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June 29, 1984

PGandE Letter No.: DCL-84-243

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

Re: Docket No. 50-275, OL-DPR-76
Docket No. 50-323
Diablo Canyon Units 1 and 2
GAP Allegations

(2.206)

Dear Mr. Denton:

As stated in our letter DCL-84-239 of June 26, 1984, we are submitting responses to allegations from the Government Accountability Project (GAP) which have not been specifically addressed previously. These allegations are contained in GAP letters dated March 23, April 12, May 3, and May 31, 1984.

For each allegation, a unique DCP allegation number has been assigned, as shown on the indices contained in Attachments 1, 2 and 3. All of the responses have been verified and the professional resumes of the verifiers have either been previously submitted or are attached to the enclosure.

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

Sincerely,
ORIGINAL SIGNED BY

J. O. Schuyler

Enclosure

cc: D. G. Eisenhut
J. B. Martin
H. E. Schierling
Service List

D803

ATTACHMENT 1

INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER

Attachment No.	Page No.	Para. No.	DCP Allegation No.	Subject
3/23/84 GAP letter				
1	2	1)	III-1	Containment doors.
	3	2)	III-2	Containment doors.
	3	3)	III-3	Not directed at applicant or its contractors.
2	1,2	Entire	III-4	Not directed at applicant or its contractors.
	3	1,2	III-4	Not directed at applicant or its contractors.
	3	1)	III-5	Pipe supports non-compliance with App. B
	4	2)	III-6	Pipe supports non-compliance with App. B
	5	8), 9)	III-7	Compliance with ANSI N45.2.6
	6	10)	III-8	Welder certifications
	8	15),16)	III-9	Falsification of records
	9	20)	III-10	Harassment
	10	21)	III-11	Min. valve wall thickness
	10	22)	III-12	Valve thickness test
	10	23)	III-13	Welding
3	1-2		III-14	Welding of CCW piping
	3		III-15	Harrassment.
	4-6		III-16	Not directed at applicant or its contractors.

ATTACHMENT 1

INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER
(Continued)

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4	1	2	III-17	Not directed at applicant or its contractors.
	2	5,6	III-18	Rebuttal to PGandE letter regarding small bore piping.
	3-7	7-11	III-19	Rebuttal to PGandE letter regarding pipe support gaps.
	7-12	12-19	III-20	Rebuttal to PGandE letter regarding pipe support calcs.
	12-14	20-25	III-21	Rebuttal to PGandE letter regarding pipe support locations.
	14-15	26-27	III-22	Rebuttal to PGandE letter regarding pipe support locations.
	15-19	28-33	III-23	Rebuttal to PGandE letter regarding pipe support loads.
	19	34-35	III-24	Rebuttal to PGandE letter regarding rigid connections.
	20-22	36-42	III-25	Rebuttal to PGandE letter regarding U-bolts.
	23	43	III-26	Summary statement (not a specific allegation)
	23-25	44-46	III-27	Rebuttal to PGandE letter regarding piping sample size.
	26	47-49	III-28	Rebuttal to PGandE letter regarding use of foreign steel.
	27	50	III-29	Rebuttal to PGandE letter regarding welding/management involvement.

ATTACHMENT 1

INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER
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Attachment No.	Page No.	Para. No.	DCP Allegation No.	Subject
5	1,2	1)	III-30	Rebuttal to PGandE letter regarding welding.
	2	2)	III-31	Rebuttal to PGandE letter regarding welding.
	3	3)	III-32	Rebuttal to PGandE letter regarding welding.
	3	4)	III-33A	Rebuttal to PGandE letter regarding welding.
	4	1	III-33B	Rebuttal to PGandE letter regarding welding.
	4	2	III-33C	Rebuttal to PGandE letter regarding welding.
	4	3	III-33D	Rebuttal to PGandE letter regarding welding.
	5	entire	III-33E	Rebuttal to PGandE letter regarding welding.
	6	1	III-33E	Rebuttal to PGandE letter regarding welding.
	6	2	III-33F	Rebuttal to PGandE letter regarding welding.
	6	3	III-33G	Rebuttal to PGandE letter regarding welding.
	6	4	III-33H	Rebuttal to PGandE letter regarding welding.
	6	5	III-33I	Rebuttal to PGandE letter regarding welding.
	7	1	III-33I	Rebuttal to PGandE letter regarding welding.

ATTACHMENT 1

INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER
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	8	5)	III-34	Rebuttal to PGandE letter regarding welding.
	9	6)	III-35	Rebuttal to PGandE letter regarding welding.
	9,10	7)	III-36	Rebuttal to PGandE letter regarding welding.
	11	8)	III-37	Rebuttal to PGandE letter regarding welding.
	11,12	9)	III-38	Rebuttal to PGandE letter regarding welding.
	12	10)	III-39	Rebuttal to PGandE letter regarding welding.
	12	11)	III-40	Rebuttal to PGandE letter regarding welding.
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	13	13)	III-42	Rebuttal to PGandE letter regarding welding.
	13	14)	III-43	Rebuttal to PGandE letter regarding welding.

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INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER
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5	13,14	15)	III-44	Rebuttal to PGandE letter regarding welding.
	14,15	16)	III-45	Rebuttal to PGandE letter regarding welding.
	15	17)	III-46	Rebuttal to PGandE letter regarding welding.
	15	18)	III-47	Rebuttal to PGandE letter regarding welding.
	15,16	19)	III-48	Rebuttal to PGandE letter regarding welding.
	16	20)	III-49	Rebuttal to PGandE letter regarding welding.
	17	21)	III-50	Rebuttal to PGandE letter regarding welding.
6	2	1),2)	III-51	Inspector training.
	4	last	III-52	Inspector training certification.
	5	enti[illegible]	III-52	Inspector training certification.
	6	1	III-53	Introductory statements. (not a specific allegation)
7	1-5	I	III-54	Rebuttal to PGandE letter regarding CCW welding.
	5-7	II	III-55	Rebuttal to PGandE letter regarding A-325 bolts.

ATTACHMENT 1

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8	1	last	III-56	Falsification of records.
	2	2,3	III-56	Falsification of records.
	2	4	III-57	Falsification of records.
	2	last	III-58	Night Shift high quality standards.
	3	2	III-59	Harassment.
	3	4	III-59A	Harassment.
	4	3-5	III-60	Harassment.
9	3	4,5	III-61	Inspector qualification/ training.
	4	1,2,3	III-61	Inspector qualification/ training.
	5	2	III-62	Illustrative example of NRC Allegation #430
	6-8	II	III-63	Quick fix - drawings control
	9-10	IV	III-64	Not directed at applicant or its contractors.
10	3,4	6)	III-65	Falsification of QC document
	6	14),15),16)	III-66	Hold tags.

ATTACHMENT 1

INDEX OF ITEMS NOT INCLUDED IN REGION V, April 27, 1984 LETTER
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Attachment No.	Page No.	Para. No.	DCP Allegation No.	Subject
10	7	20),21)	III-67	Harrassment.
	8	22)	III-67	Harrassment.
	8	23)	III-68	Night Shift high quality standards
	8	24)	III-68	Night Shift high quality standards
	8	25)	III-68	Night Shift high quality standards
	8	26)	III-69	Night Shift high quality standards
	9	29)	III-69A	Welding
11	2	3,4	III-70	Unqualified welding inspector
	4	2	III-71	Inadequate inspector training
4/12/84 GAP letter 1	4	last	IV-1	Summary Statements
	5	first	IV-1	Summary Statements

ATTACHMENT 2

INDEX OF ITEMS IN MAY 3, 1984 GAP LETTER

Location	DCP Alleg. Number	Subject
Stokes Aff.		
● 1	V-1	Inadequate training
1	V-2	Hanger 99-20
2	V-3	Out-of-date manuals
2	V-4	Sign-off on revision
2	V-5	No signed return receipts
2-3	V-6	No return receipts
3	V-7	Mark obsolete procedures "superseded"
3	V-8	Review of manuals
3	V-9	Documented review
4	V-10	Audited manuals
4	V-11	Review results
4-5	V-12	DP system/resolution
5	V-13	Gap procedure
5	V-14	Exceptions flagged
6	V-15	Program control
6	V-16	Pipe insulation
7-8	V-17	Quick Fix
8-9	V-18	Documenting DRs during Quick Fix
9-10	V-19	Review of hanger
10	V-20	Instructions to checkers
10-1	V-21	Use of judgment

ATTACHMENT 2

INDEX OF ITEMS IN MAY 3, 1984 GAP LETTER

Location	DCP Alleg. Number	Subject
11	V-22	Information via phone calls
11	V-23	20 Hz vs 33 Hz
11	V-24	Support stiffness
Anon. Aff. "A" @		
1,2	V-25	Vendor welds do not comply with AWS D.1.1
2-6	V-26	Violations of ASTM/AISC codes on bolting requirements (a) oversized holes (b) turn-of-nut tightening (c) calibrated wrench tightening (d) reuse (e) inspection
6-8	V-27	Pullman "rewrote" App. B (a) restricted inspectors (b) lacked authority (c) no freedom
Anon. Aff. "B" @		
2	V-28A V-28B	Pullman ESDs not in conformance with codes (a) elongated bolt holes (b) stuffed bolt holes
4	V-29	Harassment
4-6	V-30	Not directed at applicant or its contractors.
6	V-31	Not directed at applicant or its contractors.
6-10	V-32	Same issues as Anon. Aff. "A" @ 2-6

ATTACHMENT 2

INDEX OF ITEMS IN MAY 3, 1984 GAP LETTER

Location	DCP Alleg. Number	Subject
Lockert 0		
1	V-33	Bolting program for rupture restraints inadequate
2	V-34	ESD 243 doesn't address AISC
2-3	V-35	NCR DC-2-80-RM-002 not addressed
3	V-36	QA breakdown
4	V-37	Should be 10 CFR 21 report
4-5	V-38	Improper resolution (a) Unauthorized weld modifications (b) Oversized holes accepted (c) Oversized holes packed (d) Oversized welds (e) Defective A-490 bolts
6	V-39	ESD 243 (a) Washer table out of date (b) No bolt acceptance criteria (c) Bolt torque tables not in compliance with code
6	V-40	Pullman did not have program for designchanges
7	V-41	Washer criteria improperly issued
7	V-42	Improper torque tables
7	V-43	Pullman did not train inspectors to AISC bolting requirements
7	V-44	Defects in bolts not reported
Parks 1 0		
1	V-45	Gouge in accumulator line
3	V-46	Unit 2 support 97-38R - excessive overweld

ATTACHMENT 2

INDEX OF ITEMS IN MAY 3, 1984 GAP LETTER

Location	DCP Alleg. Number	Subject
Parks 1 @ (cont'd)		
4	V-47	Unit 2 beneath pressurizer - shopweld notto AWS
5	V-48	Unit 2 auxiliary building - CSS lug attachment welds inadequate - excessive shrinkage
6	V-49	Unit 2 auxiliary building - CCW support -inadequate welding
Parks 2 @		
1	V-50	Weld gouge near accumulator

ATTACHMENT 3
INDEX OF ITEMS IN MAY 31, 1984 GAP LETTER

Exhibit No.	Page No.	Para No.	DCP Allegation No.	Subject
1	1	1-2	VI-1	Stresses on concrete from Hilti quick bolts
1	1	3	VI-2	Ineffectiveness of the Quick Fix and Quality Control (QC) reporting systems
	2	1	VI-2	
1	2	2-3	VI-3	Residual stresses unacceptable if bolts embedded too deeply
1	2	4	VI-4	Management insensitivity to bolting problem
	3	1-2	VI-4	
1	3	3	VI-5	"Dry pack" solution ineffective
1	3	4	VI-6	PGandE and Pullman slow to resolve problem when identified
	4	1,2,3&4	VI-6	
2	1	2,3&4	VI-7	RHR environmental qualification Problem #1
	2	1,2,3&4	VI-7	
2	2	5&6	VI-8	Problem #2
2	2	7	VI-9	Problem #3
	3	1	VI-9	
2	3	2&3	VI-10	Problem #4

III-1 and 2

It is alleged that:

1. Shortly after noon on Friday, February 24, the integrity of the containment was breached when an airlock door blew open at the 140 foot level of the main containment in Unit I. All access to the containment is through this entry, which consists of two pressurized airlock doors that can only be opened one at a time. After the first door is closed, employees have to wait in a space between the doors while the second one is opened.

On the morning of the [illegible or deleted] I was on duty as a security access guard. Since there were too many people coming in and out, I had to back them up. Two employees got stuck inside the airlock when the doors didn't open. [illegible or deleted] reported the incident to [illegible or deleted] sergeant, and a PG&E crew arrived around 20 minutes later. The workers who had been stuck were drenched with sweat, because temperatures are high during hot functional testing.

Around 45 minutes later the incident happened again; this time four to five guys were stuck inside. Again it took around 20 minutes for the PG&E crew to arrive. Shortly afterward [illegible or deleted] was transferred to another post.

When [illegible or deleted] returned to the containment access door in early afternoon, [illegible or deleted] the containment had been secured and maintenance was at work on the doors. The crews described to me in detail what had happened. The outer door to the airlock blew open when some employees opened the inside door. There was a tremendous pressure, described to me by employees who were there as like a hurricane. Two fire watches standing near the outside were sucked clear through the airlock. A security officer was pulled toward the containment from around 15 feet outside the door, but held onto wooden scaffolding at the entrance. A foreman similarly was sucked in but successfully grabbed onto a door jam. A chair in the entryway flew into the containment at chest level. The outer door itself, which weighs several hundred pounds, swung open as if on a spring, according to witnesses.

Pacific Gas and Electric (PG&E) officials Mielke and Thornberry came by to survey the damage. Maintenance employees told me that to repair it they would probably

have to borrow parts from Unit II. They explained that the doors are 15 years old and aren't made any more. (3/7/84, Anon. Aff., Attachment 1, at 2-3.)

2. Maintenance workers described the cause of the accident to me as shear hinges on the door which were already worn out from overuse. This concerns me, because the plant has not yet started operation. If the maintenance workers were correct, all safety-related doors should be rechecked to see if they are worn out before the plant goes critical. (3/7/84 Anon. Aff., Attachment 1, at 3.)

On February 24, 1984, a maintenance crew was dispatched to Unit 1 to investigate door mechanism problems which had been reported a short time earlier. At or about this time a group of construction workers outside containment had opened the outer airlock door and entered the airlock. When the maintenance crew reached the airlock, another group of construction workers who were inside containment were attempting to open the inner door (the outer door was still open with the crew entering the airlock waiting for door repairs). The interlock mechanism then failed (pins sheared) which allowed the inner door to open. Due to negative pressure in containment, the door opened rapidly once it was disengaged.

The door interlock mechanism (a device which prevents both doors from being open at the same time) had worn and then failed because of excessive force being used to open both doors at the same time. The interlock mechanism was repaired. Operation of the airlock doors has subsequently been controlled by designated door operators. This prevents personnel from trying to open one airlock door when the other is already open. As far as door hinges are concerned, the

doors' structural integrity was not degraded or damaged. Since the problem was with an interlock mechanism, not the door itself, no further action to other safety-related doors was deemed necessary.

This event was covered by Nonconformance Report (NCR) DCl-84-OP-M043.

III-5

It is alleged that:

1) I am particularly concerned that until at least 1982 Pullman's program for pipe supports and pipe rupture restraints did not comply with 10 CFR 50, Appendix B. I cannot understand why the NRC would not have covered this issue in Report 83-37, since that is what the NRC is all about. Presumably there should be some effect if the NRC's recommendations are not part of the picture. In a previous affidavit I recalled how on several occasions Mr. Karner told me that we didn't have to comply with 10 CFR 50, Appendix B.

Mr. Karner was thoroughly familiar with company policy. The official excuse was that Pullman's program complied with Section Three of the American Society of Mechanical Engineers (ASME) 1971 code requirements, which are consistent with 10 CFR 50, Appendix B. (See June 13, 1978 audit, enclosed as Exhibit 1, at p 2.) The problem is that the ASME code did not cover pipe supports and rupture restraints. That left us on our own.

While PG&E paid general lip service to Appendix B, it did not enforce that policy on us through contract requirements. An October 13, 1977 Pullman memo on the NSC audit (Exhibit 2 at p. 2) explained, "We have not been required by PG&E to update to Appendix B." An unsigned, undated draft report on the NSC audit (Exhibit 3) explained further: "No attempt, however, was made to totally revise the program to incorporate specifics of 10 CFR 50, Appendix B." On page 9 of the draft, the author implies NRC approval for failing "to update the program to match Appendix B...." (3/22/84 Hudson Aff. at 3-4.)

Strict compliance with 10 CFR 50, Appendix B, is not a licensing requirement for the design and construction of Diablo Canyon, Unit 1. As has been stated by the Appeal Board in this proceeding:

> "The Commission's predecessor, the Atomic Energy Commission, recognized in promulgating Appendix B in 1970 that the nature of the construction process for a plant already being built, such as Diablo Canyon, Unit 1, precluded the complete and immediate application of the quality assurance criteria. In the Statement of

> Considerations accompanying the final version of Appendix B, it stated that the criteria would be 'used for guidance in evaluating the adequacy of the quality assurance programs in use by holders of construction permits and operating licenses.'[28] Therefore, contrary to the movants' suggestion, the applicant was not required to conform the construction quality assurance program for Unit 1 to Appendix B, upon the provision's effective date. Moreover, the applicant's commitment in the Final Safety Analysis Report (FSAR) to apply the Appendix B criteria to the extent possible for the construction of Unit 1 was completely reasonable." (ALAB-756 Slip Opinion dated December 19, 1983, at 21.)

The PGandE Unit 1 QA program and the programs of all its contractors meet the intent of 10 CFR 50, Appendix B, to the extent possible, as is described in Chapter 17 of the FSAR.

Pipe supports and rupture restraints are erected to Pullman Procedures ESD 223 and ESD 243, respectively. These procedures provide detailed installation methods and acceptance criteria as required by 10 CFR 50, Appendix B, Criterion V. The remaining criteria of 10 CFR 50, Appendix B, are addressed in the Pullman Corporate QA Manual (although not in a criterion-by-criterion manner) and in the other ESDs that are fully applied to all phases of the pipe support and rupture restraint program. The contract requirements for the QA program for pipe supports are delineated in PGandE Specification 8711, Section 4, and for rupture restraints in PGandE Specification 8833XR, Section 3.

It can therefore be seen clearly that the lack of strict compliance with 10 CFR 50, Appendix B, is not a violation of any rule, regulation, or commitment and does not, in any way, result in a decreased level of quality at Diablo Canyon.

III-6

It is alleged that:

2) After conceding the problem of not meeting 10 CFR 50, Appendix B, Pullman chose to perpetuate it. A November 3, 1978 program description (Exhibit 4) did not have any references to 10 CFR 50 in the charts and attachments for pipe supports and pipe rupture restraints. The ESD's [sic], or installation procedures, are the only guide for the QA program. (Id., Chart #3 and Attachment 3-1.) (3/22/84 Hudson Aff. at 4.)

As stated in the response to Allegation III-5, all requirements of 10 CFR 50, Appendix B, have been addressed in the pipe support and rupture restraint programs. The ESDs are not a guide for the QA program. Instead, they are an integral part of the QA program and their implementation, in conjunction with the Pullman Corporate QA Manual, meets the intent of 10 CFR 50, Appendix B.

III-7

It is alleged that:

8) In Report 83-37 the NRC accepted uncritcally [sic] PG&E and Pullman's position that Nondestructive Examination (NDE) personnel have met the American National Standards Institute (ANSI) N45.2.6 requirements since 1973 or 1974. That is false. Management has recognized a problem since 1973, but as of July 1982, they had not upgraded the program to comply with ANSI N45.2.6. In the meantime, various managers recommended commitments to honor ANSI, but it simply did not happen. For a December 1974 example of the recommendations, see enclosed Exhibit 8. The Pullman QA manager's July 1982 refusal to honor ANSI N45.2.6, is enclosed as Exhibit 9. Don't forget again, even ASME compliance would not cover the entire QA program, since ASME does not address pipe supports and rupture restraints.

9) The reason Pullman didn't meet the ANSI requirements is that it was not willing to pay for the experienced personnel required under the professional code. As Pullman's QA manager explained in a May 13, 1975 memo (Exhibit 10), "[I]t is virtually impossible to comply totally to N45.2.6 because of experience requirements. We cannot hire personnel that meet the experience requirements for the salary scale we offer." (3/22/84 Hudson Aff. at 5-6.)

ANSI N45.2.6 states that NDE inspectors "need only be certified in accordance with the requirements specified in SNT-TC-1A and supplements" (See ANSI N45.2.6-1973, paragraph 2.2 and 1978, paragraph 1.2, attached as Exhibits 1 and 2, respectively.) Pullman NDE inspectors at Diablo Canyon have always been certified in accordance with the guidelines of SNT-TC-1A. ESD 235 was written to follow the guidelines of SNT-TC-1A and all NDE personnel have been certified in accordance with this procedure. A certification program for NDE inspectors that complies with SNT-TC-1A automatically complies with ANSI N45.2.6. Certification to SNT-TC-1A is adequate

for any NDE inspector to perform NDE on pipes, pipe supports, and rupture restraints.

In regard to the quote from the May 13, 1975, memo, Mr. Hudson once again has picked a statement out of context to buttress his unsupported allegation. He has left off the following two sentences of the quote which show his concern in a true light. The sentences are:

> Even if the money were available, it would be difficult to find qualified people. We are taking the approach of a "qualification based on performance" in a specific job.

Thus it can be clearly seen that: (a) The problem was not Pullman's. At this time, there was just a shortage of qualified personnel in the industry. (b) Pullman then chose to follow an alternate course of action which is considered acceptable by the applicable standard, ANSI N45.2.6.

1.4 Definitions

The following definitions are provided to assure a uniform understanding of selected terms as they are used in this standard.

Certification (Personnel)–The action of determining, verifying, or attesting in writing to the qualifications of personnel.

Construction Phase–A period which commences with receipt of items at the construction site and ends when the components and systems are ready for turnover to operations personnel.

Contractor–Any individual or organization entering into a contract to furnish items or services to a purchaser. The term contractor includes the terms Vendor, Supplier, and Subcontractor or sub-tier levels of these where appropriate.

Examination–A critical investigation of items by nondestructive methods.

Inspection–A phase of quality control which by means of examination, observation or measurement determines the conformance of materials, supplies, components, parts, appurtenances, systems, processes or structures to predetermined quality requirements.

Item–Any level of unit assembly, including structures, system, subsystem, subassembly, component, part or material.

Owner–The person, group, company, or corportation who has or will have title to the facility or installation under construction.

Project–A planned series of activities including all actions necessary to provide, utilize and maintain a facility or a portion thereof.

Qualifications–The characteristics or abilities gained through training or experience or both that enable an individual to perform a required function.

Quality Assurance–All those planned and systematic actions necessary to provide adequate confidence that an item or a facility will perform satisfactorily in service.

Quality Control–Those quality assurance actions which provide a means of control and measure the characteristics of an item, process or facility to established requirements.

Testing–The determination or verification of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental or operating conditions.

Other terms and their definitions are contained in ANSI N45.2.10, Quality Assurance Terms and Definitions.

1.5 Referenced Documents

Other documents that are required to be included as a part of this standard are either identified at the point of reference or described in Paragraph 6 of this standard. The issue or edition of the referenced document that is required will be specified either at the point of reference or in Paragraph 6 of this standard.

2. GENERAL REQUIREMENTS

2.1 Planning

Plans shall be developed for assigning or staffing and training an adequate number of personnel to perform the required inspections, examinations, and tests and shall reflect the schedule of project activity so as to allow adequate time for assignment or selection and training of the required personnel. The need for formal training programs shall be determined, and such training activities shall be conducted as required to qualify personnel responsible for inspection, examination, and testing; and other appropriate technical support personnel whose work can directly or indirectly affect the quality or reliability of those items delineated in the scope of this standard.

2.2 Certification

Each person who verifies conformance of work activities to quality requirements shall be certified by his employer as being qualified to perform his assigned work. This certification shall be supported by appropriate measures such as education or training, testing, evaluation, and periodic review to assure the initial and continued proficiency of each person. The effective period of certification shall be established and at the end of the effective period of certification, each individual shall be recertified in accordance with the requirements of this standard. Personnel involved in the performance, evaluation and supervision of nondestructive examinations need only be certified in accordance with the requirements specified in SNT-TC-1A[1] and supplements.

2.2.1 Training. When training programs are required, they shall include indoctrination of personnel with the technical objectives of the project; the codes

[1] SNT-TC-1A and Supplements, "Recommended Practice for Nondestructive Testing Personnel Qualification and Certification", issued by the Society for Nondestructive Testing, 914 Chicago Avenue, Evanston, Illinois 60202.

AMERICAN NATIONAL STANDARD

QUALIFICATIONS OF INSPECTION, EXAMINATION AND TESTING PERSONNEL FOR NUCLEAR POWER PLANTS

1. INTRODUCTION

1.1 Scope

This Standard delineates the requirements for the qualification of personnel who perform inspection, examination, and testing to verify conformance to specified requirements of nuclear power plant items (structures, systems, and components of nuclear power plants) whose satisfactory performance is required to prevent postulated accidents which could cause undue risk to the health and safety of the public; or to mitigate the consequences of such accidents if they were to occur. The requirements may also be extended to other items of nuclear power plants when specified in contract documents.

1.2 Applicability

The requirements of this Standard apply to personnel who perform inspections, examinations, and tests during fabrication prior to and during receipt of items at the construction site, during construction, during preoperational and startup testing, and during operational phases of nuclear power plants. The requirements of this Standard do not apply to personnel who perform inspections for government or municipal authorities, or who perform as authorized inspectors in accordance with the ASME Boiler and Pressure Vessel Code.

The requirements of this Standard are not intended to apply to personnel who only perform inspection, examination, or testing in accordance with ASNT "Recommended Practice No. SNT-TC-1A", since these personnel are certified in accordance with the requirements of SNT-TC-1A and its applicable supplements. The requirements of this Standard are optional, at the discretion of the employer, for application to personnel who perform calibration or to craftsmen who perform installation checkouts as part of their basic installation responsibility to ready the installation for preoperational testing.

This Standard is to be used in conjunction with ANSI N45.2.

The requirements apply to personnel of the owners, architect-engineers, nuclear power plant system designers and system suppliers, plant designers and plant constructors, equipment suppliers, outside testing agencies, and consultants. The ASME Boiler and Pressure Vessel Code, as well as other ANSI Standards, have been considered in the development of the Standard, and this Standard is intended to be compatible with their requirements.

1.3 Responsibility

It is the responsibility of each organization participating in the project to assure that only those personnel within their respective organizations who meet the requirements of this Standard are permitted to perform inspection, examination, and testing activities covered by this Standard that verify conformance to quality requirements.

The organization or organizations responsible for establishing the applicable requirements for activities covered by this Standard shall be identified and the scope of their responsibility shall be documented. The work of establishing selection and training practices and qualification procedures and of providing the resources in terms of personnel, equipment, and services necessary to implement the requirements of this Standard, may be delegated to other qualified organizations and such delegations shall also be documented. It is the responsibility of each organization using personnel covered by this Standard to conform to the requirements of this Standard applicable to the organization's work.

It is the responsibility of the organization performing these activities to specify the detailed methods and procedures for meeting the requirements of this

Standard, unless they are specified in the contract documents.

1.4 Definitions

1.4.1 Inspection. A phase of quality control which by means of examination, observation, or measurement determines the conformance of materials, supplies, parts, components, appurtenances, systems, processes, or structures to predetermined quality requirements.

1.4.2 Examination. An element of inspection consisting of investigation of materials, supplies, parts, components, appurtenances, systems, processes, or structures to determine conformance to those specified requirements which can be determined by such investigation. Examination is usually nondestructive and includes simply physical manipulation, gaging, and measurement.

1.4.3 Testing. The determination or verification of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.

1.4.4 Refer to ANSI N45.2.10 for other definitions to be used in conjunction with this Standard.

1.5 Referenced Documents

Other documents that are required to be included as a part of this Standard are either identified at the point of reference or described in Section 6 of this Standard. The issue or edition of the referenced document that is required will be specified either at the point of reference or in Section 6 of this Standard.

2. GENERAL REQUIREMENTS

2.1 Planning

Plans shall be developed for staffing, indoctrination, and training of an adequate number of personnel to perform the required inspections, examinations, and tests and shall reflect the schedule of project activity so as to allow adequate time for assignment or selection and training of the required personnel.

2.1.1 Indoctrination. Provisions shall be made for the indoctrination of personnel as to the technical objectives of the project; the codes and standards that are to be used; and the quality assurance elements that are to be employed.

2.1.2 Training. The need for formal training programs shall be determined, and such training activities shall be conducted as required to qualify personnel who perform inspections, examinations, and tests. On-the-job participation shall also be included in the program, with emphasis on first-hand experience gained through actual performance of inspections, examinations, and tests. Records of training, when used as the basis for certification, shall be maintained.

2.2 Determination of Initial Capability

The capabilities of a candidate for certification shall be initially determined by a suitable evaluation of the candidate's education, experience, training, test results, or capability demonstration.

2.3 Evaluation of Performance

The job performance of inspection, examination, and testing personnel shall be reevaluated at periodic intervals not to exceed three years. Reevaluation shall be by evidence of continued satisfactory performance or redetermination of capability in accordance with Subsection 2.2. If, during this evaluation or at any other time, it is determined by the responsible organization that the capabilities of an individual are not in accordance with the qualifications specified for the job, that person shall be removed from that activity until such time as the required capability has been demonstrated.

Any person who has not performed inspection, examination, or testing activities in his qualified area for a period of one year shall be reevaluated by a redetermination of required capability in accordance with Subsection 2.2.

2.4 Written Certification of Qualification

The qualification of personnel shall be certified in writing in an appropriate form, including the following information:

(1) employer's name

(2) identification of person being certified

(3) level of capability

(4) activities certified to perform

(5) basis used for certification, including:

  (a) records of education, experience and training

  (b) test results, where applicable

  (c) results of capability demonstration

(6) results of periodic evaluations

(7) results of physical examinations, when required

(8) signature of employer's designated representative

(9) date of certification and date of certification expiration

2.5 Physical

The responsible organization shall identify any special physical characteristics needed in the performance of each activity. Personnel requiring these characteristics shall have them verified by examination at intervals not to exceed one year.

3. QUALIFICATIONS

3.1 General

The requirements contained within this Section define the minimum capabilities that qualify personnel to perform inspections, examinations, and tests which are within the scope of this Standard.

There are three levels of qualification. The requirements for each level are not limiting with regard to organizational position of professional status, but rather, are limiting with regard to functional activities which are within the scope of this Standard.

3.2 Level I Personnel Capabilities

A Level I person shall be capable of performing the inspections, examinations, and tests that are required to be performed in accordance with documented procedures and/or industry practices. The individual shall be familiar with the tools and equipment to be employed and shall have demonstrated proficiency in their use. The individual shall also be capable of determining that the calibration status of inspection and measuring equipment is current, that the measuring and test equipment is in proper condition for use, and that the inspection, examination, and test procedures are approved.

3.3 Level II Personnel Capabilities

A Level II person shall have all of the capabilities of a Level I person for the inspection, examination or test category or class in question. Additionally, a Level II person shall have demonstrated capabilities in planning inspections, examinations, and tests; in setting up tests including preparation and set-up of related equipment, as appropriate; in supervising or maintaining surveillance over the inspections, examinations, and tests; in supervising and certifying lower level personnel; in reporting inspection, examination, and testing results; and in evaluating the validity and acceptability of inspection, examination, and test results.

3.4 Level III Personnel Capabilities

A Level III person shall have all of the capabilities of a Level II person for the inspection, examination or test category or class in question. In addition, the individual shall also be capable of evaluating the adequacy of specific programs used to train and test inspection, examination, and test personnel whose qualifications are covered by this Standard.

3.5 Education and Experience—Recommendations

The following is the recommended personnel education and experience for each level. These education and experience recommendations should be treated to recognize that other factors may provide reasonable assurance that a person can competently perform a particular task. Other factors which may demonstrate capability in a given job are previous performance or satisfactory completion of capability testing.

3.5.1 Level I

(1) Two years of related experience in equivalent inspection, examination, or testing activities, or

(2) High school graduation and six months of related experience in equivalent inspection, examination, or testing activities, or

(3) Completion of college level work leading to an Associate Degree in a related discipline plus three months of related experience in equivalent inspection, examination, or testing activities.

3.5.2 Level II

(1) One year of satisfactory performance as Level I in the corresponding inspection, examination or test category or class, or

(2) High school graduation plus three years of related experience in equivalent inspection, examination, or testing activities, or

(3) Completion of college level work leading to an Associate Degree in a related discipline plus one year related experience in equivalent inspection, examination, or testing activities, or

(4) Four-year college graduation plus six months of related experience in equivalent inspection, examination, or testing activities.

3.5.3 Level III

(1) Six years of satisfactory performance as a Level II in the corresponding inspection, examination or test category or class, or

(2) High school graduation plus ten years of related experience in equivalent inspection, examination, or testing activities; or high school graduation plus eight years experience in equivalent inspection, examination, or testing activities, with at least two years as Level II, and with at least two years associated with nuclear facilities—or if not, at least sufficient training to be acquainted with the relevant quality assurance aspects of a nuclear facility, or

(3) Completion of college level work leading to an Associate Degree and seven years of related experience in equivalent inspection, examination, or testing activities, with at least two years of this experience associated with nuclear facilities—or if not, at least sufficient training to be acquainted with the relevant quality assurance aspects of a nuclear facility, or

(4) Four-year college graduation plus five years of related experience in equivalent inspection, examination, or testing activities, with at least two years of this experience associated with nuclear facilities—or if not, at least sufficient training to be acquainted with the relevant quality assurance aspects of a nuclear facility.

4. PERFORMANCE

Personnel who are assigned the responsibility and authority to perform functions covered by this Standard shall have, as a minimum, the level of capability shown in Table 1. When a single inspection or test requires implementation by a team or group, personnel not meeting the requirements of this Standard may be used in data-taking assignments or in plant or equipment operation provided they are supervised or overseen by a qualified individual participating in the inspection, examination, or test.

5. RECORDS

A file of records of personnel qualification shall be established and maintained by the employer. Collection, storage, and control of records required by this Standard shall be in accordance with ANSI N45.2.9.

6. REVISION OF ANSI STANDARDS REFERRED TO IN THIS DOCUMENT

When any of the Standards referred to in this document is superseded by a revision approved by ANSI, the revision is not mandatory until it has been incorporated as part of a contract.

Revisions to this Standard issued after the date of a specific contract invoking this Standard may be used by mutual consent of the purchaser and the supplier.

Table 1 Minimum Levels of Capability for Project Functions

Project Function	Level		
	L-I	L-II	L-III
Recording inspection, examination, and testing data*	X	X	X
Implementing inspection, examination, and testing procedures	X	X	X
Planning inspections, evaluations, and tests; setting up tests including preparation and set-up of related equipment		X	X
Evaluating the validity and acceptability of inspection, examination, and testing results		X	X
Reporting inspection, examination, and testing results		X	X
Supervising equivalent or lower level personnel		X	X
Qualifying lower level personnel		X	X
Evaluating the adequacy of specific programs used to train and test inspection, examination and testing personnel			X
Qualifying same level personnel			X

*Except as exempted by Section 4 of this Standard.

III-8

It is alleged that:

10) In its Report 83-37 the NRC agreed with Pullman and PG&E that the personnel files demonstrate adequate records for welder and NDE certification. As a result, the staff decided that NSC was wrong. That is false. A September 15, 1977 memo (signed September 22), from Pullman's Director of Quality Assurance to the site QA manager, (Exhibit 11), "Generic NDE and Inspection Records", including -- "lack of evidence showing the necessary records to support the certifications; lack of any certifications; certifications dated "as much as a year" after the inspectors began work; and "lack of evidence supporting previous work experience and Level I and Level II qualifications at a previous employer", among many other deficiencies. The corporate conclusions of generic deficiencies were based on a review of 95 files. The NRC looked at the same files and found nothing wrong. What happened? (3/22/84 Hudson Aff. at 6-7.)

Nothing "happened." Personnel records have been reviewed by Pullman and the NRC and there are no inadequacies in certification other than an inconsistent form of documenting qualifications. The memo cited by Mr. Hudson resulted from inconsistencies as to where and how the required information was recorded. When the necessary clarifications were available and the records were analyzed in greater detail, the education, experience, and training histories could be extracted to verify that inspection personnel had the required qualifications.

III-9

It is alleged that:

15) The signatures on pipe rupture restraint weld process sheets -- which insure the work was not done in an ad hoc manner -- were phoney. A blank sheet was signed and then xeroxed. This is evident from a review of multiple weld process sheets -- the signatures are too perfectly identical. I also confirmed this practice with engineers from the early years. Examples are enclosed as Exhibit 18.

16) In Report 83-37 the NRC made the following finding on page 18: "The inspector examined the 90 day welder's log and found that no void existed between 8/72 and 12/72." This was the basis for NRC findings. I don't know who is responsible, but that statement is false. The April 1978 Pullman response to the NSC audit (Exhibit 19, at p. 25.) concluded the opposite: "There is a void in the 90 day weld log from August, 1972 to December, 1972." Any excuse based on a purported reconstruction of the log cannot wash. The NRC should know, because my November 1983 report to Commissioner Gilinsky should have been reviewed by the NRC staff months before Report 83-37 was issued at the end of February 1984. In the last section of my report I challenged the reconstruction as not being reliable, due to inconsistencies and omissions that rendered impossible any confidence in the results. (3/22/84 Hudson Aff. at 8-9.)

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Standard format process sheets were prepared for specific types of rupture restraint work. The required steps to be accomplished and inspection hold points to be performed were in accordance with the approved procedures and were pre-typed and xeroxed to include the signatures of the preparer of the form and the QA individuals who approved the content of the form. These signatures indicate that the process sheet was correctly prepared, not that the inspections had been performed appropriately. The inspector signs the line "Inspection checks approved by" and dates the signature upon

completion of his inspection. He maintains control of the process sheets and merely adds the restraint numbers and/or identification numbers (such as field weld numbers) as the need arises prior to the start of work.

The process sheets, when completed, are then turned in to QA for review and filing in the appropriate document package. Although there is nothing in the regulations or the AWS code to preclude the use of xeroxed signatures, it was subsequently decided to discontinue this practice.

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The 90-day welders log was reconstructed, identified as such in the response to the NSC audit, and was shown to the NRC during their investigation of the NSC audit. The log was reconstructed from available evidence to close or answer the "void" identified in the NSC audit.

Mr. Hudson's allegation is based on GAP submittal of March 23, 1984, Exhibit #1, a letter from Mr. Hudson to Commissioner Gilinsky. Pages 24-30 deal with this issue. Mr. Hudson discusses DR 4713, which documented paper-handling discrepancies in regard to the containment spray piping system welding. Mr. Hudson notes that the rod requisitions listed the actual welding material used (that is, SMAW E308-16, GTAW ER-308) and therefore the welding process. The

maintenance of welder qualifications is based on the weld process used (SMAW, GTAW, etc.). Mr. Hudson then jumps to the three month gap in the welder log identified by NSC. He notes that the gap and the DR 4713 welding took place at the same time. Mr. Hudson then focuses on welder "N" and questions, if the listing of weld procedures based on the rod requisitions and process sheets is incorrect, how can the reconstruction of the 90-day welder log be correct? Mr. Hudson ignores the fact that the reconstructed log for welder "N" used his carbon steel welding, not his stainless steel welding on DR 4713, to show maintenance of his qualifications.

Since the weld rod requisitions listed the actual weld rod used, which relates directly to the weld process, requisitions can be used correctly as a basis for updating welder qualifications.

It is recognized that some uncertainty may exist whenever such an effort is required. However, it is felt that sufficient evidence existed to accomplish this effort with a high degree of confidence.

It is alleged that:

20) Management's refusal to back me against harassment from production made it more difficult to do my job properly. To illustrate, on August 13, 1982 I attempted to report harassment -- sucn as rifling my desk and taking an audit notebook. Mr. Karner refused to let the memo be sent, and threw it out. I kept a copy, which is enclosed as Exhibit 24. (3/22/84 Hudson Aff. at 9-10.)

Mr. Hudson's desk was located in the main QA/QC office. The security in this area was limited and at various times many desks had items removed from them, including pencils, pens, stationery items, and personal belongings. There was no way to identify who may have rifled Mr. Hudson's desk. However, to link any such losses to "harassment from production" is going far afield.

The memo in question was not thrown out but was forwarded to Mr. John Ryan, Pullman's Resident Construction Manager, for information and further action if he deemed such action necessary, which he did not. Mr. Karner discussed the situation with Mr. Hudson, at which time Mr. Hudson was told that Mr. Karner did not plan to remain onsite 24 hours a day to guard Mr. Hudson's desk and that Mr. Hudson should take the necessary precautions.

Mr. Hudson's desk was accorded the same level of surveillance and security as the desks of all other individuals located in that area.

III-11

It is alleged that:

21) The PG&E response to my report on minimum valve wall thicknesses is so incomplete and internally contradictory that it could be the basis for numberous [sic] allegations. I will list a few of the highlights here. PG&E asserted that procedure qualifications tests were not necessary because the inspectors calibrated their tools. But that is a totally uncontrolled response, and one which the inspector should take anyway. Additionally, my January 1984 affidavit to the NRC and my January 1984 report on minimum valve wall thicknesses also demonstrated the unreliability of calibration data for the equipment. In many instances, there was no calibration data. Obviously, this was no substitute for procedures whose reliability is proven by tests -- the normal QA foundation -- especially for valves with key safety functions. I wonder if the NRC has considered this issue in connection with PG&E's request to waive previous licesning [sic] commitments in the FSAR. (3/22/84 Hudson Aff. at 10.)

The thickness measurement itself, through use of a cathode ray tube (CRT) presentation, demonstrates the effectiveness of the measurement technique. Before and after all valve measurements, thickness reference blocks were used to adjust the CRT to ensure accurate thickness readings. These measurements of known thickness samples instill more confidence in the accuracy of the process than prior procedure qualification could ever develop.

Mr. Ed Martindale of Pullman, a qualified UT technician, ran the ultrasonic thickness program at the time that many of the data reports questioned by Mr. Hudson were made. Mr. Martindale has indicated his belief that all measurements included the performance of pre- and post-calibration. After a review of some examples of the

"no calibrated data" items that Mr. Hudson identified on Internal Audit 34, Mr. Martindale indicated there had been a paperwork oversight on the part of the UT technicians, but that the procedure itself had been followed fully.

III-12

It is alleged that:

22) PG&E's response on the inability of valve thickness test equipment to catch specific eccentricities were [sic] accounted for through a CRT screen. Unfortunately, the test procedure doesn't use a CRT screen. Instead, it uses pulse echo digital readout equipment. (3/22/84 Hudson Aff. at 10.)

The entire subject of valve wall thickness measurement was completely addressed in PGandE's Answer in Opposition to Joint Intervenors Motion to Reopen on CQA, Arnold, et al. Aff. at 19-26. The thickness measurement process (and procedure) did use the CRT screen for determining the actual thickness of all valves. Mr. Hudson is incorrect in stating that the applicable procedure requires the use of "pulse echo digital readout equipment."

III-13

It is alleged that:

23) PG&E's responses to welding allegations suffers [sic] from a gross omission. It fails to demonstrate that the procedures used to verify the quality of the welds were the same as those specified by Code 7/8 to install the welds in the first place. From the sketchy information provided by PG&E, I know there are significant differences. (3/22/84 Hudson Aff. at 10-11.)

This allegation attempts to combine and compare two distinct sets of requirements and then attempts to characterize the found "differences" as a "gross omission." Contrary to the allegation, there was no omission.

The quality procedures used to inspect, examine, and/or test welds were appropriate for the inspections, examinations, and tests specified in the construction code and/or the Project specification. Contrary to the allegation, welding Procedure Specification WPS 7/8 does not, and need not, specify the procedures to verify the quality of the work.

Contrary to the allegation, the PGandE responses to the welding allegations were not "sketchy." They were answered in sufficient detail to accurately and succinctly set forth the facts. Mr. Hudson fails to identify what he considers to be "significant differences" between the quality verification and welding procedures. The fact that different types of information are contained in the procedures

and that each procedure covers a distinctly different area of concern is understandable and proper as these were, after all, developed for different purposes.

III-14 and III-54

It is alleged that:

For example, in PG&E's March 8, 1984 letter to the NRC, DCL-84-097 (attached as Exhibit 1), PG&E tries to claim that there are no problems with welding on the component cooling water (CCW) lines when they are filled with water. However, PG&E's attempted explanation is full of false and misleading statements to support the false conclusion that there is no problem with this welding.

First of all, PG&E says that the pre-heat requirement was satisfied because the water in the pipes was greater than 50°F. The professor I spoke with, however, said that it is not even properly considered a pre-heat unless the temperature is at least 100°F. At 50°F, the temperature isn't even high enough to drive off any moisture from the outside of the pipes.

It is interesting that PG&E doesn't even mention what the temperature of the water was. I suspect that PG&E is intentionally trying to hide the fact that the water in the component cooling water system, as it travels to the components that need to be cooled, is normally at about 62°F to 65°F, according to my own knowledge and what I've been told by other people who are still out at Diablo. This is because the component cooling water goes through a heat exchanger which cools it to the temperature of the ocean, which is usually roughly between 62°F and 65°F. PG&E is misleading the reader when it says that the water temperature is "well above 50°", because it isn't enough above 50° to even drive off the moisture, much less to amount to a pre-heat.

Another way of looking at this is to consider the fact that pre-heat values are established partly based upon the thickmess [sic] of the material, and it is assumed that the back of the material is in air. However, since water has a much higher thermal conductivity rate than air, the water-filled pipe acts like a thicker section of base metal, which would require a higher pre-heat value.

When PG&E failed to mention the actual temperature of the CCW system, it tried to obscure a very significant fact, and once the temperature is considered, it is obvious that welding to the CCW lines with such cold water in them would be very difficult because of the rapid cooling of the weld and the likelihood of cracking would be greatly increased.

Likewise, PG&E omits the crucial facts when it says that the main concern is cold cracking caused by hydrogen. As the professor confirmed, the primary problem here is the quenching effect of the water. Because of the rapid cooling, the weld itself can crack, and there can be underbead cracking beneath the weld in the parent material.

This cracking problem is compounded by the fact that the welding was done on thin sections. The thin pipe walls would be rapidly cooled by the cold water, increasing the quenching effect, and making underbead cracking all the more likely. Because of this, PG&E is blatantly wrong when it says that the thinness of the sections "eliminates the possiblity of cracking." PG&E should have said that it increases the likelihood of cracking.

PG&E doesn't say that Pullman had actually qualified any procedure to weld onto water-filled lines, and I strongly doubt that Pullman has qualified any such procedure. PG&E attempts to evade the issue by saying that an engineer "reviewed and accepted" the welding before it was done. Whatever that is supposed to mean, it doesn't meet the code requirement for qualifying the procedure that is to be used.

PG&E is also wrong in saying that the use of low-hydrogen rods "minimizes the possibility" of cracking. To begin with, hydrogen only compounds the problem of the quench rate. But in addition, some hydrogen is diffused into the metal even from low-hydrogen electrodes, and there will also be hydrogen from the moisture which the cold lines tend to collect, and which would not have been driven off because there was no real pre-heating. Thus, hydrogen cracking is an additional problem.

PG&E's excuses haven't explained away the fact that cracking is likely, primarily because of the fast quench rate, which PG&E totally ignored in its analysis. If PG&E actually wanted to eliminate the possibility of cracking, it should physically examine the welds themselves with appropriate tests, such as hardness tests to check the hardness of the welds and of the heat-affected zone. Photomicrographs of the structures involved would also be recommended for this circumstance.

The professor summed up PG&E's response as being due "either to gross ignorance or to a cover-up." I agree. Either PG&E does not understand the basic concept of the rate of cooling, or they are deliberately trying to mislead the uninitiated. (3/21/84 Anon. Aff., Attachment 7, at 1-5.)

"I have read Pacific Gas and Electric's (PG&E) March 8, 1984 statement to the Nuclear Regulatory Commission, DCL-84-097, concerning welding on Component Cooling Water (CCW) piping while it was filled with water. PG&E makes a number of material false statements in that letter, that seriously affect the ultimate conclusion about the likelihood of cracking in the component cooling water lines.

"In particular, PG&E says that the fact that the sections welded were thin 'eliminates the possibility of cracking.' This is absurd. First of all, welding with water in the line means that as soon as a weld pass is made, the weld is 'quenched' by the water, which acts as a heat sink. Because of the rapid cooling of the thin material, it increases the possibility of cracking rather than eliminating it.

"Not only is there a possibility of cracking, but cracking of these welds is probably occurring in the field. I was told within the past week of two welders who were working on a CCW line that their weld bead actually froze on contact. This means that the rate of quenching is so high as to increase the likelihood that cracking or a lack of fusion will occur.

"In order to tell if these welds are cracked, Non-Destructive Examination (NDE) should be conducted. However, Pullman does not require any NDE for this welding, and none is done.

"In addition to this, I have personally observed problems with porosity and cracking at the start and termination of the bead on these welds. If cracking is occurring on the surface, it raises the likelihood that there is porosity or cracking in the root pass, and in subsequent weld passes.

"Because of these factors, I think that PG&E's statement is false when it says that cracking is unlikely in the welding done to the component cooling water system piping while it was filled with water. In fact, it is impossible to tell the extent of the cracking in the welding to these lines, and it should be thoroughly examined to determine the extent of cracking." (3/22/84 Clewett Aff. at 1-2.)

Both the allegations from the NDE inspector, and the other from an anonymous alleger with secondhand hearsay from an anonymous professor, have no technical basis and are in fact metallurgically

unsupportable. A CCW branch connection with reinforcing saddle that had been welded while filled with water has been sacrificed, examined, and tested. There were no cracks. The metallurgical structure and hardnesses in the weld and heat affected zones (HAZ) were such that cracking would not be expected. The metallurgical structure is ferritic and pearlitic with some bainite. The CCW pipe Heat Affected Zone (HAZ) had maximum hardness of only HB 210, the reinforcing pad maximum hardness was HB 255. This clearly shows there is a wide margin and no basis for concern. This data proves the allegers are wrong.

It is alleged that temperatures less than 100°F are not considered preheat. This is wrong. The B31.1 and B31.7 codes which governs the piping work at Diablo Canyon both list 50°F preheat for the materials and thicknesses of concern. ASME Section I and Section VIII also refer to 50°F as preheat. The AWS D1.1 permits prequalified welding of the specific A53 material with the low hydrogen electrodes with a preheat of 32°F.

Pullman's welding program requires the material to be dry independent of the preheating requirement. Thus, surface moisture is not a problem. In relation to this surface moisture, the professor should recall that underwater welding can produce acceptable results.

The temperature of the water is not significant. Whether it was 50°, 70°, or 100°F, it would have minimal affect on the actual

cooling rate in the weld, HAZ, or base metal in the temperature range of concern. The 50°F preheat would have been valid and acceptable for much thicker material in accordance with code requirements and engineering fundamentals.

The primary concern for this type welding operation is hydrogen induced cold cracking in the weld HAZ, sometimes referred to as underbead cracking. Hydrogen induced cracking requires a source of hydrogen and a susceptible microstructure.

The quenching effect of water needs to be considered in relation to the material's critical cooling rate. Rapid cooling by itself is not a concern. For example, many plain low carbon steel materials are water cooled in the forming processes and others are intentionally quenched to refine their grain size and improve mechanical test results without detrimental effect. In fact the effects are beneficial. The fact is that for underbead cracking to be a concern the weld cooling rate must be so very great that the HAZ will form a hardened microstructure. For plain low carbon steel such as A53, the critical cooling rate to form a hardened microstructure is very rapid, approximately 100°F per second at 1000°F. Unfounded speculation about cooling rates due to water quenching is absurd without considering the second half of the requirement, the material's critical cooling rate.

Thinness is important as it relates both to heat transfer and to restraint. As pointed out by the allegers, the water backing causes the material to cool more rapidly, as if the material were thicker. The heat dissipation issue by cooling water is not by itself a real concern. Weld cooling rates need to be considered in relation to the material's hardenability and critical cooling rate. When weld cooling rates and material critical cooling rates are considered together there is no concern. As stated previously, the material did not harden. Thus there is no concern for heat dissipation. The thin wall large diameter pipe also minimizes restraint, which is a critical element in developing cracks. Thus PGandE was again correct as regards thin material.

Forty years of industrial and research experience with Battelle underbead cracking tests show that welding with low hydrogen electrodes does not cause cracking in material which is much more hardenable and susceptible to cracking than the A53 pipe. These test data are significant because they demonstrate the importance of the low hydrogen electrodes. They are also significant because the Battelle underbead cracking test almost completely immerses the test coupon in water. Base materials much more susceptible to cracking than A53 pipe have been welded with low hydrogen electrodes and did not crack even though the water temperature was 32°F--ice water. These data also prove there is no real concern for the CCW welding.

The amount of hydrogen necessary to cause cracking is inversely proportional to the hardness and degree of restraint. When low hydrogen electrodes are used, as they were at Diablo Canyon, the HAZ microstructure may be very hard and not crack. When the HAZ microstructure is soft, as in the CCW case, the hydrogen tolerance is great--so great that low hydrogen electrodes were not necessary.

Thus, for the welding on CCW pipe filled with water, there was and is no basis for concern principally because: (1) The base material HAZ did not harden and (2) low hydrogen electrodes were used. There is a double margin.

The welding procedure specification and welders were qualified as required by the codes. There is no code requirement and no technical reason to qualify on water filled pipe.

The allegations regarding weld beads freezing on contact, starting porosity, and surface cracks at terminations relate to welder technique, not to water filled pipe. Weld beads will freeze on contact if the welding current is not set high enough or if the welder moves the arc too rapidly. The presence of water inside the pipe has little or nothing to do with the solidification of weld metal on the outside at temperatures in excess of 2700°F. Porosity, and especially starting porosity, is a welder induced defect generally caused by too long an arc length as controlled by

the welder. Surface cracks, such as the crater cracks at the termination of weld bead, are also induced by poor welding technique. Starting porosity and crater cracks are commonly ground out and the weld reworked.

The welds in question have been examined, tested, and accepted. A CCW branch connection was sacrificed and examined and found to be crack free, and also found to have microstructure which was not crack susceptible.

The paragraphs above address the specific issues raised by the allegations. The following is a simple and direct discussion of the underlying technical concerns.

Hydrogen cracking and, in particular, underbead cracking, did not occur in these welds because the two separate conditions which must exist to induce the cracks were not present in the CCW welds. These two conditions are a susceptible microstructure and the amount of hydrogen present.

A susceptible microstructure must be present. Microstructure is related to both the weld cooling rate and the materials being welded. Welding cooling rates need to be considered along with the material's critical cooling rate (CCR). Provided the weld cooling rate is slower than the CCR, cracking will not be a problem. The CCR

is dependent upon the material's chemical composition. Cooling rates more rapid than the CCR cause a hardened microstructure to form. The ease of forming a crack susceptible microstructure is described as "hardenability." One approximation of "hardenability" is the carbon equivalent. Steels with higher carbon equivalents are more hardenable, have slower CCRs, and are more susceptible to cracking.

The A53 CCW pipes at Diablo Canyon are basically plain carbon steels and are essentially nonhardenable. These steels have such rapid CCRs that, with normal welding heat input, it is not possible to form a crack susceptible microstructure. In this case, the material A53 Grade B, is such that a very high cooling rate is required to obtain the necessary microstructure. This very high cooling rate is not achieved even with water backing. This has been demonstrated by metallographicaly examining one of the CCW welds. This examination shows that the HAZ of the CCW piping is primarily ferrite and pearlite with some bainite. The maximum hardness of the CCW pipe was HB 210. The maximum hardness of the reinforcing pad was a HB 255. This structure is not susceptible to hydrogen or underbead cracking.

Hydrogen must be present in sufficient quantity to initiate cracking. As stated before, low hydrogen welding electrodes used were stored and controlled to preclude hydrogen pickup. This assures that the amount of hydrogen charged into the weld is below the amount required for cracking welds even those with susceptible

microstructure. In this case, the excellent filler material control system would ensure a crack-free weld.

The amount of hydrogen required to cause cracks is primarily related to the material hardness. If a material is soft (as is the CCW material), then the hydrogen is not a concern and ordinary non-low hydrogen electrodes would have been acceptable.

The fact that low hydrogen electrodes were used means that there was a great tolerance for a hardened microstructure. Microstructures significantly harder than were found in the CCW pipe would have been acceptable. Thus, as regards both susceptible microstructures and hydrogen, the water filled CCW welding had significant margins.

III-15

It is alleged that:

On March 13, 1984, there was a meeting between the Pullman leadmen and Pullman supervision, after which the leadmen told the Quality Control (QC) inspectors that starting immediately, for both Units 1 and 2, QC inspectors were not to write any Discrepancy Reports (DR's, which go to PG&E to be dispositioned) and were only allowed to write Deficient Condition Notices (DCN's), a Pullman in-house form.

They said that even if it should be a DR, to only write it on a DCN form, that Pullman's Quality Assurance (QA) department would review them to see if there were any conditions that required a DR, and that if so the QA department would write them up.

When inspectors asked questions about this, the QC supervisors told them that this new procedure was ordered by Bill Kimmel, the head of the QA department, and that Kimmel would issue a memo shortly.

Kimmel is the QA supervisor, and QA has no direct authority over the day-to-day actions of QC personnel. In addition to this, I am concerned that this new procedure violates 10 CFR Part 21, 10 CFR 50.55(e), and 10 CFR Part 50 Appendix B. (3/22/84 Clewett Aff. at 3.)

The entire issue of DCNs and DRs was previously addressed in PGandE's Answer in Opposition to Joint Intervenors' Motion to Reopen on CQA, Karner and Etzler Aff. at 36-39. That response stated in part that:

> Details of Pullman Power Products procedures for reporting deficient conditions are contained in procedures ESD 268 (Field Procedure for Deficient Condition Notices (DCN), and ESD 240 (Field Procedure for Nonconformance Reporting called a Discrepancy Report (DR)). These procedures have been in effect since 1973 for ESD 240 and 1978 for ESD 268.
>
> These procedures were prepared, reviewed, and approved by both Pullman QA/QC management and PGandE to be in compliance with the Pullman QA Manual section for nonconformance reporting (KFP-10) and PGandE's

Specification 8711. These procedures give the specific details for preparation of a DCN and a DR. The DCN, as identified in ESD 268, is a method for field personnel to identify what they believe to be problems that violate procedures and which cannot be corrected during the normal course of construction. In accordance with the approved procedure, ESD 268, PGandE is not required to review the DCN.

The DCN, by procedure, does require Pullman Engineering concurrence. If a DCN is prepared by engineering, it also requires Pullman QA/QC concurrence. This assures that both Pullman disciplines are aware of the condition, have the opportunity to assure that all items are accurately depicted, and that all necessary information is included in the DCN. The review by a Pullman QA/QC leadman, which is not required by procedure, was implemented to further assure that information is accurate, that all necessary information was included, and to let upper levels of responsibility know of problems that are occurring. This review is not intended to delay submittal of these reports, but is done to prevent further recurrence, to immediately provide additional training and instructions to the responsible parties, and to assure that these reports are not rejected for lack of information at the next level of review. With proper justification, a DCN can be voided at any level of review including that of the QA/QC manager. If the DCN is voided prior to reaching the Pullman QA/QC manager, it is done so only with the concurrence and agreement of the originator or his first line supervisor.

If the DCN is voided at any stage of the process, the original DCN or a copy thereof is returned to the originator. Additional instructions have been implemented to assure that these documents are handled properly and voided copies are kept on file. The DCN can be dispositioned in various ways, one of which is identifying the problem on a DR.

The "new" procedure mentioned by Mr. Kimmel was merely a restatement of the procedure which had long been in effect. This memo was issued to all QA/QC and Engineering personnel by Mr. Karner and Mr. Cornish on March 14, 1984. The actions involved herein violated no regulatory requirements.

It is alleged that:

5. In the Introduction to the February 7, 1984 PGandE Letter No: DCL-84-046, under "2. Nature of Concerns," it is stated in Paragraph (b) that "discrepancies are of a minor nature and, when revised calculations or analyses were performed, all of the piping and supports fully met the licensing criteria and commitments." I have two questions in response: (1) How can PGandE be so sure that the above statement is true when in Paragraph (a) they admit that "discrepancies have been found in the small bore piping design work"? (2) Were the effects of torsion accounted for? The calculations that I performed, including torsion, failed about 50% of the supports (these have been redone; was torsion removed?), and a co-worker, in his affidavit, says that he was not allowed to include torsion. (See attached Affidavit (Exhibit 1).) He was a member of the Unit 1 team that is performing the present review. I will volunteer to review with the NRC a sample of the 110 supports recently reviewed by PGandE, both computer and hand-calculated.

6. In reply to PGandE's conclusion that there is no reason to believe similar concerns exist outside OPEG, it should be noted that OPEG was not very different from the home office of Bechtel or Westinghouse; all were under pressure to produce to meet schedule. If OPEG had problems with document control, how can one conclude without looking at the home office that it didn't have this problem also [illegible or deleted] the overall management was the same? After PGandE's long string of calculation errors, I question whether PGandE has now reviewed the calculations correctly. PGandE must demonstrate through a full review that the calculations were based on the controlled documents listed below. (Undated Stokes Aff., Attachment 4, at 2-3.)

Mr. Stokes appears to be reading isolated statements from the PGandE letter DCL-84-046 to the NRC, dated February 7, 1984, out of context and sometimes in reverse order. In proper order, the letter states that "discrepancies have been found in the small bore piping design work," and then immediately follows with "Such discrepancies are of a

minor nature and, when revised calculations or analyses were performed, all of the piping and supports fully met the licensing criteria and commitments." As further explained in the letter, PGandE was able to make this assertion based on a detailed review of a sample of 110 small bore pipe support analyses. This subsequent review did include appropriate consideration of torsional effects in support design. The appropriateness and acceptability of the support design review have subsequently been corroborated by extensive NRC staff technical audits of this work.

Mr. Stokes' statements concerning the similarity between conditions at OPEG and those at the home office or Westinghouse are totally unfounded speculation on his part, since he had no direct involvement with either operation. The large bore effort was conducted (at the San Francisco home office) by an entirely separate design group at a different location. Moreover, there were a wide range of different circumstances involved in the large bore pipe support design effort which reinforce the high confidence level in the quality of that work. These included the use of internal technical review groups to review and monitor support designs and calculations prior to issue for construction, ready access to staff specialists for consultations on technical problems, greater emphasis on initial indoctrination and training, and wider use of periodic special training when required.

III-19

It is alleged that:

NRC Question: (Allegations 55 and 79, SSER 21) Gaps to reduce thermal loads (p. 5):

7. From PGandE's response [to Allegations 55 and 79, SSER 21], it seems obvious that they have reviewed thermal effects with blinders on. In a plant subject to seismic excitation, the only reliable anchors are those such as wall penetrations (which can vibrate depending on location) and anchors attached to walls, floors, or ceiling concrete or steel (they, too, can vibrate depending on fixity of structure). In effect, no anchor should be assumed completely in reduction of thermal load. For example, a large bore pipe is considered an anchor due to relative size. However, unless the large pipe itself is anchored close to the small pipe branch line, its location cannot be relied on over the life of the plant in establishing the thermal gaps to reduce loadings to other supports. To illustrate: [figures deleted]

8. Depending on total conditions, use of gap may not be valid. Either it should not have been used to relieve load to small bore supports, or after every seismic disturbance these supports subject to increased load should be reviewed for gap and movement changes in location of TAM of large bore line. Also a similar effect occurs on a small bore line with a restraint on each end. If this line is quite long and the hold line is shifted due to seismic activity, the support at each end could be subjected to larger than designed-for loads. Example: [figures deleted]

9. This may not be the worst case scenario: At time 0 the plant is cold. As it heats up, the line expands uniformly. This is because friction on the supports grows from the middle of the radial line out and produces balanced loading on each side of the center point until one end grows enough to encounter a restraint. The first end to hit is the right side after 1/16" growth; then this support in effect pushes or is pushed against by all friction loads on all supports as the line grows in the other direction of freedom. Time 0 on the right end is subjected to the sum of all friction force developed by internal supports. At some time in the future, during cold shut-down for refueling, a seismic disturbance occurs and the line shifts position. Expansion occurs as it did at Time 0, only now the left end is the restraint.

10. When gaps are used to relieve thermal load, there are certain requirements. I have never seen the load considered this way, with unequal placement or uncentered placement of the line in relation to gaps. The general assumption is that if there is 3/16" thermal expansion and there are a total of 3/16" gaps, then there is no thermal load to any support. This is not a conservative analysis, and I question whether or not the cases hypothesized above have been considered in the stress calculations and the resulting loads given to the support group.

11. Here, too, is the assertion that "these loads are derived from two totally different loading phenomena, one static (thermal), and one dynamic (seismic)." The same questions and concerns are raised here as in the use of gaps to reduce thermal loads. PGandE continues to state that after re-performing analysis that the licensing criteria are met. I question why a different method was used for their systems initially if a problem did not exist. These new analyses should be reviewed in depth by an outside party. (Undated Skokes Aff., Attachment 4, at 3-7.)

Mr. Stokes goes to some lengths in his affidavit to hypothesize worst case piping configurations for which modeling of thermal gaps would not yield conservative results, particularly after a seismic event that could cause piping to reposition from its original cold position. He overlooks the fact that thermal gaps were considered carefully prior to their use. Further, he completely misses the point that in the very limited number of cases where this analytical technique was used, the particular piping configurations involved would lead to repeatability of the thermal piping growth with a high degree of confidence. Notwithstanding the above, and in order to resolve its consideration as an issue, PGandE has made a commitment in PGandE letter DCL-84-214 to the NRC, dated June 7, 1984, to remove from the thermal analysis models all support gaps before the first

scheduled refueling outage. The affected analyses will be revised and qualification will be reviewed for pipe stress, pipe supports, equipment nozzle loads, and other analysis criteria. If modifications are required to allow the removal of gaps in the analysis, they will be completed during the first refueling outage.

Mr. Stokes also indicates his doubts about reanalysis done on calculations which originally used different stiffnesses for the same rigid support in static and dynamic pipe analysis and expresses skepticism about the reanalyses actually demonstrating qualification in accordance with licensing criteria. This is somewhat understandable when viewed in light of Mr. Stokes' lack of experience in piping stress analysis.

As noted, the calculations were reanalyzed and were shown to be qualified when stiffnesses were included for both load cases. The stiffness refinement was originally considered in the thermal analysis in order to more accurately determine the thermal loading condition on a particular support. The seismic loading was not reassessed because it was not in question. The inclusion of stiffness in the seismic analysis was not done to gain some imagined or particular advantage.

It is alleged that:

12. I challenge the first line in PGandE's response, concerning engineering judgments. Many of the so-called "engineering judgments" were not those of the individual engineers performing the calculations, but were suggestions made by group leaders who claimed to only want to see how the hypothesized change would affect a support that had been failing to meet design requirements. Although they told those doing the work that the suggestion would not be used, when the results came back and the stresses were now acceptable, the engineer was either pressured into signing, or the calculation was given to another engineer who did not question the method used and just signed it off. I was given supports to perform the analysis; when I demonstrated that a support was deficient and returned it to the group leader after it had been checked, I found that another engineer was performing the same calculation from scratch. This happened to other engineers also. Although the group leader acted surprised when the engineer discovered the same suggested calculation being performed by another engineer, to my knowledge every person in the Unit 1 squad from November 1982 to March 1983 was aware of this happening. In retrospect, I realize that this multiple assignment of the same support occurred so frequently as to be intentional. I remember one time the same support was assigned to three engineers simultaneously by the same group leader, only to be discovered near completion of all three. Due to the number of supports that I was finding on a preliminary basis to be inadequate, I felt that the reason for the multiple assignments was to see which results were the most favorable to passing the support. The others were thrown in the garbage can. This conclusion is based on the fact that no calculation package includes more than one original design.

13. In STRUDL modeling, possible errors by the engineer involved things like Beta angles, which were required to orient the members correctly; the determination of the proper Beta angle to be used in the model for structural steel angles; and especially unequal leg angles. Another modeling problem was that some engineers omitted the joint eccentricities where members are welded together. This could decrease the stresses, since by the omission of these eccentricities the torsional loads were reduced. Another problem in using STRUDL and hand calculations was the determination of "Ky," "Kz," "Lg," "LZ." (See attached excerpt from STRUDL Manual (Table 14.1 -- Parameters used

by the 1963 and 1969 AISC Codes (Exhibit 2)) and Quan (ECA) Memorandum to AISC Code Check Users (Exhibit 3).) These were almost never correct.

14. Other problems were common in both computer and hand calculations. The first resulted from the load case form. (See attached Stokes' Loading Cases for Hanger Form and HP 41C Program (Exhibit 4).) Two problems came out of this: (1) Teams of two were established early in the Project where one member checked the other's work and vice-versa. The individual teams resolved between them the correct way to fill out this form. Through discussions with other teams, we discovered that almost all had a different interpretation. On other design jobs, the checking was randomly assigned, so that the group inter-related and merged in practice. (2) The second problem was that typically all Load Cases A across were input to STRUDL or used in a hand calculation. In fact, there are more Load Cases (i.e., 1, 2, 3, 4, 5) than just A and B. In the case of an anchor support where FX, FY, FZ, MX, MY, MZ are filled in for cases A and B, adding all possible combinations of A and B under Case 1 will result in 36 possibilities. This number was never analyzed; only an assumed worst case was analyzed. Had anyone analyzed the 36 cases, he would have lasted at best a month before being dismissed for production reasons. The significance of this is that no one can guarantee that each support was verified adequately, except for the most simple cantilever single load (FX) or (FY) or (FZ) support.

15. Another problem involved the evaluation of torsional stresses on the members of the supports. Some engineers use the "Torsional Analysis of Rolled Steel Section," published by Bethlehem Steel, which evaluates both the warping normal contribution to bending stress and shear effects. I am not sure where Bethlehem got the procedure, but the same method is developed in "Bending and Torsional Design in Structural Members" by C.P. Heins, published by Lexington Books (copyright 1975). I should note that the necessary projection for angles is not included in the Bethlehem data, nor is it completely developed in Heins' book. But the necessary factors can be found in other texts or calculated using analysis similar to that for structural channel shape in Heins' book. I used this method, and with the added shear stress and bending stress, many angles exceeded 1.0 in the interaction equation. The other method of torsion evaluation came from a book entitled, "The Design of Welded Structures" by Omer W. Blodgett, published by Lincoln Welding Foundation, in Section 2.10: "Designing for Torsional Loading." (See

Exhibit 5.) This method is limited to shear stress. Some problems occurred between Table 1 (Torsional Properties of Various Sections) and Table 4 (Torsional Resistance of Frame and Various Sections). Table 4 was sometimes used incorrectly. Another problem with this method was that on page 2.10-8 the equation $\tau = Tt/R$ was used without considering equation τmax [sic] = $T(1+t/4a)$. The $t/4a$ would have resulted in substantial increase to resulting stress if it were considered.

16. Many times an angle would not pass with only the shear calculation per Blodgett. Since the Bethlehem method was more involved than Blodgett's, I resorted to a two-step analysis. I checked the angle using Blodgett and if the interaction was .75 or above, I would then check it using the Bethlehem method -- including the effects of warping normal (bending stress) contribution. This usually would exceed the interaction value of 1.0 and fail the angle. Other engineers did not do this because of management policy. (See Exhibit 1.) Other engineers and I felt that angles should be checked per AISC Section 1.5.1.4.66 for unbraced length. However, we were not allowed to nor was any method given to compute a reduced bending stress allowable.

17. It is impossible to determine whether an error originated with the designer by looking at the type of error. The engineer should be asked if his engineering judgment was used or whether it was a suggestion from a supervisor. I believe an additional cause of discrepancies was suggestions by the supervisors, and this has been confirmed by my asking others.

18. At page 11, Paragraph 3, PGandE concludes: "The fact that when the discrepancies were addressed the supports were accepted without modification substantiates the adequacy of the design process." It is my understanding that support No. 100-132 or another support did fail after being corrected. It is noted that six supports have not been finished. These could include the one that failed and continues to be analyzed.

19. It is also stated that "the methods and criteria were not modified for this evaluation." This implies to me two possibilities: (1) all errors that have been found may still exist, and (2) things not included in the past still are not included, as described in Exhibit 1 and my earlier disclosures. I volunteer my services again to the NRC in reviewing a sample of the 110 packages. (Undated Stokes Aff., Attachment 4, at 7-12.)

In this allegation, Mr. Stokes seems to contend that once any pipe support calculation has been done which does not demonstrate that the support meets criteria, no amount of additional analysis, ingenuity, or new perspective can ever be used to qualify that support. Once it "failed" by his calculation, the support is apparently doomed. A more reasonable engineering approach to a design verification effort such as that undertaken for the Diablo Canyon Project (where one is evaluating a piping system that is already built) would be to expend additional effort to demonstrate qualification of pipe supports when feasible. Normal engineering methodology includes use of trial run calculations to evaluate various optional assumptions and analytical approaches as well as the use of the experience, expertise, and perspective of various engineers to resolve a problem. These methods were appropriately and legitimately employed at OPEG to demonstrate pipe support qualification to project licensing criteria.

Mr. Stokes goes on to detail several specific areas where he speculates that calculation deficiencies might exist involving Beta angle, joint eccentricities, use of the load case form, evaluation of torsional stresses, and evaluation of the effects of warping normal stress contribution. In fact, the review of the 110 pipe supports design packages was done using a comprehensive procedural check sheet which specifically includes the items identified above in addition to numerous other technical points. The review has been completed, and

in every case after any calculation discrepancies were resolved, the evaluation showed that all piping and supports fully met the applicable licensing criteria and commitments. Furthermore, the adequacy of the support design review has been corroborated by the extensive NRC staff technical audits of this work.

It is alleged that:

20. PGandE states that "It has been industry practice to ignore the dead bands when performing seismic analysis." I agree. However, generally, industry and manufacturer recommendations and good engineering practice also require that a snubber would not be used unless pipe movements required it and would not be placed close to a bilateral support unless it allowed sufficient pipe movement for the snubber to operate. In all plants and projects where I have worked, a snubber would usually be used with (a) a rigid support in one direction and snubber in the other direction, or (b) snubbers in two directions.

21. In addition, when using a snubber near a one-direction rigid support, close attention would be given to how the snubber and rigid restraint interfaced. In other words, a snubber would not be placed on the side of the rigid restraint where the pipe movement would cause the snubber clamp to hit the rigid restraint and restrict the axial movement. Most engineers issued the two packages (snubber and rigid) to the field together. Also, both packages would note that one should be considered in relation to the other on installation to prevent interference problems.

22. Drawings on the other projects and the old drawings on Diablo Canyon included the snubber movements so that someone in the field could catch any installation interference problems (Note: Originally in Unit 1 work, we included this data, but when someone decided it was unnecessary we were instructed to remove all movements.).

23. In no case would I use a snubber when the thermal displacement in that support direction was less than 1/16", which is typically an industry-used value. Had these requirements been written into M9, there would be few dead band problems at Diablo Canyon.

24. I have three concerns: (1) Why were these snubbers placed so close to bilateral supports and anchors? (2) In all cases where a snubber does not activate, was the stress analysis for that load case redone omitting the snubber? (See Snubber Displacement Chart (Exhibit 6).) (3) Has anyone reviewed the records to determine what was installed first: the snubber, the rigid restraint, or the anchor?

25. I think PGandE's summary of attachments is worth restating in different terms. Seven of fifteen snubbers do not lock up under Design Earthquake (DE) displacement, six of fifteen snubbers do not lock up under Double Design Earthquake (DDE) displacement, and four of fifteen do not lock up under Hosgri (Hos) displacement. Is it possible that 46% of all snubbers in the Plant are unnecessary? How much money was wasted due to (1) engineering design, (2) material, (3) construction, (4) re-evaluation, (5) removal, (6) possible risk to workers to perform removal if the plant is in operation? All as a result of, inadequate design criteria by management. (Undated Stokes Aff., Attachment 4, at 12-14.)

Mr. Stokes begins this allegation by acknowledging that industry practice is not to include snubber dead band when performing seismic analysis. He then seems to contradict this by mentioning the "dead band problems at Diablo Canyon." First of all, the total number of snubbers installed at Diablo Canyon is consistent with the number found at other nuclear power plants. While there are some snubbers installed at Diablo Canyon which are not needed to qualify the final installed piping configuration, they are relatively few in number. In no case do these unnecessary snubbers result in a piping overstress or a support overload. The presence of these snubbers, therefore, has no effect on plant safety.

The Diablo Canyon design criteria are intended to define piping design requirements consistent with plant safety, not to achieve the optimum usage of snubbers. Notwithstanding this lack of safety significance, but in order to reduce future maintenance requirements, PGandE has committed in letter DLC-84-060 to the NRC Region V, dated February 15, 1984, to a snubber reduction program to eliminate all unnecessary snubbers by the second refueling outage.

program to eliminate all unnecessary snubbers by the second refueling outage.

It is alleged that:

NRC Question: (Allegation 89, SSER 21)
Improper resolution of pipe interferences (p. 21):

26. When I was in Quick Fix for Unit 2, I deleted a support that was in the process of being installed when a Pullman field engineer brought this problem to my attention. Upon a visual inspection of the line configuration and support proximity, I questioned the necessity for adding a support at that location. I placed the support on hold for 24 hours until I could check with the stress group to see why it was being added and whether it was necessary. Upon locating the stress engineer, I was told that the pipe was resting on a piece of unistrut and that ME101 would not allow a dead load seismic restraint and that a support had been modeled in. This support was unnecessary, as loads to all supports were in the neighborhood of 10 pounds. The stress engineer should have requested the removal of the unistrut or its movement, so as not to interfere with the pipe. However, upon discussion, he agreed that the support could be removed and told me the stress analysis would be corrected, and I agreed to void the design through Quick Fix to prevent its being installed.

27. In the last line of its response, PGandE states that "it would appear that this situation demonstrates good communication between Construction and Engineering, sound engineering practice, and a proper solution that resulted in a system that meets the design criteria." In fact, this "proper solution" occurred only at my initiative, and I was later laid off for taking these kinds of initiatives. This kind of response cannot be assumed for other cases, and by other engineers. (Undated Stokes Aff., Attachment 4, at 14-15.)

Although the specific instance Mr. Stokes relates in his affidavit occurred, it does represent a reasonable example of "good communication between Construction and Engineering, sound engineering practice, and a proper solution that resulted in a system that meets the design criteria." Mr. Stokes did identify the problem with the

pipe support. He did not mention that the removal of the unistrut also required reanalysis, redesign, and construction. The reason that the unistrut was removed was that it was more cost-effective than installing a new pipe support. The fact that this positive outcome resulted due to Mr. Stokes' initiative is gratifying, since that was what he was being paid to do. Mr. Stokes' contention that he was later laid off for taking these kinds of initiatives is incorrect. His layoff was part of a planned force reduction.

It is alleged that:

NRC Question: (Allegation 79 and 88, SSER 21)
Calculation of the load-carrying capacity of small bore piping suport (p. 22):

28. PGandE states that "All final calculation packages are retained and permanently filed. There is no regulatory or other project requirement to retain the intermediate or interactive analyses." However, 10 CFR 50.34(b)(4) provides that "A final analysis and evaluation of design and performance of structures, systems, and components with the objective stated in paragraph (a) (4) of this section and taking into account any pertinent information developed since the submittal of the "Preliminary Safety Analysis Report (PSAR)" (emphasis added). The problem is that PGandE's and Bechtel's final documents at Diablo Canyon ignore pertinent information developed in the design verification review. Vital data was not taken into account, incorporated or even referenced in the final calculations. It just disappeared. Consistent with standard industry practice, one would expect to find a steady progression to a more detailed, more technical, more expert calculation. This is in fact Bechtel's procedure or standard in practice at other plants, even though it may not be stated in writing.

29. Having worked in the nuclear industry with and for Bechtel, I can describe the company's and the industry's standard practice for the history of a support analysis. First, there is a preliminary calculation by the design engineer. He may approach the problem using several proposed designs. These may be based on his knowledge and creativity or on others' knowledge and creativity obtained through discussions. In any case, a final approach is decided upon and calculations are completed by him. This analysis is then given to a checker (an independent reviewer). He will check technical points, Code sections relied on, math, ease of construction, and cost competitiveness compared to an alternative. He either agrees with the results as they are or suggests changes and returns the package to the design engineer. The design engineer then reviews the checker's comments. He may not agree, and then the designer and checker will have a discussion, usually coming to a mutual understanding. After the calculation is complete to the satisfaction of both the designer and checker, they sign it and the package is given to a supervisor for review and approval.

Sometimes the supervisor (who would have greater experience) will ask for a complete redesign. The designer and checker then redo the calculation, sign it, and return it to their supervisor. He signs it. After his signature, the preliminary calculation becomes a final calculation package.

30. Later, new loads may be imposed due to a mistake being discovered. The calculation is then reviewed to see (1) if it is still acceptable; or (2) if it will require modification. These calculations are necessary as a basis for subsequent modifications. Even if the loads are of a preliminary nature, no need arises to remove the calculations showing non-compliance with Codes. In those cases, final loads can be compared against preliminary failing loads that are used to determine if the support requires modification. In review of final loads against preliminary loads, in many cases an engineer need only compare loads and reduce previous calculated stresses as a percentage reduction of load. In others, the results may not be so easy and an engineer may redo some or all of the calculations. When doing a later review for load changes, many engineers do not review a previously checked calculation if in the past it was passing. However, if the previous calculation was failing, complete review of the calculation would be necessary to see if errors had occurred that might be corrected and cause the support to pass before modifying it. (See attached example calculations on hanger 100-132 R-1 by both Gary Katcher and G.R. Shaw (Exhibit 7).)

31. With respect to Exhibit 7, I would like to make several points. PGandE stated that they have sharpened their pencil to prove the supports adequate now, even though they failed under preliminary loads. A careful comparison of the calculation of Gary Katcher and that of Shaw is instructive. Mr. Katcher's STRUDL model is considerably more detailed than Shaw's: (i) The cover sheet demonstrated that Katcher's version was performed before Shaw's; (ii) Katcher's includes more pages than Shaw's. Note on Katcher's three-sheet Summary his finding that base plates and anchor bolts failed; Shaw's didn't. Note also the sketches in Katcher's drawing that show the detail to which he resorted in investigating in the field the true configuration; Shaw used Katcher's sketches. Compare Katcher's load sheets load point by load point to Shaw's. They are identical. Both loads are the same, not more advanced as PGandE has claimed to the NRC. Finally, compare calculations; Katcher's is more detailed than Shaw's.

32. The only conclusion to be drawn is that Katcher sharpened his pencil while Shaw dulled his, unless the later model was a suggestion by his group leader to omit eccentricities or to introduce various other management-imposed inaccuracies. Also, I believe Mr. Katcher's work is a good, typical example of all the unused failing calculations that PGandE has admitted to throwing away.

33. This comparison contradicts a number of statements made by DCP personnel at the December 15, 1983 meeting with the NRC Staff. One example: "[We] use more sophisticted techniques, more advanced techniques to see if it is possible that more detailed, more thorough, more sophisticated analysis can show that the pipe and supports in its existing configuration is acceptable." (Transcript, p. 9.) This was a false statement. Simliarly, on page 11, second paragraph: "Even the logic of an implication that we intentionally mislead is faulty." For anyone to suggest that we would risk all of this effort to save a support on a half-inch line to keep from modifying a support on a 3/4 inch line is ludicrous in my mind." It would be ludicrous to me, as well, on the above-stated premises. But it is not so ludicrous if the modification would exceed the percentage determined by the Diablo Canyon Project to require expansion of the sample and thereby cause delay in the start-up of Unit 1. I have been told by supervisors that the cost per day to PGandE during any non-operation amounts to about a million to a million and a half dollars. (3/23/84 Stokes Aff., Attachment 4, at 15-19.)

Mr. Stokes' apparent "understanding" of the record retention requirements for superseded calculations is simply wrong. The only calculations required to be retained are the final calculations which reflect the analysis actually relied upon to show adequacy of design. ANSI standard N45.2.9(1979) does not require retention of intermediate calculations, nor does any NRC regulation, regulatory guide, standard, or procedure. The section of 10 CFR 50.34 which Mr. Stokes refers to in this allegation has to do with the Diablo Canyon FSAR, not superseded calculations.

A discussion of the history of the calculation for support 100-132 (calculation MP-444) was presented in PGandE letter DCL-84-046 to the NRC, dated February 7, 1984, pages 31 and 32. Notwithstanding Mr. Stokes' preoccupation with the unique historical background of this support, the support has been shown to meet all licensing criteria without modification.

Mr. Stokes then erroneously interprets the small bore reverification sample program basis. The program was described in detail in the PGandE response dated March 6, 1984, to Joint Intervenors' Motion to Reopen DQA, Attachment B, paragraphs 21 to 28. In that response PGandE states clearly that any technical matter for which a support failure was identified would automatically cause the sample to be expanded to address that concern generically.

It is alleged that:

34. PGandE states that "no joint is completely 100% rigid." This is true for the figure 100%, since the loads transferred to a joint cause strains that stretch the material making up the joint. From any basic strength of materials or structural design text this can be shown. However, in many such texts, designs are postulated that for all practical purposes are 100% fixed.

35. In many instances, the joint is modeled so that no moment resistance is offered by the steel to which the member is attached. In structures, these connections would be, for example, column to beam with angle clips. However, in pipe supports, almost all joints are designed as moment connections, at least to carry the moments induced and calculated at the joint. Also, to my knowledge the only joint that would qualify for a moment release in any direction is a single line weld about the axis along its length. It would still have 2 moment resistance. [Example deleted]

All joints configurations [examples deleted] and others should not have joint releases used. Some computer programs allow that factor as an input for the joint, but these usually are no lower than .6 or 60% fixed. PGandE's response does not resolve the allegation or explain the use of joint releases for rigid connections. (Undated Stokes Aff., Attachment 4, at 19.)

Mr. Stokes apparently is not familiar with the use of the "joint release" technique as a method of providing an accurate representation of end connections in the analysis of structural members. He claims "All joints configurations...should not have joint releases used." This practice, however, is standard in structural engineering evaluation of frame structures. The NRC staff reviewed this issue and concluded in SSER 22: "However, the staff also finds the engineering basis and approach as described by the DCP acceptable and in accordance with current engineering practice," and

later, "The issue of assumed joint releases for rigid connections is considered resolved."

It is alleged that:

36. Although PGandE's response mentions only section NF-3260 of ASME Section III, the section NF-3260 includes sections 3261, 3262, 3262.1, 3262.2, 3262.3, and 3262.4, and U-bolts come under sections NF-3261, NF-3262, and NF-3262.4 (component standard supports as defined in section NF-1214). Also relevant is section NF-3226.1 -- "Bearing Loads" -- which states, "(a) The average bearing stress for resistance to crushing under the maximum load, experienced as a result of design loading, test loading, or any seismic loadings, except those for which Level D limits are designated, should be limited to yield stress (Sy) at temperature, except that when the distance to a free edge is larger than the distance over which the bearing load is applied, a stress of 1.5 Sy at temperature is permitted." (Emphasis added.) (See ASME Section III, NF-3226.1, 3260 et seq. (Exhibit 8).) This section in effect requires that the support to the pipe not exceed the recommended bearing stress level.

37. I believe an accurate calculation would show that at the point of loadng the pipe to the U-bolt, only a point contact occurs. It is obvious that any load applied on a point will have an infinite stress, which will cause the U-bolt to fail under this section. In B31.1, I should note Section 102.3.1(B): the "allowable stress values in bearing may be taken at 160% of tabulated value." Even this section will dictate that a U-bolt not be used.

38. In ASME section NF-1241.1 "Types of Component" -- standard supports are listed (U-bolt is not listed). Shoes, lugs, rings, clamps, slings, straps and clevises are listed. These load-transmitting hardware typically have common characteristics. They are form fitting and all have width. They all spread the load over a larger area of pipe than a U-bolt. I understand that the use of U-bolts by many in the industry is justified on the grounds that they offer a simple installation of a cheap component. However, their use at Diablo Canyon is not supported by local bearing stress calculations. Note that even a component supplied as a catalog item should be chosen by the stress engineer to comply with all requirements of the Code selected as the design basis, whether B31.1 or ASME Section NF. I know many engineers fail to check bearing stress. At other plants, after I raised this point, management decided to replace U-bolts or pad load area so that bearing stress was acceptable.

39. In Paragraph (1) of its summary of conservatisms, PGandE states: "The test loads used in the equation of NF-3260 represent the lowest tension and side test loads found for 1/4 in. and 3/8 in. diameter rod U-bolts, respectively." To illustrate my point, results are summarized below from the U-bolt test data sheets:

1. Pipe Size 1/2"
   Rod 1/4"
   Force at .025 Displaceemnt [sic]:

   Run 1 = 1700 lb. (which failed)
   Run 2 = 2600 lb.
   Run 3 = 3500 lb.
   Run 4 = 2300 lb.
   Run 5 = 1800 lb.

2. Pipe Size 3/4"
   Rod 1/4"
   Force at .025 Displacement:

   Run 1 = 1900 lb.
   Run 2 = 900 lb.
   Run 3 = 1300 lb.
   Run 4 = 2000 lb.
   Run 5 = 1900 lb.

3. Pipe Size 1"
   Rod 1/4"
   Force at .025 Displacement:

   Run 1 = 4000 lb.
   Run 2 = 2700 lb.
   Run 3 = 1900 lb.
   Run 4 = 3100 lb.*
   Run 5 = 1800 lb.** (1700 at .025")

* Run 4 stopped for safety reasons
** Run 5 carried to .0263 in.

40. Thus, the low tension values are as follows: 1/2" [d] pipe was 1800 lb. at .025"; 3/4" [d] pipe was 900 lb. at .025"; and 1" [d] pipe was 1700 lb.; 3/4" [d] pipe with 1/4" rod size tension load using PGandE's failure point of .025 in. shows that the lowest failure is 900 lb. force. Inserting this as TL in Equations NF-3262.4 Level A Limits Load Ratio = TL x 1.0 (S or Fall/Sy) using S = 32.8 at 200°F KSI SU = 65KSI, the load rating for this U-bolt would be 454 lb. per Dwg. 049243 Sh 26 1/2 pipe 1/4" bolt

tension load case 1&2 = 2000 lb. In short, PGandE exaggerated the strength by over four times.

41. PGandE's response does not explain how the data in the U-bolt Test Program became 049243 Sheet 26, nor does it prove that the results are conservative. (See attached Sh 26 of 049243 and 1/4" Rod Data Sheets (Exhibit 9).)

42. I am at the disposal of the NRC for an in-depth look at the U-Bolt Test Program and the results of the data. (3/23/84 Stokes Aff., Attachment 4, at 20-22.)

The information relative to the development of "U" bolt allowances was provided to Mr. Stokes over one year ago when he requested a copy of the test data from OPEG management. The NRC has reviewed the basis for U-bolt allowables and has found it consistent with the reverification effort. Numerous allegations have been made and satisfactorily answered, and still Mr. Stokes is unsatisfied.

The statements made in this allegation are either wrong, misquoted, or confused, and make response difficult.

It is obvious to anyone familiar with ASME Section III that when one quotes a main paragraph number all relevant subparagraphs are automatically included. For example, if one were to cite NF3260, it goes without saying that it includes the applicable sections NF3261, 3162, etc.

Mr. Stokes states, "Also relevant is section NF3226.1..." To the contrary, 3226.1 is a subparagraph under the general heading NF3220, "Design of Plate and Shell Type Supports by Analysis." This

paragraph is clearly not relevant or applicable. Furthermore, the point that Mr. Stokes is attempting to make on "test loading" is wrong. The test load referred to in NF3226.1 is the pipe operational condition and not the method used to qualify the pipe support.

The point contact issue is apparently referring to Section NF3226.1 which is not applicable to the method of qualification by testing. It is difficult to understand why Mr. Stokes steadfastly refuses to accept the results of a comprehensive testing program but rather desires to prove by theoretical analysis that a U-bolt fails when the test clearly demonstrates that it doesn't.

Mr. Stokes refers to a nonexistent ASME Section NF1241.1. Section NF1214 lists some of the component standard supports and states that Figure NF1214-1 shows typical catalog items. This figure shows a "U bolt" as a "Typical Component Standard Support Unit."

The load values cited are not the test/failure loads that NF3262.1 allows. These values are much higher than the values cited. The method used by PGandE to qualify U-bolts by test is consistent with the rules of Section NF, "Design by Load Rating."

It is alleged that:

43. I am reviewing documents supplied to the NRC and will also do my own research on references in this country to which I will submit an in-depth statement on applicability of Australian papers and any available U.S. information. My contention is that the use of a nuclear plant as a proving ground for a new design is not in the interest of public safety. As a licensed professional engineer, I believe the use of this information is premature until the profession in this country is able to assimilate and verify its reliability for the unique conditions at a particular nuclear plant, such as Diablo Canyon. (Undated Stokes Aff., Attachment 4, at 23.)

Mr. Stokes contends that use of Australian data as the basis for design of unbraced angle members in bending should not be allowed until the profession in the U.S. has a chance to assimilate and verify its reliability. In fact, the AISC has endorsed the use of the Australian data. A reprint of the Australian paper "Safe Load for Laterally Unsupported Angles" was published in the official Engineering Journal/AISC, First Quarter, 1984. The AISC's position is summarized in the editor's note to the reprint. The editor stated: "The AISC Specification and Manual offers limited direct design criteria for such members." The paper was reprinted "in response to the many inquiries AISC has received on the subject." The editor also mentioned that the Australian papers "have often been referenced in the past to provide requested design guidance." Thus, it is PGandE's belief that AISC has adopted the use of the Australian paper for design of angles in bending.

It is alleged that:

44. I was told, as were others, that a sample based on 5000 feet of pipe would be examined to justify the design of 25,000 feet; and that if 5% of these 5000 feet failed to meet criteria, then all 25,000 feet would have to be reviewed. Also, we knew of the generic categories of THERMAL, Seismic Anchor Movements, and Thermal Anchor Movements code break and active valves.

45. PGandE states in Paragraph 2 of its response that the sample was 5000 feet for 25,000 feet and, in Paragraph 4, that it later changed to end up with 5000 feet for 15,000 feet. This contradicts the statement that "the initial sample selected in the fall of 1982 remained the 'sample' throughout the small bore reverification program." It appears evident that when supports failed in the sample and justified a complete review of all supports, PGandE reclassified those problems as generic rather than admit the need to review all supports.

46. If this statement is true on the other hand, then the supports in the sample which were reviewed as generic should still be considered as sample supports. In that case, approximately 40% of the sample failed. This figure is based on the fact that the sample was used to justify 25,000 feet of piping originally, which later was reduced to 15,000 feet. The difference here, 10,000 feet, would have been determined to be generic. 10,000 feet divided by 25,000 feet is equal to 40%. I have told the NRC that I was failing about 50% of the supports. I believe the difference, 10%, may be due to the inclusion of torsion in my calculations. In any case, under these circumstances, the review program must be expanded to a full review of the additional 15,000 feet. The results of the work done are further in question, since the NRC Staff reported that nine out of twelve packages that they reviewed were unacceptable, due to one or more errors.

51. In conclusion, since time does not permit a complete rebuttal to PGandE's response, I would like to make one last point. In all of the responses I have read, no detailed calculation was included demonstrating that the issue raised through a specific example of support has been accurately resolved and is no longer a problem. Based on previous practices and the false statements that I can identify through personal experiences, these responses cannot be accepted without a verifiable public record of

supporting data. I would like to see copies of specific support calculation packages that I will identify, with notes of problems originally discovered. These may be placed on public record, so that the quality of engineering work at Diablo Canyon can be reviewed by other interested parties.

I would like to restate that I am available to discuss with the NRC any of the issues relating to the subject matter of this Statement, to any earlier affidavits, or to any other matters concerning Diablo Canyon of which I am aware. (Undated Stokes Aff., Attachment 4, at 23-25.)

The source of Mr. Stokes' misinformation concerning the small bore sample program is not clear, but it most certainly did not come from his supervisors within QPEG. Specifically, the alleged 5% failure limit is totally unfounded and without basis. No such limit was ever even considered for the program. Mr. Stokes apparently refuses to understand the basis for the sample and generic aspects of the small bore reverification program. He states "It appears evident that when supports failed in the sample and justified a complete review of all supports, PGandE reclassified those problems as generic rather than admit the need to review all supports." What he fails to recognize and/or understand is that by reclassifying a problem as generic, all supports which exhibited traits or characteristics similar to the problem support--that is, those which had the same generic concern--were reviewed .

Mr. Stokes then concludes this allegation with a mathematical exercise which leads him to a conclusion that 40% of the sample supports failed. This appears to arise from his arbitrary rejection

of the generic review concept and his view that all support modifications under the generic review are failed sample supports.

It is alleged that:

47. In reply to PG&E's letter: DCL-84-083 Question 2, the true intent here was that foreign steel was being used (not that it was from Japan). Canadian steel was admitted. However, it is contended that steel with 1.5t radius does not exist at Diablo. I know this to be false. My supervisor, Jeff Van Klompenburg, had a piece of 2x2x1/4 tube on his desk which had one corner with a 1.5t radius. He said he obtained it by having a piece cut from stock. This fact, when combined with PG&E responses, leaves only one possibility. Steel from another country was used at Diablo.

48. PG&E response to questions 2b, 2c and 2d. The problem between 1.5t, 2t or 3t is the magnitude of weld which AWS gives credit for, based on 5/16 R. If the condition exists where R=1.5t instead of R=3t as assumed by PGandE, the installation would result in a condition that is 50% deficient from original design. In some cases the joint detail might have to change. Instead of a butt joint (tube to tube) to plate might be required so that a fillet cap could be added to increase the weld. This is especially true on 2x2x1/4 TS.

49. Attachment C of PG&E's Letter. United Engineers state that when welding 3x3x1/4" tube that problems were encountered in obtaining 5/16 R welds. As a [illegible or deleted] they recommended that a 1/8" electrode be required for the first pass to ensure adequate penetration. This resolution should also be required for 2x2x1/4 tube, 3x3x3/16, and other tube stock. Upon review of Pullman's procedures, no limit of 1/8" electrode is required. Therefore per PG&E's own statements, welds on 3x3x1/4 tube and under are in question as to meeting the 5/16R amount which was assumed by design. (Undated Stokes Aff., Attachment 4, at 26-27.)

This issue was fully addressed in PGandE response to ILP Allegations JIR-18 and 19, provided in PGandE letter DCL-84-239, dated June 26, 1984, to the NRC.

III-29

It is alleged that:

50. I would like to also state that I have read the rebutal [sic] to Pacific Gas and Electric (PG&E) comments concerning welding. I completely agree with the authors [sic] beliefs and through my own personal efforts have substatiated [sic] that almost no meetings have been held as contended by management to corect [sic] the problems at Diablo Canyon construction site. (Undated Stokes Aff., Attachment 4, at 27.)

It is not clear to which rebuttal regarding welding Mr. Stokes is referring, or what alleged problems the meetings were intended to address. There is insufficient substance in the allegation to permit a meaningful response. However, each of the rebuttals regarding welding is addressed separately separately in this filing.

III-30

It is alleged that:

1. "If any misinterpretation concerning weld symbols occurred, steps were taken to prevent reoccurrence by conducting meetings with personnel or by clarifying procedures."

Response: P G & E's response to this particular concern is only partially true. In fact, Pullman has issued various revisions to ESD [illegible]3 (one of the relevant construction engineering documents in this instance), yet failed to reference American Welding Society Standard (AWS) A2.4 as being the standard for weld symbol interpretation. The significance of this is that the procedures still do not reference a governing, controlled document that establishes universal interpretation of welding symbols throughout the plant. This ambiguity can allow welding that does not meet the original design intent to be performed in the plant on Seismic Category I structures. Without a standard to use, it is impossible to have a quality assurance program to verify the "Design" to "Installation" criteria is [sic] properly applied.

I further take exception with the position that extensive steps have been taken by management through meetings to clear up the confusion. To my knowledge, as of March 16, 1984 meetings to discuss the weld program deficiencies have not been held with the field pre-inspect engineers responsible for implementing any changes in established practices. I know this, for I personally would have been in attendance. I found this response puzzling, and questioned my lead, John Rhodes, as to P G & E's commitment to AWS A2.4. His response was that we were not committed to AWS but were committed to whatever management told us to do. See attachment 7, interoffice memorandum 034318. This document states that not until October 15, 1983 did they require strict compliance with AWS A 2.4. (Undated Anon. Aff., Attachment 5, at 1-2).

The following allegations relate to PGandE's letter to the NRC Region V, DCL-84-040, dated February 7, 1984, which, as requested by the NRC, provided an overview of the weld symbols issues. This letter included examples of some problems, and an

explanation of how those were accommodated. The letter pointed out that welding symbols are a part of a communication process. Welding symbols were addressed in PGandE letter DCL-84-166 to the NRC, dated April 30, 1984. The overview on welding symbols from the letter is repeated here.

WELDING OVERVIEW

WELD SYMBOLS

The following twenty-two allegations are based on weld symbols: 171, 173, 174, 234 through 246, 248, 249, 252, 253, 254, and 263. These allegations represent 16% of the allegations in GAP II. The allegations come from only two sources: first, Mr. Stokes, and these were previously addressed; and second, GAP II anonymous affidavit attachments, which have not been made available. The allegations all fail for either a lack of substance, lack of context, technical errors, false or misleading statements, or a combination of these reasons. The subject of weld symbols was discussed with the NRC and documented in PGandE's letter DCL-84-040, dated February 7, 1984. It is recommended that the February 7th letter be reviewed to assist in understanding the response.

This overview is provided to keep the significance of the allegations in perspective. The total program with regard to weld symbols has worked effectively from design calculations to as-built structures.

American Welding Society symbols for welding have been used at Diablo Canyon since its inception. Symbol usage has been incorporated into the project by numerous references to contract specifications and other documents. AWS symbols have been used as the common basis for communication within the United States welding industry, regardless of the fabrication code specified or product constructed. As stated in AWS A2.4, the intent of symbols is to facilitate

communication. The AWS symbols have been used by common consent even where not specifically referenced, just as the English language has been used at Diablo Canyon. Symbols may have occasionally been used imperfectly, but the required meaning was conveyed and understood, and the use of any non-standard symbols has not resulted in unacceptable welds. The parallel between weld symbols and the written and spoken language exists in that grammatically imperfect language can effectively convey meaning and requirements.

Engineering and inspection personnel have acquired knowledge of welding symbols through their experience, education, training, and use of references. Pullman has included questions regarding weld symbols in the QC inspectors' qualifications tests since 1974, and has included AWS A2.4 in the reading list for QC inspectors. Welding symbols are not difficult to master. In fact, approximately six symbols account for almost all field welds.

Due to the rapid expansion of the Diablo Canyon plant staff, specific training programs were conducted regarding AWS A2.4 weld symbols. Three hundred and fifty engineers and QC inspectors were trained during May, June, and July of 1983. Additional pre-certification training was conducted for the AWS Certified Welding Inspectors Program in June-July and November-December, 1983.

PGandE letter DCL-84-040 provided an overview of the weld symbols issue. Examples of symbol concerns and unclear symbols were intentionally included. Notations were made on example drawings contained in DCL-84-040 to show how the Project addressed the specific concern, and how the Project compensated for lack of specific or clear weld size information.

Previous correspondence was included with DCL-84-040 showing examples of how some imprecise weld symbols on previously issued drawings were to be interpreted. Additional correspondence displaying examples of preferred symbols, labeled DO, and non-preferred symbols, labeled DON'T, were also included. The DOs and DON'Ts were identified as applicable to new drawings.

In a few cases, specific narrow scope exceptions to the standard symbols have been documented. These

documented exceptions to A2.4 symbols use are permissible and correct in the context of the Diablo Canyon Project.

Weld symbols are not used in a vacuum but are part of a program of communication between design engineering and construction in the field. There have been, and will continue to be, additional verbal and documented communications between engineering and construction clarifying design requirements. These communications are a necessary and proper method to assure that the welds required by the design are installed in the plant.

As has been explained, the AWS welding symbols have been used at Diablo Canyon since its inception. These symbols are the common basis for communication within the United States welding industry. The fact that Pullman did not reference the A2.4 document in ESD [illegible] is of no consequence because the use of these symbols and their interpretation is inherent. Contrary to the allegation, this did not result in an ambiguity. Because the AWS welding symbols are commonly available in references, this complaint has no merit.

The assertion that the Project was not in compliance with AWS symbols until October 15, 1984, is also false. The alleger's Attachment 7 was included in PGandE letter DCL-84-40. This subject is also addressed in III-33G and III-37, below.

It is alleged that:

2. "Also, potential weld requirement misinterpretations were accounted for in the design process."

Response: A direct interpretation of this statement leads one to believe the engineers intentionally designed ambiguity into their design. This statement is ludicrous. If the potential existed for misinterpretation and was realized by management/engineering, why wasn't the situation remedied from the on-set?

AWS D.1.1, paragraph 1.5 states that special conditions shall be fully explained by added notes or details. Had this basic engineering practice been followed it would have minimized the confusion, the cost overruns and schedule delays. This position by P G & E/Bechtel management could only be an open admission to intentional cost overruns or gross mismanagement of their contractors. (Undated Anon. Aff., Attachment 5, at 2.)

The alleger apparently considers the design process to be limited to the simple act of drawing a symbol on paper. The design process in fact is obviously more complex. The process involves the initial drawing, Construction's interpretation of the drawing, preparation of the as-built drawing, and reconciliation of the as-built drawings.

In this process, Construction systematically interprets weld symbols most conservatively making longer, thicker, larger welds where there may be questions. In reviewing the as-builts, designers use the smaller, shorter interpretations if a symbol is ambiguous. At this stage, the designers do not take any credit for ambiguous or non-quantified symbols, such as square grove welds, seal welds, and heavy welds, unless the welds can be quantified.

PGandE letter DCL-84-040 to the NRC Region V, dated February 7, 1984, contains numerous examples of special conditions being explained by added notes or additional details.

III-32

It is alleged that:

3. "The Diablo Canyon program is typical for the industry . . .".

Response: To me this statement reflects P G & E/Bechtel position that "we're not worse than the rest of the industry, don't pick on us." The relevant codes have been implemented since the early 1970's. The failure to comply with these rules is a burden that rests upon P G & E irrespective of industry practice. (Include copy of "Focus on Nuclear", Attachment # 16).

To further illustrate this fact, it has long been a position that Pullman is erecting the plant in compliance with ANSI B31.1, and ANSI B31.7 with welders qualified to ASME Section IX. ANSI B31.7, paragraph 700.2 directly invokes AWS A.3.0 (Terms and Definitions). (Undated Anon. Aff., Attachment 5, at 3.)

This allegation does not assert that anything is incorrect; it simply expresses an opinion. PGandE's use of welding symbols was proper in accordance with ASME, ANSI, and AWS codes.

III-33A

It is alleged that:

4. "The weld symbols used at Diablo Canyon are consistent with the standards specified in AWS D.1.1, Section 2.4".

Response: This author has been told on several occasions that AWS standards do not apply to Diablo Canyon, since it is being built to ANSI B31.1, ANSI B31.7 and welders qualified to ASME Section IX. Yet the ANSI standards and ASME codes do not directly reference the use of welding symbols at all. The only clarifying point made in the ASME/ANSI codes states that all joints must be detailed to give the installers the necessary information to insure the joint is welded as designed.

To my knowledge, there exists no controlled, centralized document on site that clearly defines the proper use and interpretations of weld symbols on the project. This shortcoming exacerbates the lack of uniformity in compliance with consistent practices of proper weld design.

Further, AWS D.1.1 Section 2.4 as referenced in the P G & E [sic] response addresses only filler material and not weld symbols. The correct AWS standard is AWS A2.4 "Symbols for Welding and Non-destructive Testing". (undated Anon. Aff., Attachment 5, at 3.)

It is correct that the AWS D1.1 Structural Welding Code does not apply to piping or to pipe supports governed by ANSI B31.1 and B31.7. Contrary to the allegation, there need not be a controlled centralized document on site that defines welding symbols. AWS welding symbols are the common basis for communication just as the English language is. The Project does not and need not have a dictionary available as a central reference; likewise, a central reference to AWS welding symbols is not needed.

It is alleged that:

To illustrate further, the use of improperly applied symbols or terms such as "typical" is abused on many Hanger drawings. An example of the unclear use of "typical" is shown on Attachment 1, Item 1 A Spring Hanger No. 20-145V. The best use of this callout would be to indicate the welds at the two (2) joints where item 2 attaches to Existing 24WF100. Note that no weld had been called out for item 2 to item 1 joints previously, since the circled arrow was the reason for this revision. This is not a minor problem. Almost every drawing issued has a question raised as to how the "typical" should be interpreted and applied. In this example, it was cleared up by Engineering, but in others it isn't and in those cases each person in the chain has their own idea of what is the correct use and no consistent interpretation is applied. (Undated Anon. Aff., Attachment 5, at 4.)

The allegations regarding Spring Hanger 20-145V, Item 1, express the personal opinion of the alleger. The use of the typical symbol is perfectly clear. The drawing was indeed clarified and improved as pointed out by the alleger. Such a clarification is an acceptable practice even though it may not have been necessary. He is complaining that the welds on the opposite ends of a member were not specifically called out, although these were labeled "typical." It is wrong to state that no consistent interpretation was applied.

In a worst case, the joint in question, which relied on the typical call out, would have been unsymbolized and that in turn would cause a symbol to be applied. This issue has no technical merit. The alleger has simply offered an opinion regarding his preference for symbolization.

III-33C

It is alleged that:

Another problem with Hanger No. 20-145V is item 2. Here the use of a note "Seam Weld 4 PLCS" is incorrectly used. A spring Hanger Bracket is a cold rolled plate which has a radius on the side where this symbol is pointing and the correct call out would be for a flare-bevel grove weld or if radius is extremely small a fillet weld. Without investigation into the size of the brackets the correct weld symbol can not be determined by viewing the drawing, but under no condition would a seam weld be applicable. When comparing this use to AWS A2.-Figure 22 it becomes obvious that this use is incorrect. (Undated Anon. Aff., Attachment 5, at 4.)

The allegations regarding Hanger 20-145V, Item 2, seam weld, is a gross misrepresentation of fact. This weld symbol encircled by a scallopped balloon was intentionally included in PGandE letter DCL 84-040 to the NRC Region V, dated February 7, 1984, as an example of a symbol problem, and how that problem was addressed. This scallopped balloon noted, "Weld not taken credit for in calc." The Project recognized the problem and compensated for it. The alleger is clearly making a misrepresentation when he cites this as an example of a symbol failure. It is, in fact, an example of a properly functioning program which addressed problems clearly and directly.

III-33D

It is alleged that:

In continuing, see Attachment 2, Item 1, DCN # DC-1-E-P-3858, line # 1-55-48-3, a class I line. The design calls for an unequal leg fillet weld, Item 1, which would result in one leg @ 1/4" long and the other leg @ 3/16" long. However, on the drawing the weld design is depicted by a symbol without any expanded details to show which leg goes to which item and to assure compliance with design requirements. (Undated Anon. Aff., Attachment 5, at 4.)

The allegation regarding lack of clarity for the location of unequal legs of a fillet weld is frivolous. It is obvious from inspection of the referenced attachment that the 3/16-inch leg belongs adjacent to the 2-inch Schedule 40, 0.154-inch-thick pipe stanchion and that the 1/4-inch leg is to be on the thicker run pipe. It would be absurd to do the reverse.

III-33E

It is alleged that:

Significant problems result when weld symbols are not uniformly interpreted at the plant. See Attachment 3 Item 1 Hanger 58N-4R. The symbol indicates a full penetration flare bevel weld with a 1/4" fillet cap. When welded, the AWS standards allow you to take credit for 5/16 times radius of bend (R) "effective throat" partial penetration weld even though shown as a full penetration weld.

The addition of a fillet weld does not increase the structural strength of all joints when used unless the fillet size is increased in relation to size of tube steel welded. It does create a false impression of "additional" structural strength when in reality the strength only increases minimally or not at all. (Undated Anon. Aff., Attachment 5, at 5.)

The example shown in affiant's Attachment 3, Item 1, Hanger 58N-4R, is a 1/4-inch fillet reinforcing a flare-bevel weld. This weld connects a length of 4 X 4 X 1/2-inch tube steel member to a 5 X 5-inch plate. The designer used an effective throat of 5/16-inch (0.31 in.) for the flare-bevel weld. The throat would increase to approximately 0.39-inch with the 1/4-inch fillet addition. This is well known by the designers. This issue is really moot since the designer only requires 35% of the flare bevel weld without reinforcement to qualify the support.

The flare-bevel weld with a fillet cap was simply an as-built reflection of the installed support; it was not designed to have the fillet reinforcement. This fact is clearly stamped on the affiant's

exhibit. It is improper for the alleger to state this fillet weld gives a false impression; it does not.

III-33F

It is alleged that:

On this same Attachment, Items 2 and 3 pose a different problem. The use of 3/16" and 1/4" as shown are per AWS A2.4 indications of the depth of preparation to be made. (Undated Anon. Aff. at 6.)

The alleger has identified these symbols as being in compliance with AWS. He claims these represent a problem.

He apparently intends to inform us of what this problem is at a later date. In the interim, our review shows that the designer has chosen not to include these welds in his calculations to qualify the support. The two adjacent 1/4-inch fillet welds shown in another view are more than enough to qualify this joint. There is no technical or safety problem.

III-33G

It is alleged that:

At this point I would like to emphasize the last line of Attachment 4 "All pipe support as-builts issued by General Construction after October 15, 1983 should have all weld symbols in conformance with AWS A2.4," and Attachment 7, last paragraph "Welding symbols in strict compliance to standard of AWS A2.4," and Attachment 9 under Responses Item 1 where a contradiction to AWS A2.4 is expanded on as the correct use. It appears to me that the use of AWS A2.4 is not consistent by management. They only use AWS A2.4 when they want to, where they want to, and how they want to, but not as AWS A2.4 states it is to be used. (Undated Anon. Aff., Attachment 5, at 6.)

This appears to be another misrepresenation of facts and presentation out of context. The alleger's Attachment 7, dated October 10, 1983, addressed pipe supports and emphasized the need to comply with AWS. Attachment 4, dated October 25, 1983, reconfirmed that pipe support weld symbols would comply with AWS A2.4. The alleger's Attachment 9 relates to HVAC work by different personnel, not to pipe supports. In this case, the kinds of weld joints and material thicknesses used in HVAC installations are different from pipe supports or structural steel. A minor problem was recognized with HVAC symbols and the Project addressed the problem, clearly identifying the symbol convention being used. This was a correct and appropriate Project action.

It should be noted that all three of the alleger's attachments were also attached to PGandE's letter DCL-84-040, dated February 7, 1984, to the NRC. This allegation does not represent any new information, or have any technical or safety significance.

III-33H

It is alleged that:

On Hanger 1-36R, Attachment 5, Items 1 and 2 notes added to the design drawings specify "1/4" fillet weld - all accessible-typical." Not only are the design requirements ambiguous but the application of these requirements results in insufficient Quality Assurance criteria to qualify "what is accessible". There has to be a specific quanity [sic] (size & length) of welds required by the design. It is not possible to conduct calculations on the basis of a phrase like "all accessible" welds. there is no method to assure the engineer, who performed the calculations that theoretical welds be [sic] used for calcuations were indeed welded in the field, or later verified from as-built by Engineering correctly. (Undated Anon. Aff., Attachment 5, at 6.)

This allegation is also based on PGandE letter DCL-84-040, dated February 7, 1984, to the NRC. The alleger's Attachment 5 was provided in PGandE's letter as an example of drawings for which SFHO engineers requested additional or clarifying information concerning as-built weld conditions. The two locations referenced in this allegation did not require verification because loading conditions were satisfied even with a minimal amount of installed weld. This fact was confirmed by the final as-built drawings supplied after construction which reported the actual installed weld.

III-33I

Attachment 6, Hanger drawing 20-44R. Item 1 is a prime example of the abuse of "typicals" and "3 sides". The requirements specified in the example call for 9 welds on a angle member while simultaneously specifying 9 welds on a channel member. Item 2, Per AWS 2.4, indicates a full penetration weld with a 3/16" fillet. In trying to figure out what is intended here, see Attachment 8 under Integral Attachment Do's Dont's. The callout is under Do's a partial or complete penetration weld on sides and 1/8" fillet on one end. This is ridiculous. One possible question is does this mean 3/16 preparation on partial penetration weld and 3/16 fillet or does it mean full penetration with 3/16" fillet? Item 2 also has the arrow pointing at the member. It should point to the joint in question. (Undated Anon. Aff., Attachmen 5, at 6-7.)

In this case the alleger continues to present data and figures out of context. All of this was addressed in PGandE letter DCL-84-040, dated February 7, 1984, which presented facts to the NRC.

The complaint about his Attachment 6, Item 1, is groundless. The meaning of weld "3 sides-typical" on both the angle and the channel, is clearly shown in his Attachment 6. The weld symbol arrow clearly points to the three outside surfaces of the channel, the two inside surfaces, and the vertical outside surface of the angle.

The alleger's complaint about his Attachment 6, Item 2 is, once again, totally out of context. This item was included in DCL-84-040 as an example of a problem and the figure contains its own resolution: "Partial penetration weld not taken credit for." This weld symbol was not well done. Symbols like this were the cause of the Project issuing the "Do's and Don't's" which were also included

in DCL-84-040. The context of the figure is very clear. It indicates that fillet welds are to be generally used for lug attachments (except for nuclear Class A or, when fillet welds become large, partial or full penetration welds should be used). The alleger's opinion appears to have been based on an improper comparison of existing acceptable weld symbols with a new preferred design instruction. The symbols are understandable as used. The comparison between Attachment 6 and Attachment 8 is inappropriate. The questions asked regarding the alleger's Attachment 6, Item 2, were answered in PGandE letter to the NRC, DCL-84-040, dated February 7, 1984.

III-33J

It is alleged that:

AWS A2.4 paragraph 9.2.5 states in part "except for square groove welds, the effective throat '(E)'... '(E)' only is shown for the square groove weld." The symbol requirements are clearly stated for square groove welds. In contrast, Hanger drawing 49-46A, attachment 11, Item 1, PG & E has used a size number to the left of the weld symbol that should indicate the depth of preparation for the square groove weld. Further the "square-groove" weld symbol appearing in the design drawing 25-8R, Attachment 10, Item 1, indicates a full penetration square groove weld 1/8" long. I submit that it must have an impact on the QA when the weld symbols guiding the work are so inaccurate. (Undated Anon. Aff., Attachment 5, at 7.)

This subject was addressed in an attachment to PGandE letter DCL-84-040, dated February 7, 1984, to the NRC, as an example of communication clarifying requirements. See page 3 of the September 30, 1983, Pullman memorandum to and approved by J. Arnold, which is included with DCL-84-040. The square groove weld referred to on hanger 40-46A, alleger's Attachment 11, (not 49-46A, as stated by alleger) is on a nonsafety-related angle frame restraining line K-3249-3. This seal weld is not taken credit for and has no safety significance. The square groove weld referred to on hanger 25-8R, the alleger's Attachment 10, is clearly indicated as, "weld not taken credit for in calculation." This was included in PGandE Letter DCL-84-040. The alleger has clearly misrepresented this case. There is no problem.

III-33K

It is alleged that:

Attachment 11, page 2 of 2, Item 3, order of welding wrong-reading from line, groove weld should be first then fillet weld.

A thorough review of the hanger designs at the plant would reveal that even the most basic of all AWS weld symbols "the field weld flag" is reversed on drawings. This is a small point and a non-safety related one, yet it does violate AWS A2.4 and illustrates the incompetence of employees. Note the drawings used in PG & E's letter No. DCL-84-040 supplied by management are used as my attachments of incorrect symbols usage. (Undated Anon. Aff., Attachment 5, at 7.)

The alleger's Item 3 on his Attachment 11 is an example of an imperfect symbol which, nonetheless, has a perfectly clear meaning. The designer wanted a fillet weld reinforcement on a partial penetration weld. The requirement has been perfectly communicated even though the symbol is not perfect. This item requires a minimal amount of common sense to understand. A quick review of this allegation shows that it consists largely of misrepresentation, incomplete review of the PGandE documents, and items taken out of context. In any event, we would agree with the alleger that this allegation is, as are his others, "a small point and nonsafety-related."

It is alleged that:

5. "For configurations that are somewhat difficult to symbolize, it is understandable that construction personnel might need periodic clarification of these symbols."

Response: If the joint symbol is too complicated to be understood, then sound engineering practice would have been to detail the joint in blow-up fashion to assure no confusion results. The proper response is not to perpetuate the use of drawings which cannot be understood. AWS D.1.1 paragraph 1.5 states "special conditions shall be fully explained by added notes or details."

Management has, however, attempted on occasion to legitimize their abuse of AWS weld symbols by issuing memos, Attachments 7 and 8. Unfortunately, these memos "clarify" by issuing contradictory instructions.

Attachment 9, a February 6, 1984 memo from F. A. Morsy to M. Leppke, "welds specified on HVAC drawings", states in part: "[T]he intent on the engineering drawing for the partial penetration weld as shown below [example in original] is that the fraction shown, not in parentheses, is to be the "effective throat."

In contrast, Attachment 12, page 2, paragraph 2, memo from P. S. Brooks to D. A. Rockwell, dated August 24, 1983 "Pipe Support Welding Symbols," states in part "the dimension placed to the left of partial penetration groove welds, when chamfered or beveled for welding, is depth of penetration, not weld size.

The disparity of application and use of weld symbols evident in these memos provides no assurance for PG&E's position that "weld symbols at Diablo canyon are consistent." The only consistency that a close scrutiny can reveal is the inconsistency that is widespread throughout the project. (Undated Anon. Aff., Attachment 5, at 8.)

This is the same issue as this alleger's previous complaint which we have numbered III-33G. As was explained above, the HVAC discipline recognized a symbol problem and the Project took corrective action to document and clearly identify the symbols convention being used. This was a correct and appropriate action.

The alleger has viewed this HVAC action outside its proper context and has contrasted it again to the standard pipe symbols convention used in the pipe support discipline. Each discipline is internally consistent.

It is alleged that:

6. "In view of this fact, welding symbols were used as only one means of conveying weld requirements."

Response: What other method exists to convey weld requirements to the field? This author knows of no other viable method to accomplish this requirement and assure conformity. Since that was my job, I question whether this statement is false and/or misleading. (undated Anon. Aff., Attachment 5, at 9.)

The PGandE response is again represented out of context. The relevant portions of PGandE letter DCL 84-040 to the NRC dated February 7, 1984, are inserted here to show some other forms of communication which help to convey welding requirements. The alleger would wrongly have one believe that all symbols are always perfect, and that he has never asked a question or answered one. Straightforward questions and answers are the simplest form of communication.

As stated in PGandE letter DCL-84-040, at pages 1-4:

A. Overview

The weld symbols used at Diablo Canyon are consistent with the standards specified in AWS D1.1, Section 2.4. For configurations that are somewhat difficult to symbolize, it is understandable that construction personnel might need periodic clarification of these symbols. This is particularly true when modifications are performed on a plant that is already constructed, such as Diablo Canyon. In view of this fact, welding symbols were used as only one means of conveying weld requirements. To date, no situation has been identified in which misinterpretation of weld symbols has resulted in the installation of unacceptable welds. Consequently, there is no safety significance to this issue.

B. Program Elements

The Diablo Canyon Welding Program consists of the following:

1. Regular communication between Engineering and Construction personnel on weld design and intent.

2. Discussions between design engineers and construction personnel to clarify any special problems with interpreting weld symbols.

3. Provision for substantial reserve margins in weld design.

4. Verification of design calculation without reliance on welds made to ambiguous specifications in design calculations.

* * * *

D. Communication of Information

Communication on weld design and weld symbol use has taken several forms, including discussion sessions and written direction. With respect to the first method of communication, Engineering and Construction have conducted meetings to discuss welds, and this program will continue to assure proper communication of weld symbol use and weld design (Attachment 3). These sessions are comprehensive and widespread in that they are conducted with design engineers, field engineers, inspectors, and contractor personnel.

The design information pertinent to welding and weld symbols provided by Engineering to Construction is supplemented by a significant amount of other types of communication. For example, correspondence is transmitted between Construction and Engineering on a regular basis. A representative sampling of correspondence is provided in Attachment 4 to illustrate that questions regarding welding are thoroughly discussed and resolved. This information is used by both Engineering and Construction to revise existing procedures and instructions and to standardize and clarify the intent of welding requirements. This process serves to ensure that the design intent is communicated to Construction and that construction implementation is communicated to Engineering. Design Engineering also sends engineers

to the field in response to any questions which arise. Engineers are present when construction work is in progress to ensure that the designer's intent is provided to Construction and to resolve any possible installation difficulties. Attachment 5 contains a representative sampling of Engineering clarification provided in the field.

The process involved in communicating and implementing the designer's intent has led to many discussions. Items requiring interpretation are identified and handled in the same general manner. Identification of most points requiring interpretation occur during pre-field construction reviews, preparation of erection drawings, assembly of work traveler packages, and during construction but prior to QC acceptance. Items requiring interpretation are resolved by:

1. Referral to OPEG for design clarification.

2. Return to OPEG for design revision.

3. Return to Engineering for design revision.

4. Review jointly by Engineering and Contruction for revision of field installation instructions.

In addition, during the QC review, or after final acceptance, the process identified above may be supplemented by issuance of a discrepancy report with Engineering input for resolution, or by issuance of a discrepancy report with the Project Team General Construction (PTGC) welding engineer input for resolution."

Clearly, this program is simply common sense and is not false or misleading.

It is alleged that:

7. "To date, no situation has been identified in which misinterpretation of weld symbol's has resulted in the installation of unacceptable welds."

Response: This is a false statement. From personal observation I know that many of the "situations" identified in this rebuttal involve unacceptable welds. On several occasions, I authored memos (Attachment 14) questioning the application of welding symbols. Upon reviewing this response from PG & E (Attachment 15), I questioned John Rhodes, the Technical Coordinator for my group, as to PG & E's commitment to comply with AWS A2.4. His response was that we were not committed to AWS A2.4, but were in fact committed to doing whatever management tells us to do.

Further, management has developed an excuse for not finding fault on welding that did not comply with the original requirements as specified on the hanger drawing, and ESD. Instead they have opted to not include the field weld in the hanger calculations, and claim it was unnecessary for stress requirements in the first place. If the weld was unnecessary, why was it specified? By this criteria the original hangers we replaced would have been acceptable. Management would not have developed this excuse if the welds were all right to begin with.

Further, I question whether the welds are unnecessary. my concern on this matter can be illustrated by Attachment 6, Item 2 Hanger drawing 20-44R. In this instance there is no record stating what the bevel (fit up) was, since QC inspection does not document the bevel angle and root gap. Assuming a 3/16" 45° bevel the partial penetration weld specified would result in 1/16" effective throat. (Per AWS A3.0, effective throat is defined as the minimum distance from the root of a weld to its face, less any reinforcement.; Further AWS D.1.1 gives the relationship between depth of preparation and effective throat for a bevel weld (in this instance, assuming a 45° bevel, 3/16" minus 1/8" = 1/16" (E)). PG &E has added a note to this drawing stating that no credit was taken for the partial penetration weld. By this inference they can only be taking credit for the 3/16" fillet weld (overlay). The problem is that in this installation the fillet weld is irrelevant in the hanger calculations due to tis [sic] specified application. In order for the fillet weld to contribute to the structural calculations in this

application, its weld size would have to have been twice as large, or 3/8". [Oversized welding is discouraged per PG & E instructions.] This leaves me to wonder: it [sic] PG & E did not take credit for the partial penetration weld, and they cannot take credit for the fillet weld, then how did the hanger calculations pass? See Attachment 18 for sketch.

To illustrate: for PG & E to make a broad statement that some welds can be thrown out, see Hanger 2033/25 SL (Attachment 17 and 17B) Revision 0 of DC-2-E-P-14584. Item 7 was welded to the embed plate with a 1/2" fillet weld on both sides of the tube steel with no weld on the heel or toe. Revision 1 was issued to add the full penetration weld on the toe of item 7 to the embed plate. If the hangers are so overdesigned at the start, why increase the overdesign? Why cause the additional work on an existing hanger that will just about be impossible to bevel without removal, when these welds are not required? Or, is it possible that these (and other) welds are really required? (Undated Anon. Aff., Attachment 5, at 9-10.)

The alleger's Attachment 14 does not address weld symbols; it addresses the work rate of preinspection engineers performing their constructability review.

Also contrary to this allegation, all efforts were made to standardize on AWS 2.4 weld symbols. If questions arise on how a weld symbol was to be interpreted, a PSDTC engineer could be asked to clarify the design intent. The final as-built drawing showed the actual weld installed.

The allegation concerning welds that are subsequently determined to be unnecessary in whole or in part indicates the alleger has little understanding of the weld design process and time constraints.

Welds are frequently specified before all loads are finalized. The original load assumptions are generally conservative, resulting in the welds being larger, longer, and thicker than absolutely necessary. This is more economical than delaying the design until all loads are precisely known. Another conservatism occurs when designers specify welds to fully develop the load capacity of the member joined rather than the actual loads. Therefore, if a weld's quality or dimension is uncertain at the time when actual loads are known, it may be most effective (and conservative) to abandon the weld for design purposes and not consider it in the calculations. The actual loads and the as-built are then reconciled when the facts are all available.

The alleger's Attachment 6, Item 2 is such a case. The alleger's analysis of the 3/16 partial penetration weld situation is faulty. This allegation is essentially the same as an anonymous allegation made the night of April 11-12, 1984, during the NRC sponsored plant tour for allegers. The response to that allegation was made in PGandE letter DCL-84-170 dated May 2, 1984. The response clearly shows the effective throat of the fillet weld is maintained. PGandE did not take credit for the partial penetration groove effective throat because it was not confirmed. However, PGandE did not assume the weld groove was a void. The alleger's assertion that a 3/8-inch fillet weld is needed for this condition is absurd.

The reverse case, that of additional loads, is shown in the alleger's Attachments 17A and B which show that a hanger drawing was revised to add a weld across the toe (obtuse side) of a skew tube connection which was originally welded only along the sides. This clearly shows that the design process was working properly. Frequently fillet welds across the obtuse side were not cost effective and were omitted in the original design. When the revised loads were known, the addition of a groove weld across the toe was required in revision 1.

The alleger has grossly overestimated the difficulty of preparing the tube steel for the required weld.

No technical or safety concern has been raised in this allegation.

III-37

It is alleged that:

8. "Consequently, there is no safety significance to this issue."

Response: The safety significance is the lack of any previous standard until October 15, 1983. In my opinion it is impossible to avoid safety significance if the welders and inspectors did not know what was expected of them. AWSA2.4 is to be the standard now. Yet to my knowledge there has never been comprehensive training in the General Construction Department, Engineering or other departments to insure its use or the consistency of its interpretation. In general, field work previous to and after October 1983 remains shrouded in ambiguity. Questionable, or undocumentable work practices constitute an unreviewed safety question and should be thoroughly reviewed and corrected. (Undated Anon. Aff., Attachment 5, at 11.)

The alleger is expressing his opinion and lack of knowledge. The weld symbols issue has no safety significance. AWS welding symbols have been the basis for communication since the Project's inception.

As stated in PGandE letter DCL-84-166, to the NRC, dated April 30, 1984, pages 47-49:

> This overview is provided to keep the significance of the allegations in perspective. The total program with regard to weld symbols has worked effectively from design calculations to as-built structures.
>
> American Welding Society symbols for welding have been used at Diablo Canyon since its inception. Symbol usage has been incorporated into the project by numerous references to contract specifications and other documents. AWS symbols have been used as the common basis for communication within the United States welding industry, regardless of the fabrication code specified or product constructed. As stated in

AWS A2.4, the intent of symbols is to facilitate communication. The AWS symbols have been used by common consent even where not specifically referenced, just as the English language has been used at Diablo Canyon. Symbols may have occasionally been used imperfectly, but the required meaning was conveyed and understood, and the use of any non-standard symbols has not resulted in unacceptable welds. The parallel between weld symbols and the written and spoke language exists in that grammatically imperfect language can effectively convey meaning and requirements.

Engineering and inspection personnel have acquired knowledge of welding symbols through their experience, education, training, and use of references. Pullman has included questions regarding weld symbols in the QC inspectors' qualifications tests since 1974, and has included AWS A2.4 in the reading list for QC inspectors. Welding symbols are not difficult to master, in fact, approximately six symbols account for almost all field welds.

Due to the rapid expansion of the Diablo Canyon plant staff, specific training programs were conducted regarding AWS A2.4 weld symbols. Three hundred and fifty engineers and QC inspectors were trained during May, June, and July 1983. Additional pre-certification training was conducted for the AWS Certified Welding Inspectors Program in June-July and November-December, 1983.

PGandE letter DCL-84-40 provide an overview of the weld symbols issue. Examples of symbol concerns and unclear symbols were intentionally included. Notations were made on example drawings contained in DCL-84-40 to show how the Project addressed the specified concern, and how the Project compensated for lack of specific or clear weld size information.

Previous correspondence was included with letter DCL-84-40 showing examples of how some imprecise weld symbols on previously issued drawings were to be interpreted. Additional correspondence displaying examples of preferred symbols, labeled DO, and non-preferred symbols, labeled DONT, were also included. The DOs and DONTs were identified as applicable to new drawings.

In a few cases, specific narrow scope exceptions to the standard symbols have been documented. These documented exceptions to A2.4 symbols use are permissible and correct in the context of the Diablo Canyon Project.

Weld symbols are not used in a vacuum but are part of a program of communication between design engineering and construction in the field. There have been, and will continue to be, additional verbal and documented communications between engineering and construction clarifying design requirements. These communications are a necessary and proper method to assure that the welds required by the design are installed in the plant.

The alleger is incorrect in asserting that comprehensive training was lacking and that the work was ambiguous. The Project conducted weld symbols training for 350 engineers and inspectors in the spring of 1983. Pullman has included weld symbols in its reading list for many years. Weld symbols are easily learned through prior training, education, work experience, or simply picking up commonly available references.

It is alleged that:

9. There is "[r]egular communication between engineering and construction personnel on weld design and intent."

Response: To my knowledge, the only such regular communication has been between the "Quick-Fix Engineer", and a "Field Engineer" on specific problems with hangers in question on an as needed basis, not on a scheduled basis. In most instances only the "engineers" involved with the problem would have an intimate knowledge of the solution.

Historically, the inadequate communication left a pathetic record. In one instance, a Bechtel team member "as-built" a support. He was apparently untrained in welding symbols and inspection. This is evidenced by his report stating "heavy weld all around". How can you factor "heavy weld all around" into a hanger stress calculation, or assure that it has an "effective heavy throat?" No one communicated to us what was intended. You just had to guess.

The contentions identified in this rebuttal are sufficient to confirm that communication between department managers is still lacking also. (Undated Anon. Aff., Attachment 5, at 11-12.)

The Project's response was not meant to imply regularly scheduled meetings in a formal environment. The regular meetings referenced were, in fact, the very ones the alleger acknowledges from his own experience.

The "heavy-weld all around" example cited does not support a lack of communication. This note was placed on the drawings before the "Bechtel team" was even on the job. This issue was previously responded to in PGandE letter DCL-84-166 to the NRC, dated April 30, 1984, page 89:

During the Project's Corrective Action Program, certain pipe support as-built drawings were found to contain incomplete weld descriptions, such as the example "Heavy-weld all around." When an incomplete weld description was found, the support was analyzed assuming the weld did not exist; or, if it was necessary to include the weld in the analysis, a documented reinspection was performed to accurately describe the weld. This follow-up documentation was incorporated in the design calcuations and as-built drawings. Contrary to the allegation, the analysis was proper.

III-39

It is alleged that:

10. There were "[d] iscussions between design engineers and construction personnel to clarify any special problems with interpreting weld symbols."

Response: Refer to responses #1, 4, 5, 7 and 9. In my opinion, they demonstrate that this PG & E claim, similar to other assertions, also is false. (Undated Anon. Aff., Attachment 5, at 1-2.)

The alleger is allowed his opinion; however, even he acknowledges in his affidavit, under paragraph number 9 (III-38), communication between the "Quick-Fix Engineer" (design engineer) and "Field Engineer" (construction personnel). PGandE letter DCL-84-40, dated February 7, 1984, provides additional examples of communications between design and construction regarding symbol interpretation.

It is alleged that:

11. There is "[P]rovision for substantial reserve margins in weld design."

Response: This statement on face value is invalid without a comprehensive review of each calculation package to verify that stress loads are low enough such that unwelded or unqualified welds can safely be neglected. Example: Attachment 13 Item 1 and #7 above with Attachment 17A and 17B. (Undated Anon. Aff., Attachment 5, at 12.)

The allegation presents one element of the overall program out of context. The full context as set forth in PG&E letter DCL-84-040 to the NRC, dated February 7, 1984, page 2, is:

B. Program Elements

The Diablo Canyon Welding Program consists of the following:

1. Regular communication between engineering and construction personnel on weld design and intent.
2. Discussions between design engineers and construction personnel to clarify any special problems with interpreting weld symbols.
3. Provision for substantial reserve margins in weld design.
4. Verification of design calculation without reliance on welds made to ambiguous specifications in design calculations.

As has been previously described in III-36, there are several generalized conservatisms in all designs. These include combining loads based on the assumption they will act together; assuming the minimum specified strength for the material; postulating loads in excess of actual, then sizing welds to support the assumed larger

loads; sizing welds to sustain the material load capacity rather than the actual loads; and providing closely spaced redundant supports.

The alleger's Attachments 13 (78-1595L) and 17 (2033-255L) prove nothing about the general case for substantial reserve margin in weld design. Attachment 13 is the pre-inspection markup of 78-1595L. It shows an example of a square groove weld for which no credit is taken. Attachment 17 is a design revision of 2033-255L calling for an additional weld resulting from increased loading due to finalized piping loads.

III-41

It is alleged that:

12. "Verification of design calculation [was made] without reliance on welds made to ambiguous specifications in design calculations."

Response: This assertion needs supporting proof and explanation to be meaningful. Who decides what were ambiguous weld symbols? If, upon review of field welding, welds were found not to be in compliance with requisite engineering design documents, why weren't they repaired rather than factored into the load calculations? If the welds were not necessary initially for stress/loading considerations, why were they specified to be performed? Why were ambiguous symbols not fixed? See Attachment 13, Item 1. (Undated Anon. Aff., Attachment 5, at 12-13.)

Again, the alleger is entitled to his unsupported opinion. PGandE letter DCL-84-040 provided numerous examples of unclear symbols for which questions were raised by a variety of personnel.

As was stated previously (III-36) in the later stages of construction, when all the loads are finalized, it is possible to abandon some welds, in whole or in part, for design calculational purposes. This approach is more effective than reworking hardware for unnecessary and frequently trivial reasons. At this stage of work, it is much quicker and less costly to do calculations based on actuality rather than to perform unnecessary rework.

The questions regarding welds which are subsequently found to be unnecessary are addressed in response to the design conservatism allegation above, III-40. The ambiguous weld symbols are not

corrected when these welds are abandoned for design purposes because it is costly to revise drawings and the revision serves no purpose.

III-42

It is alleged that:

13. "Weld installation reviews performed early in the design verification program (1981) consisted of reviewing all available as-built information and performing plant walkdowns to obtain additional information."

Response: The "as-built" of 1981 and previous "as-built" performed by Pullman were performed without any universal standard or specification, by untrained and sometimes unqualified inspectors. This process did not provide enough accurate information to adequately assure a comprehensive repair program. (See, e.g., use of meaningless terms for engineering work, such as "heavy weld", that came out of the walkdowns. Page , supra.) (Undated Anon. Aff., Attachment 5, at 13.)

This allegation consists of unsupported opinion. The issue of "heavy weld" was addressed above (III-38). The Pullman personnel performing as-built reviews are qualified in accordance with ESD 235 and 237. The process is conducted using the universal standards found in ESD 223. These procedures were applicable long before 1981.

III-43

It is alleged that:

14. "Welding codes specify minimum weld sizes to ensure that adequate fusion with the base metal is achieved. When welded components are subjected to an analytical evaluation, the weld stresses are almost always low."

Response: This comment is incorrect. Many supports require more than the minimum, as when full penetration welds are specified. On the other hand, too much welding creates high stresses. If in fact management's assertion is correct, why were memos issued to stop the flagrant "over-welding" of hangers at the plant. Over-welding in some cases can be as detrimental to structural soundness as undwerwelding. The excessive heat generated by the process can result in the excessive distortion of the base metal, metal being more susceptible to crack propagation and brittle fracture, if the metal temperature is improperly controlled. (Undated Anon. Aff., Attachment 5, at 13.)

The alleger has again presented material out of context. The original statement in PGandE letter DCL-84-040 was correct. The next sentence in DCL-84-040 is, "This is especially true for electrical raceway and HVAC suppports." Many codes, AISC, AWS D1.1, and ASME NF do have minimum weld sizes as functions of the material thickness and the weld sizes are not related to loads.

The alleger is mixing apples and oranges again. The code minima at Diablo Canyon relate to the building, electrical installations, and HVAC installations. Pipe supports built to different codes were not subject to code imposed minimum weld sizes.

The principal reasons for avoiding overwelding is that it is costly and time consuming. This is especially true in the context of pipe supports (hangers).

Base metal distortion is not a problem provided the final assembly is within its design tolerances. For the kinds of steels used, the thicknesses used, and the design used in construction of pipe supports, excessive welding is not a metallurgical or welding concern.

III-44

It is alleged that:

15. "Designers, using as-built drawings, did not take credit for welds in design calculations if the weld configuration was not clearly shown or if interpretation of weld symbols was not consistently made."

Response: This is so false that frequently the opposite occurred.

Any use of this symbol in the field has been assumed to be 3/16" preparation, with a 45° preparation angle (at present). Under traditional practices, engineering specifications would have allowed the angle to be as small as 37-1/2°. Standard practice in the field resulted in a 3/16" fillet cap weld overlay on a 3/16" partial penetration bevel weld. For reasons discussed in response #7, the analysis pertaining to attachment 6 would apply in this case also. The significance of this problem is that the weld symbol directed engineers to take credit for effective throat size of welds that add nothing to the structural strength of the hanger. (Undated Anon. Aff., Attachment 5, at 13-14.)

This subject, 3/16 inch partial penetration groove welds with reinforcing fillet, is also addressed in Allegations III-36 and 50 and in response to the NRC sponsored plant tour for allegers. The concern for 37-1/2° bevels was originally addressed in PGandE letter DCL-84-083 to NRC Region V, dated February 29, 1984. Jobsite interviews with the NRC staff and supplemental information provided to the staff in relation to the alleger's plant tour also address these issues in PGandE letter DCL-84-170, dated May 2, 1984, and DCL-84-200 dated June 1, 1984.

It is alleged that:

16. "Engineering and construction have conducted meetings to discuss welds, and this program will continue to assure proper communication of weld symbols use and weld design (attachment 3)."

Response: Refer to responses 9 and 10 for discussions on meetings. Further, as of March 16, 1984 the referenced Attachment 3 was not issued to the field, or at least to anywhere that I or anyone I know at Diablo Canyon has worked.

A further example of the inadequacy of management's attempts to assure proper interpretation of symbols and design requirements is evidenced by Attachment 7, a memo from G. V. Cranston to R. D. Etzler dated October 10, 1983 "Clarification of Pipe Support Weld Symbols" and Attachment 8, memo from G. V. Cranston to R. D. Etzler dated October 10, 1983, "Do's and Don'ts for Welding Symbols." These two memos, both from the same individual and dated the same day, in theory were authored to clearly define the proper use of weld symbols. Yet a close scrutiny of page two of both Attachment 7 and 8 reveals that they offer contradictory instructions. In one memo (Attachment 8), the author presents the use of a particular symbol to ensure that the resultant weld is what was desired. The other memo, by contrast, instructs personnel to "don't" use the same weld symbol. (Undated Anon. Aff., Attachment 5, at 14-15.)

The alleger claims to be unaware of the jobsite training programs regarding weld symbols which were conducted in May, June, and July of 1983, in which 350 engineers and inspectors received training in weld symbols. Attachment 3 to PGandE letter DCL-84-040 is almost identical to the weld symbol handout distributed in those sessions. Thus, the allegation that Attachment 3 to PGandE letter DCL-84-040 was not distributed onsite is false. A copy of the jobsite handouts was in fact given to an NRC inspector onsite.

The alleger's Attachment 7 was an Engineering to Construction (930-CA2) clarification of pipe support weld symbols that had been used previously. The symbols used were not wrong; however, they were not as clear as they could have been. The figures attached to alleger's attachments graphically showed the requirements. The alleger's Attachment 8 was an Engineering to Construction memo (929-CA2) that clearly identified the preferred practice and a nonpreferred practice labled "DO and DON'T" respectively. It was correct and logical that some of the less than perfect symbol identified in the 930-CA2 (alleger's Attachment 7) would be brought forward, labled DON'T and that the preferred DO symbol would be shown in 929-CA2 (alleger's Attachment 8).

III-46

PGandE Position:

17. "These sessions are comprehensive and widespread in that they are conducted with design engineers, field engineers, inspectors, and contractor personnel."

Response: Again this statement is false, or at least overwhelmingly misleading. The author can remember that as of March 16, 1984 only one meeting was held that even vaguely resembled those taken credit for. It was neither comprehensive nor widespread. (Undated Anon. Aff., Attachment 5, at 15.)

This issue was addressed in PGandE letter DCL-84-166, dated April 30, 1984, in which it was noted that the job site training programs regarding weld symbols were conducted in May, June and July of 1983. It could be that the alleger's memory is faulty.

III-47

It is alleged that:

18. "The design information pertinent to welding and weld symbols provided by Engineering to Construction is suppplemented by a significant amount of other types of communication. For example, correspondence is transmitted between Construction and engineering on a regular basis. A representative sampling of correspondence is provided in Attachment 4."

Response: Refer to response #16 for examples of communication transmitted between departments. Attachment 4 referenced in this statement as attachment 7 and 8 here.

A further example of the referenced attachment 4 makes use of weld symbols not recognized by AWS. The issuance of this document perpetuates and legitimizes the abuse of welding symbols in the field. (Undated Anon. Aff., Attachment 5, at 15.)

This is simply an opinion, without factual support.

As is shown by the attachments to PGandE letter DCL-84-040, dated February 7, 1984, there was effective communication between Engineering and Construction on the subject of weld symbols.

The issues raised in the alleger's #16 (III-45) were addressed and shown to be out-of-context comparisons. The communications did not legitimize the abuse of weld symbols. The communications clarified previously used, but less than perfect, acceptable symbols and, in fact, emphasized the need for more clear symbols.

"...General Construction shall issue all the as-builts of pipe supports for Unit 2 with welding symbols in strict compliance to standard AWS A2.4." This is hardly "legitimizing improper symbols."

III-48

It is alleged that:

19. "The angle is to be in accordance with either the prequalified or specially qualified procedure."

Response: Per the AWS codes "the angle is to be in accordance with either the pre-qualified or specially qualified procedure." However, engineering was informed that for design, only AWS D1.1 prequalified stick weld process was to be used. This presents a problem, since the weld procedures on site required only a 37-1/2° prior to June 28, 1983 fit up bevel angle. By AWS code this bevel angle applies only to pipe joints as described in AWS D.1.1. In Figures 2.9 and 2.10 the angle requirement for "stick" process allows two options: 1) 60° angle with no deduction of weld and 2) 45° angle with a deduction of 1/8". The site Engineering standard (ESD 223) did not comply with either of the options allowed by AWS D.1.1. In fact, it limited angles to 15° (0° to 180° for skewed -T joints). Not only does the AWS code fail to permit such a small angle, it does not even specify a reduction factor (e.g., minus 1/8") that would compensate for a 15° angle. The deviation is so far from "standard industry practive" [sic] that there isn't any standard way to account for it. Management's practive [sic] of adapting the "pre-qualified welds" allowed under AWS without the necessary qualifying angles resulted in an assumed installed angle of 45°. Under AWS codes this would require a deduction of 1/8" more weld per fit-up than allowed for in the design calcualtions of the hangers. In other words, in most instances the hanger would have received 1/8" less weld (minimum) than required. (Undated Anon. Aff., Attachment 5, at 15-16.)

This entire subject was addressed in PGandE response dated March 6, 1984, to Joint Intervenors' Motion to Reopen on DQA, Breismeister, et al., affidavit at 28-30, 51-53, 57-59. The proper weld effective throats have been used in the calculations to accomodate the root conditions.

III-49

It is alleged that:

20. "Generally, the construction forces have interpreted these symbols by installating the stronger joint."

Response: This statement is dishonest without data to support its noncredible conclusion. It implies that the welder/fitter teams in the field erecting Class I Siesmic restraints knew by intiution [sic] what the engineer really intended in his ambiguous Category I designs. I know from discussions that this assertion is false. And if they didn't know what was wanted in the first place, how could they do it better? (Undated Anon. Aff., Attachment 5, at 16.)

This allegation should be read in conjunction with allegations III-31 and III-50. Craftsmen see the same types of welded connections over and over again, especially on pipe supports and seismic restraints. It is not uncommon to see welds all around a connection when lesser welds were specified. It is not uncommon to see fillet welds reinforcing groove welds in corners, where only groove welds were specified, and it is very common to see oversize fillet welds. Stronger joints than specified are not uncommon.

III-50

It is alleged that:

21. "The designers have interpreted them conservatively by reducing the assumed strength of the joint."

Response: This statement is inherently false for specific examples above. To illustrate, it is not possible to reduce the strength of a 3/16" partial penetration weld with an allowable effective 1/16" throat in the bad calculations. What value could be assigned in the resulting calculation? Any value less than 1/16" could make the calculation(s) show the hanger failing under its own weight.

One final point should be added. The NRC staff has concluded that workers were not afraid to raise problems at Diablo Canyon. It is true that I wasn't afraid to raise issues. But my willingness to defend the integrity of my profession cost me my job. The last incident occurred after I submitted a February 15, 1984 memorandum confirming verbal management pressure to pre-inspect in 4.5 hours (Attachment 14). It is impossible to document and identify deficiencies in that amount of time. It is only possible to accept whatever is in the field. That makes the program worthless as a reliable indicator of anything. After I submitted the memo, my supervisor stopped talking with me. In a March 6, 1984 memorandum (Attachment 15), management confirmed the scheduling pressure as described. Unfortunatley, I was laid off within a few hours of receiving the confirmations. My last day on the job will be March 23, 1984. (Undated Anon. Aff., Attachment 5, at 17.)

This allegation should be reviewed along with related allegations III-31 and III-49.

The alleger keeps reiterating a single concern that relates to a 3/16-inch partial penetration weld with a fillet reinforcement. This was addressed in III-33E, III-36, and III-44. As has been pointed out and acknowledged by the alleger, credit was not taken for partial

penetration welds if they were unconfirmed. The relation between these welds and fillet welds also has been discussed. The allegation has no merit.

The alleger, a preinspection engineer responsible for constructability reviews, was not layed off for documenting deficiencies as alleged. The alleger was originally hired by PTGC on March 31, 1983, and, as part of a scheduled force reduction, was let go on March 23, 1984. His ranking in March 1984 was 143 out of 147. Subsequent to his layoff by PTGC he was hired by Pullman on April 9, 1984. He currently works for Pullman.

III-51

It is alleged that:

1.) Pullman never required the prerequisites of schooling and on the job training per ANSI N45.2.6, paragraph 3.1.2 of its inspector candidates for Level II capabilities. Currently there are inspectors who hired in as SNT-TC-1A Nondestructive Examination personnel and who have been subsequently upgraded to Level II visual, dimensional, and welding inspectors. Many of these people do not have a four year degree and two years of experience or a high school degree with four years experience, as required by ANSI N45.2.6.

2.) Neither Pullman nor PG&E told the Pullman inspector that he was certified to and responsible for ANSI N45.2.6 Level II capabilities. Pullman's certification card for the inspector does not reference ANSI N45.2.6, the required basis for certification. (3/21/84 Lockert Aff. at 2.)

It was not until 1983 that Pullman Power Products was first required by PGandE Specification 8711 to develop a Quality Assurance Program in accordance with ANSI N45.2. This requirement has been fully met. First, as a point of correction and clarification, there is no paragraph 3.1.2 in ANSI N45.2.6-1978 (see Exhibit 1 attached). Second, Pullman is in full compliance with the training requirements of paragraph 2.1.2, "Training," (see Exhibit 2 attached.) in that a training program was established that included an on-the-job participation requirement. Finally, ANSI N45.2.6, paragraph 3.5 states (see Exhibit 1 attached) that the education and experience requirements listed in the standard are only recommendations that can "be treated to recognize that other factors may provide reasonable assurance that a person can completely perform a particular task. Other factors which may demonstrate capability in a given job are

previous performance or satisfactory completion of capability testing." Pullman uses this option from time to time to qualify inspectors and all qualification, training, and testing records are documented and maintained on file.

Although Pullman does not specifically "tell" inspectors that they are certified to and responsible for ANSI N45.2.6 Level II capabilities, the Pullman certification card issued to inspectors plainly lists the level of certification and states that the inspector "is qualified in accordance with Pullman Power Products procedures to perform duties as indicated on the back of..." the certification card. There is no requirement anywhere that an inspector be specifically told that he is qualified to N45.2.6, and it should not make any practical difference whether or not the individual knows that he is qualified to N45.2.6.

Pullman Procedure ESD 278 specifically describes the responsibilities of the inspector in paragraph 2.0, the capabilities of a certified inspector in paragraph 5.5, and the fact that all personnel engaged in inspection and testing activities are qualified and certified in accordance with ANSI N45.2.6. It is expected that qualified inspectors are capable of reading and understanding this document if they choose to do so.

(7) results of physical examinations, when required

(8) signature of employer's designated representative

(9) date of certification and date of certification expiration

2.5 Physical

The responsible organization shall identify any special physical characteristics needed in the performance of each activity. Personnel requiring these characteristics shall have them verified by examination at intervals not to exceed one year.

3. QUALIFICATIONS

3.1 General

The requirements contained within this Section define the minimum capabilities that qualify personnel to perform inspections, examinations, and tests which are within the scope of this Standard.

There are three levels of qualification. The requirements for each level are not limiting with regard to organizational position or professional status, but rather, are limiting with regard to functional activities which are within the scope of this Standard.

3.2 Level I Personnel Capabilities

A Level I person shall be capable of performing the inspections, examinations, and tests that are required to be performed in accordance with documented procedures and/or industry practices. The individual shall be familiar with the tools and equipment to be employed and shall have demonstrated proficiency in their use. The individual shall also be capable of determining that the calibration status of inspection and measuring equipment is current, that the measuring and test equipment is in proper condition for use, and that the inspection, examination, and test procedures are approved.

3.3 Level II Personnel Capabilities

A Level II person shall have all of the capabilities of a Level I person for the inspection, examination or test category or class in question. Additionally, a Level II person shall have demonstrated capabilities in planning inspections, examinations, and tests; in setting up tests including preparation and set-up of related equipment, as appropriate; in supervising or maintaining surveillance over the inspections, examinations, and tests; in supervising and certifying lower level personnel; in reporting inspection, examination, and testing results; and in evaluating the validity and acceptability of inspection, examination, and test results.

3.4 Level III Personnel Capabilities

A Level III person shall have all of the capabilities of a Level II person for the inspection, examination or test category or class in question. In addition, the individual shall also be capable of evaluating the adequacy of specific programs used to train and test inspection, examination, and test personnel whose qualifications are covered by this Standard.

3.5 Education and Experience—Recommendations

The following is the recommended personnel education and experience for each level. These education and experience recommendations should be treated to recognize that other factors may provide reasonable assurance that a person can competently perform a particular task. Other factors which may demonstrate capability in a given job are previous performance or satisfactory completion of capability testing.

3.5.1 Level I

(1) Two years of related experience in equivalent inspection, examination, or testing activities, or

(2) High school graduation and six months of related experience in equivalent inspection, examination, or testing activities, or

(3) Completion of college level work leading to an Associate Degree in a related discipline plus three months of related experience in equivalent inspection, examination, or testing activities.

3.5.2 Level II

(1) One year of satisfactory performance as Level I in the corresponding inspection, examination or test category or class, or

(2) High school graduation plus three years of related experience in equivalent inspection, examination, or testing activities, or

(3) Completion of college level work leading to an Associate Degree in a related discipline plus one year related experience in equivalent inspection, examination, or testing activities, or

Standard, unless they are specified in the contract documents.

1.4 Definitions

1.4.1 Inspection. A phase of quality control which by means of examination, observation, or measurement determines the conformance of materials, supplies, parts, components, appurtenances, systems, processes, or structures to predetermined quality requirements.

1.4.2 Examination. An element of inspection consisting of investigation of materials, supplies, parts, components, appurtenances, systems, processes, or structures to determine conformance to those specified requirements which can be determined by such investigation. Examination is usually nondestructive and includes simply physical manipulation, gaging, and measurement.

1.4.3 Testing. The determination or verification of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.

1.4.4 Refer to ANSI N45.2.10 for other definitions to be used in conjunction with this Standard.

1.5 Referenced Documents

Other documents that are required to be included as a part of this Standard are either identified at the point of reference or described in Section 6 of this Standard. The issue or edition of the referenced document that is required will be specified either at the point of reference or in Section 6 of this Standard.

2. GENERAL REQUIREMENTS

2.1 Planning

Plans shall be developed for staffing, indoctrination, and training of an adequate number of personnel to perform the required inspections, examinations, and tests and shall reflect the schedule of project activity so as to allow adequate time for assignment or selection and training of the required personnel.

2.1.1 Indoctrination. Provisions shall be made for the indoctrination of personnel as to the technical objectives of the project; the codes and standards that are to be used; and the quality assurance elements that are to be employed.

2.1.2 Training. The need for formal training programs shall be determined, and such training activities shall be conducted as required to qualify personnel who perform inspections, examinations, and tests. On-the-job participation shall also be included in the program, with emphasis on first-hand experience gained through actual performance of inspections, examinations, and tests. Records of training, when used as the basis for certification, shall be maintained.

2.2 Determination of Initial Capability

The capabilities of a candidate for certification shall be initially determined by a suitable evaluation of the candidate's education, experience, training, test results, or capability demonstration.

2.3 Evaluation of Performance

The job performance of inspection, examination, and testing personnel shall be reevaluated at periodic intervals not to exceed three years. Reevaluation shall be by evidence of continued satisfactory performance or redetermination of capability in accordance with Subsection 2.2. If, during this evaluation or at any other time, it is determined by the responsible organization that the capabilities of an individual are not in accordance with the qualifications specified for the job, that person shall be removed from that activity until such time as the required capability has been demonstrated.

Any person who has not performed inspection, examination, or testing activities in his qualified area for a period of one year shall be reevaluated by a redetermination of required capability in accordance with Subsection 2.2.

2.4 Written Certification of Qualification

The qualification of personnel shall be certified in writing in an appropriate form, including the following information:

(1) employer's name

(2) identification of person being certified

(3) level of capability

(4) activities certified to perform

(5) basis used for certification, including:

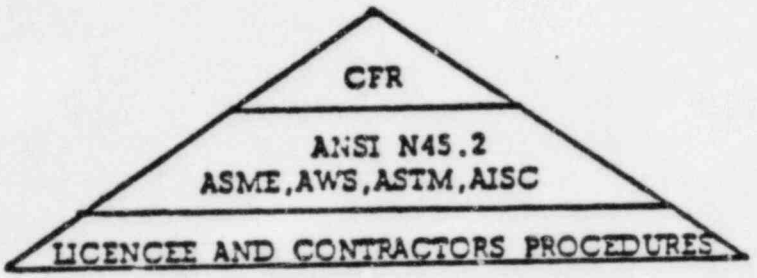
  (a) records of education, experience and training
  (b) test results, where applicable
  (c) results of capability demonstration

(6) results of periodic evaluations

III-52

It is alleged that:

The Quality Assurance requirements at a nuclear power plant can be viewed as a pyramid with the most important requirements at the top. The next lower tier would hold more requirements as the nature of the work becomes diversified and more specific. The lowest tier would be the actual instruction to each person for each act requiring quality control in the construction of the plant. Each tier supports and hopefully includes all



applicable requirements from the tier above it. Pullman inspectors were not certified to ANSI N45.2.6 requirements and neither were they allowed to conduct themselves as inspectors capable of recognizing problems within the quality assurance pyramid because Pullman inspectors were blocked from obtaining information beyond company procedures and boxed in the lowest tier of the quality assurance pyramid. For PG&E to make the statement that Pullman QC inspectors were certified to ANSI N45.2.6 requirements without telling the inspectors or allowing the inspectors to conduct themselves as such, appears to be only for the purpose of misleading the NRC into granting a license before a complete evaluation of construction Quality Assurance problems has been completed. (3/21/84 Lockert Aff. at 4-5.)

As indicated in response to Allegation III-51, and contrary to this allegation, all Pullman QC inspectors are certified in accordance with ANSI N45.2.6. As to the allegation that "Pullman inspectors were blocked from obtaining information beyond company procedures and boxed in the lowest tier of the Quality Assurance pyramid,"

Mr. Lockert has attempted to translate his own experiences, where he was repeatedly warned not to leave his assigned work area without appropriate supervisorial notification and approval, into this broad charge. Inspectors are not blocked from researching codes and standards specific to problems that arise during the course of inspections. However, they are directed to request permission to leave their assigned work area before pursuing such research, and to make their leadmen aware of the problem identified or document it on the appropriate reports; then, appropriate action can be taken by the responsible individuals and the inspector can continue his inspection work. There is no institutional freedom for inspectors to roam the site at will despite Mr. Lockert's claims to the contrary. As was previously indicated in PGandE's Answer in Opposition to Joint Interveners' Motion to Reopen on CQA, Karner and Etzler Aff. at 19-22:

> 30. "At no time has any inspector, Mr. Lockert included, been forbidden to research applicable codes and standards or other pertinent documents. However, such research activities must be performed within the time constraints of the individual's assigned activities. In the case of QC inspectors, they are assigned to specific activity areas in the plant and are required to be in those areas to sign off on the work being performed when the appropriate hold points are reached. Mr. Lockert was not terminated for merely being physically outside of his assigned work area to do research, but rather, he left his assigned work area without asking the permission of his leadman or supervisor, and his whereabouts were unknown for extended periods of time. Such absences led to work stoppages and/or delays. Had Mr. Lockert requested the necessary approvals, or had he pursued his research during other available times, the information he desired could have been easily obtained as it is always readily available. It can be further pointed

out that in most cases, the need for QC inspectors to perform such research is minimal. The procedures in use generally reflect the requirements of the relevant specifications, codes, and standards. Thus, the originating documents should not need to be researched once the procedure has been approved.

The statement by Mr. Lockert that PGandE is attempting to mislead the NRC into "granting a license before a complete evaluation of construction Quality Assurance problems has been completed" is untrue and is based upon his inaccurate perception of Pullman's Quality Assurance Program and the role and responsibilities of the inspectors.

It is alleged that:

PG&E has also made false statements in its February 17, 1984 letter to the NRC concerning the welding of A-325 bolts. (DCL-84-067, attached as Exhibit 2.) PG&E tries to sidestep the fact that cold cracking is more likely when high-strength materials are welded, by saying that, "cold cracking is easily detected by visual inspection." I couldn't believe that PG&E would make such a statement, so I discussed this point, also, with the professor. He said that PG&E's statement was the most ridiculous thing he had heard in years.

In fact, cold cracking is not easy to detect visually because it usually occurs in the interior part of the weld or in the parent material, and therefore is not visible as a surface crack. A cold crack can gradually grow until it reaches a critical size, and then can take off as a "running crack", rapidly growing in size (at a speed of 1500 feet per second), which can lead to the sudden total failure of the welds. I am told that because of such running cracks, more than 30 of the Liberty Ships built for the U.S. Navy in World War Two suffered catastrophic cracking and sank.

On February 29, 1984, PG&E sent the NRC a supplement to their attempted explanation of welding A-325 bolts (DCL-84-078, attached as Exhibit 3). This describes an after-the-fact effort to qualify the welding of A-325 bolts.

Aside from the fact that welding procedures are supposed to be qualified before the work is done, there are several flaws in PG&E's process. First of all, PG&E is wrong in saying that "approximately two days" is "adequate for hydrogen....to diffuse into the base metal." In fact, the problem with cold cracking is that it can develop long after the weld is done, as much as six months or more.

Even more incredibly, PG&E says that they will perform a liquid penetrant test to show the acceptance of the procedure. However, liquid penetrant testing can only detect surface cracks, while the main problem with cold cracking is that it is underbead cracking which doesn't show up on the surface. So PG&E's testing on which they [sic] propose to retroactively qualify the welding of A-325 bolts is the wrong test. It will be unable to detect the kind of cracks that are most likely to occur.

Once again, PG&E is either amazingly incompetent or they have deliberately tried to mislead the NRC and the public with this explanation.

I have only reviewed a small sample of the PG&E responses in this affidavit. However, they represent an example of the quality of PG&E's analysis of problems brought up to the NRC. I believe that the NRC is being seriously misled by PG&E in their responses. PG&E is playing fast and loose with the facts, apparently to try to cover up previous mistakes. I hope the NRC, through lack of technical knowledge, doesn't hastily accept PG&E's false and misleading explanations. Local residents here in San Luis Obispo county deserve better. The NRC should make sure that they demand the truth from PG&E before they vote on allowing the plant to go critical. (3/21/84, Anon. Aff., Attachment 7 at 5-7.)

This allegation is without merit and essentially the same as that authored by Mr. Lockert. The DCL-84-195 response to NRC allegation numbers 450 and 460 completely covers the issues raised here.

There is one new twist which is in fact irrelevant to the case at hand. The liberty ship running crack concern is related to different materials in very large and restrained structures that were not welded with low-hydrogen electrodes.

As has been indicated before, this was and is of no technical concern for the A325 bolts because these were welded with low hydrogen electrodes, the welding heat caused the heat affected zone to be soft, and the two inch long, 5/8-inch diameter studs do not develop significant restraint. Thus cracking is not a concern. However, as indicated in PGandE letter DCL-84-161 to NRC, dated April 27, 1984, the pipe support design has been revised to require that the base

plates be welded in lieu of relying on the A325 welded bolt connections.

It is alleged that:

For example, when I was at Atkinson, I observed an inspector sitting at his desk in the office, repeatedly signing someone else's name to a whole stack of documents. It turned out that an inspector had left Atkinson, and after he left someone decided that there were a number of documents that he should have signed or initialled. So, instead of re-inspecting the work, or even trying to get the first inspector to try to reconstruct the paperwork, Atkinson chose to have another inspector forge the signature of the first inspector. Since he was doing this in the office I assume that it was done with the knowledge of management, and probably at their direction, to make the paperwork good-looking, even if inaccurate.

Also while I was at Atkinson, during the time that seismic modifications were being done to the turbine building, I discovered that someone had signed my name as having inspected some work that I knew quite well I had never inspected. At that time Atkinson had two shifts, and I discovered that it was a person on the other shift who had forged my name. I confronted him about it and he admitted that he had signed my name, and the signature was corrected. He did not, to the best of my knowledge, ever forge my signature again.

Incidents like this one point out the need for QC personnel to always be alert to the possibility of being set up, so as to take the rap for having approved bad work, a tactic that has been used to fire people at Diablo. (3/21/84 Anon. Aff., Attachment 8, at 1-2.)

The allegations relating to large scale signing of someone else's name and forging of signatures are unsubstantiated and untrue. As structural modification work started on the first few bays of the turbine building, a more detailed inspection/documentation system was developed to provide specific inspection traceability for the documentation of each unique welded or bolted field connection (Guy F. Atkinson Company (GFACo) Form FE-1). The existing (initial)

inspection documentation considered several joints or connections at a common location as a single entity. Multiple forms identifying the previously completed and inspected joints were prepared from the single previously completed inspection forms by QC lead inspectors or by a QA engineer. The original QC inspector was contacted for confirmation and initialing/signing of the inspection forms for each numbered joint for which he was responsible. This might account for the observation by the alleger that an inspector was seen repeatedly signing documents. However, such signings were with the individual's own name, not that of others. In cases where the original inspector was not available or when inspection of the joints could not be verified by review of the inspection documentation, the work was either reinspected or the incomplete or missing information was documented through an NCR.

Obviously, no one can be absolutely certain that isolated instances where individuals surreptitiously signed the name of another inspector to a form did not occur. However, such a practice was neither sanctioned nor condoned by PGandE or its contractors. Anyone identified to management as having done this would have been dealt with severely. Specific avenues for reporting of failures and defects (and forgery/falsification) were set up under the requirements of 10 CFR 21 and were made known to all employees. Neither the alleger nor anyone else brought forth any information about this alleged act of forgery, which supposedly occurred over

five years ago, to the attention of management via any one of the available avenues or in any other manner before this instant affidavit.

III-57

It is alleged that:

> The same problem exists at Pullman. I have been told by two separate QC inspectors at Pullman that they were upset that Harold Karner, the QA/QC manager, had forged their names on documents. At least one of them was talking about hiring a lawyer, although I do not know if he did. (3/21/84 Anon. Aff., Attachment 8, at 2.)

This allegation is based on hearsay and the fact that it is totally devoid of factual content makes it impossible to respond to in detail. Mr. Karner categorically denies having ever forged the name of anyone to QA/QC documents and the fact that no one has come forward with such a claim, either through the many available mechanisms on-site or through the appropriate off-site law enforcement authorities, would appear to indicate that, the Intervenors' affiants have made an unfounded accusation.

III-58, III-60 and III-67

It is alleged that:

The particular reason I was concerned about the possibility of being set up at Atkinson is that another inspector and I, who were on the swing shift at the time, had a reputation for taking a firmer attitude toward inspection than that of the inspectors on the day shift, because we tried to insist that the work be done right. This led to a series of verbal confrontations because the word was put out that the swing shift was going to be shut down because of us. The other inspector had the tires of his car punctured. (3/21/84 Anon. Aff., Attachment 8, at 2-3.)

Shortly after that incident, I was physically retaliated against by two ironworkers. One of them asked me to inspect the root pass on some welding. To get to it I had to climb down below the floor level, and as I was down there, another ironworker dumped a bucket of water, of indeterminate quality, on my head. The ironworkers had coordinated this to get me down there so they could dump the water on me.

When I told my leadman about this, he told me that since I was leaving soon anyway to go to work for Pullman (I did plan on leaving in approximately two weeks) that he would put someone else on the job, and I should just lay low for my remaining time at Atkinson.

For the next two weeks I did essentially no inspection work. In effect, the ironworkers had succeeded in running me off the job. No one ever took any action against either of the ironworkers, and I did not press the issue myself because I was leaving. (3/21/84 Anon. Aff., Attachment 8, at 4-5.)

20. One of my crew suffered crude harassment after an inspection. Construction crews from two floors above, or around 35-40 feet, doused him with mopwater from the blue room. That means they dumped mopwater on him from the bathroom.

21. Construction crews threatened inspectors with personal bodily harm as reprisal for interfering with production. For example, in a March 8, 1979 swing memorandum (Exhibit 5) one of my inspectors described an ironworker's "357 rumor and you." "357" referred to a ".357 Magnum" handgun.

22. Construction crews repeatedly threatened me with physical retaliation for obstructing production. Threats included such incidents as gang rape by ironworkers. Although I didn't take the threats seriously, after one incident I returned to the parking lot. My truck was tilted on its chin and there were two flat tires, from being slashed. (3/9/84 Hedrick Aff. at 7-8.)

The issue of the tire slashing was previously discussed in the PGandE Answer in Opposition to Joint Intervenors' Motion to Reopen on CQA, Karner and Etzler Affidavit at 46-48. Unfortunately, the incidents involving the dousing of an inspector with water and the slashing of tires did occur. However, the implication on the part of the affiant that such incidents were condoned or overlooked by GFACo (or any other contractor on the site) is not substantiated by the facts. The incidents in question were fully investigated by GFACo management when their occurrence became known to management. Although it was impossible to determine that all of the facts were exactly as alleged, GFACo paid for replacement tires for the inspector's vehicle and took steps to minimize the likelihood that such incidents could reoccur.

It should be pointed out that incidents of this nature, actual or alleged, are not unheard of on any construction project. On a project of this magnitude, it is impossible to police all personnel and all activities at all times. In addition, an inherent conflict of interest exists between the production oriented craftworkers and the quality responsibilities of the inspectors. This conflict can result in flared tempers or petty acts of retribution if matters are

not handled with tact and diplomacy. Harassment and threats are not condoned by PGandE or its contractors and appropriate disciplinary action is taken when evidence is available to corroborate complaints. Without such evidence, however, it is impossible to press charges or take other "positive" actions. It is unclear just which actions the allegers would have wanted GFACo to take without the necessary witnesses or proof of who committed the incidents. Craftworkers are told, in no uncertain terms, that any such actions will not be tolerated and inspectors, hopefully, learn to handle the act of rejecti..g the work of others in a diplomatic manner.

III-59 and III-68

It is alleged that:

> Atkinson did shut down the swing shift, and each of us was transferred to the day shift, soon after which an ironworker superintendant [sic] threatened me, saying that I was not going to "get away with" the same things on day shift as on swing shift, and I had better watch out. I was quite intimidated. (3/21/84 Anon. Aff., Attachment 8, at 3.)
>
> 23. Management was openly hostile to the night shifts [sic] high quality standards, and around April 1979 abolished our entire shift. There was little question about the reason for abolishing the shift. Supervisors informally told us the reason was that it was not economical to keep our shift when we wouldn't buy the work.
>
> 24. This cancelling our shift was the last incident after a period of management hostility against the night shift. Earlier management had warned us to ease up on our standards.
>
> 25. When management cancelled the night shift to eliminate a production obstacle, it also sacrificed the best qualified inspectors for the Hosgri modifications on the turbine building. Most of the inspectors on night shift went to Cal Poly during the day where they were in the midst of advanced engineering or welding programs. When the night shift was cancelled we inherently lost those inspectors, since they were scheduled for classes during the day. By contrast, the day shift inspectors left to cover everything consisted primarily of individuals whose basic qualifications were that they needed the work and passed a one-week inspection course. (3/9/84 Hedrick Aff. at 8.)

Contrary to the allegation, the GFACo night shift was disbanded in April 1979 because the GFACo work was entering the completion stage (GFACo left the site in August 1979). The amount of work remaining and simple economics dictated that a single day shift was all that was necessary to complete the work on schedule. The allegations that GFACo management advised the night shift to "ease up on its

standards" or that the "best qualified inspectors" were sacrificed when the night shift was disbanded are unsubstantiated. All inspectors, both day shift and night shift, were qualified through training/certification to perform their assigned inspection duties in a professionally acceptable manner. At no time did GFACo management instruct their inspectors to sacrifice quality for production. In fact, management always stressed quality workmanship and standards. All inspection activities on all shifts were performed to the same standards.

III-59A

It is alleged that:

As I checked the temperature, the welder demanded to know "what are you doing?", suggesting that he didn't even know the requirements for maintaining the temperature of the work above a certain minimum. And when I told him that he was in violation of the code, he got very upset, especially because about six feet of welding had to be ground out. (3/21/84 Anon. Aff., Attachment 8, at 3-4.)

The alleged fact that a single welder was supposedly found to be unaware of specified preheat and interpass temperature requirements is not indicative of any generic problems at Diablo Canyon, but instead clearly demonstrates that the Quality Control program was working properly. However, it would be prudent to question whether the events actually happened as they are recounted by the affiant. Depending on which word the welder emphasized or the inflection of his voice when he asked, "What are you doing?" (as he saw the inspector climbing up to him), the alleged query may well have reflected either anger or bemusement on the part of the welder, rather than the alleger's interpretation of procedural ignorance.

In any case, the fact that the QC inspector was aware of the failure to follow the guidelines of the appropriate welding procedure and that he caused the "six feet of welding" to be ground out and redone properly, is a clear indication that the QC program was functioning as it was intended to. If there were no expectations that inspectors would uncover anomalies in the course of their activities, then there would be no need for inspectors and inspections. The fact that the

welder got "very upset" when told that he had to grind out the material and reweld is not unexpected as such a task would most certainly be arduous and leave him open to admonishment from his supervisor. The experienced "upset" or even anger is not an uncommon emotion to encounter under these conditions.

One constant thread of contention seems to run through this and other similar affidavits. The implication is that the identification of a discrepancy in the course of a mandated inspection process automatically bespeaks shoddy workmanship or a programmatic breakdown. To the contrary, such an event indicates the reason for such inspections and the fact that the quality inspection process does work. Deficiencies are identified and corrected throughout the course of any project with no resulting adverse impact on the end product.

III-61

It is alleged that:

I have spoken with many of these inspectors and the majority of them agree that they feel they were not qualified or trained properly to perform their work. Most of them have stated that they would not care to have their previous work inspected.

The problems we were experiencing in our QC program of not having enough qualified inspectors, was (sic) also evident in the Pullman field engineering department. Although field engineers had a somewhat limited responsibility in regards to design work, they were given the power to make field changes - called quick fixes - that in some instances completely altered the original design. I will expand on this later as a separate issue.

With very few exceptions the people that Pullman hired as field engineers had no previous nuclear experience, had no previous experience in any related field such as oil refinery or pipeline work, and had no engineering degree.

Nor did Pullman train the field engineers any more thoroughly than the QC personnel, and so they had to take the same sort of on-the-job training approach while the work was proceeding. As inspectors, we were expected to identify errors made by field engineers. But for much too long a period, we had a "blind leading the blind" system. (3/21/84 Anon. Aff., Attachment 9, at 3-4.)

This allegation is based on hearsay. QC inspection has been constantly evolving into a more and more complex art. The dramatic expansion of Diablo Canyon QA/QC procedures attests to that. All inspectors develop and improve their own inspection methods and techniques as time on the job increases. Their work, after any extended period on the job, should obviously be superior to their initial efforts. This might explain the alleged statement that "most of them have stated that they would not care to have their previous work inspected." Field work is sample reinspected by PTGC before

final acceptance of the work and all documentation is reviewed for accuracy and completeness before the installation is deemed totally acceptable and complete. The reference to a "blind leading the blind" system is a misleading one since all aspects of erection and inspection are described in detail in the applicable Pullman procedures and inspectors receive adequate training prior to being "turned loose" on the job. In the event of uncertainty in any area of inspection, an inspector could go to his leadman or supervisor for information, direction, instruction, or clarification. The inspectors were not inadequately prepared nor were they left on their own, as is inferred in this allegation.

Since the alleger is a QC inspector, he is not responsible for hiring engineers and therefore cannot provide any detailed information (other than hearsay) about the qualification of engineering personnel.

Engineering personnel are hired by the Chief Field Engineer or the Engineering Supervisor only after their resume and/or application are reviewed and evaluated. Field engineers are hired based on a combination of their education and previous experience. Although a degree is not a prerequisite, degreed engineers are hired preferentially over non-degreed engineers.

After hiring, they are required to complete the requirements of a Pullman Engineering Instruction which details the training

requirements of engineering personnel. Completion of these requirements is documented and the records are kept in the individual's personnel file. Because of their previous education and/or experience background, the field engineers need only familiarize themselves with the jobsite practices and procedures to be able to perform their work in an acceptable manner. Thus, the allegation that Engineering and QC personnel were not adequately trained is patently false.

It is alleged that:

As an example, procedures for rupture restraints using ESD 243 and the American Welding Society (AWS) code are quite different from pipe supports using ESD 223 and the American Society of Mechanical Engineers (ASME) code. This led to great confusion and far too many mistakes by all concerned. The problems were so numerous that separate departments were set up to perform only one type of work. This seemed to help alleviate some of the problems, but only after many errors were made that still exist in completed work. (3/21/84 Anon. Aff., Attachment 9, at 5.)

The alleger's claim that "many errors were made that still exist in completed work" is so vague that a direct response is impossible. However, when one considers the numbers and various levels of inspection and reinspection that the supports and restraints have been subjected to, the alleger's claim of many errors or generic problems is not reasonable.

The reason that separate groups were established was to maximize engineering and craft efficiency and to enhance communication between the engineering staff and craft workers. It is apparent that the alleger was not privy to the management decision process to split the two groups. Therefore, he has no firsthand knowledge of the factors that go into such a decision.

III-63

It is alleged that:

Another generic failure at Pullman that I think has seriously compromised the quality of Pullman's work is the lack of effective drawing control, and therfore [sic] inadequate control of the design of the plant. The drawings issued to the field for work often needed modifications that were outside the tolerances allowed by Pullman's procedures, the ESD's. To accomplish these design changes, a system called "Quick Fix" - later changed in Unit 1 to Pipe Support Design Tolerance Clarification - was instituted. The Quick Fix form is filled in by a Pullman field engineer and then cosigned by a Bechtel field engineer. Thus the quick fix was a change of design made in the field. The basis for these design changes was strictly a matter of the engineering judgement of the field engineers as to what seemed like it would work. There was no requirement for any load or stress calculations.

The situation is made worse by the manner in which Quick Fixes are often prepared. Often they were hand drawn under poor conditions and were in many cases impossible to interpret. The Quick Fix program was designed to expedite construction, and therefore there was pressure to write Quick Fixes hastily.

Practically every drawing issued would require at least one Quick Fix, and I have seen as many as thirty-five Quick Fixes for a single hanger. This can make interpretation very hard, because several Quick Fixes could address the same item and describe different solutions. Some would supersede and void portions of the drawing or of other Quick Fixes, but it was difficult or, at times, impossible to clearly understand what was intended.

At times, a complete redesign occurred thorugh the use of Quick Fixes. The Quick Fix became the design, but they were not controlled nor were they stamped as approved for construction as the original drawing was required to be indicating that they were controlled copies, ready for use in construction.

Presumably, the completed work was submitted to PG&E for reanalysis. However, because of the often confusing nature of Quick Fixes, and the lack of control, I doubt that the drawings submitted to PG&E accurately reflect what exists in the field.

I feel that considering the conditions and pressures that we are [sic] required to work under, anything less than a clear and precise drawing to work from is bound to promote mistakes and faulty workmanship, and to leave the ultimate quality of the installed work as a big question mark. (3/21/84 Anon. Aff., Attachment 9, at 6-8.)

Contrary to the allegation, design modifications which occurred by means of the Pipe Support Design Tolerance Clarification (PSDTC) program were accomplished by use of controlled documents and a controlled process. Regardless of whether the initial design solution to a construction problem was hand-drawn, the final installation was as-built, received QC and QA inspection, and was verified according to procedure by Engineering to ensure that the "front-line" solution met design and licensing criteria.

It is true that there were occasions when the design issued to the field needed modifications which exceeded the limits of the authority granted to Pullman as set forth in its procedures. In such cases, proposed modifications were initiated by the Pullman field engineer and reviewed, approved, and numbered by the PSDTC engineer.

It is true many PSDTCs were hand-drawn; however, hand-drawn drawings were clear and explicit. Mr. Stokes claims that many of these drawings were impossible to interpret; however, the craftsmen had no problem interpreting the drawings and constructing the hangers in accordance with the PSDTCs.

It is also true that some drawings required multiple modifications for a single hanger. However, all PSDTCs that affected a large bore hanger were assembled and transmitted along with the final as-built drawing to San Francisco for final design acceptance. Pursuant to procedure, Pullman field engineers prepared as-built drawings of the hangers based upon all the information contained in the hanger package, including all PSDTCs. The as-built drawing was then verified against the actual as-built condition in the field by Pullman field engineers, and the final as-built drawing was verified by Pullman QC and QA. This ensured that all PSDTCs that affected a large bore hanger were accurately described on the final as-built drawing sent to SFHO for engineering review.

Contrary to the allegation, Pullman effectively controlled PSDTCs and prepared final as-built drawings for small bore hangers. The final drawings were prepared by the Pullman field engineers to ensure that they accurately depicted field conditions. Quality Control then verified in the field that the drawings accurately depicted the field conditions. The Pullman Quality Assurance review group then verified that the final document package contained the original design and all PSDTCs to ensure that each item that required a PSDTC was documented in the final hanger package. The installed hangers received two individual as-built inspections in addition to a final Quality Assurance review to ensure that all design information was recorded. Following all reviews, all necessary load-or-stress calculations were

performed when Project Engineering received the final as-built drawing for final as-built evaluation. The only difference between the small and large bore process was that the final large bore hanger package sent to SFHO for engineering review contained the PSDTCs and the final as-built drawing; whereas, the small bore package sent to OPEG for engineering review contained only the final as-built drawing without the PSDTCs.

Contrary to the implication in the allegation, there was no requirement to stamp the PSDTC as approved for construction because the very existence of the signed-off PSDTC meant that the change was approved for construction.

Mr. Stokes fails to recognize the totality of the PSDTC program which ensures that all changes receive the same level of engineering review and approval as a design originating in San Francisco and continues to focus on his narrow role in the process.

III-65

It is alleged that:

6. Management had quality control documents falsified to upgrade the incomplete inspection records. Other personnel doctored the records to add information that hadn't been included by the initial inspectors, after the originators had left the job. To illustrate, separate detailed inspection records were created and substituted for one check mark that approved multipe [sic] welds in the earliest records. I was an eyewitness to this practice. (3/9/84 Hedrick Aff. at 3-4.)

The allegation that management had quality control documents falsified is, itself, false.

This issue is apparently the same one that has been addressed in the response to Allegation III-56. As is stated in that response, as modification work on the first few bays of the turbine building proceeded, it became apparent that it would be useful to provide documentation for each unique joint, connection or plate rather than collective documentation for several joints, connections or plates at a common location. Multiple forms identifying the previously completed and inspected joints were prepared by QC lead inspectors or by a QA engineer from the previously completed collective forms. The original QC inspector was contacted for confirmation and initialing/signing of the inspection form for each numbered joint for which the inspector was responsible. When the original inspector was not available or when inspection of the joints could not be verified by review of the inspection documentation, the work was either reinspected or the incomplete or missing information was documented through an NCR. There was no falsification of documents.

III-66

It is alleged that:

14. At management instructions production crews ignored and/or removed hold tags I had issued. In fact, production crews worked for three days on the welds in one case. In that instance even the production foreman supported my reject tag because he knew the welds could not pass ultrasonic testing (UT) examination. Even the welder wanted to hang a new plate. The techniques were so poor that lack of fusion was a near certainty. But management overrode the reject tag. (See July 28, 1978 swing memorandum, enclosed as Exhibit 4).

15. Another instance where production crews removed the hold tags is described in the March 8, 1979 swing memorandum, enclosed as Exhibit 5. Production didn't take any metal out or remove the weld as they should have. Instead, crews just ground it down so you wouldn't know that a weld was there.

16. During the summer of 1978 the hold tag log book was falsified to erase any reference to a hold tag I had handwritten. Consistent with usual practice I had issued and logged in by hand hold tag 026 one evening. The hold tag involved a violation that occurred from damage when an erection aid was removed from a gusset plate. In the process, about 1/4 inch divit had been ripped out from the base metal when the erection aid was broken off. The next day after I filed my entry in the log the secretary took that page and on a new page typed the entries up to my hold tag 026. Then she stopped and returned the typed version to the log. Eventually, someone else logged in a new hold tag 026. Mine vanished. To my knowledge the violation was not fixed. A copy of the relevant log page is enclosed as Exhibit 6. (3/9/84 Hedrick Aff. at 6.)

The general subject of how "Hold" and "Reject" tags which were used to control questionable or rejectable work has been previously discussed in responses to NRC Allegations #408, #409, and #410 which were filed with PGandE letter DCL-84-145, dated May 29, 1984. As paragraph 14 of Mr. Hedrick's allegations appears to use "Hold" tag and "Reject" tag interchangeably and the circumstances associated

with the specific welds are therefore not clear, it is impossible to respond to this allegation in detail. However, under no circumstances was a generic management directive issued to ignore any such tags issued by Mr. Hedrick.

Mr. Hedrick implies that once a "Hold" tag is issued, it may never be removed by anyone other than the inspector who originally placed the tag. This is untrue. In certain specific cases, if the welds were in progress and could be ground out and rewelded such that they would pass a UT examination, the decision to continue with the welds (rather than cutting them out and starting over) was valid. In all cases, a "Hold" tag could be removed after a determination of an appropriate course of action or the acceptability of the existing weld. Such a determination could only be made in conjunction with QA and/or Engineering. The ultimate acceptability of the welds would be indicated on an inspection form signed by a QC inspector.

Paragraph 15 of Mr. Hedrick's allegations relates to "Hold" tags associated with excessive weave and oversized welds. These concerns were addressed in response to NRC Allegation #420 (Mr. Hedrick's Paragraph 7) which discussed the generic resolution of excessive weave and oversized welds. Further, as described in response to NRC Allegation #416 (Mr. Hedrick's Paragraph 3), the identified excess welding was ground down in preparation for UT inspection in accordance with previously defined and accepted procedures.

Mr. Hedrick's allegation that "the hold tag log book was falsified" was refuted in PGandE's response to NRC Allegations #408, #409, and #410. That response indicated that "Apparently, Mr. Hedrick's 'Hold' tag was incorrectly entered in the 'Reject Tags Issued' log and subsequent correction of the log deleted this incorrect entry." There were no requirements for the listing of a "Hold" tag unless such a tag resulted in a nonconformance report (NCR). Had Mr. Hedrick's "Hold" tag met this criteria and had it been entered in the proper log, "NCR Hold Tags Issued", it would not have been deleted. The work tagged by Mr. Hedrick, as described in Exhibit 6 of his affidavit, was likely determined by the day shift QC supervisor to be work in progress and approved methods and procedures for repairing the base metal existed. Thus, the tag was removed and the required work performed.

Therefore, all of the activities of "management" addressed herein were conducted in an appropriate manner.

III-69

It is alleged that:

26. Management was not satisfied merely to dissolve my shift. Around April or May I was transferred to conduct an audit in the vault as punishment for our inspection record. It was unusual that a supervisory welding inspector would be auditing documents in the vault for 30 days.

When after around a month I found too many violations and correction action became backlogged, the pattern of retaliatory transfers continued. I was sent back to the field as a weld inspector until the end of the contract. (3/9/84 Hedrick Aff. at 8-9.)

It is not uncommon for experienced inspectors to be assigned the task of auditing internal documents during periods of diminished activity elsewhere. It is assumed that an experienced inspector would be able to perform the auditing activities in a timely and efficient manner. Neither the assignment nor the period of time involved was unusual.

As a point of clarification, the "vault" alluded to by Mr. Hedrick is not an airless, closet-like "black hole" structure but, in reality, is a well-lit, interior room, with limited but ample working space for at least four individuals.

Mr. Hedrick's assignment did not result in "too many violations" and the corrective action system did not become backlogged as he states. He was sent back to the field because the auditing activities were at an appropriate breakpoint and a need had been identified in the field for additional QC inspection support.

III-69A

It is alleged that:

29. Undocumented welds, performed by unknown welders, were a common occurrence. Even if the weld were repaired, there would only be documentation identifying the second welder who fixed it. There was no way to identify the original welder whose work was deficient. On site we jokingly referred to those undocumented welders as "ghost welders," (See February 14, 1979 memorandum, enclosed as Exhibit 8.) (3/9/84 Hedrick Aff. at 9.)

The response to NRC Allegation #399 filed with PGandE letter DCL-84-195, dated May 29, 1984, addressed the subject of undocumented welds in greater detail. "Undocumented welds, performed by unknown welders" were not a common occurrence at Diablo Canyon as is alleged. In cases where names of welders were not identified on inspection documentation (Hedrick Exhibit 8), subsequent follow-up by QC inspectors usually resulted in identification of the welders as required on GFACo Form FE-1. In cases where the name of the welder could not be determined, the welds were documented on an NCR as a basis for acceptance or rewelding.

III-70

It is alleged that:

This is even more disturbing when considering my first period of employment as an Electrical Inspector. I was at the mercy of the crafts if the work I was to inspect on any given assignment required knowledge in addition to that of welding. This is because I did not have nor ever have had in depth training in the electrical field.

Numerous times I quizzed supervision as to why I was performing the inspections without a level II inspector in attendance. The response to my inquiries was that "they were working on upgrading me to a level II inspector." Finally I felt that my concerns were a dead issue and ceased quizzing supervision about the situation. (3/20/84 Anon. Aff., Attachment 11, at 2.)

The alleger assumes that in order to be a qualified electrical inspector an inspector must be an electrician. Although this is the opinion of the alleger, there are no code or specification requirements that electrical QC inspectors be electricians. Inspectors execute inspection activities to verify conformance of the electrical work with documented instructions and predetermined requirements in procedures, specifications, and drawings. All acceptance criteria are contained in these documents. The QC inspector determines whether or not the component meets the inspection criteria based on the criteria and not on whether the inspector himself would be capable of performing the work inspected.

During his first period of employment, the alleger received extensive on-the-job training in the use of Quality Control Procedures for electrical inspection of raceways and supports, electrical equipment,

and associated welding. In fact, records indicate that he received more than 90 days of on-the-job training, which is twice the amount required by procedure. Therefore, one would expect that he was adequately trained to determine the acceptability of the work he inspected.

Level II inspectors are authorized to evaluate the validity and acceptability of inspection, examination, and test results of a Level I inspector. It is acceptable for a Level II inspector to monitor the Level I inspector's work. The monitoring can be accomplished by reviewing the inspection data generated by the Level I inspector, observing the Level I inspector's work, or reinspecting the weld inspections performed by the Level I inspector. The Level II inspector is responsible to evaluate the work of the Level I inspector to the extent necessary to satisfy himself that the work of the Level I inspector is acceptable.

Level I inspectors may perform, but are not limited to, inspections which entail a measurement of discrete variables with predefined tolerances from the nominal dimensions. These inspections may be performed and documented without participation of a Level II inspector at the time of the actual inspection.

The fact that supervision was trying to upgrade the alleger to a Level II inspector indicates that the Level II inspector responsible

for monitoring the alleger's work was quite satisfied with his performance as an inspector and does not support the implication in the allegation that it was for the purpose of avoiding inspection requirements.

III-71

It is alleged that:

To further illustrate the inaccuracies of the PGandE letter, I was expected to fill out my own Training Record documenting my "training" received in the "training program," which was largely non-existent. To the best of my recall, I can only remember one, possibly two group training seminars. These group meetings were mostly futile, in that they covered very little relevant information to educate or assist me in the performance of my duties. (3/20/84 Anon. Aff., Attachment 11, at 4.)

Contrary to the allegation, inspectors in training did not fill out their own training records to document the training received. Training in procedures orientation was accomplished by private reading of the procedure by the new inspector and on-the-job training on how to properly implement the procedures. During the reading phase the new inspectors were required to account for their progress insofar as the amount of material they had read. However, the progress record kept by the new inspector was not considered the official certification of the training received by the new inspector as implied in the allegation. The supervisor has the responsibility of documenting satisfactory completion of training requirements, and it is this documentation that is relied upon as evidence of training.

The allegation is correct in stating that the group seminars did not attempt to educate or assist the new inspectors in the performance of their duties. The group seminars were never intended to educate inspectors in the inspection process. The seminars were designed to

focus upon the role of inspections within the regulatory process. The specific training in the procedures and conduct of inspections was accomplished by reading, familiarization with procedures, and practical implementation during the on-the-job training.

As stated in PGandE letter DCL-84-195, dated May 29, 1984, in response to NRC allegation #378, based upon the information provided in the affidavit and a review of Foley records, only one individual's employment history in terms of dates of employment and job assignment matches the information contained in the affidavit. Contrary to the allegation, that individual received extensive training under supervision of a qualified inspector during both of his periods of employment.

During his first period of employment, the alleger received extensive on-the-job training in the use of Quality Control Procedures for electrical inspection of raceways and supports, electrical equipment, and associated welding. In fact, he received more than 90 days of on-the-job training which is twice the amount required by procedure.

During the second period, the alleger received documented training in 10 CFR 50, Appendix B, PGandE Specifications 8802 and 8807, and the following Quality Control Procedures:

QCP-3	"Processing and Control of Deviations and Nonconformances"
QCP-5A	"AWS D.1 Welding (Structural Steel)"
QCP-7	"Installation of Electrical Equipment"
QCP-9	"Installation and Inspection of Stud and Shell Concrete Expansion Anchors"
QCP-10	"Power Control and Signal Wires"
QCP-10A	"Installation of Coaxial and Triaxial Cables"
QCP-11	"Cable and Wire Terminations"
QCP-17	"Initiation of Work"
HPF-E1	"Installation and Documentation of Non-Class I Systems ECO E-182 and E-161"
HPF-E2	"Installation and Documentation of Fire Alarm, Cardox System, Deluge System and Smoke Detectors"
HPF-E3	"Installation and Documentation of Non-Class I System ECO E-203"
HPF-E4	"Installation and Documentation of Non-Class I System ECO E-194"

Therefore, the alleger received adequate training to perform his duties and there is no basis to the allegation.

IV-1

It is alleged that:

I believe that this is just more than sloppy report writing and a full understanding of how bad the welds really are can be attempted only after the data appropriate for PG&E's report is found for the period of time that the weld was made. It is true that F. W. 212 no longer exists because it has been replaced but that leaves the seven other nozzle to pipe welds that were performed with the same WPS that the original F. W. 212 was welded to. (4/10/84 Lockert Aff. at 4-5.)

Each of the points raised in the summary on pages 1 and 2 and the last of page 4 and top of page 5 of Mr. Lockert's affidavit have been fully and completely responded to in PGandE letter DCL-84-195 dated May 29, 1984. As was shown in great detail, none of Mr. Lockert's allegations has any merit.

Although the details are in the response referenced above, a brief summary of the main points is set forth below.

There were no false statements made in 1977 regarding the steam generator feed water nozzles. The material in question was an ASME Section IX P12B material, not a P3 material. This is confirmed by ASME Section IX and Mr. Lockert's exhibits about the California-authorized inspector. Mr. Lockert refuses to accept this fact.

The permanent steam generator nozzle welds were preheated. Specifically, FW 197 was preheated, as is documented on recording charts.

There were no QA program problems. The reports required were provided and documentation of these reports is contained in the referenced response.

Mr. Lockert's detailed comments on the failure analyses report have been fully addressed. The previous response was full, complete, and presented all the relevant data. As has been reported several times, including advance notice to the NRC and in a final report to the NRC, all the steam generator feed water nozzles to pipe welds were inspected internally (in fact, the feed water pipe was cut apart to permit access) and repaired as required.

PGandE's entire handling of the steam generator feed water nozzle problem was proper, correct, and responsible both as regards engineering and quality assurance. This began with the initial telephone notice to the NRC when the problem was revealed and continued until final closeout approximately a year later.

V-1

It is alleged that:

In the April 2 transcript on page 33, Mr. Shipley states "The supervisor trains the new employee, although new means new to Diablo and not new to the process. He trains that person on the job, carefully checking the first work that he does." During the time I spent under Mr. Mangoba, the Pipe Support Lead supervisor, I saw new people brought into the design group who were given other engineers' work to check before ever performing any design work of their own. This was a result of 1) pressure to get the work done and 2) the new people were slower as originators than the people who had been on the job longer 3) by giving the new personnel work to check instead of design, production was not effected. Employees still in Mr. Mangoba's trailer told me that this practice followed him in the March 1983 move to the new unit 1 trailer. The trailer staff was comprised of a fifty-fifty split between new employees and old employees. As of that date none of the unit 1 calculations had been completed. (4/30/84 Stokes Aff. at 1.)

Mr. Stokes questions the adequacy of the on-the-job training provided to pipe support engineers newly assigned to OPEG. First, it should be reemphasized that, as Mr. Stokes has acknowledged, pipe support engineers ppssess specialized knowledge and experience which qualifies them to do their jobs. In general, minimum technical indoctrination and training are necessary. A thorough review of the technical background of the engineers in the small bore pipe support group at the site shows that experienced, technically qualified engineers had been hired. Thus, there was no need for additional technical instruction regarding how to make small bore piping calculations other than on-the-job training normally provided to familiarize them with the project design criteria and project calculational methodology. Most of the engineers had worked on two

or more other nuclear power projects, with many having worked on five or more plants. All have at least a BS in Engineering or equivalent, and their minimum professional experience is one year; the maximum professional experience is 14.5 years, and the average professional experience is greater than five years. Thus, these OPEG engineers did not need specific training in the technical methods of performing small bore calculations since they already had the technical expertise to perform the calculations.

The on-the-job training consists of an appropriate level of project-specific indoctrination by a supervisor or others with project experience to familiarize new engineering personnel. This training included identifying project standards, describing the work process and design criteria, and acquainting the new employee with the organization and his responsibilities. A new design engineer, who worked in very close physical proximity to his associates, was given various assignments involving original design, reviewing, or checking. Problems were frequently discussed with associates and supervisors, reference documents were readily available, and precedents existed as a result of prior design work.

In this context, the fact that newly assigned engineers might be given other engineers' work to check before actually originating a calculation themselves is entirely normal, appropriate and acceptable.

V-2

It is alleged that:

On page 35 Mr. Shipley continues by stating "I believe that Mr. Yin's approach to the problem would have been extremely conservative. I believe that the analyst's approach to the problem was a reasonable representation of the piping and support when taken together." I am aware of the problems which the NRC discovered in hanger 99-20 and I am sure that if the professors teaching in the engineering schools were polled on whether Mr. Yin or the PG&E personnel are taking the most reasonable approach, the results would show that Mr. Yin's would be considered the most reasonable, as I my self [sic] do. (4/30/84 Stokes Aff. at 1.)

Mr. Stokes questions the reasonableness of the simplified representation of a pipe support used in the analytical model of the support for qualification, and he speculates that the more precise model advocated by himself and Mr. Yin would be preferred in a poll of engineering professors. PGandE's point in the cited transcript passage is that the level of detail used in the simplified modeling representation is entirely adequate to demonstrate support qualification, given the relatively conservative nature of the support design and small magnitude of the loads involved. While levels of modeling sophistication even more precise than those advocated by Mr. Stokes do exist and could be undertaken, the fact remains that the simplified and conservative model used does lead to support qualification and is fully acceptable.

V-3

It is alleged that:

Mr. Kahler on page 65 testified that "In their investigations, they identified that in OPEG group, there were sixty three manuals containing one hundred and thirty three criteria documents, four hundred and twelve procedures, and fifty one instructions were review [sic] -- to give you an idea of the scope that was done for this particular issue. The results of that review showed that ninety percent of the documents were -- that were under control, were properly and correctly in place. In no cases, did they find any out of date criteria." Note the words used by Mr. Kahler following the second pause "that were under control". Was this an attempt to avoid making a false statement? Even though no statement was made as to whether any review was made of the documents of personnel who were not assigned control documents to see if they possessed old out-of-date control documents, evidently Mr. Kahler was aware that out-of-date documents did and probably still do exist in the employees' control and use. (4/30/84 Stokes Aff. at 2.)

Mr. Kahler's transcribed remarks concerning the results of the review of the 63 controlled manuals assigned to OPEG engineers clearly do not apply to any uncontrolled copies of procedures or instructions which Mr. Stokes feels may have been in the possession of OPEG engineers. The use of such uncontrolled documents was not authorized. While it cannot be stated with certainty that no such unauthorized material existed, the engineers were instructed to use only current and properly controlled procedures, instructions, and criteria.

V-4, V-5 and V-6

It is alleged that:

On page 66 Mr. Kahler states that "engineers would receive a procedure, sign off that he had received it". This statement is either misleading or false depending on how Mr. Kahler used the word engineers. During my employment and as one of the few to have controlled documents I received many revisions and was asked to sign only once for receiving them. In using the term engineers was he indicating management and the clerks? I know it didn't apply to the casuals or job shoppers. (4/30/84 Stokes Aff. at 2.)

Mr. Oman continues with this ridiculous assertion on page 69 and I quote "and the control and distribution of those procedures was managed by the project administration group, using a system of signed returned receipts." The only way this statement can be true during the time I was in OPEG is that the project administration group signed the receipts themselves. I am assuming that the project administration group includes management and clerks. (4/30/84 Stokes Aff. at 2.)

On page 72 Mr. Oman states "there was always a return receipt system with distribution of instructions." The only return receipt I saw was when I received my first documents, never later. (4/30/84 Stokes Aff. at 2-3.)

Mr. Stokes' allegations question the existence of a return-receipt system for distribution of piping discipline procedures, instructions, and criteria at OPEG. Such a system does, in fact, exist on the Project and is evidenced by Mr. Stokes' own statement that he signed a receipt for his original controlled manual assignment. During the period Mr. Stokes was assigned to OPEG, the Administration Group at OPEG did sign the receipts for procedure

revision distributions, return them to San Francisco Home Office (SFHO) Project Administration Group, and distribute them to the appropriate manual holders within OPEG. This was done in an attempt to more closely monitor revision distributions and timely receipt acknowledgments. Project records indicate that Mr. Stokes was assigned a controlled manual of piping procedures and instructions in February 1983, and by his own admission he did receive revisions to these procedures.

V-7

It is alleged that:

Mr. Kahler again states on page 73 that "The requirement is that if an engineer wishes to keep an outdated procedure in his manual, he is required to mark it as a superseded procedure, clearly mark it as superseded." I was never instructed either orally or in writing that if I wished to keep the old procedures that I should write superseded on them. (4/30/84 Stokes Aff. at 3.)

The practice of maintaining outdated procedures, particularly in the same binder with current procedure revisions, is discouraged because of the obvious potential confusion that can result. Engineering Manual Procedure 5.1 states that obsolete pages may be kept for reference if each page is marked in a manner which clearly indicates that it is superseded.

V-8, V-9 and V-10

It is alleged that:

On page 73 everyone attempts to get into the action when Mr. Vollmer asks "How often are the supervisors supposed to review their employees manuals for current status?" Mr. Oman answers "I believe the procedure either specifically states which I believe it does that it's a monthly requirement, that the supervisor review the manuals of the engineers under his supervision on a monthly basis." Then Mr. Tresler says that "I just spoke with Myron Leppke and he informed me that the procedure had been to perform this review on a monthly basis. Recently it was changed to a periodic basis,". [sic] (top of page 74) During my involvement with OPEG I never saw nor was otherwise made aware that my supervisors performed this inspection. (4/30/84 Stokes Aff. at 3.)

Mr. Tresler continues to be mistaken on page 74 about whether this review is documented. "I'm sorry, it is documented." "It's documented as a report by QA, those QA individuals assigned to monitor OPEG." Mr. Vollmer says "It's an audit function of theirs?" Tresler "Yes" "No, I say it is documented, it is documented in an audited report." Then following a pause "I'm sorry. As a clarification, this is Mike Tresler again. Apparently, the audits being performed by the supervisors are not documented but there are audits performed by the QA organization within OPEG to verify that the audits being performed by the supervisors are effective." Mr. Tresler still doesn't give up. When asked by Mr. Vollmer "so, how do they audit an activity that's not documented?" Tresler says "they audit the manuals to verify that the supervisors' reviews are effective." To my knowledge this review was never documented nor conducted by my supervisors nor was any audit ever performed on my documents to see if they were up to date and even if they were in order that finding would not prove that the supervisor was performing this review. (4/30/84 Stokes Aff. at 3-4.)

The practice of regular periodic audits of piping procedure and instruction manuals by supervisors is a current procedural requirement at OPEG. This fact is clarified on page 75 of the transcript by Mr. Tresler who further noted that, in the past, audits

were performed but not on a fixed frequency. The need to improve the maintenance of controlled procedure manuals was recognized and documented in PGandE letter DCL-84-046, dated February 7, 1984. On page 41 of that letter it is noted that "Procedure P-1 was revised in Rev. 4, dated January 20, 1984, to require a monthly supervisory review of all controlled manuals to assure that procedures, instructions, and criteria are kept current." In the transcript (pages 73-74), Mr. Tresler clarified a more recent change to the procedure which requires such reviews on a periodic basis with the intent that reviews be performed at whatever frequency is necessary to ensure adequate control exists. It may be more frequent than monthly. These revisions to Procedure P-1 were not in effect during the period of Mr. Stokes' employment at Diablo Canyon, which would account for his lack of familiarity with them. As previously pointed out, none of the calculational errors found in the support calculation packages were related to document control.

V-11

It is alleged that:

I find the statements made on page 84 by Mr. Kahler that "In our reviews, we concluded that there was no effect on the design process." and was followed by Mr. Allison that "Not only on the product but on the process." [sic] to be ridiculous. This is in light of the following facts 1) that PG&E has admitted that they have found that approximately 74% of the small bore calculations have what they consider minor problems and an additional 22% which required completely redoing in order to be confident of the initial work, 2) that since I submitted my DR on generic welding problems on units 1 & 2 PG&E/BECHTEL have issued scores of memorandums and made procedure changes in an attempt to clear up many questions ranging from the design group to the field construction personnel, 3) PG&E has spent the last several months trying to explain away my allegations of QA problems, destruction of documents, technical deficiencies in the calculations (such as omission of eccentricies [sic], secondary stresses from torsion, anchor bolt spacing requirements per the manufacturer and M-9 the Pipe Support Design Manual issued by PG&E, and the failure to limit structural angle members length per AISC Sect. 1.5.1.4.6b, the use of gaps to reduce thermal loads to supports, the placement of snubbers rigids and anchors close to other supports, and others) which were substantiated by Mr. Yin and many remain unresolved. (4/30/84 Stokes Aff. at 4.)

Mr. Kahler's comments in the cited transcript passage are taken out of context by Mr. Stokes. Mr. Kahler is simply stating that as a result of the Project's review, there was no apparent effect on the small bore design process or the final design product resulting from problems related to out-of-date procedures at OPEG. Mr. Stokes has extrapolated from this conclusion referring solely to OPEG work, to design work by other design groups as well as to construction. Clearly, the cited transcript passage by Mr. Kahler is not intended, nor does it in fact, have such a broad applicability.

V-12

It is alleged that:

Mr. Manoli asks a pertinent question about the Diablo Problem (DP) program on page 93 "Did any of these DP's have dispositions on generic bases that effect [sic] other packages or more generic implications that you really need to document it so that you can handle it in all applicable cases, not just on a single case." Which is answered by Mr. Tresler "No." Each DP was specific to a discipline and was not a plant generic issue or concern". During the time I was employed at the site, I know management suppressed the use of Design Change Notices (DCN's), Discrepancy Reports (DR'S) and Non-Conformance Reports (NCR's). DP's were used to report problems on specific hangers, problems about a list of hangers, and frequently generic problems on both units 1 & 2. (4/30/84 Stokes Aff. at 4-5.)

Mr. Stokes' understanding that Diablo Problems (DPs) were used to report generic problems is incorrect. DPs were used to document questions by Construction to Engineering. The answering of a DP did not authorize Construction to deviate from the established design. Only the issuance of a design change notice (DCN) in accordance with approved procedures could authorize such a deviation from the original design. In fact, DPs were used to document specific items within a particular discipline.

Mr. Stokes' claim that management suppressed the use of DCNs, DRs, and NCRs is incorrect and is not supported by any facts.

V-13

It is alleged that:

On page 95 Mr. Shipley in explaining the lack of a procedure on the use of gaps, the lack of a procedure on "developing a 'KL over R' criteria, buckling, the engineer must determine what that end condition is and apply the appropriate factor in order to arrive at the proper result. It's a well-known engineering technique and it is not considered necessary to instruct the engineer precisely in each and every case which one he should use." He closes on page 95 with "we believe that a specific procedure is not required because it's common engineering practice." I have worked as a structural engineer for the past 9 years on many nuclear projects and even though these principles are taught in colleges, they are the most incorrectly used. They may be calculated close to correct on simple structures, but on complicated pipe supports when time is limited by the demand for quantity rather than quality almost no one performs these types of detailed analysis or get [sic] them right if they [sic] do attempt them. Procedures are needed to refresh memories, and provide consistency in application. (4/30/84 Stokes Aff. at 5.)

In this allegation, Mr. Stokes apparently holds the view that the application of certain basic engineering principles must be closely controlled by detailed procedures in order to prevent experienced, educated engineers, who are involved daily in a fundamentally repetitive design process, from forgetting how to properly apply these basic principles. We believe this is too harsh a view by Mr. Stokes of his own capabilities as well as those of his peers. The Project's practice of not requiring a specific procedure for well-known engineering techniques and common engineering practices is consistent with normal industry practice, and is considered to be entirely appropriate for this type of engineering work.

V-14

It is alleged that:

Mr. Soffell follows up on page 102 with "I'm wondering where cases of gaps and/or joint releases, that is the exceptions, are flagged so that the checker is kind of, so to speak, being asked, do you agree with what I've done here." This is responded to by Mr. Shipley "Okay. So there's a piece of paper that says, hey, I did this. In the computer model you would see a gap in the actual input to the analysis, in the output and so forth." The answer is NO, the exceptions are not flagged. The only way you would be able to find them is to know of their use (my method) or perform an in depth review of each analysis package. (4/30/84 Stokes Aff. at 5-6.)

The question being asked in the cited transcript passage concerns how clearly the specific use of thermal gaps or joint releases is documented in a support calculation such that the calculation checker would note their use. Mr. Shipley's response states that use of these techniques would be apparent in the support computer model input and output. The point being made is that an engineer sufficiently competent to check the calculation could clearly ascertain that these techniques were used. Mr. Stokes contends that this could only be found by an in-depth review of the analysis package. That is precisely what the checker of a calculation does in the process of his work.

V-15

It is alleged that:

Mr. Shipley again on page 112 misleads everyone with "It was a very well-controlled program". Careful review of specific information supplied by Mr. Tateosean [sic] demonstrates that Mr. Shipley's conclusion was false. It was not a "very well controlled program". Mr. Tateosean [sic] states on page 113 "On cited interferences, I've gone back and talked to the stress engineer who was on the walkdown". What criteria was [sic] established and followed to distinguish cited interferences from those which weren't cited as interferences? With only 10 people who performed the stress walkdown, why didn't Mr. Tateosean [sic] question them all, and not just the stress engineers? He also states "other interferences on these lines, but in his judgment, what he saw here was really interferences that weren't interferences because the -- it was such a slight interference." Was this program conducted on intuition as was [sic] the design calculations Mr. Shipley speaks of on page 147? What was the criteria which each member could apply to decide consistently what was an interference? (4/30/84 Stokes Aff. at 6.)

Contrary to Mr. Stokes' allegation, the stress walkdown program was in fact a very well controlled program for the purpose for which it was intended. Mr. Stokes was not involved in implementing this program and apparently does not understand its purpose. On page 109 of the transcript, Mr. Shipley, in reading from the applicable procedure, clearly states that the purpose of the stress walkdown effort "is to review the installed condition of large bore Class 1 piping and confirm that they satisfy the design calculations. Since confirmation of the dimensions given in the piping isometric or piping support drawing are within the scope of the as-builting program, no detailed measurements are required as part of the walkdown effort." The subject being discussed at this point in the

transcript involved Mr. Yin's inspection report observation that the stress walkdown procedures were inadequate because they didn't address some of the information and documentation that are required by USNRC IE Bulletin 79-14. It is emphasized on page 109 of the transcript that "the stress walkdown program was never conceived to be any part of the 79-14 Bulletin requirement, it was not designed to measure things," and "the specific walkdown under consideration was developed on this project to identify potential interferences before plant heatup commenced, and that was its only requirement." On transcript page 110, it is further emphasized that there is no NRC requirement or Project commitment to do stress walkdowns, and the task was undertaken simply as an additional measure to minimize potential interference problems during initial plant heatup.

The identification of potential interferences was based upon the engineering judgment of the walkdown team members who were experienced stress and pipe support engineers. They documented their observations when, in their judgment, the observed potential interferences might jeopardize the validity of the applicable design calculation. They were not required by procedure and, in fact, did not document any observations which did not meet that standard. The overall quality and success of the implementation of the stress walkdown program has now been confirmed by the relatively trouble free initial plant heatup sequence, which was completed in April 1984, and the low power testing program, which was completed in May 1984.

V-16

It is alleged that:

Mr. Tateosean [sic] says on page 113 "Typically you had an inch and a half or so of insulation, and we're talking about calcium silicate insulation and it has the ability to crush that much or more." Had Mr. Tateosean's [sic] stress walkdown been provided criteria such as that provided in the FIELD ENGINEER POCKET HANGER REFERENCE which BECHTEL went to the trouble and expense to write and then changed their mind about issuing, even the crushing of calcium silicate insulation would have become important. I would like to quote from BECHTEL's proposed FIELD ENGINEER POCKET HANGER REFERENCE on pages 1-10 and 1-11 under "NOTES: PIPE INSULATION CHART".

Forth [sic] paragraph, "Most insulation failures are caused by water entering through breaks in the finish, such as expansion crack, or un-flashed openings, therefore, particular attention should be given to complete detailed specifications in regard to weatherproofing."

From paragraph 5, "The usual insulating materials and jackets for heated piping and equipment allow the moisture to escape in the form of vapor. However in the medium temperature range, and where shut-downs are frequent, moisture in the insulation is not driven off and water damage is most likely to occur. For these conditions, the insulation should be thoroughly dry before applying the jacket, the surface of the pipe should be primed and painted, and corrosion-restraint [sic] wire or bands used for securing the insulation. If possible, insulation should be applied to high temperature piping while heated to insure the complete dryness of the completed installation."

From paragraph 6, "The layout of insulated piping and equipment should provide adequate clearances for proper application of the insulation and also safeguard against mechanical damage during normal operation and maintenance." (4/30/84 Stokes Aff. at 6-7.)

The response to this allegation is contained in the response to NRC #484 in PGandE letter DCL-84-195, dated May 29, 1984, page 158, paragraph 330. As stated therein:

> 1. Pages 1-10 and 1-11 contain general information concerning piping insulation, which is nonspecifc in nature, presents commonly used practices, and identifies factors which can be considered in selection and application of insulation...
>
> The reference to safeguarding against mechanical damage to insulation during construction and maintenance can hardly be construed to apply to the very minor, localized crushing of calcium silicate insulation credited for resolving certain stress walkdown findings. The small number of cases identified where this occurs has been analyzed by Engineering and found to be acceptable. The booklet accurately reflects the general policy in effect on this Project with the exceptions noted.
>
> Identification of these items as technical concerns reflects a lack of understanding on the part of Mr. Stokes of acceptable insulation application practices.

V-17

It is alleged that:

In his discussion of the Quick Fix program on page 128 Mr. Oman says, "they would, on a case by case basis, make a judgment based on their knowledge of M-9 which is the guide lines for design of Class 1 pipe supports and restraints for the project, the design criteria for pipe supports. They would make a judgment on a case by case basis whether an expanded tolerance, a deviation beyond that specifically allowed by ESD 223, could be made while still maintaining an acceptable support design." I personally know that some of the Quick Fix engineers were hired and placed in the group without ever performing any calculations or spending any time learning what was in M-9 or ESD 223 nor were they given a copy of Instruction 12 which supposedly defines the responsibilities and authorities of the Quick Fix group. Mr. Oman's statement is misleading in that he implies the engineers have knowledge of the documents mentioned above. Can we expect Mr. Oman to supply us with the negative elements as well as the positive without a specific question on point? Would the fact that the QF engineers were not trained in the performance of their assigned tasks bear on the quality of their work? Mr. Yin was not aware that some of the QF engineers had never worked in any aspect of the review program on Diablo Canyon before becoming Quick Fix engineers, until I pointed this out to him. (4/30/84 Stokes Aff. at 7-8.)

This allegation is essentially identical to allegation JIR-11, responded to in PGandE letter DCL-84-239, dated June 26, 1984. Several practical points should be recognized regarding the subject of this allegation.

1. Pipe support engineers employed at OPEG, including PSDTC engineers, were technically qualified and experienced.

2. Most nuclear power plant construction projects utilize some form of program similar in many ways to the PSDTC program, which

relies on engineering judgment to develop field modifications of pipe support designs to facilitate their installation. Such programs utilize various forms of official, documented approval at a later date, as does the Diablo Canyon Project through its "as-built" acceptance program. This type of program is certainly not unique to Diablo Canyon and was familiar to most of the PSDTC engineers.

3. Diablo Canyon Pipe Support Design Criteria M-9 is not fundamentally different from the corresponding criteria used by other projects where OPEG engineers had gained their prior experience. It does not represent a radical departure from criteria with which they were already familiar. As a practical matter, an experienced engineer would not require extensive study to gain a working familiarity with M-9.

4. PSDTC engineers did not perform calculations to verify their judgments, but rather, relied on their experience to determine the acceptability of proposed changes to support designs. The validity of such judgments by experienced engineers would not be expected to vary widely from one project to another due to differences in design criteria. Simply stated, an experienced pipe support engineer has a good understanding and "feel" for an adequate support design, particularly when making adjustments to an existing design which is known to be adequate.

5. The vast majority of engineers who were ever assigned to the PSDTC group were already familiar with M-9 at the time of their assignment by virtue of prior experience in pipe support work involving its use. The few exceptions gained experience with M-9 while working with other members of the PSDTC group. These few exceptions do not invalidate the program as Mr. Stokes would suggest.

6. Not every PSDTC team member was assigned his own copy of M-9. Practically speaking, an engineer working within the plant did not carry a copy of M-9 around with him. Copies of M-9 were available in the PSDTC group's in-plant office area in the turbine building which afforded ready reference access in a centralized location.

7. As discussed in numerous prior submittals, the judgments made by PSDTC engineers were never the final qualification for the pipe support. In all cases, the PSDTCs were included in the as-built drawing of the support and the as-built drawing was subsequently reviewed, checked, and approved under the formal engineering process. The as-built acceptance process involved review of the revised support design and performance of necessary calculations for qualification of the design. Where qualification could not be shown, a new design was issued for construction. This comprehensive process of review and acceptance of changes made

by PSDTCs as a part of the as-built acceptance program has been corroborated by recent NRC staff audits.

V-18

It is alleged that:

Mr. Oman states on page 127 "Also, those modifications which -- or those hangers which a preexisting condition was determined to be unacceptable were not handled under this program. They were documented by discrepancy reports within Pullman Piping Contractor and General Construction." During the time I was in Quick Fix, almost none of the existing problems were written up on discrepancy reports. This was because I was the only QF engineer to have controlled documents for most of the program and I was the only QF engineer (to my knowledge) to have a copy of a memorandum which was written to clear up questions involving the operation of the program. This document states that a DR had to be issued against existing supports before I could issue a Quick Fix (QF) resolving the problem. Often when I demanded a DR the field engineer for Pullman would walk away saying he had been instructed to get it resolved without having a DR issued. In discussions with the QF engineers on different shifts, I found that another Pullman engineer on their shift had gotten a QF from them without a DR being issued.

He continues on the bottom of 127 to state "Upon completion of construction of that support, the as-built package, the entire as-built package of that support, was included in the original design and any subsequent tolerance clarifications were all incorporated into one as-built package which was returned to engineering for acceptance of the final as-built condition in accordance with project procedures." In discussions with the unit 1 personnel, I was told that they never saw any QF's when approving an as-built, only the as-built drawing. I was told that hardly any one [sic] reviewed these in any detail; they just rubber stamped them OK. (4/30/84 Stokes Aff. at 8-9.)

The contents of this allegation are included in Allegations JIR-12 through JIR-15 of Exhibit 6 to Joint Intervenors' June 11, 1984, Reply to PGandE and NRC Staff Answers to Joint Intervenors' Motions to Reopen Design and Construction Quality Assurance, and Allegation III-63 of March 21, 1984, Anonymous Affidavit, Attachment 9 to March 23, 1984, letter to the NRC, from the

Government Accountability Project. The PSDTC program is described in its entirety in Applicant's responses to those allegations.

The first part of the allegation was addressed in PGandE's response to JIR-13. As there stated, the actual memorandum that was released did not assign any responsibility to the PSDTC engineers to ensure that a contractor quality document (DR or DCN) was issued. Mr. Oman's statement is correct.

Regardless of whether DCNs or DRs were written, all installations as modified under the PSDTC program were verified to ensure that design and licensing criteria were satisfied, thus ensuring no defect. The PSDTC was never the final design qualification for a pipe support modification. All modifications authorized by the PSDTC were formally reviewed and approved by Engineering, using controlled procedures as part of the as-built acceptance program. Consequently, there are no undocumented and unreviewed conditions involving pipe supports which were created as a result of the PSDTC program.

Regarding the second part of the allegation, as pointed out in applicant's response to Allegation III-63, the engineer who reviewed and approved a small bore modification did not receive a PSDTC with the as-built drawing. OPEG engineers only received the final as-built drawing with the PSDTC modifications incorporated in the drawing for use when performing the as-built verification.

V-19

It is alleged that:

On page 129, Mr. Oman states "the fact that every tolerance clarification is included in the as-built package and is reviewed as part of the final hanger acceptance, leads to the conclusion that particular finding would not affect the final qualification of the supports." See comments paragraph above.

Mr. Shipley states on page 145, "I'm actually reading from the February 7th submittal that acceptable with minor supplemental calculations or comments, is 78 percent. Acceptable with detailed calculations, which means that there was something found that the reviewer felt that without additional work, he was not able to justify it on the basis of the original calculation alone -- that was 17 [illegible or deleted]. And, unacceptable is zero.

That was at the time of this document. At that time there were six supports that had yet to be completed. They have since been completed and they are also acceptable. So, that would bring the 17 to 22 percent, today."

I would like to point that all through the April 2 transcript the 17 percent figure has been used without any correction being proffered by PG&E/BECHTEL. The first I believe is on page 42 when Mr. Yin and Mr. Shipley used it, the second was the quote above, the third is on page 156 when it was used by Mr. Faulkenburg and Mr. Shipley again, and the forth is on page 160 when it was used by Mr. Taylor and Mr. Shipley again. I am sure there are other locations where the 17 percent is used without a correction when the number should be 22 percent. Maybe I expect too much voluntary information but 22 seems more significant than 17. (4/30/84 Stokes Aff. at 9-10.)

Ironically, the references to 17 percent rather than 22 percent, of the calculations reviewed having been demonstrated to be acceptable with additional detailed calculations, were made primarily to avoid confusion by maintaining consistency with the statistics previously submitted in the PGandE letter being quoted. Contrary to Mr. Stokes'

view, the significant point being made is not 17 or 22 percent, but rather that qualification to licensing requirements has been demonstrated for all supports reviewed.

V-20

It is alleged that:

Mr. Vollmer on page 147 asks "what sort of instructions are the checkers given, who perform that evaluation." Mr. Shipley replies on page 147 that "there is an intuitive ability of the designer, an experienced designer, to understand small bore piping." This point is followed up on by Mr. Manoli on page 154 with this comment: "So, it leaves, I think a hole here, where a person can just make judgments and thinks that the support is adequate." I would like to add that we were asked by group leaders to use our judgments on all most [sic] everything in the design. The worst use of this was when we all followed management's directive to take for granted that the supports as installed were installed under a valid Quality Assurance (QA) program. This I discovered was far from the truth. How much credibility can be given a reverification program which was based on intuition? There were so many assumptions which had no truth or basis which were never questioned in the review program that I can not [sic] see how anyone living in the vicinity of the plant can be safe with Diablo operating. The omission of information supplied by PG&E/BECHTEL similar to that supplied by me above, I feel is relevant for the companies' credibility. (4/30/84 Stokes Aff. at 10.)

Mr. Stokes uses unconnected quotes from different parts of the transcript completely out of context in order to conclude that the verification program was based on intuition. This is a distortion of the cited transcript passages which, when read in their entirety, clearly relate only to the level of detail achieved in the checking of small bore pipe support calculations. The point being made is as stated in PGandE letter DCL-84-046, dated February 7, 1984:

> Both the originator and reviewing engineer focused on the parameters of primary importance to the adequacy of the support. Although satisfactory for criterion and safety considerations, the level of rigor associated with these supports was different from that

achieved in other parts of the plant. In general, this variation in rigor is clear to those familiar with design practices in power plant and industrial plant facilities throughout the country. More importantly, the rigor of design documentation varies according to (1) the importance of the system, (2) the degree to which the system design may be challenged (large loads vs. small loads), and (3) the conservatism which exists in the design.

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

Mr. Stokes notes that "we were asked by group leaders to use our judgments on all most [sic] everything in the design." His reluctance to use his judgment is unusual, since engineering judgment is a principal attribute of a qualified engineer. Mr. Stokes' remarks about supports not installed under a valid QA program are incorrect and simply not supported by the facts.

V-21

It is alleged that:

On page 157 Mr. Tresler says "The judgments were used more in the small bore that [sic] it was in the large bore.

And I think that Larry is trying to point out also that this is industry practice. Is that correct?" Mr. Shipley replies "Yes". It is my experience that Diablo Canyon if it is industry practice to be at the lowest end of the scale and had I worked on any plant that I believed to be as unsafe as Diablo then I would never have gotten to work on Diablo for I would have become a WHISTLEBLOWER on that plant. (4/30/84 Stokes Aff. at 10-11.)

Mr. Stokes apparently takes issue with the statement that, as an industry practice, engineering judgment is used more in small bore pipe support design than it is in large bore pipe support design. The statement is well founded in actual industry practice. Mr. Stokes also voices his personal views on the relative safety of the Diablo Canyon plant compared to other facilities. Mr. Stokes' opinions represent a personal view based on very limited knowledge and perspective.

V-22

It is alleged that:

Mr. Tresler makes the statement on page 171 that "There was a very short period of time where the vehicle of phone calls were [sic] used in lieu of the normal process," and he continues on page 172 with "I don't know -- a month or so, the work was expedited by use of the phone call, and the intent was that those calculations would not be finalized until the written information came through." I was on site from Nov. 8, 1982 until Oct. 14, 1983 and during this time the phone was consistently used to obtain necessary design information and almost none of the engineers documented these calls since no phone memorandum forms were available. Only a few of us indicated in the calculation that it was preliminary and that a written reply was necessary. (4/30/84 Stokes Aff. at 11.)

The transcript passage cited in this allegation involves a discussion of those small bore pipe support design loads which were calculated in the SFHO, transmitted by telephone on a preliminary basis, and later documented by a formal transmittal. As stated by Mr. Tresler in the transcript, this practice was used for a limited period of time (approximately one month) to expedite completion of the small bore support design calculations. Before and after that limited period of time, the small bore support design loads which originated in SFHO were transmitted to OPEG only by transmittal of the corresponding piping stress analysis.

Mr. Stokes takes this limited discussion out of context and applies it to all telephone conversations with SFHO. Conversations with SFHO certainly did occur continually, not just for a one-month period.

However, these calls were not to be used to document final design inputs for small bore pipe support calculations.

V-23

It is alleged that:

On page 175 Mr. Knight asks "Okay. So, for the record, .025 was the criterion?" and was answered by Mr. Shipley "Yes, sir." Mr. Knight asked again "And it was the only criterion that was employed?" and Mr. Shipley replied again "Yes". This is not true, we also used .009 inch. Both of these values were supplied to us in M-9. The .025 value was for 20 hertz and .009 was for 33 hertz. (4/30/84 Stokes Aff. at 11.)

Mr. Stokes is confused about the Diablo Canyon criteria for allowable support deflection and associated natural frequency. The Project licensing commitments, and the basis for the Project criterion on this point, require limiting support deflections in the restrained direction to 0.025-inch which corresponds to a natural frequency of 20 hertz or greater. Compliance with this criterion will meet Project licensing commitments. As a matter of Project preference, in the design of any new Class I support or modification of any existing Class I support, efforts were made to provide a design which resulted in a natural frequency of at least 33 hertz in the restrained direction, which corresponds to a static deflection of no more than 0.009-inch. This latter value was not a Project criterion required for compliance with licensing commitments, but was selected to provide additional conservatism for new support construction.

V-24

It is alleged that:

Mr. Shipley on page 178 says "The 20 hertz is -- is -- is only a criteria. It clearly doesn't set a pass/fail situation for the support --". As one of the criteria we were designing to, the support failed if it did not meet this requirement. I wonder now after considering Mr. Shipleys' statement if those supports which we failed due to insufficient stiffness were later changed to passing? (4/30/84 Stokes Aff. at 11.)

The minimum pipe support natural frequency value of 20 hertz referred to by Mr. Stokes in this allegation is a value established to simplify piping stress analysis by allowing the stress analyst to assume that all supports meeting the 20 hertz criterion are rigid for purposes of stress analysis. This does not imply that a pipe support is automatically unacceptable if its natural frequency is less than 20 hertz. For such cases, the actual stiffness of the support can be used in the stress analysis to demonstrate piping qualification. This is a somewhat more cumbersome but entirely acceptable method. Supports do not "fail due to insufficient stiffness," as Mr. Stokes asserts, simply because their natural frequency is less than 20 hertz.

V-25 and V-26

It is alleged that:

I had intended to identify some examples of unacceptable workmanship with respect to the following three codes and specifications:

1. Vendor welds not complying with applicable AWS Code D1.1 Section 8.15 "Quality of Welds".

8.15.1 Visual Inspection. All welds shall be visually inspected. A weld shall be acceptable by visual inspection if it shows that

8.15.1.1 The weld has no cracks.
8.15.1.2 .....
8.15.1.3 All craters are filled to the full cross section of the weld.
8.15.1.4 Weld profiles are in accordance with 3.6
8.15.1.5 Irrespective of length, undercut shall not exceed the value shown in Fig. 8.15.1.5 for the primary stress direction category applicable to the area containing the undercut. Further, the undercut may be twice the value permitted by Fig. 8.15.1.5 (for the aplicable stress category) for an accumulated lengh [sic] of 2 in. in any 12 in. (51 mm in 305 mm) length of weld, but in no case may undercut on one side be greater than 1/16 in. (1.6 mm), the permitted length should be proportional to the actual length.

2. Violations of ASTM/AISC Codes governing bolting requirements on Rupture Restraints, and Class 1 structural steel installations. The Manual of Steel Construction (AISC), specification for "Structural Joints Using ASTM A325 or A490 Bolts", section 3, "BOLTED PARTS" states,

(a) The slope of surfaces of bolted parts in contact with the bolt head and nut shall not exceed 1:20 with respect to a plane normal to the bolt axis. Bolted steel parts shall not be separated by gaskets and shall fit solidly together after the bolts are tightened. Holes may be punched, subpunched and reamed, or drilled, as required by the applicable code or specification. Standard holes shall have a diameter nominally 1/16-in. in excess of the nominal bolt diameter.

Where shown in the design drawings and at other locations approved by the designer, oversize, short

slotted, and long slotted holes (see Table 7 in Commentary) may be used with high-strength bolts 5/8-in. diameter and larger in connections assembled as follows:

1. Oversize holes may have nominal diameters up to: 3/16-in. larger than bolts 7/8-in. and less in diameter, 1/4-in. larger than bolts 1-in. in diameter, and 5/16-in. larger than bolts 1 1/8-in. and greater in diameter. They may be used in any or all plies of friction-type connections. Hardened washers shall be installed over oversize holes in an outer ply.

2. Short slotted holes are nominally 1/16-in. wider than the bolt diameter and have a length which does not exceed the oversize diameter provisions of subsection 3(a)1 by more than 1/16-in. They may be used in any or all [illegible or deleted] or bearing-type connections. The slots may be used without regard to direction of loading in friction-type connections but shall be normal to the direction of the load in bearing-type connections. Hardened washers shall be installed over short slotted holes in an outer ply.

3. Long slotted holes are nominally 1/16-in. wider than the bolt diameter and have a length more than allowed in subsection 3(a)2 but not more than 2 1/2 times the bolt diameter. The slots may be used without regard to direction of loading in friction-type connections but shall be normal to the direction of the load in bearing-type connections.

Long slotted holes may be used in only one of the connected parts of either a friction-type or bearing-type connection at an individual faying surface.

Where long slotted holes are used in an outer ply, a plate washer or continuous bar of at least 5/16-in. thickness with standard holes shall be provided. This washer or bar shall be of structural grade material, but need not be hardened. If hardened washers are required to satisfy Specification provisions, the hardened washers shall be placed over the outer surface of the plate washer or bar. These washers or bars shall have a size sufficient to completely cover the slot after installation.

(b) When assembled, all joint surfaces, including those adjacent to the bolt head, nuts or washers, shall be free of burrs, dirt, and other foreign material that would prevent solid seating of the parts. Paint is permitted unconditionally in bearing-type connections.

5 INSTALLATION

(c) Turn-of-Nut Tightening

When the turn-of-nut method is used to provide the bolt tension specified in subsection 5(a), there shall first be enough bolts brought to a "snug tight" condition to insure [sic] that the parts of the joint are brought into good contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remining (sic) holes in the connection and brought to snug tightness. All bolts in the connection shall then be tightened additionally by the applicable amount of nut rotation specified in Table 4, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

(d) Calibrated Wrench Tightening

When calibrated wrenches are used, they should be set to provide a tension at least 5% in excess of the minimum bolt tension specified in subsection 5(a). The wrenches shall be calibrated at least once each working day for each bolt diameter being installed. Wrenches shall be recalibrated when significant changes are made in the equipment or when a significant difference is noted in the surface condition of the bolts, nuts, or washers. Calibration shall be accomplished by tightening, in a device capable of indicating actual bolt tension, three typical bolts of each diameter from the bolts being installed.

When adjusting the wrenches to provide the required tension, it shall be verified during actual installation in the assembled steelwork that the calibration selected does not produce a nut or bolt head rotation from snug tight greater than that

permitted in Table 4. If manual torque wrenches are used, nuts shall be in tightening motion when torque is measured.

When using calibrated wrenches to install several bolts in a single connection, the wrench shall be returned to "touch up" bolts previously tightened, which may have been loosened by the tightening of subsequent bolts, until all are tightened to the prescribed amount.

(f) Reuse

A490 bolts and galvanized A325 bolts shall not be reused. Other A325 bolts may be reused if approved by the engineer responsible.

Retightening previously tightened bolts which may have been loosened by the tightening of adjacent bolts shall not be considered as a reuse.

6 INSPECTION

(a) The Inspector shall determine that the requirements of Sections 2, 3, and 5 of this Specification are met in the work. When the calibrated wrench method of tightening is used, the Inspector shall have full opportunity to witness the calibration test prescribed in subsection 5(d).

(b) The Inspector shall observe the installation of bolts to determine that the selected procedure is properly used and shall determine that all bolts are tightened. Bolts installed by the turn-of-nut method may reach tensions substantially above the value given in Table 3, but this shall not be cause for rejection.

COMMENTARY C5 INSTALLATION

Where long slotted holes are used, experimental evidence has shown that a plate washer or continuous bar of at least 5/16-in. thickness with standard holes is necessary to provide adequate bearing. This washer or bar shall be of structural grade material but need not be hardened. However, if hardened washers are required to satisfy Specification provisions, the hardened washer shall be placed over the outer surface of the plate washer or bar.

3. Examples of non-compliance with Pulman [sic] Power Products' own Engineering Specifications - Diablo (ESD's).

My concerns relating to ASTM/AISC Bolting Requirements led to a review of an internal PPP document "Tensioning - ESD-243" Authored by R. L. Werner, which deals with the inadequacy of ESD 243 with respect to under tensioning and over tensioning of A325 and A490 bolts. This document also delt [sic] with the implementation of the disposition of NCR DC2-80-RM-002, dated 11-19-80. Page 3, paragraph 5 states:

> Bolts which have rejectable indications shall be discarded and replaced with new bolts and new nuts. If bolts are grouted in wall the connection shall be "As-Built" and the As-Built submitted to the assigned engineer for review and disposition.

This document leads me to believe that PG&E provided explicit instructions for the handling of accessable [sic] and fairly easily resolved problems and provided a built-in escape clause for problems that were inaccessable [sic] or required extensive rework. (4/18/84 Anon. Aff., Exhibit 2, at 1-6).

Although the alleger "intended to identify some examples of unacceptable workmanship," no specific examples are cited. He cites at length from the AISC without giving any specific examples of concern.

It should also be noted in passing that the allegation cites the Eighth Edition of the AISC Manual of Steel Construction, whereas the Seventh Edition is the licensing basis of this plant.

Allegations regarding the quality of vendor welds have been addressed in PGandE letter DCL-14-114, dated March 22, 1984, in relation to Bostrom Bergen and in response to the April 11-12 NRC sponsored night

tour for allegers. A similar allegation coming from that tour was addressed in PGandE letters DCL-84-170 (May 2, 1984) and DCL-84-200 (June 1, 1984) and Allegation V-47 herein.

V-27

It is alleged that:

Another document I reviewed was PPP EMPLOYEE SELF-STUDY BOOK #2, relating to Pullman's version of 10CFR50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants." The Pullman version differs substantially from the legal version with respect to organizational structure for the QA program. The official version reads as follows:

I. ORGANIZATION

The applicant[1] shall be responsible for the establishment and execution of the quality assurance program. The applicant may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part thereof, but shall retain responsiblitity [sic] therefor. The authority and duties of persons and organizations performing structures, systems, and components shall be clearly established and delineated in writing. These activities include both the performing functions of attaining quality objectives and the quality assurance functions. The quality assurance functions are those of (a) assuring that an appropriate quality assurance program is established and effectively executed and (b) verifying, such as by checking, auditing, and inspection, that activities affecting the safety-related functions have been correctly performed. The persons and organizations performing quality assurance functions shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions. Such persons and organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety considerations, are provided. Because of the many variables involved, such as the number of personnel, the type of activity being performed, and the location or locations where activities are performed, the organizational structure for executing the quality assurance program may take various forms provided that the persons and organizations assigned the quality assurance functions have this required authority and organizational freedom. Irrespective of the organizational structure, the individual(s)

assigned the responsibility for assuring effective execution of any portion of the quality assurance program at any location where activities subject to this appendix are being performed shall have direct access to such levels of management as may be necessary to perform this function.

(Footnote 1.) While the term "applicant" is used in these criteria, the requirements are, of course, applicable after such a person has received a license to construct and operate a nuclear powerplant [sic] or a fuel reprocessing plant. These criteria will also be used for guidance in evaluating the adequacy of quality assurance programs in use by holders of construction permits and operating licenses.

(NOTE: Those parts of 10CFR50, App.B, I. ORGANIZATION that are omitted or paraphrased in Pullman's version are underlined.)

The Pullman version is as follows:

The applicant shall be responsible for the establishment and execution of the quality assurance program. The applicant may delegate to other organizations the work of establishing and executing the quality assurance program or any part thereof, but shall retain responsibility therefore. The authority and the duties of persons and organizations performing quality assurance functions shall be clearly established and delineated in writting (sic). Such persons and organizations shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. In general, assurance of quality requires management measures which provide that the individual or group assigned the responsibility for checking, auditing, inspecting, or otherwise verifying that an activity has been correctly performed is independent of the individual or group directly responsible for performing the specific activity.

(NOTE: Pullman's paraphrases are underlined in the above quote.

The rest of appendix B is typed verbatim except for the omission of the words "fuel reprocessing plant" where they occur. My "official version"is (sic) ((35 FR 10499, June 27, 1970, as amended at 36 FR 18301, Sept 17, 1971; 40 FR 32100 Jan. 20, 1975.))

Had Pullman complied with the legal version of 10 CFR 50, App. B, the proper respect for safety related work could have been maintained throughout the company. However, the Pullman version pervaded the attitudes of the supervisors involved. Their attitudes served to restrict inspectors like myself from broadening our knowledge of the requirements and attempting to document and seek out resolution to safety-related problems. Pullman's arrogance in rewriting the law on Quality Assurance disturbs me. The lack of authority and independent freedom of the actual inspectors to cut through red tape and follow a problem to a conclusion can be traced back to the omissions and paraphrases of the legal Code. Pullman's omissions effectively placed the inspectors in a position of accepting only work shown to them rather than striving to prevent recurrence of problems in workmanship and design.

I was unaware of Pullman's omissions and thought they had given us a real copy of 10CFR50 App.B to study. In fact, in my first Affidavit I identified a requirement to maintain a separate QA/AC department as a requirement of 10CFR50 App.B even though this requirement is casually addresses [sic] in the Pullman relaxed version. It is clearely [sic] defined in the legal version. I am deeply concerned with Pullman's relaxed version because of the attitude of management to relax requirements even further in practice.

Based on my knowledge of what Pullman classifies as a QA program, I have serious doubts as to the ability of their version to "stand alone" under the real requirements of 10CFR50, App. B. This is not responsible behavior. (4/18/84 Anon. Aff., Exhibit 2, at 6-9.)

The "Pullman version" accurately addresses all of the aspects of the full, unabridged version of 10 CFR 50, Appendix B. Although in hindsight it might have been appropriate to note that Pullman had paraphrased the Appendix, when the "legal version" is compared to "Pullman's version," there is no significant departure from the intent of the actual Appendix B. It should first be noted that the Pullman "version" of Appendix B in Self Study Book #2 is not a Pullman document that "stands alone", but is a part of a general

description of Pullman's quality assurance involvement. This study book is not part of an approved procedure, specification, or the QA Manual and should be viewed in that light. The book was not and is not a mandatory reading requirement for certification of any QA/QC personnel and is no longer being used as a controlled self-study guide or as part of the current reading list utilized for training. No work is conducted or performed in accordance with this book.

Insofar as Pullman's training of QA/QC Inspectors is concerned, the applicable aspects of Appendix B are those which deal with the quality assurance functions. The "Pullman version" in the self-study manual was written in that light. Appendix B states that, "quality assurance functions are those of (a) assuring that an appropriate quality assurance program is established and effectively executed and (b) verifying, such as by checking, auditing and inspection, that activities affecting the safety-related functions have been properly performed.". The QA/QC personnel do not perform safety-related functions; they only verify that activities affecting these functions have been properly performed. The "Pullman version" emphasizes establishment of the quality assurance functions only. Hence the paraphrasing approach was used. Where personnel involved in quality assurance functions are concerned, the context of Appendix B has not been altered or diminished, as is alleged.

As mentioned in Appendix B (both "versions"), "sufficient authority and organizational freedom" shall exist "to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions." This can be either on an individual or organizational level. Both "versions" go on to say that reporting shall be to a management level that is independent of the individual or group that has caused the quality problem. Appendix B also allows the flexibility to create an organization that will address quality problems in any manner appropriate as long as independence from the cause is maintained. The quality assurance organization can choose to "seek out resolution to safety-related problems" through avenues other than the originator of the quality problem report. In other words, the individual who identifies a quality problem does not have to follow completely through to resolution any problem that he or she has identified as long as the quality assurance organization has established a method of addressing such problems. Pullman's organization allows its inspectors to continue on with QC functions in support of construction efforts so that the inspectors don't get tied down in research and follow-up efforts. Support quality assurance personnel are employed to handle research, back-up documentation, resolution, implementation and verification of correction of quality problems.

The statements by the alleger that proper respect for safety-related work was not maintained throughout the company and that the "Pullman

version pervaded the attitudes of the supervisors involved" and that "their attitudes served to restrict inspectors like myself" are unsubstantiated statements of opinion and cannot be acknowledged or answered as no specific incidents or examples are cited. The statement that inspectors lacked authority and independent freedom "to cut through the red tape and follow a problem to a conclusion" could be "traced back to the omissions and paraphrases of the legal code" is inaccurate because, as has already been explained above, the inspector does not personally have to follow a problem through to a conclusion if the quality assurance organization has created a way to do so, which is the case with Pullman. There is no requirement in the Appendix B that an individual who identifies a problem must be the same individual who follows the problem through to resolution.

Pullman provides a system of review and disposition/resolution by individuals at management levels for problems in workmanship. These individuals communicate corrective measures to the fabrication/erection portion of Pullman to improve the quality of workmanship and, at the same time, enforce implementation of the corrective measures. Design is not Pullman's responsiblity, but PGandE's. Any design problems discovered by inspectors are documented and addressed to PGandE for evaluation.

V-28A

It is alleged that:

The ESD's I was expected to perform my inspections to were supposed to conform to the AISC/ASTM codes, when in actuality they often conflicted with them. This is especially important because the ESD's did not reference any requirements pertaining to the shape or size of the hole the anchor bolts were mounted in.

I identified the deficiencies of the ESD to my supervisor, [illegible or deleted] on several occasions. In each instance I was instructed to inspect to the ESD's because Pullman worked to them and not to codes.

[illegible or deleted] discovered a structural support on the Unit 1 pipe rack where six of the eight mounting/bolting holes were elongated to the point where the washers could not cover the holes. [illegible or deleted] researched [illegible or deleted] supervisors, fellow inspectors (old timers), engineers, and the design drawings. The design drawing showed no enlongated [sic] holes. In all cases the personnel advised that:

1. Work was performed by another contractor;
2. Not to worry;
3. PG&E knew about it, it was old work and was accepted as is.

[illegible or deleted] had to accept these statements as being gospel, mainly because there was insufficient documentation in existence and available [illegible or deleted] to dispute their claims. (4/18/84 Anon. Aff., Exhibit 3, at 2-3.)

Since this allegation lacks specifics, it is impossible to respond in any detail. The subject of the adequacy of using standard round washers for structural steel bolted connections with slotted holes was previously addressed in full in PGandE's letter DCL-84-162, dated April 27, 1984. This letter indicated that:

"...the governing code, AISC, 7th edition, first printing, contained no specific requirements for connections using slotted holes. A few of the pipeway structure bolted connections contain slotted holes with bolts and washers that were installed in accordance with this edition of the AISC code. In subsequent printings of the 7th edition of the AISC code, requirements for adding plate washers to slotted hole connections were included to ensure that the bolts would have adequate bearing area against the base metal. Since the existing bolt washers do not completely cover the bolt holes, Engineering performed an analysis of the existing configuration of the pipeway structure connections. This analysis found that the washers provided sufficient contact with the base metal such that the actual bearing stresses were within allowable stresses given in the AISC code.

296. The implications in the allegation that these bolts were not installed in conformance with the AISC code and that PGandE incorrectly accepted this condition are unfounded. The subject bolted connections were installed in accordance with the then existing AISC code, and engineering analysis demonstrates that the connections are fully acceptable."

The Pullman ESDs are written to be in compliance with PGandE specifications and the applicable codes. All ESDs, including those for rupture restraints, have been reviewed and approved for use at Diablo Canyon by PGandE.

Pullman's direct responsibility is only for its own work. In instances when potential deficiencies are identified in the work of others, it is Pullman's responsibility only to bring these items to the attention of PGandE. Therefore the noted responses could all be proper when used in the appropriate context. It is understandable that an inspector could be told by his lead or supervisor that the existing items were indeed supplied and installed by others with the

knowledge of PGandE and therefore no further action was required by Pullman.

This individual seems intent on pursuing work beyond the contractual requirements and constraints of his employer. In Allegation V-28B, he indicates that he had the freedom to and did consult with PGandE inspectors. It is presumed and expected that these latter unnamed individuals pursued the matter to an acceptable conclusion.

V-28B

It is alleged that:

This type of problem was widespread throughout the plant. I had discovered [illegible or deleted] similar situations in Unit 1 Reactor Building and Unit 2 Reactor Building. In some instances I found the crafts had stuffed the holes with short sections of soft tie-wire to serve as packing. I could not understand this practice. When I questioned what document provided the instructions for this practice, none could be provided. I consulted the pipefitters [sic] involved, my supervisor, PG&E inspectors and the engineers. Their reply was that "we had always done it this way, PG&E is aware of it and had accepted it as is."

To me, this constituted covering up poor workmanship by virtue of oral procedure or at best by internal memo rather than by approved procedures or AISC/ASTM codes. (4/18/84 Anon. Aff., Exhibit 3, at 3.)

Rod packing of holes was an approved practice in accordance with Pullman QA Instruction #64 which was first put in effect in 1974. This instruction was included in ESD 243 during the period that most of the work involving bolt holes was initially performed. Although this instruction was dropped from the ESD in 1979, when the need arose in 1982 to revalidate this process, PGandE reconfirmed (via response to DQs 278 and 450) that this practice was still considered acceptable. Current PGandE Design Drawing #447253, revision 4, also shows this practice as acceptable.

The practice has been re-reviewed and found acceptable as reported in PGandE letter DCL-84-220 dated June 3, 1984. Thus, the practice is permitted by formal procedures, is not a cover-up for "poor workmanship," and is an acceptable engineering practice.

It is alleged that:

> My persistance [sic] in persuing [sic] these examples of non-compliance with the codes led to my being harassed in the performance of my job. Finally, in [illegible or deleted] 1981, I had the opportunity for other employment away from Diablo Canyon. I immediately seized it even with a reduction in pay. I was relieved to be removed away from the harassement [sic] and the butting of my head against a brick wall. However the problems I had identified continued to bother me. (4/18/84 Anon. Aff., Exhibit 3, at 3-4.)

The allegations of harassment are sufficiently vague to preclude a detailed response. Harassment of inspectors was not practiced or condoned by Pullman management. This individual seems to have been upset by his inability to personally pursue issues all over the site and on work performed by other contractors. That was not his job. He brought his matters of concern to the appropriate personnel and it was their job, not his, to resolve the issues.

A review of the Pullman records was undertaken to see if any of the inspectors resigning in 1981 had complained of harassment. No such complaints have been found. Nor have any of the inspectors who resigned in 1981 come forward with any complaint until the recent affidavit.

V-32

It is alleged that:

I feel that had I been allowed to accompany the tour I could have provided first-hand examples of workmanship that would have violated the following code requirements from the Manual of Steel Construction (AISC), Specification for "Structural Joints Using ASTM A325 or A490 Bolts," Section 3 BOLTED PARTS, Section 5, INSTALLATION; Section 6, INSPECTION; and COMMENTARY, Section C5:

3. BOLTED PARTS

(a) The slope of surfaces of bolted parts in contact with the bolt head and nut shall not exceed 1:20 with respect to a plane normal to the bolt axis. Bolted steel parts shall not be separated by gaskets and shall fit solidly together after the bolts are tightened. Holes may be punched, subpunched and reamed, or drilled, as required by the applicable code or specification. Standard holes shall have a diameter nominally 1/16-in. in excess of the nominal bolt diameter.

Where shown in the design drawings and at other locations approved by the designer, oversize, short slotted, and long slotted holes (see Table 7 in Commentary) may be used with high-strength bolts 5/8-in. diameter and larger in connections assembled as follows:

1. Oversize holes may have nominal diameters up to: 3/16-in. larger than bolts 7/8-in. and less in diameter, 1/4-in. larger than bolts 1-in. in diameter, and 5/16-in. larger than bolts 1 1/8-in. and greater in diameter. They may be used in any or all plies of friction-type connections. Hardened washers shall be installed over oversize holes in an outer ply.

2. Short slotted holes are nominally 1/16-in. wider than the bolt diameter and have a length which does not exceed the oversize diameter provisions of subsection 3(a)1 by more than 1/16-in. They may be used in any or all plies of friction-type or bearing-type connections. The slots may be used without regard to direction of loading in friction-type connections but shall be normal to the direction of the load in bearing-type connections. Hardened washers shall be installed over short slotted holes in an outer ply.

3. Long slotted holes are nominally 1/16-in. wider than the bolt diameter and have a length more than allowed in subsection 3(a)2 but not more than 2 1/2 times the bolt diameter. The slots may be used without regard to direction of loading in friction-type connections but shall be normal to the direction of the load in bearing-type connections.

Long slotted holes may be used in only one of the connected parts of either a friction-type or bearing-type connection at an individual faying surface.

Where long slotted holes are used in an outer ply, a plate washer or continuous bar of at least 5/16-in. thickness with standard holes shall be provided. This washer or bar shall be of structural grade material, but need not be hardened. If hardened washers are required to satisfy Specification provisions, the hardened washers shall be placed over the outer surface of the plate washer or bar. These washers or bars shall have a size sufficient to completely cover the slot after installation.

(b) When assembled, all joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of burrs, dirt, and other foreign material that would prevent solid seating of the parts. Paint is permitted unconditionally in bearing-type connections.

5 INSTALLATION

(c) Turn-of-Nut Tightening

When the turn-of-nut method is used to provide the bolt tension specified in subsection 5(a), there shall first be enough bolts brought to a "snug tight" condition to insure [sic] that the parts of the joint are brought into good contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. All bolts in the connection shall then be tightened additionally by the applicable amount of nut rotation specified in Table 4, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation

there shall be no rotation of the part not turned by the wrench.

(d) Calibrated Wrench Tightening

When calibrated wrenches are used, they should be set to provide a tension at least 5% in excess of the minimum bolt tension specified in subsection 5(a). The wrenches shall be calibrated at least once each working day for each bolt diameter being installed. Wrenches shall be recalibrated when significant changes are made in the equipment or when a significant difference is noted in the surface condition of the bolts, nuts, or washers. Calibration shall be accomplished by tightening, in a device capable of indicating actual bolt tension, three typical bolts of each diameter from the bolts being installed.

When adjusting the wrenches to provide the required tension, it shall be verified during actual installation in the assembled steelwork that the calibration selected does not produce a nut or bolt head rotation from snug tight greater than that permitted in Table 4. If manual torque wrenches are used, nuts shall be in tightening motion when torque is measured.

When using calibrated wrenches to install several bolts in a single connection, the wrench shall be returned to "touch up" bolts previously tightened, which may have been loosened by the tightening of subsequent bolts, until all are tightened to the prescribed amount.

(f) Reuse

A490 bolts and galvanized A325 bolts shall not be reused. Other A325 bolts may be reused if approved by the engineer responsible.

Retightening previously tightened bolts which may have been loosened by the tightening of adjacent bolts shall not be considered as a reuse.

6 INSPECTION

(a) The Inspector shall determine that the requirements of Sections 2, 3, and 5 of this Specification are met in the work. When the

calibrated wrench method of tightening is used, the Inspector shall have full opportunity to witness the calibration test prescribed in subsection 5(d).

(b) The Inspector shall observe the installation of bolts to determine that the selected procedure is properly used and shall determine that all bolts are tightened. Bolts installed by the turn-of-nut method may reach tensions substantially above the value given in Table 3, but this shall not be cause for rejection.

COMMENTARY C5 INSTALLATION

Where long slotted holes are used, experimental evidence has shown that a plate washer or continuous bar of at least 5/16-in. thickness with standard holes is necessary to provide adequate bearing. This washer or bar shall be of structural grade material but need not be hardened. However, if hardened washers are required to satisfy Specification provisions, the hardened washer shall be placed over the outer surface of the plate washer or bar.

The examples I could have identified to the NRC on the plant tour would have been Code violations with respect to:

1. Design drawings not specifying elongated holes;
2. Hole sizes outside of Code Specifications;
3. Torquing method;
4. Bolt reuse;
5. Examples of "packing" violating foreign material specifications. (4/18/84, Anon. Aff., Exhibit 3, at 6-10).

This allegation has been completely addressed in response to Allegation V-26 above.

It is alleged that:

A discussion of the Bolting Program for Rupture Restraints as practiced by Pullman is best discussed through Pullman D.R. 4342, PG&E Nonconformance Report DC2-80-RM-002, and my own inspection experience dated late-July to mid-December of 1983. PG&E required that Pullman adhere to Contract Specification 8833XR for structural steel erection (contract includes Pullman's Rupture Restraint Program). 8833XR specifically states that structural steel erection be conducted to the AISC Steel Construction Manual, Seventh Edition.

AISC's specifications for structural joints using ASTM A-325 and A-490 High Strength Bolts has provided values for minimum fastener tension in Table 3, page 5-195. Basically, this Table requires that all A-325 and A-490 H.S. bolts be tightened to 70% of their tensile strength measured in tension. When turn-of-nut tightening is used the additional requirements of Table 4, page 5-196, are specified. Note that the turn-of-nut rotation is dependent on:

1) Disposition of outer faces of bolted parts.

2) Bolt length.

Additionally, thread pitch should be mentioned because it is a factor in the determination of the required turn-of-nut rotation to achieve the specified tensile bolt preload.

Pullman's ESD 243-1983 Torque Instructions per Charts A, A1, B and Field Process Sheets prepared by Pullman Field Engineers, simply, do not take into account the pre-requisites of the AISC Manual. (4/26/84 Lockert Aff. at 1-2.)

ESD 243 is in compliance with the AISC manual for all connections that are torqued to the 70% value. The AISC requirements are based on this value. Connections that were torqued to a value less than 70% (i.e., 25% to 50%) as specified by ESD 243, were evaluated and specified by Engineering. Thus, these connections meet the

applicable design requirements. The torque and bolt reuse requirements of AISC do not apply to connections that are torqued to these values because the bolt is considered unused for "reuse criteria" until it has been tensioned by torque or turn of the method to 70 percent of its ultimate tensile strength.

V-35 and V-36

It is alleged that:

Non Conformance Report DC2-80-RM-002 initiated by Robert Torstrom on 11/19/80 amd [sic] dated 12/12/80 for Corrective Action states:

SHEET 1: Cause of Non Conformance

Pullman Power Products' Rupture Restraint Program has had inadequate design change control, inspection performance, and control.

SHEET 2: Description:

1) a. Out of tolerance gaps behind base plates... nuts not engaged per requirements.

b. ...There are cases of material and welds not conforming to the specification.

2) a. Welds exist which do not have documentation.

b. Modifications have been performed...and have not been documented.

c. There are bolts that have 'Torque Seal'... However, inspection records do not exist....

RESOLUTION:

Pullman Power Products shall perform a documented inspection of all bolted and welded connections and applicable documentation, required by the Specification, as set forth in approved contractor's ESD's in order to:

1) Identify connections which do not conform to specification requirements, and

2) Identify connections which do not have required documentation. (4/26/84 Lockert Aff. at 2-3.)

I would first like to point out that the cause of the NCR indicated a complete breakdown of Quality Assurance with respect to Pullman's Rupture Restraint Program meeting 8833XR Specification requirements. Of course, Mr. Torstrom

did not use those exact words but one only has to look at the resolution of the NCR to see that PG&E required Pullman to do a 100% reinspection of "all bolted and welded connections and applicable documentation" required by Specification 8833XR. (4/26/84 Lockert Aff. at 3.)

All that Mr. Lockert has done in these allegations is to copy documents that were generated in accordance with the QA/QC program and then allege that the program was not effective and did not function as designed. However, the reinspection and repair of rupture restraints is an issue which was fully documented and reported to the NRC several years ago. The NRC Region V inspectors were actively involved in the assessment and resolution of this issue.

V-33

It is alleged that:

I have reason to believe that the Bolting Program for Rupture Restraints in Units 1 and 2, conducted during late July to December of 1983, by the Pullman Power Product [sic] Corporation has failed to meet licensing requirements. I use the word "licensing" because the "Corrective Action" part of the Final Safety Analysis Report (FSAR) has not functioned as reported per 17.1.16 paragraph of the FSAR, "The Quality Assurance Program requires that conditions jeopardizing quality be promptly referred to responsible parties and that appropriate steps be taken to correct such situations." (4/26/84 Lockert Aff. at 1.)

The bolting program for rupture restraints in Units 1 and 2 meets all licensing requirements and ESD 243. This program also meets the AISC criteria for bolted connections as explained in response to Allegation V-34 below.

V-37

It is alleged that:

Second, I would like to point out that Mr. Torstrom refers to the non-conforming conditions as Deficient Conditions; I do not feel deficient is the correct word. A departure from the requirements of 8833XR (a Procurement Document) is a "Deviation" defined by 10CFR21.3(e).

The deviations occured [sic] in work that had already been accepted by Pullman's Quality Assurance people as meeting the Design Drawings and 8833XR Specifications. Already being QA/QC accepted, the Rupture Restraints with deviations included were being offered to PG&E as an acceptable installation by Pullman. The deviations can now be spoken of as "Defects" per the 10CFR21.3(d) definition. It should be pointed out that the defects were not reported per 10CFR21.21. (4/26/84 Lockert Aff. at 3-4.)

The reinspection and repair of rupture restraints is an issue which was fully documented and reported to the NRC several years ago. This program was evaluated and reported to the NRC in accordance with 10 CFR 50.55(e), which is the applicable federal regulation for reporting a construction deficiency.

It is alleged that:

Now lets [sic] discuss the Resolution and Corrective Action in Torstrom's NCR of 12/12/80. Proper resolution required an identification of "all bolted and welded connections" which did not conform to 8833XR Specification requirements. Further, it was stated that:

> Pullman Power Products has developed and implemented a program which assures adequate control of design change. Training and indoctrination programs have been developed and implemented which assures adequate performance of inspection personnel.

Attachment 1 of NCR DC2-80-RM-002 correctly shows that the minimum tension for High Strength bolts (ASTM A-325 and A-490) is 70% of the minimum tensile strength. However, Anchor bolts used as "Through bolts" in concrete walls and floors and Anchor bolts cast in concrete are allowed to be tensioned to 55% and 25% of the minimum tensile strength, respectively. If the Anchor bolts happen to be A-235 or A-490 bolts, which I know for a fact that many of them are, then the instructions of the NCR are an apparent deviation from the requirements of the AISC Manual, paragraph 1.23.5, Table 1.23.5. In other words, the resolution of the bolting problem was resolved by instructions to deviate from the requirements of the AISC Manual.

I do not know if NCR DC2-80-RM-002 had been closed by the time I was employed by Pullman (July of '83). I do know that I was not instructed in the resolution requirements of the NCR and that Pullman did not report defects that still existed in Rupture Restraints from July to December of 1983. Defects that I had noted that had not been previously reported were:

1. Unauthorized modifications to fillet welds that encroached on bolt or washer land areas.

2. Oversize holes already QC accepted outside the tolerances of ESD 243 and AISC Manual.

3. Oversize holes in base plates packed with steel rods and wires without the benefit of an approved Pullman procedure. (This work was performed to a memo from Mr. Torstrom in violation of 10CFR50 App B, Criteria V and VI.)

4. Oversize welds beyond that allowed by AWS D1.1 and beyond that allowed by Pullman's ESD 243.

5. Defects in A-490 bolts had been found after the bolts had been "dedicated" by Pullman's QA Receiving Department and sent to the field for installation. (4/26/84 Lockert Aff. at 4-5.)

Attachment 1 of NCR DC2-80-RM-002 provides the tensioning requirements for ASTM A-325 and A-490 bolts used in rupture restraints. The tensioning requirements for permanent steel-to-steel requirements meet the AISC requirements. Tensioning requirements for bolts in other than steel-to-steel connections are not within the jurisdiction of the AISC code. The design of these bolts are provided for in engineering calculations, including the tensioning requirements. The tensioning requirement for steel-to-steel connections which are periodically detensioned and reused are based on engineering evaluation. These bolts were tensioned to levels below yield to allow their reuse.

Final disposition of DC2-80-RM-002 will be made when resolution of all items is complete. The disposition of all alleged defects will be complete prior to disposition of the NCR. It should be noted that this NCR is for construction of Unit 2. A similar NCR has already been closed out for Unit 1 construction.

In addition to the NCR, PGandE has addressed oversize hole questions by the NRC in PGandE letter DCL-84-220, dated June 3, 1984.

In response to NRC questions on this issue PGandE stated::

PIPE RUPTURE RESTRAINTS INSIDE CONTAINMENT

The rupture restraint base plates are anchored to wall or floor concrete. In cases where the base plate holes were oversized, the gaps were filled with steel rods to enable the bolts to transfer the load to concrete. These were determined to be limited to rupture restraints installed inside containment (Reference drawing #447253, Rev. 4). A total of 246 anchor bolts were affected.

Six rupture restraints having 15 oversized anchor bolt holes were identified as being the typical cases and the amount of steel rods packed into the oversized holes was documented.

Details of this resolution are presented in Attachment 1 [Exhibit 1 attached] along with technical justification of this arrangement.

The review of rupture restraint documents shows that when steel rod was used on rupture restraint base plates installed inside the containment, it was recorded on process sheets. Twenty packages out of a total population of 222 rupture restraints installed outside the containment were reviewed, and it was found that the process sheets did not indicate that steel rod was used in these restraints.

Attachment

PIPE RUPTURE RESTRAINTS INSIDE CONTAINMENT

BASEPLATE OVERSIZE HOLE - ROD PACKING DETAIL

1. Statement of Concern

A concern has been raised regarding the acceptability of the shear transfer detail used for oversize baseplate anchor bolt holes. This detail, defined on drawing #447253 Rev. 4 (Zone A9), specifies the use of A36 steel rod (1/4-in. max. diameter) to fill the space between the baseplate and anchor bolt.

2. Background

The shear transfer detail using A36 rod packing is confined to rupture restraints located inside containment. Application of this detail is specified on drawing #447253 Rev. 4. The oversize hole packing was applied to the Embedment "Class" A, B, and C embedments.[1] Two hundred and forty-six anchor bolts use this detail.

The detailing practice used by the steel fabricator shop was to oversize the baseplate in accordance with the AISC "Detailing for Steel Construction" manual. Table 7-1 of that manual recommends the following:

Table 7-1. Recommended Hole Sizes for Anchor Bolts

Bolt size	Hole size
3/4" to 1" incl.	Diameter + 5/16"
Over 1" to 2" incl.	Diameter + 1/2"
Over 2"	Diameter + 1"

The above AISC table recommends the anchor bolt hole sizes for normal building construction. Since the Project specification required conformance to the AISC criteria, the steel fabrication with oversize holes was within the specified limits. However, the rod packing detail was developed to provide a positive mechanism to transfer shear from the baseplate to the anchor bolt. The shear is transfered by bearing between the baseplate and the rod packing/anchor bolt shank. This detail was

[1] The term Embedment Class refers to the type of embedment detail used and is not related to safety class.

1215d/0015K

approved by engineering for use in the installation of rupture restraints inside containment.

DCP understands the current concerns regarding the rod packing shear transfer detail to be:

a. The adequacy of the rod packing under the bearing loads imposed under design conditions, and

b. Possible relative movement between the baseplate and anchor bolt due to rod packing compaction.

3. Field Survey

DCP construction personnel conducted a document survey and interviewed knowledgable construction personnel to verify the extent of the rod packing detail. The use of rod packing was noted on construction process sheets. A review of rupture restraint documentation confirmed the use of this detail inside containment. A review of 20 of the 222 outside containment restraint packages revealed no use of this procedure.

Pullman Power Products and PGandE General Construction (GC) personnel with historic knowledge of the rupture restraint installation were interviewed by GC management personnel. Interviswed personnel confirmed that the rod packing detail was confirmed to inside containment application.

4. Field Evaluation

Engineering defined a representative sample of inside containment rupture restraints for field inspection of anchor bolt packing. The sample selected included the Priority Code "C" restraints (critical to Civil) specified by the "Procedure for Measuring Hot Gaps on Rupture Restraints" (Procedure P-37, Revision 1).

The field inspection sample was modified by limiting inspection to:

a. Restraints that were accessible without the installation of scaffolding, and restraints which did not represent an excessive safety hazard to personnel.

b. Restraints and/or bolts which did not require disassembly or rigging for nut removal.

Fifteen bolts were inspected. Thirteen restraints were in the Priority Code "C" category. Eleven of the 13 restraints were anchored to concrete using the rod packing detail. Only 6 of the 11 restraints could be accessed without scaffolding. Fifteen nuts could be removed from these six restraints without disassembly of structural components.

An initial inspection on May 29 and 30, 1984, identified five "worst case" rod packing cases. "Worst Case" bolts were those with visibly loose rod packing and/or voids. A followup field inspection was made on June 1, 1984, to measure bolt offsets and rod packing densities. The results of the June 1 inspection were used for a quantitative engineering evaluation.

5. Engineering Evaluation

Engineering evaluated the following aspects of the rod packing detail:

- Rod packing ultimate bearing capacity compared to anchor bolt ultimate strength design limits for shear.
- Worst case baseplate displacement relative to the anchor bolt associated with rod packing compaction.

a. Bearing Capacity - Rod Packing Material

The rod packing material is confined between the bolt body, baseplate, washer/nut and the wall/floor slab. Local deforming or flattening of a rod is considered self-limiting. Local contact forces which result in plastic deformation of the rods will result in increased contact area. The limiting case is full flattening of the rod.

Normal bearing stress on the rod material was evaluated for the limit state case of rods completely flattened to 100% compaction. The predicted normal bearing stress, for bolts at the design shear force limit ranges from 37% of the faulted allowable bearing stress for 1-in. bolts to 60% of the allowable for 3-in. bolts. The allowable bearing stress was computed in accordance with the AISC Section 1.5.2.2 bearing stress criteria, factored for the faulted pipe break condition.

b. Baseplate Displacement

Baseplate displacement can occur due to loose packing (construction packing tolerance allowed up to 1/8-in. gaps) and due to deformation of the rod material. The worst case displacement was predicted by:

- Computing the density of the rod packing as measured in the field.
- Assuming complete compaction of the rod material between the bolt and baseplate, i.e., the rod material is fully plastically deformed to a zero void state.

Even in the fully displaced state there would be some amount of void left in the interspaces between the compacted rods. However, based upon a conservative estimate of the assumed condition of no void, the maximum predicted displacement of the baseplate relative to the anchor bolt would be 1/4 in.

The worst effect of baseplate relative displacement occurs when one bolt is in initial contact with the baseplate and the other bolt is separated by loose rod packing (see Figure 5-1). In the illustrated case, Bolt B will resist the shear load immediately. Bolt A will gradually resist shear as the rod packing compacts. As Bolt B deforms, Bolt A will increasingly resist shear.

The embedded anchor bolts for restraints inside containment are ductile. Embedment depth is sufficiently deep to develop the full tensile design strength of the bolt. Research has indicated that deeply embeded bolts (with respect to tensile cumpacity) are also ductile in shear. Illustrations of bolt ductility are found in:

- The Ollgaard, Slutter and Fisher, "Shear Strength of Stud Connectors in Lightweight and Normal-weight Concrete," AISC Engineering Journal, April 1971.

- Fisher and Struik, Guide to Design Criteria for Bolted and Riveted Joints, Section 4.2.2 "Bolts Subjected to Shear," 1974.

The Ollgaard AISC Engineering Journal experimental investigation studies the behaviour of steel stud connnectors embedded in concrete and loaded in shear. Ollgaard observed that 5/8-in. and 3/4-in. diameter shear studs achieve maximum strength at laternal displacements of 0.23 in. to 0.42 in.. Ollgaard further observed that the studs exhibit "substantial inelastic deformation before failure", and that "at ultimate load there was no sudden failure evident." These results indicate that the concrete anchors can still provide the required shear resistance at displacements of 3/8 to 1/2 of the bolt's diameter. The worst case projection of bolt displacement associated with loose rod packing is equivalent to 1/6 to 1/8 of the bolt's diameter.

The Fisher Criteria for Bolted and Riveted Joints reports on the shear deformation behaviour of A325 and A490 bolts in steel-to-steel connections. The typical shear-deformation curve for standard A325 and A490 bolts show shear deformations of about 3/16 in. at ultimate. It is expected that the rupture restraint bolts, which are larger than typical structural bolts, have higher deformations at ultimate strength.

In summary, the inherent ductility of bolting material in steel-to-steel connections and embedded in concrete, allows relative base plate to anchor bolt displacements in excess of 1/4 in. while retaining the connections load carrying capacity.

6. Summary

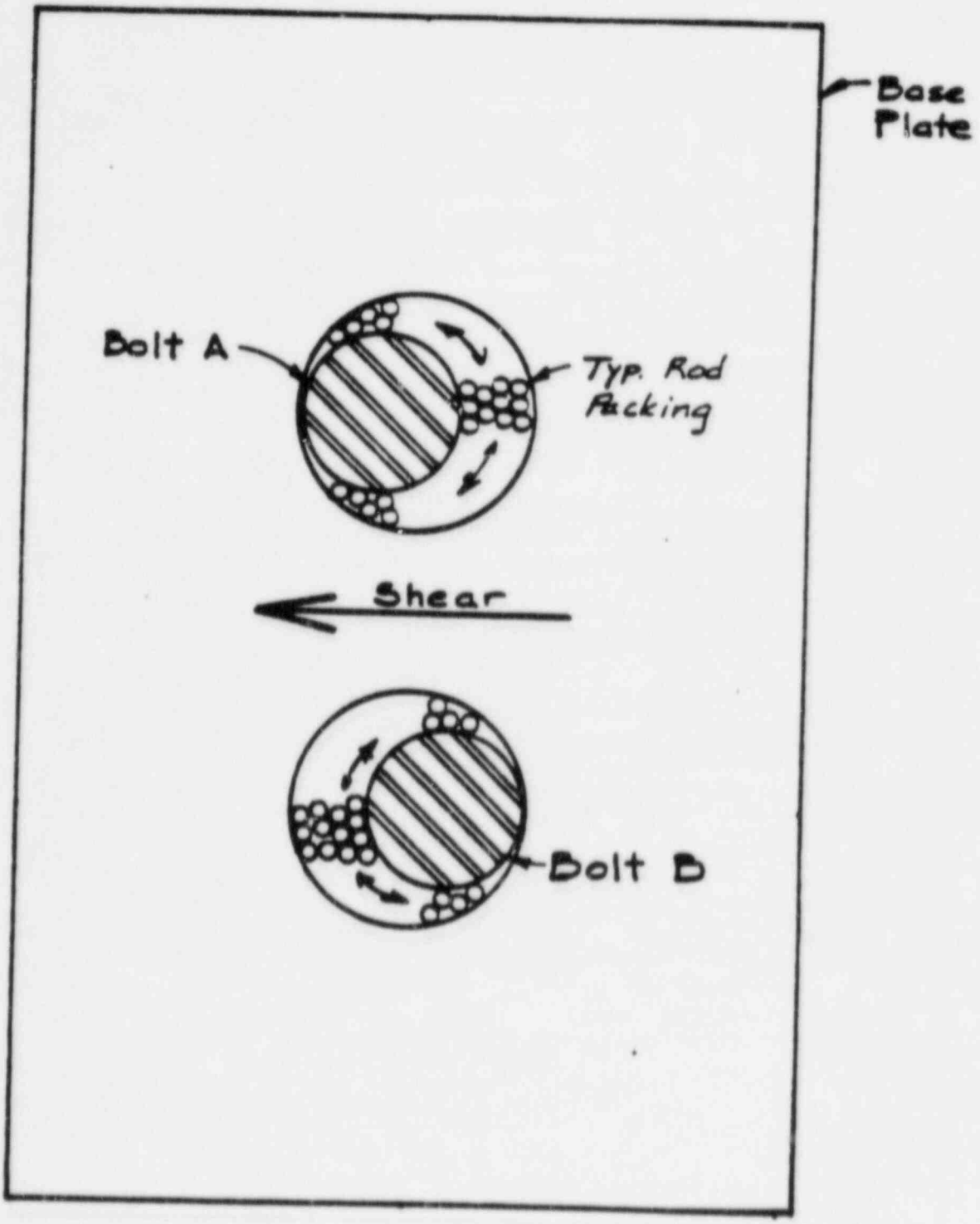
Bolt holes for rupture restraints baseplates inside containment were oversized for installation. The spaces between the baseplate and anchor bolt were packed with rod material to provide a positive shear transfer mechanism. Field inspection and engineering evaluation indicate that the baseplate may displace up to 3/16 in. to 1/4 in. relative to the anchor bolt. Shear deformations of this magnitude are considered acceptable based on overall structural system ductility and the nature of rupture restraint "one time" loading. Bearing force on the rod packing material was evaluated and considered acceptable. In summary, the rod packing shear transfer detail specified by drawing 447253, Rev. 4 is adequate for its intended function.

DIABLO CANYON PROJECT
CALCULATION SHEET

CALC. NO
REV. NO

SHT Figure 5-1

DE BY DATE CHECKED BY DATE JOB NO 18320



V-39, 41, 42, and 44

It is alleged that:

(In addition to the above mentioned hardware problems, Pullman's ESD 243 of late 1983 had procedure problems written into the Rupture Restraint Program:)

6. The tables provided for the description of acceptable Washers had not been updated per the requirements of AISC, Sec 5, Page 191, para. 2(a).

7. Acceptance criteria for High Strength bolts was [sic] not defined in ESD 243. Filed [sic] Inspectors did not know, nor were they legally able to reject bolts that were defective per ASTM A-490, ASTM A-325, and ANSI B18.2 requirements.

8. Bolt Torque Tables in ESD 243 were still out of compliance with AISC Manual requirements as late as December '83. Discussions with Pullman Field Engineers Dale Warren and Larry Werner indicated that although the tables had been recently updated, they still do not meet AISC Manual requirements. (4/26/84 Lockert Aff. at 5-6.)

b) Field Engineer Dale Warren issued the proper Washer Criteria for myself without notification or acceptance by Pullman or PG&E QA Departments. QA/QC Manager Harold Karner, when notified of out of date Washer Criteria in ESD 243, did not issue a Non-Conformance Report nor update the present ESD 243. (4/26/84 Lockert Aff. at 7.)

c) Pullman did not have the proper Torque Tables in effect three years after the writing of NCR DC2-80-RM-002. (4/26/84 Lockert Aff. at 7.)

11. Defects in bolts were not reported per a NCR. I was unable to report the defects I had found in A-490 bolts because I was not allowed to consult the procurement documents needed to properly generate such a report. Pullman Supervisor, Russ Nolle specifically prevented me from referencing these documents by saying that I was out of my area. (See Oct. 17 indicent (sic) of Lockert Letter addressed to Mark Padovan, USNRC dated 1/2/84.) (4/26/84 Lockert Aff. at 7.)

None of these allegations are new and all have been responded to previously. The allegation about the use of washers was previously answered in reply to NRC SSER 22, allegation #129G (DCL-84-186, May 17, 1984). That answer said, in part, that:

> "This allegation has been addressed in PGandE response dated March 19, 1984, to Joint Intervenors' Motion to Reopen on CQA, Geske, et al. Aff. at 22-23. As stated in the response, the Pullman ESD was more conservative than the current industry standard. Because ESD 243 was more than adequate, there was no pressing need to advise all other inspectors of a pending revision. ESD 243 is in the process of being revised..."

Although when initially submitted, it was intended to conform the revised ESD to the present ASTM A 436 industry standard, subsequent discussions have indicated that full-scale adoption of this standard cannot be achieved. However, the revised ESD will explain the acceptable washer criteria in sufficient detail to ensure that all installations are accomplished in an acceptable manner.

The issue of acceptance criteria for high strength bolts has been previously addressed in response to NRC allegation #242 (DCL-84-195, May 29, 1984).

The response to JI #118 states:

> 45. Not only is the allegation in the Motion incorrect, it is not supported by the underlying Lockert affidavit. Mr. Lockert said nothing about "the procedure covering installation of pipe rupture restraint bolts." The

affidavit refers to the criteria for accepting or rejecting the bolts, not the procedure for installing them.

46. The affidavit states that there were no rejection criteria for the bolts in ESD 243. This is correct. The criteria for accepting bolts are procurement criteria and, as such, they would not be found in ESD 243. The correct action for Mr. Lockert to have taken was to reject the bolts with the "visible forging laps" - which he did - and then refer the rejection to receiving QA personnel to determine whether the bolts met acceptance criteria, an action which he did not take. As a Pullman Field QC Inspector, checking procurement specifications was outside the scope of both his training and job duties. This was exactly what Mr. Lockert's supervisor told him. He was at no time told to accept the bolts because the rejection criteria were not in the ESD, as alleged in Mr. Lockert's affidavit.

47. The acceptance criteria for the bolts are properly specified in the procurement documents. The acceptance criteria for the installation of bolts are contained in the ESD. Thus, the allegation that there were no "rejection criteria" is simply not true.

Once again, intervenors have resubmitted an issue previously addressed under the guise of a "new" allegation. It is neither "new" nor true.

The issue of bolt torque tables is also not new. Pullman Power Products, in a letter to PGandE's R. D. Etzler, dated July 19, 1982, expressed their concerns and questions about the bolt torque tables in ESD 243. PGandE provided the values to tighten all future rupture restraint bolted connections in letters dated February 22, 1983, and March 14, 1983. The letter used the AISC Manual 7th Edition dated February 4, 1976, as a reference. The values issued in the referenced letters have been used since February 22, 1983.

The process sheets for tightening of rupture restraint bolts reflect the values specified by PGandE since February 22, 1983. These process sheets are reviewed and approved by both Pullman QA and PGandE prior to field issue and work implementation. The applicable documentation package for each specific restraint includes a reference to the PGandE requirements.

The values for tightening bolts on rupture restraints, as specified by PGandE, are indeed in effect and are in accordance with the AISC Manual to the applicable as explained in response to Allegations V-34 and V-38 above.

V-40

It is alleged that:

9. Pullman Power Products did not develop nor implement a program to control design changes.

> a) Design Drawings did not reflect unauthorized modifications to fillet welds because no As-Built Drawing was generated by Engineering when they were notified of such modifications. (4/26/84 Lockert Aff., at 6-7.)

This allegation has been previously addressed in PGandE's response, dated March 19, 1984, to Joint Intervenors' Motion to Reopen on CQA, Breismeister, et al., Aff. at 38-39. The fillet welds in question are actually fillet caps over full penetration welds. They were in excess of the weld size required by design.

Mr. Lockert asserts that unauthorized grinding occurred on these American Bridge shop welds on a rupture restraint. The grinding was performed in order to allow adjacent bolts to be properly installed.

American Bridge drawings usually include specific instructions regarding the grinding of welds to allow bolt installation. All grinding is in accordance with these drawings. If grinding is required, the operation is controlled by a process sheet. In those cases where the drawing does not address grinding, a design question (DQ) is forwarded to PGandE for evaluation of whether grinding can be allowed.

In general, any oversize weld may be ground to the acceptable size to improve cosmetic contour, or to permit bolts, nuts and other mating parts to fit, without changing the applicable drawing.

It is alleged that:

10. Pullman did not train nor indoctrinate inspectors to the requirements of the AISC Manual for Bolting. (Accidental reinspection of work accepted in late '82 or early '83 revealed hole sizes outside the tolerances of the AISC Manual.) (4/26/84 Lockert Aff. at 7.)

Mr. Lockert refuses to accept the fact that the PGandE-approved procedures, such as ESD 243 for rupture restraints, contain the criteria to which the inspectors are required to inspect and there is no need to review the AISC code, as he states.

On-the-job training as well as testing on the requirements of ESD 243 are given to inspectors working on rupture restraints. ESD 243 includes the bolting requirements for rupture restraints. This procedure is available in the field for the inspectors' use should any question arise. The inspectors, including Mr. Lockert, inspect the holes to the criteria of ESD 243 and the design drawing. If the holes exceed these tolerances, then the condition is identified to PGandE for disposition.

Lead men, engineers, supervisors, and PGandE personnel are also available to answer questions and provide interpretation of the requirements. Mr. Lockert, during his time on the job, availed himself of all these avenues.

V-45, 46, 47, 48, and 49

It is alleged that:

ITEM #1, Tag. #2: Elevation 116, Unit 1 Reactor Building. Line Designation NO.52-254-10, in the area of Pressurizer and Reactor Coolant Pump 1-2.

Problem Description: Weld attaching Safety Injection Accumulator line to nozzle of the cold leg line (NO.S2-254-10). On the side facing Reactor Coolant Pump (RCP) is a grinding gouge in the pipe at the pipe-weld interface approximately 3/8 inches long, 1/8 inch at widest point and 1/16 inch deep (dimensions as visually determined by NRC Inspector - no measurements taken). Additionally, there appears to be a slight amount of undercut at two locations. The undercut is approximately 5/8 inches on the weld side facing the RCP and approximately 1 inch at 120° from the side away from the RCP.

Code Violation: American Society of Mechanical Engineers (ASME) Section III, "Rules for Construction of Nuclear Power Plant Components - 1977 edition, Division I General Requirements, Subsection NB, "Class 1 Components", para NB-4424 "Surfaces of Welds".

"As-welded surfaces are permitted, and for piping the appropriate stress indices given in Table NB-3683.2-1 shall be applied. However, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, and abrupt ridges and valleys to meet (a) through (f) below:

(a)...

(b)...

(c)Undercuts shall not exceed 1/32 inch (0.8mm) and shall not encroach on the required section thickness.

(d)...

(e)...

(f)If the surface of the weld requires grinding to meet the above criteria, care shall be taken to avoid reducing the weld or base metal below the required thickness."

The discrepant condition identified by the witness violates the code requirements with respect to being "free from coarse ripples, grooves, overlaps, [sic] and abrupt ridges and valleys to meet (c) and (f)." (4/17/84 Parks Aff. at 1-3.)

ITEM #2. Tag #4: Unit 2 Reactor Building, Elevation 115, Support 97-3R in vicinity of RCP 2-3.

Problem Description: "Excessive overweld has caused excessive shrinkage of SS line. This was supported to be a full penetration weld with fillet cap and is as specified. The overwelding can damage the pipe because calcultions don't account for residual stresses caused by such overwelding."

Code Violation: United States of America Standard (USAS) B31.7-1969 "Code for Pressure Piping - Nuclear Power Piping" (note: this standard now is known as ANSI-B31.7), foreword "FABRICATION REQUIREMENTS AND THEIR CORRELATION WITH DESIGN", page XVI paragraph 5. "Even hanger attachment details are covered. For Class 1 piping, complete penetration welds are required. The designer must consider all stresses in the attachment as well as their effect on the pressure retaining part."

The welds in question do not conform to the stated intent of the "Nuclear Power Piping" code with respect to the residual stresses induced by the overwelding. It is the concern of this particular anonymous witness that these residual stresses should have been but were not a factor in the design calculations. (4/17/84 Parks Aff. at 3-4.)

ITEM #3. Tag #5: Unit 2 Reactor Building, large restraint wall attachment (around surge line), beneath Unit 2 Pressurizer.

Problem Description: "Shopwelding is supposed to conform to AWS D1.1 standards. The inner welds are excessively rough and of a such a profile that they would not conform to AWS D1.1. The welds are ragged."

Code Violation: American Welding Society (AWS) Structural Welding Code - Steel, paragraph 8.15

"Quality of Welds", subparagraph 8.15.1 "Visual Inspection." "All welds shall be visually inspected. A weld shall be acceptable by visual inspection if it shows that

8.15.1.1 The weld has no cracks
8.15.1.2 Thorough fusion exists between adjacent layers of weld metal and between weld metal and base metal
8.15.1.3 All craters are filled to the full cross section of the weld
* 8.15.1.4 Weld profiles are in accordance with (para.) 3.6 [weld profile]"

The weld in question does not conform to the requirements specified in paragraph 3.6 [weld profiles] or the evident thorough fusion requirements as stated in 8.15.1.2. (4/17/84 Parks Aff. at 4-5.)

ITEM #4. Tag #6: Unit 2 Auxilliary Building, area GW, elevation 115, line No. 2-S2-265-8 (Containment Spray Discharge Pipe - 4 lug attachments between S and T line.)

Item Description: "Lug attachments are called out to be 1/2 inch fillet welds on three sides. Actual size is 7/16 inch fillet or less."

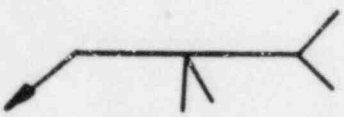
Problem Description: "Actual size is alleged to be less than or equal to 7/16 inch which is 1/16 inch less than required. The excessive welding used in the design of the lugs attachment welds, when welded to Schedule 10 stainless thin wall pipe, has caused excessive shrinkage. The excessive shrinkage causes residual stresses in the pipe which has not been accounted for in the design or stress analysis. The position of the clamp is such that there is a torsional force applied to the lugs, because the clamp cannot contact the wall of the pipe due to the shrinkage. This torsional force is not accounted for in the design and compromises the pipe integrity."

Code Violation: Refer to "Code Violation" discussion in "ITEM #2, Tag #4". The welds in question do not conform to the stated intent of the "Nuclear Power Piping" code with respect to the residual stresses induced by the welding or the torsional force applied to the lugs due to excessive shrinkage. It is the concern of this particular anonymous witness that these stresses should have been but were not a factor in the design calculations. (4/17/84 Parks Aff. at 5-6.)

ITEM #5. Tag # 7: Unit 2, Auxiliary Building, Area 2H, support 413-131R around CCW line.

Problem Description: "Eight lug attachment welds are required to be full penetration welds on three sides. Actual weld is not a full penetration weld, but is, instead a fillet weld, contrary to the design."

Code Violation: American Welding Society (AWS) - A2.4 - 79 "Symbols for Welding and Non-Destructive Testing," paragraph 9.0 "Groove Welds," subparagraph 9.2.2 "Complete Joint Penetration Required." "When no depth of groove preparation or effective throat is shown on the welding symbol for single-groove and symmetrical double-groove welds, complete joint penetration is required.



Symbol provided on "Detail" for weld(s) in question.

PGandE has stated in their letter, DCL-84-040, "The weld symbols used at Diablo Canyon are consistent with the standards specified in AWS..." and in an Interoffice Memorandum "file no. 930, 146.20, CA2) dated October 25, 1983 that "all pipe support as-builts issued by General Construction after October 15, 1983 should have all weld symbols in conformance with AWS A2.4."

> The welds in question were incorrectly performed because of lack of proper interpretation of the weld symbol utilized on the design drawing. It is the concern of this particular anonymous witness that this discrepancy provided an example of code compliance violation due to a lack of intimate knowledge with AWS A2.4. These particular welds had been inspected and accepted by Pullman Quality Control and PGandE Quality Control prior to the discrepancy being identified by a Pre-Inspection Engineer. (4/17/84 Parks Aff. at 6-7.)

These allegations previously have been fully responded to in PGandE letters to the NRC, DCL-84-170, dated May 2, 1984, and DCL-84-200, dated June 1, 1984. These letters answered the questions which were raised during the midnight tour on the night of April 11, 1984.

V-50

It is alleged that:

On page 1 of the 4/17/84 statement, under Item 1, Tag #2, a weld (RC-2-16) was identified on the Safety Injection Accumulator line as having a grinding gouge and was undercut. This condition is in violation of ASME III para. NB-4424 "Surfaces of Welds", with respect to the undercut and the "grinding gouge." (4/30/84 Parks Aff. at 1.)

This allegation is based upon the entire eight-page Affidavit of Richard D. Parks, dated April 30, 1984. Contrary to the allegation, the non-linear indication at Weld RC-2-16 on the Safety Injection Accumulator Line is neither a gouge nor an undercut.

This subject has been addressed in two PGandE letters to the NRC: No. DCL-84-170, dated May 2, 1984, and No. DCL-84-195, dated May 29, 1984. DCL-84-170 was prepared in response to the items identified on April 11, 1984, by the anonymous allegers, and DCL-84-195 was prepared in response to the GAP III and IV petitions. For the third time, the weld is acceptable.

The allegation relates to a condition that was pointed out during the NRC-sponsored plant tour conducted the night of April 11, 1984. The day after the tour, the weld was inspected by two welding engineers who are AWS certified welding inspectors. The alleger apparently thought that a slight difference in thickness between the flattened weld crown and outside wall of the pipe was an undercut. However, he was mistaken. The difference was not an undercut, but the result of differences in the outer dimensions of the welded pipes.

The welding engineers also identified a mark in the pipe fitting just below the field weld which was not an undercut. The metal was uniformly discolored with no bright metal exposed. The mark was present in the fitting prior to the field weld completion.

Contrary to the allegation, it can be determined that minimum wall thickness requirements have been maintained. The depth of the alleged gouge area in question has been determined by mechanical measurement to be 0.031-inch deep. Engineering review has determined that the 10-inch diameter schedule 140 pipe has a nominal wall thickness of 1.000 inch with a manufacturing tolerance of minus 12.5%, which may result in a minimum wall thickness of 0.875 inch. The design requirement for wall thickness for this line, based on pressure and temperature considerations, is 0.748 inch. As stated above, the depth of the ground area is 0.031-inch deep. Based on a worst case of 0.875 inch, minus 0.031 inch, a reserve margin of 0.096 inch still exists above the minimum design wall thickness requirement. The weld condition is proper.

Since the remainder of the affidavit draws conclusions based upon the incorrect assumption that Weld RC-2-16 was defective and upon facts contained in public documents written by both the NRC staff and PGandE, the recommendation for a comprehensive reinspection is without merit.

VI-1, VI-3 and VI-5

It is alleged that:

The allegations concern stresses on the concrete from Hilti Quick [sic] Bolts which may result in failures of the bolts themselves. The alleged conditions include--1) deep embedment; and 2; failure to consider the possible design effects when bolts are installed too close to the back of other bolts from opposite sides of concrete walls.

The particular examples are on safety related work, specifically in the GE area, 85 foot level elevation in the Auxiliary Building just outside the containment wall. They help support an anchor-type hanger in Component Cooling Water (CCW) system 14. The witnesses described these specific examples as illustrative of a generic condition. The problems have been reported on Quick Fix process sheets and recently on a Deficient Condition Notice (DCN). There still has not been effective corrective action, although one witness estimated that the problem should have been reported to the NRC with in [sic] 24 hours under 10 CFR Part 21 due to its potential to cause failure in a safety-related system. The witness was deeply concerned with the potential for the bolts to shake right out of the wall during an earthquake, unless there is a full review and any necessary corrective action. (5/22/84 Devine Aff. at 1).

The first alleged problem is that bolts were embedded a minimum of 10.5 inches into concrete that was only 12 inches thick. Although the witnesses were not aware of specific calculations to demonstrate whether this condition were [sic] acceptable, I was informed that unacceptable residual stresses can result if bolts are embedded too deeply into the concrete. Allegedly an inspector on-site has requested relevant back-up data to see if the problem were [sic] considered but has not received any response. Mr. Stokes informed me that at most nuclear plants in his experience the concrete is 24 inches thick when embedment is that deep.

I was told that the origin of the problem was instructions on design drawings to achieve a minimum of 10.5 inches embedment. Allegedly the deep embedment had been considered necessary to achieve the required strength for the structural loads--the hangers. The potential problem depends on whether the consequences from excessive embedment also were taken into account. As one witness

said, "It doesn't do much good to fix one problem by creating another that may be worse." (5/22/84 Devine Aff. at 2.)

They also were concerned that the corrective action at the time was ineffective. The "solution" was to "dry pack" the voids left when the concrete fell out. "Dry packing" means applying filler to the void that does not have any structural value. In other words, the corrective action was ineffective from a design perspective and was only applied to a few examples for a potentially generic condition. (5/22/84 Devine Aff. at 3.)

These concrete expansion anchor concerns were previously addressed in response to NRC questions transmitted by PGandE letter DCL-84-203, dated June 1, 1984. Recapping the previous response: Questions have been raised regarding the adequacy of Hilti Kwik-Bolt expansion anchors when (a) embedded deeply into thin concrete elements and (b) installed in close proximity to each other from opposite sides of concrete elements. As specific field problems occurred relative to these subjects, engineering evaluations were made on a case-by-case basis.

Regarding question (a), Diablo Canyon expansion anchor installation criteria do not limit the depth to which Hilti Kwik-Bolts may be installed. Hilti engineers have recommended to some of their clients that the embedment depth be limited to 80% of the concrete element thickness. This recommendation is based on Hilti's judgment that deeper embedments may result in concrete spalling on the back side of the concrete element when hammering the anchor into the hole. Neither Hilti nor PGandE is aware of any analytical or test data that

validate this recommendation. Further, Hilti has not published this recommendation as it is not considered to be an installation requirement but rather an optional precautionary measure.

At Diablo Canyon, QC inspectors noted a few cases in which concrete was spalled during installation of Hilti Kwik-Bolts in a thin (12-inch) slab. The spalling occurred either while hammering the bolt into the hole or during the torque-setting operation. Subsequent inspection found that the spalled concrete did not extend into the concrete surrounding the anchor wedge. The anchors were set in accordance with normal installation procedures and held the final torque, 360 ft-lb. The spalled areas were then repaired by drypacking. The drypacking procedure was followed simply to preclude environmental exposure.

Anchoring of Hilti Kwik-Bolts is achieved by forcing spring steel clips at the wedge-shaped base of the anchor into the surrounding concrete. Expansion anchors are not loaded in compression, so the concrete below the clips carries no load. Further, spalling of the concrete below the clips does not affect the strength of the concrete shear cone that anchors the bolt when it is subjected to tensile loads. While spalling of the concrete below a Hilti Kwik-Bolt is not desirable, it does not affect the adequacy of the anchor. Thus, there is no technical reason to limit the depth of embedment.

Regarding question (b), Diablo Canyon expansion anchor installation procedures do not require mapping of anchor locations on opposing sides of concrete elements. In practice, it would be difficult to accomplish this mapping within the accuracy necessary to identify close spacing of anchors on opposite sides of walls and slabs. Since most of the concrete in the safety-related structures at Diablo Canyon is thick (greater than 12 inches), and most of the expansion anchors require installation at relatively shallow embedments (less than 6 inches), the potential for this type of overlapping to occur is extremely low.

Hilti is currently performing tests to quantify the effects of closely spaced anchors installed in opposite sides of concrete elements. These tests are being performed at the request of another utility and are being monitored by cognizant NRC personnel. A final report is not expected to be completed until August 1984, but preliminary indications are that there is no significant reduction in anchor strength, even when the anchors are installed as close as 1-1/2 bolt diameters (center-to-center). These preliminary results support the judgment of the Hilti engineers (and that of PGandE Engineering) that an overlapping condition has a negligible effect on the adequacy of the anchors.

VI-2, VI-4 and VI-6

It is alleged that:

Beyond technical significance, if true the accounts below of the two major bolting issues demonstrate the ineffectiveness of the Quick Fix and Quality Control (QC) reporting systems to identify, disclose and correct all related deficient conditions. They also demonstrate a pattern of management non-response to a significant issue that has been raised repeatedly over the last year. Both the effects -- bolting -- and the cause -- mismanagement -- should be corrected before Diablo Canyon goes commercial. (5/22/84 Devine Aff. at 2.)

The nature of management's response may be as signficant as the bolting problem itself. Last June a QC inspector identified the issue to Pullman Power Products (PPP) engineers. Despite recognition of specific problems and individual corrective action--the use of "thru-bolts"--the generic condition was never addressed.

Last June 28 a different inspector allegedly also identified a similar problem, but in this instance a Pullman engineer disregarded the warning and responded that structural integrity would not be effected [sic].

Unfortunately, the engineer was mistaken. During installation, concrete cones directly beneath three relevant bolts suffered a structural failure: the concrete popped out. The allegers were concerned that the concrete failure could cause the bolts to fail as well. (5/22/84 Devine Aff. at 2-3.)

In 1983 Pacific Gas and Electric (PG&E) engineers also were alerted to this problem and instructed the relevant Pullman engineer to resolve it. As seen by the recent DCN, however, the problem wasn't resolved. The new DCN allegedly was filed several weeks ago but Pullman management has not responded. The witnesses inquired whether Pullman is violating the NRC 24 hour reporting requirements for significant conditions. They told me that for all practical purposes the embedment problem is the same as last year, and the quality of the bolting remains indeterminate after three attempts to work within the system.

Allegedly the DCN author raised an ancillary question whether there was any design consideration for the structural effects when Hilti Quick Bolts are embedded too closely to each other from opposite sides of the concrete.

In that circumstance the zones of structural influence from the bolts might conflict, leading to the possibility of structural failure such as cracking and resulting voids on the concrete. As with the embedment problem, the witnesses were concerned that this could cause failure of the bolts themselves, and compromise the hangers and the lines being supported.

The anonymous witnesses stated that in fact there have been instances when bolts from one side had been hit during the drilling and installation of bolts from the opposite side. Those types of conditions were found as late as last fall. The occurrences suggested to the witnesses that design control had been inadequate to prevent the conflicts.

The witnesses told me that both technical issues were identified on Quick Fix process sheets. In fact, the bolting embedment was verified by QC inspectors and placed on the back of Quick Fix sheets. But the relevant as-built drawings do not reflect this specific information. They only reference the 10.5 inch minimum requirement. As a result, specific information on the Quick Fix sheets was factored out of the as-built reviews.

The witnesses emphasized that the specifc examples may be generic because so many other instances of voids, cracks, buried drain pipe, forms left in concrete and dry packed knock outs are still being identified in the field. (5/22/84 Devine Aff. at 3-4.)

These allegations identify two specific cases of field problems dispositioned by PSDTCs. In the first specific case, the PSDTC disposition substituted through bolts for the concrete anchor bolt required by the original design. The through bolt installation exceeded the original design requirement in its ability to support load. The second specific case occurred on June 28, 1983. In this case concrete chipped out below the bottom of the concrete anchors and was again identified by the PSDTC process. The condition was evaluated and dispositioned to leave the anchors installed since the chipped concrete was below the bottom of the anchors and the anchors

were set and torqued thereby achieving an acceptable installation. In neither of these cases did engineering evaluation determine that an NRC reportable condition existed or that a "generic" problem existed. Based on engineering evaluation, no problems existed and, as such, these construction matters were not brought to management attention. Construction expansion bolt problems continued to be handled on a case-by-case basis.

Approximately one year later, May 4, 1984, a Pullman QC inspector expressed his "concern" about an expansion anchor problem. He used the Pullman Deficient Condition Notice (DCN) as a vehicle to express his "concern." He also contacted the hotline program and cited these two specific cases as typical of his "concerns." The DCN was not written by either of the inspectors who were involved with the actual installation. Neither inspector had documented any concerns with respect to the resolutions of either installation.

Management responded by reviewing the engineering evaluations performed for the previous PSDTCs. Included in this re-evaluation were all the questions and concerns identified by the originator of the DCN. A summary of this re-evaluation was provided in response to NRC inquiries and is recapped in response to Allegations VI-1, VI-3, and VI-5. The re-evaluation again concluded that no unsafe condition or "generic" problem exists. The individual who originated the DCN has been contacted and the disposition of his "concerns" is being discussed.

The fact that individual instances of installation problems are identified and resolved on a case-by-case basis indicates that appropriate inspections and controls that are so important to a sound construction quality assurance program are being implemented. Management's response and subsequent engineering re-evaluation illustrates its firm commitment to a sound quality assurance program.

VI-7

It is alleged that:

Problem #1: During the "As-built Inspection", the responsible QC Inspector identified that the 5/8" studs holding the valve motor to the seismic valve support plate (piece #1, Attachment 1 page 9) had never been replaced. These studs were required to be changed by the original Design Change #DC-2-E-P-10544, (refer to Note #2 Attachment #1, page 7). This deficient condition was documented on a DCN (Attachment 1 page 16) and identified that a Deviation Report should be submitted to PG&E. This should have resolved the problem; however, the original inspector was over ridden [sic] and his DCN changed by A. Weinstein on 2/27/84. A Weinstein's justification for his action is described on page 17 of Attachment 1.

The individuals that I reviewed this problem with informed me that the reason the studs had to be replaced was 1) due to the addition of a 1/2" support plate being bolted to the motor housing, it was necessary to ensure sufficient projection of threads, and 2) the existing old studs had visible indication of damaged threads. Apparently the craft, when disassembling the valve to make the modification, had used vise-grips to back the studs out of the motor. Thus to ensure adequate strength with respect to fastening/torque requirements the studs should have been replaced. They were not.

Conclusion: If the threads on the studs in question were in fact damaged, they should have been replaced. Paragraph 3 on page 36, Attachment 1 identifies that if any doubt existed on the studs, "good maintenance practice" would have been to replace them. Unfortunately, they were not. (5/22/84 Parks Aff. at 2.)

The QC inspector properly documented that the studs had not been replaced when he performed the final as-built inspection. The requirement for stud length is that they must be of a length sufficient to provide for full nut engagement when the nut is torqued. The existing studs meet this requirement. The studs need not have been replaced because the studs installed were of adequate

length to ensure full nut engagement after the 1/2-inch plate was installed. Therefore, the engineer properly dispositioned the DCN. This was confirmed by a Pullman memo dated February 27, 1984, and approved by PGC.

The Attachment 1 referenced in the affidavit is a portion of PGandE's Department of Nuclear Operations Environmental Qualification Maintenance Training Manual. The manual and NUREG-0588 address the environmental qualification of the valve, not its seismic mounting.

The documentation package for Hanger 413-143SC and DCN 1350-011 have been reviewed. These documents have no notation of "Damaged Studs." In addition, these studs were inspected by PGandE and the NRC Staff on June 27, 1984. All nuts have full thread engagement. One stud has indication of one flattened thread at the end of the stud. This is very minor in nature. This thread is approximately 1/2-inch past the nut. It was obvious that the minor flattening was not caused by "vise grips." The studs are acceptable and meet all bolting criteria.

It is alleged that:

Problem #2: The uncontrolled disassembly of an EQ Nuclear Safety Related Valve without use of a controlled procedure resulted in damage to the valve and discharge of personnel involved. This is documented on pages 35 and 36 of Attachment 1. This incident resulted in the generation of an MVR; that was deemed to be only a violation of Project Instruction #8 (Tagout Procedure) and a "PPP in-house Non-Compliance Report". However, the MVR was marked as "not reportable" and "not a Non-Conformance", despite its relevance for NUREG-0588 compliance.

Conclusion: Due to the significance of the valve and the conflicting statements on reportability, it should have been deemed "reportable" and reported to the NRC. (5/22/84 Parks Aff. at 2.)

The valve was not disassembled. The nuts holding the hanger plate were removed. The valve motor operator and the valve body separated when the motor was operated.

The MVR properly identified the real problem as safety of personnel, not a problem with improper disassembly as alleged. This concern has no relevance to NUREG-0588 as claimed.

Each construction mishap is not required to be reported. The incident referenced was properly documented in accordance with the QC program.

The primary reason for discharging the personnel involved was violation of the clearance and tagging procedure. The Project's first priority is safety. The process sheet specifically stated that

Engineering must be contacted to arrange for a safety clearance. The personnel involved ignored this requirement and were terminated for cause.

Unfortunately, the person that provided Mr. Parks with the documentation copied Minor Variation Report M4490. Had he copied the revised MVR M4490-R1, it would have been apparent to Mr. Parks that NCR DC2-84-RM-N003 was generated to resolve any further problems identified during valve support installations.

Finally, the subsequent documented inspection and repair of the valve demonstrates that the environmental qualification of the valve has been maintained.

It is alleged that:

Problem #3: Attachment 1, page 38, "EQ Effects on Maintenance" states in part "...provide detailed description of maintenance work performed as input for failure analysis (trend) study."

However, a review of Valve Maintenance Report (#MVR [sic] -1845), Attachment 1 page 41, does not include a listing of "what damaged parts were repaired or how they were repaired." (5/22/84 Parks Aff. at 2-3.)

The repair of the Unit 2 valve was not necessitated by deterioration or failure due to operating conditions; therefore, detailed descriptions of maintenance work performed as input for failure analyses (trending) study is not required.

The section of NPO training manual entitled "EQ effects on maintenance" addresses the requirement that EQ equipment be qualified for the operating life and when exposed to radiation, temperature, chemical spray, high energy line break, etc. The requirement to provide detailed description of maintenance work performed is part of a failure analysis "trend" study. The trend study is used to evaluate repairs that are necessitated such as exposure to radiation, temperature, high-energy line break, etc. None of these conditions exists in Unit 2 at this time.

As stated in the training manual, "Materials considered susceptible to postulated worst case environment are all from nonmetallic groups. Examples which we will encounter are: motor and cable

installations, lubricants, seals, molded switch materials, gasket materials, and special conductor terminations."

In accordance with the EQ program, the portions of the valve which required EQ documentation were specified and the necessary gaskets replaced. This is shown by Item 7 of Exhibit A-1, page 41 to Mr. Parks' affidavit. The only repair that was required was the removal of a small scuff mark on the valve stem threads. This was accomplished by stoning and buffing with emery cloth. The valve was then tested using written approved test procedures. All parameters were within approved acceptance criteria.

For Unit 1, NPO currently complies with NUREG 0588 as interpreted in SER Supplement 15. This program will be in place in Unit 2 prior to fuel load. In addition, General Construction has a test status log of all tests that are performed for both EQ and non-EQ equipment.

VI-10

It is alleged that:

Problem #4: A letter from D A. Rockwell to P. Stiegel (Attachment 1, page 34) identifies that the practice of installing seismic valve supports to EQ valves could be violating EQ requirements. The letter requires Pullman Power Products (PPP) to respond and provide "a list of all seismic valve supports completed or presently being worked" by March 5, 1984. This is a problem because valves that have already been disassembled to install the seismic supports may have already violated EQ Nuclear Safety Related Requirements and have gone unreported. In the instance of FCV-641A, the violation occurred 10 months before the problem was officially "flagged" to PPP for EQ compliance.

Conclusion: There is an apparent deficiency in PG&E's training program to acquaint personnel with the requirements of EQ and Nuclear Safety Related Equipment. (5/22/84 Parks Aff. at 3.)

As stated in the response to VI-8, the generic issue of training Unit 2 personnel has been addressed and resolved in accordance with NCR DC2-84-RM-N003. The EQ valves that were modified in Unit 1 were modified by Nuclear Plant Operations (NPO) in accordance with the EQ program.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF D. B. MIKLUSH

STATE OF CALIFORNIA)
) ss.
COUNTY OF SAN LUIS OBISPO)

The above, being duly sworn, depose and say:

I, David B. Miklush, am the Maintenance Manager for the Pacific Gas and Electric Company at the Diablo Canyon Power Plant.

My responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of my knowledge, information, and belief.

III-1, and III-2.

Dated: June 28, 1984

D. B. Miklush

Subscribed and sworn to
before me this 28th day
of June, 1984

Wendy Sproul

Wendy Sproul
Notary Public in and for the
City and County of San Luis Obispo
State of California
My commission expires
June 30, 1986

OFFICIAL SEAL
WENDY SPROUL
NOTARY PUBLIC - CALIFORNIA
SAN LUIS OBISPO COUNTY
My comm. expires JUN 30, 1986

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF H. W. KARNER

STATE OF CALIFORNIA	)	
	)	ss.
COUNTY OF SAN FRANCISCO	)	

The above, being duly sworn, depose and say:

I, Harold W. Karner, am Quality Assurance/Quality Control Manager for the Pullman Power Products Corporation.

My responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of my knowledge, information, and belief.

III-5, 6, 7, 8, 9, 10, 11, 12, 15, 51, 52, 57, 61, 62.

V-27, 28, 29, 39, 40, 41, 42, 43, 44.

VI-1, 3, 4, 5, 6.

Dated: June 29, 1984

H. W. Karner

H. W. Karner

Subscribed and sworn to
before me this 29th day
of June, 1984

C. T. NEAL MADISON
NOTARY PUBLIC – CALIFORNIA
CITY AND COUNTY OF
SAN FRANCISCO
My Commission Expires Dec. 27, 1985

C. T. Neal-Madison

Cynthia Neal-Madison
Notary Public in and for the
City and County of San Francsico
State of California
My commission expires
December 27, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF F. C. BREISMEISTER AND M. E. LEPPKE

STATE OF CALIFORNIA	)	
	)	ss.
COUNTY OF SAN FRANCISCO	)	

The above, being duly sworn, depose and say:

I, Fred C. Breismeister, am Manager of the Research and Engineering/Materials and Quality Services Department, San Francisco Area Office, for the Bechtel Group.

I, Myron E. Leppke, am Onsite Project Engineer for the Diablo Canyon Project.

Our responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of our knowledge, information, and belief.

III-13, 14, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 55, 63.

IV-1.

V-25.

Dated: June 29, 1984

F. C. Breismeister

M. E. Leppke

Subscribed and sworn to
before me this 26th day
of June, 1984

C. T. NEAL MADISON
NOTARY PUBLIC – CALIFORNIA
CITY AND COUNTY OF
SAN FRANCISCO
My Commission Expires Dec. 27, 1985

C. T. Neal-Madison

Cynthia Neal-Madison
Notary Public in and for the
City and County of San Francsico
State of California
My commission expires
December 27, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF L. E. SHIPLEY, R. G. OMAN, M. R. TRESLER, AND N. J. TUHOLSKI

STATE OF CALIFORNIA)
) ss.
COUNTY OF SAN FRANCISCO)

The above, being duly sworn, depose and say:

I, L. E. Shipley, am Technical Consultant for Piping for the Diablo Canyon Project.

I, R. G. Oman, am an Assistant Project Engineer for the Diablo Canyon Project.

I, M. R. Tresler, am Assistant to the Unit 1 Project Engineer for the Diablo Canyon Project.

I, N. J. Tuholski, am a Civil Engineering Supervisor for the Diablo Canyon Project.

Our responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of our knowledge, information, and belief.

III-18, 19, 20, 21, 22, 23, 24, 25, 27.

V-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 32, 33, 38.

VI-1, 3, 5.

Dated: June 29, 1984

L. E. Shipley

R. G. Oman

M. R. Tresler

H. J. Tuholski

Subscribed and sworn to before me this 29th day of June, 1984

C. T. Neal-Madison

Cynthia Neal-Madison
Notary Public in and for the
City and County of San Francsico
State of California
My commission expires
December 27, 1985

C. T. NEAL MADISON
NOTARY PUBLIC – CALIFORNIA
CITY AND COUNTY OF
SAN FRANCISCO
My Commission Expires Dec. 27, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF W. N. HARRIS

STATE OF CALIFORNIA	)	
	)	ss.
COUNTY OF SAN FRANCISCO	)	

The above, being duly sworn, depose and say:

I, W. N. Harris, was a Quality Assurance Manager at the Diablo Canyon Power Plant for the Guy F. Atkinson Company.

My responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of my knowledge, information, and belief.

III-56, 58, 59, 59A, 60, 65, 66, 67, 68, 69, 69A.

Dated: June 29, 1984

W. N. Harris

Subscribed and sworn to
before me this 29th day
of June, 1984

C. T. NEAL MADISON
NOTARY PUBLIC – CALIFORNIA
CITY AND COUNTY OF
SAN FRANCISCO
My Commission Expires Dec. 27, 1985

C. T. Neal-Madison

Cynthia Neal-Madison
Notary Public in and for the
City and County of San Francsico
State of California
My commission expires
December 27, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF D. A. ROCKWELL AND J. E. HERBST

STATE OF CALIFORNIA	)	
	)	ss.
COUNTY OF SAN FRANCISCO	)	

The above, being duly sworn, depose and say:

I, Donald A. Rockwell, am Special Projects Engineer for the Pacific Gas and Electric Company at the Diablo Canyon Nuclear Power Plant.

I, J. E. Herbst, am a Senior Engineer for the Pacific Gas and Electric Company.

Our responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984 are true and correct to the best of our knowledge, information, and belief.

III-63

V-34, 35, 36, 37, 45, 46, 47, 48, 49, 50

VI-7, 8, 9, 10

Dated: June 29, 1984

D. A. Rockwell

J. E. Herbst

Subscribed and sworn to
before me this 29th day
of June, 1984

C. T. Neal-Madison

Cynthia Neal-Madison
Notary Public in and for the
City and County of San Francsico
State of California
My commission expires
December 27, 1985

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT OF DeVERNE G. DUNNUM, JR.

STATE OF CALIFORNIA	)	
	)	ss
COUNTY OF SAN LUIS OBISPO	)	

The above, being duly sworn, depose and say:

I, DeVerne G. Dunnum, Jr., have been employeed by the H. P. Foley Company and assigned to the Diablo Canyon Nuclear Power Plant for four months. I am currently the QA Supervisor of the Special Task Force. I am responsible for research and response to employee quality concerns, implementing the training program for H. P. Foley personnel and respond to NRC inspections related to allegations concerning H. P. Foley's Quality Assurance program.

I attended Whitman College, Walla Walla, Washington, from 1972 to 1974 majoring in engineering and law. In 1979 to 1980 I matriculated at Walla Walla Community College where I attended courses in welding.

I have eight years of experience in Quality Assurance and Engineering programs of nuclear power plants for which the last seven year have been in the capacity as a supervisor.

From 1976 to 1981 I was employed by Westinghouse Hanford at the Hanford Environmental Development Laboratories in Richland, Washington. During my tenture I work on a variety of tasks such as:

- The Breader Research and Development Department for which the proto-type Clincs River Breader Reactor driver full assemblies were designed and built.

- Test Article Development which I was responsible for engineer's assembly and inspection of the General Electric Grid Driver fuel assemblys.

- In February 1981 I joined J. A. Jones Construction Company as a Senior Quality Assurance Engineer certified as a Level II. In March I was promoted to a QA Records Supervisor for which I held until the end of October 1982.

In November 1982 I joined Henry J. Kaiser as a Quality Assurance Records Supervisor and shortly later accepted the engineering position of Technical Services Supervisor. As the Technical Services Supervisor my responsibilities included, work package preparation (piping/mechanical), work package control, engineering walkdown of all piping and mechancial supports. Technical Engineering review and resolution to NRC inspections related to allegation involving Henry J. Kaiser installations.

My responses to the following allegation numbers in PGandE Letter No. DCL-84-243, dated June 29, 1984, are true and correct to the best of my knowledge, information, and belief.

III-70, and III-71

Dated: June 29, 1984

DeVERNE G. DUNNUM, JR.

STATE OF CALIFORNIA
COUNTY OF SAN LUIS OBISPO ss

Subscribed and sworn to
before me this 29th day
of June, 1984

WITNESS MY HAND
AND OFFICIAL SEAL

OFFICIAL SEAL
IDA DUTRA
NOTARY PUBLIC - CALIFORNIA
SAN LUIS OBISPO COUNTY
My comm. expires JAN 2, 1987

IDA DUTRA

PROFESSIONAL QUALIFICATIONS

Professional qualifications for the following affiants have been previously submitted in the PGandE Response to Joint Intervenors' Motion to Reopen the Record on Design Quality Assurance. (March 6, 1984)

Fred C. Breismeister
Myron E. Leppke
Michael J. Jacobson
Robert G. Oman
Larry E. Shipley
Michael R. Tresler

Professional qualifications for the following affiants have been previously submitted in the PGandE Response to Joint Intervenors' Motion to Reopen the Record on Construction Quality Assurance. (March 19, 1984)

Harold W. Karner
Donald A. Rockwell

In addition, statements of the Professional Qualifications for the remaining affiants are either enclosed with their affidavit or attached to this submittal.

David B. Miklush
De Verne G. Dunnum
W. N. Harris
Julius E. Herbst
Neil J. Tuholski

PROFESSIONAL QUALIFICATIONS OF

DAVID B MIKLUSH

My name is David B. Miklush. I have 12 years of experience as a mechanical engineer, the majority of it in the field of nuclear engineering. Since February 1978 I have been employed by PGandE. From February 1978 to June 1980 I was a Power Production Engineer in the Technical Department. I became a Senior Power Production Engineer in June 1980 and held this position through February 1983. These assignments were in the surveillance testing and engineering evaluation areas of Diablo Canyon. From February 1983 to the present I have been the Maintenance Manager in charge of the Mechanical and Electrical Maintenance Departments.

I graduated with a B.S. in Mechanical Engineering from UCLA in 1972. I have a P.E. License in Mechanical Engineering from the state of California and I hold a Senior Reactor Operator License at Diablo Canyon.

From September 1972 through April 1976 I was employed by the General Atomic Company and participated in the Technical Graduate Program with three 6-month assignments in manufacturing, design engineering, and site startup at the Fort St. Vrain Nuclear Power Plant. From August 1974 to April 1976 I was permanently assigned to Fort St. Vrain in construction and operations.

From April 1976 through February 1978 I was employed by General Electric Company as a Design Engineer with responsibility for BWR refueling, fuel handling, and auxiliary service bridges. This assignment consisted of the verification of vendor hardware designs and initial design of the fuel grapple for BWR 6.

PROFESSIONAL QUALIFICATIONS OF

WILLIAM N. HARRIS

My name is William N. Harris. I am employed by the Guy F. Atkinson Company as Quality Assurance Manager in the construction division office.

I am a Professional Engineer registered in the State of California and am an ASME Level III Inspection Engineer.

In 1950, I began working as a mechanical engineer for the California Research and Development Company at Livermore, California, and at Argone National Laboratory in Chicago, on nuclear research projects. In 1953, I joined E. I. Dupont as an engineer and tested nuclear components for increased reactor productivity and safety at the Savannah River Laboratory, Nouth Carolina. I entered the U. S. Navy in 1955 and spent three years with the Naval Reactors Branch of the Atomic Energy Commission (AEC) reviewing designs of components for nuclear-propelled ships. Following my discharge, I continued my work with the AEC until 1962 as project engineer responsible for evaluating designs for nuclear reactors for power production.

In 1962, I became a member of the joint venture of Aetron-Blume-Atkinson at the Stanford Linear Accelerator Center. As a project engineer, I was responsible for coordinating the engineering design of the major accelerator structures. In 1966, I was employed by the Guy F. Atkinson Company as Data Processing (DP) Department Manager. I held this position for the next two

years during which the initial data processing system was installed. I spent the following year in the construction division office assisting in scheduling and quantity surveying DP applications.

In 1969, I was assigned to the Diablo Canyon Nuclear Power Plant as Quality Assurance Manager and continued in that capacity until 1973. During this assignment, I was responsible for the development and management of a program to ensure acceptable workmanship, materials, and equipment associated with the Project.

In 1973, I returned to the construcion divsion office where I provided guidance and assistance to nuclear and hydroelectric projects concerning quality assurance and quality control requirements. In addition, I am currently working on special assignment with the Company's Diversified Operations Group as Senior Research Associate.

PROFESSIONAL QUALIFICATIONS OF

JULIUS E. HERBST

My name is Julius E. Herbst. I have 34 years of experience as an electrical engineer including 23 years with the Pacific Gas and Electric Company.

I graduated in 1950 with a degree in Electrical Engineering from Ingenieurschule Polytechnikum Giessen, Germany.

From 1950 to 1959 I was employed as an electrical engineer for Lahmeyer G.M.B.H., Frankfurt, Germany with responsibility for transmission line design. From 1959 to 1961 I was an engineer with Western Knapp Engineering Company, San Francisco, California with responsibility for the design of a 50KV transmission line.

Since 1961 when I joined PGandE I have had increasingly responsible positions. I worked on Diablo Canyon from 1970 to 1972, and again in 1982 where I was responsible for the seismic requalification of the Class IE equipment to new HOSGRI requirements and the associated extensive testing program. From 1982 I have been a Senior Engineer with responsibility for the environmental qualification of electrical equipment for the Diablo Canyon Project.

PROFESSIONAL QUALIFICATIONS OF

NEIL J. TUHOLSKI

My name is Neil J. Tuholski. I am employed by Bechtel Power Corporation as a Civil Engineering Supervisor on the Diablo Canyon Nuclear Project. I am a graduate of the University of California with a BSCE (1963) and a MSCE (1972) and am a Registered Engineer in California. Prior to joining Bechtel in 1973, I worked for four years for the U.S. Navy Ship Research and Development Center in Maryland.

Since September 1982 on the Diablo Canyon Project I have been the Deputy Civil Group Supervisor with responsibility for the containment building design group as well as the coordination of field activities. Prior to this assignment I worked for three years as Civil Group leader on the Limerick Nuclear Plant, two years as the testing activity leader in the Applications Engineering Group in Bechtel's Research and Engineering Operation, and as a Senior Engineer for several mining projects and the Midland Nuclear Power Project.