechanical side, was harassed quite a bit by

construction at first.

He was inforcing them to try to meet code and the procedure and they didn't want to because it was costing them X amount of rework.

MR. KAUFMAN: When you say "them," who?

MR. ROAM: Construction.

MR. KAUFMAN: Who specifically?

MR. ROAM: You mean the construction foreman?

MS. DURBIN: Either that or a company name?

MR. ROAM: Well, it's Foley. We were all Foley people there.

MR. TENNYSON: What superintendent would be in charge of that?

MR. ROAM: I don't know. I was just trying to think of the guy's name.

MR. KAUFMAN: When this harassment occurred Mr. Spencer, I take it, reported this to you?

MR. ROAM: Correct.

MR. KAUFMAN: And what did you do when you received his report?

MR. ROAM: Went up and talked with the foreman, told him, "He's here to do his job. We will meet code. We will meet the specifications."

They didn't really like it but realized that they had to try to meet some of it.

The thing that was bothering them was that the inspection intensity was not that strong before.

Now, all of a sudden, how come it is?

MS. DURBIN: What time was this? What year? What month?

MR. ROAM: First part of '83.

MR. TENNYSON: Yes.

MR. KAUFMAN: Did anything change after you talked to the superintendent?

MR. ROAM: Not really. They just more or less tolerated each other but they managed to work some things out.

When I finally had to remove Richard and put him over at the welders' certification program, they was very upset with it because they learned that he was picking out things in advance to help them so they wouldn't have a delay.

Then we had the situation with Roger Meek and I really don't know.

MR. TENNYSON: He was a quality control inspector for civil at that time inspecting on welding and structural.

He had been in the field numerous times and been harassed by a production person, unknown to me.

MR. KAUFMAN: Could you indicate what type of harassment that was being done to him?

MR. TENNYSON: Roger -- it's kind of touchy. I think they were playing with him.

There was an iron worker out there evidently that would go around patting him and calling him "fat boy" and threatening to kiss him on the cheek and things of that nature.

Roger tried to avoid him and he finally told him that if he didn't leave him alone, he was going to have to

tell his foreman.

He finally did have to go to the foreman and tell him that the man was harassing him or bothering him.

Roger had many inspections to perform out there and he was limited in the time that he had to do them.

Anyhow, the production man was quite upset, I guess, because Roger Meek had gone to the foreman on him and he told him if he ever went to the foreman he was going to whip him or something, threatened him in some way.

Well, he kept grabbing him or holding onto him and Roger kept trying to get away. Finally he did get away from the man and he come into the office to explain it to me.

So I, in turn, took the situation up to Mr. Moses. Moses, as far as I know, did absolutely nothing about it.

It was dropped at that point and Roger was left on the job and I changed him around, put him in another area or something.

MR. ROAM: You put him in another area to get him away from the guy to divert the situation.

MR. KAUFMAN: Was harassment a problem for your people in preventing them from doing their job?

MR. ROAM: We just found ways of getting around it.

MS. DURBIN: It was a problem, though?

MR. ROAM: Oh, yes. Basically with the new people coming in it was.

The old-timers that had been there for years, they understood the situation in some aspects. They didn't like it but they knew they had to live with certain things.

But a lot of new travelers coming in did have problems.

MR. KAUFMAN: What was your relationship to the Nuclear Regulatory Commission inspectors?

MR. JONES: Could you be a little more explicit. What do you mean by that?

MS. DURBIN: Did you ever meet any Nuclear Regulatory Commission inspectors? Did you ever see them?

MR. TENNYSON: Well, I understood that we had two resident NRC people at Diablo but, I think, the only time they ever came to see me or to negotiate at any time with me was during a time when we had an NRC audit.

Then they might come along with the offsite NRC people or in one or two cases they came down with PG&E quality assurance personnel on an audit.

Other than that I had no communication much at all with them.

MR. KAUFMAN: The only time that either of you saw the NRC inspectors or anyone from NRC was during these audits; is that correct?

MR. TENNYSON: Yes.

I had many more dealings with Dennis Kirsch, who was an offsite Nuclear Regulatory Commission inspector and John Burdoin. They were fairly regular to come in every few months and weeks in some cases to either do an audit or a follow-up on a previous audit to see if we conformed to certai -- well, maybe it was design changes and things of that nature

How they determined what they're going to audit

when they come in to see us I don't know.

We are told what they're going to audit.

MR. KAUFMAN: Did the NRC individual inspect actual work or only the records?

MR. TENNYSON: They did go out and inspect actual work and then in most cases balanced their inspections against the findings in the documentation.

MR. KAUFMAN: How much of the work did they look at when they did this?

MR. TENNYSON: Normally they're down there a couple days, three or four days at a time when they came.

They would pick a particular area out. I mean, one individual NRC man would pick a particular area like terminations or maybe welding or something.

Then he would go into that particular phase and go out and inspect. How much really in regard to percentage or anything I couldn't say. I wouldn't have the slightest idea.

I'd say the percentage is pretty small.

MR. KAUFMAN: Did they ever consult with you about areas in which you were having a particularly high run of NCR's?

MR. TENNYSON: No, not to my knowledge. I don't recall anything like that.

MR. KAUFMAN: Before 1974 did the NRC inspectors coming out to the site --

MR. JONES: Before when?

MR. KAUFMAN: 1974.

-- to review your work --

MR. JONES: I don't see how he can answer that.

MR. KAUFMAN: I was asking Mr. Roam.

MR. ROAM: I remember one time when the AEC came out. At that time it was AEC -- not NRC -- that brought about the original change.

MS. DURBIN: In the procedures?

MR. ROAM: In developing a quality program.

At that time what they looked at I don't know because I didn't talk to them.

MS. DURBIN: Were these audits or inspections announced to you in advance? Did you know when they were coming out?

MR. TENNYSON: Most times we knew they were coming in.

MS. DURBIN: Was anything special done to prepare for these audits?

MR. TENNYSON: I can only answer for my department and nothing special was done at that time that hadn't already been done to satisfy any requirements or anything.

Our documentation was there and open to them.

MS. DURBIN: Do you know if production knew in advance which particular work the NRC inspectors might be looking at?

If you don't know, you don't know.

MR. TENNYSON: I don't know.

MR. KAUFMAN: Did the NRC inspectors ever find any NCR's in areas where you hadn't found them?

MR. TENNYSON: They have picked up -- well, what they did was, they would do an audit.

They have picked up minor problem areas and through an audit given them back to PG&E. PG&E, in turn, would write their own non-conformance against The Howard P. Foley Company for not documenting certain problems.

They have been very minor, as far as non-conformances go.

One particular that I remember was a detail of the way an electrical support was installed. Out of numerous welds, which were called out by size and configuration, one weld was left off of the PG&E document not stating the proper size.

The man who bought that weld, along with the rest of the welds, which were supposed to have been typical was questioned and at that time we did go back a year in the files and check out the work that he did and everything as a result of the audit.

MR. KAUFMAN: Do you have a procedure for checking the work of your inspectors?

MR. TENNYSON: I don't think there was. No, there wasn't.

MR. ROAM: Basically just trying to get the supervisors to get out there to check to see the man is doing the job.

MR. TENNYSON: The way the system was set up really was through a document system and the supervisor I had over document control and management.

He would inspect all of the necessary paperwork and review it to see if the necessary documentation was with that particular package and all the requirements were fulfilled on it so that it could be signed off.

Then there was a QC stamp that went on it before it went into the file and signed off by the supervisor of that department.

MR. KAUFMAN: Did you have any contact with the independent design verification program for Diablo?

MR. TENNYSON: Not to my knowledge, no.

MR. KAUFMAN: So they were not reviewing any of your work?

MR. TENNYSON: They could have been under another program but as far as me being connected with that portion of it, no.

MR. KAUFMAN: I think someone mentioned earlier that you did review the quality of materials that were coming to the site; is that correct?

MR. TENNYSON: Yes.

MR. ROAM: Yes, materials received, yes.

MR. KAUFMAN: What kind of material is that?

MR. TENNYSON: Anything that had a Class 1 requirement placed on the purchase order of which could be used in a Class 1 installation.

MR. KAUFMAN: What were you checking? What standards were you checking that material with?

MR. TENNYSON: Well, in most cases the material was checked for an approved vendor to buy from. Also certain

requirements concerning the steel, that the requirements be listed on the purchase order to call out the type of steel it was and the configuration.

We could check for a letter of compliance on the material and mill test reports in areas where they were required.

These requirements are pretty well spelled out in the various specifications depending on the particular job that you're doing in the field or buying the material for.

So each specification calls out the requirements of the material to be bought.

MR. KAUFMAN: Were you finding a large number of NCR's with respect to quality of the material to be bought?

MR. TENNYSON: No. Any material that came in we had a procedure set up that if the material came in and did not meet the requirements of the purchase order it would be red tagged at that time and placed in a holding area until it was completely approved.

This was done either by returning it to the vendor or the necessary paperwork and proper paperwork was received before it would be released, in most cases.

MR. KAUFMAN: Were you ever asked to accept material that did not meet the appropriate standards?

MR. TENNYSON: Yes, we were.

MR. KAUFMAN: When was that?

MR. TENNYSON: The year I cannot tell you. It could have been a year and a half, two years ago that we started receiving material in from the Bostrom Bergen Company.

MR. KAUFMAN: What kind of material is that?

MR. TENNYSON: That was fabricated steel and steel shapes and configurations for various installations in the plant.

These were fabricated to Pacific Gas & Electric's design drawings which were sent to Bostrom Bergen and also negotiated through their San Francisco office back and forth with the company.

The materials were coming in in some cases without the necessary paperwork that we were required to have for the installation.

MR. KAUFMAN: What kind of paperwork was that?

MR. TENNYSON: In some cases it might have been your letter of compliance. In some cases a mill test report, test results of the steel and showing the type that it was and so on.

This material was released to the field to speed up production -- prior to receiving the proper paperwork on it -- by memo from Skip Moses, signed by him, which overrode my authority to hold it.

Now, where he got his information or direction to release, I'm not real sure of.

There was an audit performed by the NRC, I think, and there was an allegation made by somebody saying that this had happened. I don't know how it came about.

But they came out to look for this particular situation where items were being released prior to paperwork received and they did find all of the memos in the file -- as

I had in my documentation -- signed by Mr. Moses releasing the materials to the field.

We set up quite a review program and reviewed all of the purchase orders at the request of the NRC and pulled out all of the memos releasing items and getting with Bostrom Bergen, dealing back and forth with them, getting all of the necessary paperwork brought up to date to close out this non-conformance.

We had to write a non-conformance against The Howard P. Foley Company for doing this. That's about all I can remember about that part of it.

It was finally closed out by the Pacific Gas & Electric Company.

MR. KAUFMAN: By that you mean it was determined that the material met the standards?

MR. TENNYSON: Yes.

MR. KAUFMAN: But you haven't seen the documentation for that, have you?

MR. TENNYSON: Yes. We reviewed the documentation as it came in and I had help from our engineering staff in correlating the paperwork back and forth from Bostrom Bergen to The Howard P. Foley Company and in building the necessary packages with the necessary paperwork to satisfy the requirements of it.

MR. KAUFMAN: Off the record.

(Discussion off the record.)

MR. KAUFMAN: Did you have a relationship with the quality assurance management of the other companies at the

site?

MR. TENNYSON: No.

MR. KAUFMAN: You didn't talk to them at all?

MR. TENNYSON: No.

MR. KAUFMAN: I don't think I have any more questions other than the catchall question, that is, at the time you left the site, how many NCR's were outstanding? If you can answer that question.

MR. TENNYSON: I would say in the neighborhood of 80, wouldn't you?

MR. ROAM: Somewhere in that area.

MR. TENNYSON: We had a hundred and twenty some when we were working on that Saturday and by working on them we brought them down.

MR. ROAM: Sunday.

MR. TENNYSON: Yes, Sunday.

MR. KAUFMAN: Could you give us a breakdown of where these NCR's were located? What areas do they involve?

MR. TENNYSON: You wrote them.

MR. ROAM: Virtually all disciplines that we handled. The majority of them were in the civil structural site.

MR. KAUFMAN: You're going to have to break that down a little bit for me.

MR. ROAM: Some in termination and calibration which would have been along the electrical side.

Then some mechanical, some on the instrumentation, old ones that weren't in the limelight.

Then the rest were like on the civil structural

site.

MR. KAUFMAN: Had you been asked by your own production-management or PG&E to remove any of these tags?

MR. ROAM: No. Not on the electrical or mechanical and stuff like that, no.

MR. KAUFMAN: Thank you.

MS. DURBIN: I have a few more questions.

You said you were working on a Sunday. Was it common for you to work on weekends?

MR. TENNYSON: We were working quite a few hours at that time. Myself, when I started in with the overtime I was putting anywhere from 60 to 65, 70 hours a week.

Then it went up to 70 and 75 in a week or so. One week or two I put in 80 some hours, 85.

MS. DURBIN: What time period was that?

MR. TENNYSON: Right after the first of the year, January, February.

MS. DURBIN: Were your people working for you putting in equivalent hours?

MR. TENNYSON: Yes.

MS. DURBIN: You were all putting in 60, 70 hours a week on a regular basis?

MR. TENNYSON: Well, no. All of the inspectors were putting in a 60-hour week.

MR. ROAM: Yes.

MR. TENNYSON: They were required to work -- it was mandatory to work ten hours a day, six days a week.

MS. DURBIN: Is this common in the construction

industry?

MR. TENNYSON: Oh, I think it does happen throughout the construction industry if they get a big push on something but this one lasted so long people were getting pretty tired.

MS. DURBIN: Did you ever feel that your people were working when they oughtn't to have been? They were overly tired or overly stressed?

MR. TENNYSON: It was hard for me to tell. I was pretty tired myself.

It would be hard for me to answer. It's hard to put a time limit on how long a person can stand up. Some people can do 60, 70, 80 hours a week for weeks after weeks and others will break down under the strain.

MS. DURBIN: Lawyers have the same experience.

MR. TENNYSON: Everybody was showing -- including production forces in the field -- which you've seen in the newspapers -- where they refused to go into work.

They were tired of six and seven days a week.

MS. DURBIN: Was it common to have a night shift of quality assurance people also?

MR. TENNYSON: Any time there were production people doing Class 1 installation or non-Class 1 that would require inspection, yes.

MS. DURBIN: Is that common in the construction industry?

MR. TENNYSON: Not generally in construction, I don't think.

MR. ROAM: When you say "construction industry,"

you mean nuclear power plant construction industry or construction industries in general?

MS. DURBIN: Nuclear power plant construction.

MR. ROAM: Most of them would have a requirement for that.

MS. DURBIN: How about construction in general, non-nuclear power plant construction?

MR. ROAM: Then it depends totally on the contract. Some require; some don't.

MS. DURBIN: Sounds like construction was really at a feverish pitch by the time you were leaving?

MR. ROAM: Still is.

MR. TENNYSON: Yes.

MR. ROAM: They just now wound down and went back to a 40-hour week recently.

After we quit they went to a 70-hour work week.

MR. JONES: This is based on information others have told you?

MR. ROAM: Yes. Sorry. I wasn't there so --

MR. JONES: Let me caution you to answer of your own knowledge. That will keep things shorter, too.

MR. KAUFMAN: Let me ask you this: We also are involved with OSHA. We are not representing them in this particular instance, but I feel some need to just ask you a few questions about the other reports we've seen in the newspapers about high amounts of ozone from welding at the site.

Were your people -- and you in particular -- required

to work in circumstances where it was difficult to breathe, where you were wheezing and coughing during your inspections?

MR. ROAM: Yes. I had lost time by inspectors of being sick from being up in there.

MR. KAUFMAN: When did these problems start?

MR. ROAM: When they started welding in there. They started from then.

MR. KAUFMAN: And that's welding in the fuel-handling building?

MR. ROAM: Yes.

MS. DURBIN: Has that been a consistent problem?

MR. ROAM: Consistent with crafts as well as our own people. They get sick and you just try to shuffle them around, put somebody else in there and let him clear his lungs out.

MR. KAUFMAN: Do you believe this had an impact on the quality of work that production was performing?

MR. ROAM: No, I don't. I really don't want to answer that.

MR. JONES: If you don't know, you don't have to answer.

MR. KAUFMAN: That's right.

Well, did it have any impact on the quality of work that your own people were doing?

MS. DURBIN: Was it substantially harder for them to do their job?

MR. JONES: That's a different question.

MS. DURBIN: I was just trying to help.

MR. ROAM: Only from the grumblings of the people themselves but as to say whether they did it good or bad, I could not say.

All I can do is listen to their grumbles and complaints to me.

MR. KAUFMAN: Okay. One last series of questions.

Are you familiar with the intake cove at the plant? That's where the water comes in from the ocean to the cooling pumps that sends the sea water through the plant?

MR. ROAM: I'm not real familiar with it. I've been down there several times.

MR. KAUFMAN: Have you been there during the storms which have recently occurred this year? That's a convoluted question.

MR. ROAM: Well, I've been down there once during the storm, yes. It was the earlier part of the storms.

MR. KAUFMAN: Were waves breaking over the revetment?

MR. ROAM: I really wasn't paying much attention to the waves.

I was looking at the water coming down the goddamn conduits and wondering about all the connections inside. I wasn't worried about the waves outside.

MS. DURBIN: You didn't happen to see how far up towards the plant the waves were breaking on the shore?

MR. ROAM: Most of them were breaking on the breakwater themselves.

I wasn't paying that much attention to whether they

was carrying in there at the screens.

MR. KAUFMAN: Off the record.

(Discussion off the record.)

MS. DURBIN: When you were hiring people fairly close to the end of the big push were you hiring some people who had no previous experience as quality control inspectors?

MR. TENNYSON: You're saying near the end. What I was referring to a while ago was, you know, earlier.

MS. DURBIN: At any point during the time you worked there, did you hire people who had no experience as inspectors?

MR. TENNYSON: Yes.

MS. DURBIN: Did you hire people who had no previous experience with construction or in the nuclear industry?

MR. TENNYSON: Yes, in some cases, yes.

MS. DURBIN: How much training did they get?

MR. TENNYSON: Other than possibly maybe some schooling along the way, engineering training or something to that effect?

MS. DURBIN: Well, how much training did you give them?

MR. TENNYSON: They were trained with an experienced inspector for sometimes maybe 30 days before they were really turned out by themselves to perform inspections and not then if we felt that they were still weak in certain areas.

MS. DURBIN: Okay. Thank you.

MR. KAUFMAN: I promise you, just this last question.

Is it common practice in quality assurance programs

to check the work of the inspectors on a formal basis, the work that the inspectors have done on a formal basis?

In other words, does the quality assurance program in most industries require that the work the inspector does is, in turn, inspected by someone else in the quality assurance organization?

MS. DURBIN: Is there any quality assurance for quality assurance?

MR. ROAM: You got two phases. You got quality control and quality assurance.

That's where everybody is mistaken. Quality control is the inspection. Quality assurance is the assurance that the inspection and procedure is correct.

There's no quality assurance of the quality assurance.

MR. TENNYSON: Your quality assurance is the monitoring device to see to it that you're adhering to your procedural requirements.

MS. DURBIN: Well, is there quality control of quality control?

MR. ROAM: What you're saying basically: Is there direct supervision or monitoring of inspectors?

MS. DURBIN: Right.

MR. TENNYSON: Yes.

MR. ROAM: Yes. Not per se. It's written up and that's your job, you know.

MS. DURBIN: To go out and do it?

MR. ROAM: Right.

MR. KAUFMAN: Do you do that on a judgmental basis or do you have any --

MR. ROAM: Same as you would do with your secretary working for you is how you do it. The same thing.

MR. KAUFMAN: Are there any areas in which you inspect more than others?

MR. ROAM: Depends on the position of the man. If I'm strapped behind a desk I'm trying to look at all the paperwork and judge it from that.

MR. KAUFMAN: All right.

Thank you very much for coming. We appreciate all the time you have taken to help us in this matter.

MS. DURBIN: The statement is now closed.

(The sworn statements concluded at 3:30 p.m.)

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STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, BONNIE L. WAGNER, a Certified Shorthand Reporter, License No. 5881, and duly qualified Notary Public of the County of Marin, State of California, do hereby certify:

That the foregoing transcript of sworn statements of Virgil M. Tennyson and Richard E. Roam, taken on Tuesday, the 5th day of April, 1983, is a true, accurate, and complete transcription of my shorthand notes.

DATED this 12th day of April, 1983.

BONNIE L. WAGNER, CSR #5881

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that on this date I caused copies of the foregoing "Motion of Governor George Deukmejian to Reopen the Record on Construction Quality Assurance" served on the following by U.S. Mail, first class, postage prepaid.

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