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MEMORANDUM FOR: Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

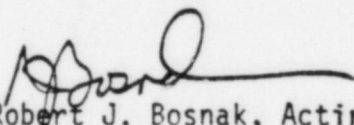
FROM: Robert J. Bosnak, Acting Assistant Director
Components and Structures Engineering
Division of Engineering

SUBJECT: EVALUATION OF ALLEGATIONS ON DIABLO CANYON
UNITS 1 AND 2

The Mechanical Engineering Branch has evaluated the following assigned allegations, shown in the enclosure:

368	890	1039	1423	1424	1425	1430	1432	1547	1548	1549
898	891			1431	1428		1433			
1328					1429					
1372										
1434										
1466										
1469										
1550										

The classification of these allegations per Knighton's November 30, 1984, memorandum is also included.


Robert J. Bosnak, Acting Assistant Director
Components and Structures Engineering
Division of Engineering

Enclosures:
As stated

cc: Cherny, DE
 H. Schierling, DL
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 T. Sullivan, DE
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<u>Task:</u>	Allegation or Concern No.	368
		898
		1328
		1372
		1434
		1466
		1469
		1550

ATS No.:

BN No:

RV 84A071
RV 84A073
RV 84A88
RV 84A91

Characteristics

Deficiencies in the Diablo Canyon Project "Quick Fix" program.

Implied Significance to Plant Design, Construction, or Operation

Piping supports modified under the DCP "Quick Fix" program may contain deficiencies which could lead to pipe overloading.

Assessment of Safety Significance

The staff's review of the "Quick Fix" program is fully described in Section 6 of SSER 25, "Quick Fix Program, License Condition 2.C.(11) Item 6."

Staff Position

The staff has found the PG&E and IDVP responses to its review acceptable. The findings are described in SSER 25, Section 6. These allegations are therefore considered resolved.

Action Required

None.

Task: Allegations or Concerns Nos: 890
891

ATS No:

BN No:

Characterization

Same person who originally performed a calculation (designer) was also the person who checked the calculation (checker). Design did not leave controlled documents that they needed to reduce the possibility of calculation errors. PG&E stated otherwise.

Implied Significance to Plant Design, Construction, or Operation

Possible design errors not discovered thru independent checking or thru lack of controlled design documents may lead to overestimation of piping support load carrying capacities.

Assessment of Safety Significance

The concerns expressed in these allegations were previously addressed under Allegations 79, 82 and 97, SSER 22, which resulted in license conditions 2.C(11), Items 1 and 7. These license conditions required PG&E to requalify independently in San Francisco all small bore piping computer analyzed supports which were evaluated at the site.

Staff Position

An NRC task group reviewed and audited the resolution of the license condition and found them acceptable. These findings are fully described in SSER 25, Section 1. These allegations are therefore considered resolved.

Action Required

None.

Task: Allegation of Concern No. 1039

ATS No:

BN No:

Characterization

Engineering group did not receive any technical guidance in performing stress calculations. Consequently items were omitted in their calculations; also no training program documented.

Implied Significance to Plant Design, Construction, or Operation

Small bore piping supports may have been designed incorrectly leading to overestimation of support load capacities.

Assessment of Safety Significance

See Allegation of Concerns No. 890, 891.

Staff Position

The audit which the NRC task group performed during the resolution of License Condition 2.C(11), Item 1 included interviewing, on a sample basis, personnel who were directly involved in the requalification of the pipe supports; and the review of various design criteria documents which provide guidance and instructions to designers. The technical training of the interviewed personnel was determined to be acceptable, and the design documents were also found to be acceptable in providing the required design guidance. This allegation is therefore resolved.

Action Required

None.

Task: Allegation or Concern No. 1423

ATS No:

BN No:

Characterization

PG&E made an incorrect statement when they stated that "warping normal and shear stresses were present in only a few cases due to the preponderance of angle and tube steel shapes."

Implied Significance to Plant Design, Construction, or Operation

The exclusion of warping normal and shear stresses for beam shapes where these stresses may be significant could lead to underestimation of the peak stresses in piping supports.

Assessment of Safety Significance

PG&E has satisfactorily addressed this concern in response to License Condition 2.C.(II), Items 1 and 7, as described in SSER 25, Sections 1 and 7.

Staff Position

The statement by PG&E is basically correct. Stresses due to warping effects are generally small for beam shapes such as angles and tubes, as stated in the engineering literature, and are therefore considered as secondary and negligible in the structural analysis of such members. The concern therefore has no basis and this allegation is considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1424
1431

ATS No: BN No:
RV 84A88

Characterization

PG&E should not have excluded certain snubbers on pipe qualified by the span rules from their review as discussed in the July 2, 1984 transcript. The pipe stress group considered a pair of pipe supports in isolation when they must be considered in combination.

Implied Significance to Plant Design, Construction, or Operation

Exclusion of snubbers from being reviewed may not ensure that these snubbers will operate properly under seismic conditions, thus inducing higher piping stresses than designed for. Closely spaced supports designed without consideration of interaction effects may overstress the supported piping.

Assessment of Safety Significance

The concerns expressed in these allegations were addressed by PG&E in its response to License Condition 2.C.(11), Items 2 and 3 regarding the general issue of proximity of rigid supports and snubbers to other rigid supports, snubbers and anchors for small bore piping. (See SSER 25, Sections 2 and 3).

Staff Position

An NRC task group reviewed the PG&E response and found it acceptable. These findings are fully described in SSER 25, Sections 2 and 3. These allegations are considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1425
Allegation or Concern No. 1428
Allegation or Concern No. 1429

ATS No:

BN No:

RV 84A088

Characterization

The alleged questions whether or not serious errors were found in light of the fact the NRC has only audited 21 of the 357 supports, of which only 191 were completed at the time of the audit. Examination of the audit performed by the NRC into the 21 of 191 supports casts serious doubt as to what PG&E has not done, as well as the NRC staff's standards. The modifications since 1981 are not enough to counteract the effects of a .75G earthquake.

Implied Significance to Plant Design, Construction, or Operation

There is a possibility that serious errors exist in the designs of the 357 small bore computer analyzed supports which could lead to underestimation of the loads acting on these supports and overstressing of the pipes, when subjected to the Hosgri earthquake.

Assessment of Safety Significance

An NRC task group audited the PG&E review of the designs of the 21 supports in depth to check compliance with License Condition 2.C.(11), Items 1 and 7, including interviewing some of the analysts. In addition, the review of the 357 supports constituted a second level review by the Bechtel San Francisco Office. No significant errors were found in the review.

Staff Position

The results of the audit and the findings are described in detail in SSER 25, Sections 1 and 7. The likelihood of finding serious errors in the supports which were not reviewed is considered to be very small. The audited supports were found to satisfy the appropriate design allowable under the Hosgri seismic loading, and, on a sample basis, all supports are considered as capable of sustaining the seismic loading due to the Hosgri earthquake. These allegations are therefore considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1430

ATS No:

BN No:

RV 84A088

Characterization

Concerns about (1) a branch line being subjected to axial buckling or tensile stress and (2) whether this was considered in the qualification of 15000 ft. of small bore piping qualified by span rule.

Implied Significance to Plant Design, Construction, or Operation

Restrained lines subjected to large axial loads due to anchor movements may fail due to tensile tearing as compressive buckling or collapse, if these failure modes were not considered in the design of 15000 ft. of small bore piping qualified by span rule.

Assessment of Safety Significance

The staff has evaluated the qualification of the 15000 ft. of small bore piping, based on a sample of 5000 ft. which were computer analyzed by PG&E. This evaluation is described in SSER 25, Section 8. In addition, the licensee has also addressed this allegation specifically.

Staff Position

The staff has reviewed the licensee's response to this allegation. He has stated that the computer analysis of the 5000 ft. sample considered all problems that included prescribed seismic and thermal anchor motion. Supports were placed such that piping bending allowables were met. This precludes the type of failure modes expressed in the concern. The staff finds the response acceptable and considers these concerns resolved.

Action Required

None.

Task: Allegation or Concern No. 1432
Allegation or Concern No. 1433

ATS No: BN No:

RV 84A088

Characterization

Many of the lines subjected to high pressure and temperature will grow more than anticipated resulting in failure of the support or of the pipe. The walkdown program at Diablo Canyon did not include checking the seismic clearances on pipe and supports to ensure adequate clearance.

Implied Significance to Plant Design, Construction, or Operation

Unaccounted for or unchecked radial growth of large bore pipes due to high temperature and large internal pressure may cause binding within rigid supports, leading to support and pipe overloading and possible failure. Insufficient seismic clearance may lead to impacting and damage to adjacent pipes or structures.

Assessment of Safety Significance

PG&E has performed walkdowns of piping systems at elevated temperatures to verify that piping systems are restrained only as designed. An NRC task group has reviewed the PG&E procedures for walkdowns during initial plant heat up and during power assension, and participated in such walkdowns as required by License Condition 2.C,(11), Item 5 and described in SSER 25.

Staff Position

The NRC task group determined that PG&E had conducted an acceptable visual verification that piping systems and supports were properly restrained to preclude damage during heatup, power assension and seismic motion. This included verification that free movements of pipes within rigid restraints were not impeded due to binding, particularly for large bore hot piping. Since such binding is precluded, the procedures automatically account for pipe radial growth. This allegation is therefore considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1547

ATS No:

BN No:

Characterization:

Change of seismic design reviews criteria for pipe supports which permitted supports which would have failed to pass in calculations.

Implied Significance to Plant Design, Construction, or Operation

Piping support load capacity may be smaller than required, leading to possible overstress.

Assessment of Safety Significance

The staff reviewed the technical instructions issued by PG&E for designers in San Francisco office requalifying the piping supports as required by License Condition 2.C.(11), Item 1. These instructions included the verification that the loads from the latest pipe stress analysis were used.

Staff Position

The NRC task group confirmed as part of the audit performed on the PG&E license condition effort, that the designers had verified that the latest loads had been used in the qualification of the piping supports. The allegation is therefore considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1548

ATS NO:

BN No:

Characterization

Failure to provide justification for use 5 X less pipe supports than AISC requirements.

Implied Significance to Plant Design, Construction, or Operation

This allegation pertains to the calculation of safe unbraced lengths for angle members. Exceeding these unbraced lengths can lead to lateral/torsional buckling of such members.

Assessment of Safety Significance

The staff has performed additional review of documents related to this issue and has also communicated with the AISC regarding the applicability of the Manual of Steel Construction rules to the design of angle members in bending. The AISC has stated that the unbraced length requirement in the manual is not applicable to angle members.

Staff Position

The staff has accepted the technical basis used by the licensee for specifying the unbraced lengths of angle members used in piping supports, and has determined that there is no basis for the concern. The allegation is therefore considered resolved.

Action Required

None.

Task: Allegation or Concern No. 1549

ATS No:

BN No:

Characterization

Continued design errors due to inaccurate assumptions used in design calculations.

Implied Significance to Plant Design, Construction, or Operation

Design errors may lead to underestimation of piping support load carrying capacities and piping overstress.

Assessment of Safety Significance

The concerns raised in this allegation have been addressed in the assessments of Allegations Nos. 1642-1648.

Staff Position

The resolution of this allegation conforms to those of Allegations Nos. 1642-1648.

Classification of Allegation within MEB scope of Review (per memo of November 30, 1984 from George Knighton.)

368	D
890	D
891	D
1039	D
1328	D
1372	D
1423	R
1424	D
1425	D
1428	D
1429	D
1430	D
1431	D
1432	D
1433	D
1434	D
1466	D
1469	D
1547	D
1548	R
1549	D
1550	D