

9/19/83

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

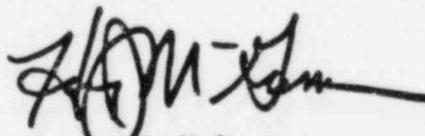
BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

NRC STAFF RESPONSE TO GOVERNOR DEUKMEJIAN'S FIRST SET  
OF INTERROGATORIES AND FIRST DOCUMENT REQUEST TO THE STAFF

On September 2, 1983, Governor Deukmejian filed his "First Set Of Interrogatories And First Document Requests To The NRC Staff." Pursuant to 10 C.F.R. § 2.720(h)(2)(ii), written interrogatories to be answered by the Staff are to be filed with the presiding officer. Upon making the necessary findings under that provision, the presiding officer may then require the Staff to answer the interrogatories. Governor Deukmejian did not comply with the provisions of 10 C.F.R. § 2.720(h)(2)(ii). However, in the spirit of cooperation between the parties and to expedite the completion of discovery in this proceeding, but without waiving the provisions of 10 C.F.R. § 2.720(h)(2)(ii) with respect to any other interrogatories, the Staff voluntarily provides the following responses to the Governor's interrogatories.

Respectfully submitted,



Henry J. McGurren  
Counsel for NRC Staff

Dated in Bethesda, Maryland  
this 19th day of September 1983

DESIGNATED ORIGINAL

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF RESPONSE TO GOVERNOR DEUKMEJIAN'S FIRST SET OF INTERROGATORIES AND FIRST DOCUMENT REQUEST TO THE STAFF" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or as indicated, by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, this 19th day of September 1983:

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Interrogatory 1

With respect to contention 1(a), do you deny that the scope of the IDVP review of both the seismic and non-seismic aspects of the designs of safety related systems, structures and components was too narrow in that the IDVP did not verify samples from each design activity (seismic and non-seismic)?

Response

Yes. (J.P. Knight, H.E. Schierling, J.S. Wermiel)

Interrogatory 2

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) Among the facts relied upon in support of our conviction that the IDVP was not too narrow for the intended purposes are:

- The IDVP was intended from its inception to be based upon suitable sampling.
- The IDVP program plan for both Phase I and Phase II was reviewed by the Staff and approved by the Commission.
- The technical competency of the IDVP participants was reviewed by the Staff and found acceptable.
- The success of the sampling techniques was demonstrated in the disclosure of generic concerns for safety related structures,

fluid system piping, electrical conduits and raceways etc.  
including additional sampling as necessary.

- The samples were chosen based on qualified engineering judgement and experience by parties expert in the design of nuclear power plant structures and systems.
- The adequacy of system and component function has been demonstrated by operation of the individual components and systems and by successful completion of plant hot functional tests.
- Staff review and evaluation of the documents listed in 2(b) below and the Staff evaluation and conclusions presented in SER Supplement 18.
- IDVP technical Staff and management have been observed by the Staff and our consultants and have demonstrated the requisite expertise for design and evaluation of nuclear power plant systems, structures and components.

(b) The documents relied upon in the response include:

NRC Staff SER including all Supplements; IDVP Program Plan Phase I; IDVP Program Plan Phase II; Commission Order CLI-81-30; NRC Letter to PG&E dated Nov. 19, 1981; SECY 82-89; SECY 82-414; SECY 83-366; all semi-monthly reports of the IDVP; Blume internal review report;  
all IDVP ITR's and revisions through the time of this response; Correspondence with consultants (BNL);  
transcripts of NRC meetings with IDVP and/or PG&E.

(c) The Staff believes that the request is objectionable in that it is overly broad, imprecise and would be unduly burdensome to comply with if interpreted in its broadest sense. See Illinois Power Co.

(Clinton Power Station, Units 1 and 2), ALAB-340, 4 NRC 27, 34 (1976). Accordingly, the Staff will not reply to this Interrogatory except upon direction by the Appeal Board as provided in 10 C.F.R.

§ 2.720(h)(2)(ii). The Staff would note, however, that various allegations contained in filings by the Governor and Joint Intervenors may be viewed as contradictory to or inconsistent with the Staff's position on the preceding Interrogatory.

(d) J.P. Knight, H.E. Schierling, J.S. Wermiel.

### Interrogatory 3

With respect to contention 1(b), do you deny that the scope of the IDVP review of both the seismic and non-seismic aspects of the designs of safety-related systems, structures and components was too narrow in the in the design activities the IDVP did review, it did not verify samples from each of the design groups in the design chain performing the design activity?

### Response

Yes. (same as 1 above)

### Interrogatory 4

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) See 2a above.
- (b) See 2b above.
- (c) See 2c above.
- (d) See 2d above.

Interrogatory 5

With respect to contention 1(c), do you deny that the scope of the IDVP review of both the seismic and non-seismic aspects of the designs of safety-related systems, structures and components was too narrow in that the IDVP did not have statistically valid samples from which to draw conclusions?

Response

Yes. (C.P. Knight, P.T. Kuo)

Interrogatory 6

If your answer to the preceding interrogatory is a denial of the contention stated therein:

- (a) Please state each and every fact on which you rely in support of your denial.
- (b) Please identify each and every document on which you rely in support of your denial.
- (c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.
- (d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) - The IDVP sampling concept was reviewed by the NRC Staff and approved by the Commission.
  - The term "statistically valid" as usually understood in the application of statistical methods in engineering infers a rigor in terms of numerical classification of information that is prohibited by the nature of the engineering tasks evaluated by the IDVP.
  - Where numerical statistical techniques are recognized as applicable by the engineering community they generally have been and will be applied to the design construction and operation at Diablo Canyon.
  - See also response to 2(a).
- (b) See 2(b). Also, "Probability, Statistics and Decision for Civil Engineers", J. R. Benjamin, C. Allen Cornell, McGraw-Hill Book Company, 1970.
- (c) Same as 2(c) above.
- (d) J. P. Knight, P. T. Kuo.

Interrogatory 7

With respect to contention 1(d), do you deny that the scope of the IDVP review of both the seismic and non-seismic aspects of the designs of safety-related systems, structures and components was too narrow in that the IDVP failed to verify independently the analyses but merely checked data of inputs to models used by PG&E?

Response

Yes. (Same as above)

Interrogatory 8

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

Interrogatory 7 lacks specificity regarding the analyses referred to. It is not clear if the analyses referred to are those performed prior to the design verification effort or after or both.

(a) The IDVP did perform independent and complete analyses of selected design activities such as calculational methodologies of temperature/pressure transients resulting from pipe breaks including calculations using a separate computer program, and extensive piping and equipment computer code seismic analyses. In addition, the IDVP independently reviewed and evaluated models and computer programs used by the ITP in its analyses and provided comments to the ITP during technical interchange meetings.

(b) See 2(b).

(c) See 2(c).

(d) See 2(d).

Interrogatory 9

With respect to contention 1(e), do you deny that the scope of the IDVP review of both the seismic and non-seismic aspects of the designs of safety-related systems, structures and components was too narrow in that the IDVP failed to verify the design of Unit 2?

Response

Yes. (Same as 1 above)

Interrogatory 10

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The IDVP was not too narrow. The IDVP was intended and approved only for Unit 1.

(b) See 2(b) above.

(c) See 2(c) above.

(d) See 2(d) above.

Interrogatory 11

With respect to contention 2(e), do you deny that the scope of the ITP review of both the seismic and non-seismic aspects of the designs of the safety-related systems, structures and components was too narrow in that the ITP did not verify samples from each design activity (seismic and non-seismic)?

Response

Yes. (Same as 1 above)

Interrogatory 12

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) - The ITP was not based on sampling.
- The ITP included a comprehensive corrective action program.
- The ITP was carried out by engineering personnel expert in the design of nuclear power plant structures, systems and components.
- ITP activities were verified by the IDVP.

- The adequacy of system and component function has been demonstrated by operation of the individual components and systems and by successful completion of of plant hot functional tests.
- The ITP separately identified a number of concerns and initiated appropriate corrective actions.
- Staff review and evaluation of the documents listed in 12(b) below and the Staff evaluation and conclusions presented in SER Supplement 18.
- ITP (Diablo Canyon Project) technical staff and management have been observed by the Staff and our consultants and have demonstrated the requisite expertise for design and evaluating of nuclear power plant systems, structures and components.

(b) The documents relied upon in the response include:

NRC Staff SER including all Supplements; Commission Order CLI-81-30; NRC Letter to PG&E dated Nov. 19, 1981; SECY 82-89; SECY 82-414; SECY 83-366; all semi-monthly reports by PG&E, specifically report No. 8 dated February 26, 1982; PG&E Phase I Final Report; PG&E Phase II Final Report; Blume internal review report correspondence with consultants (BNL); PG&E letter to NRC dated April 6, 1982; transcripts of NRC meetings with IDVP and/or PG&E, FSAR and amendments.

(c) See 2(c) above.

(d) See 2(d) above.

Interrogatory 13

With respect to contention 2(b), do you deny that the scope of the ITP review of both the seismic and non-seismic aspects of the designs of the safety-related systems, structures and components was too narrow in that in the design activities the ITP did review, it did not verify samples from each of the design groups in the design chain performing the design activity?

Response

Yes. (Same as 1 above)

Interrogatory 14

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) See 12(a) above.

(b) See 12(b) above.

(c) See 2(c) above.

(d) See 2(d) above.

Interrogatory 15

With respect to contention 2(c), do you deny that the scope of the ITP review of both the seismic and non-seismic aspects of the designs of the safety-related systems, structures and components was too narrow in that the ITP did not have statistically valid samples from to draw conclusions?

Response

Yes. (Same as 1 above)

Interrogatory 16

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) See 12(a) above.

(b) See 12(b) above.

(c) See 2(c) above.

(d) See 2(d) above.

Interrogatory 17

With respect to contention 2(d), do you deny that the scope of the ITP review of both the seismic and non-seismic aspects of the designs of the safety-related systems, structures and components was too narrow in

that the ITP has failed systematically to verify the adequacy of the design of Unit 2?

Response

Yes. (Same as 1 above)

Interrogatory 18

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP Unit 1 corrective actions will be applied to Unit 2.

(b) See 12(b) above. Letter of April 22, 1982 from PG&E to NRC.

(c) See 2(c) above.

(d) See 2(d) above.

Interrogatory 19

With respect to contention 3(a), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that it accepted the mean measured performance of structures and materials in lieu of code-specified minima and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (H. Polk, P. T. Kuo)

Interrogatory 20

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved NRC criteria.

- See 2(b) and 12(b).

(b) - FSAR amendment 50 page 4-4 and 4-5 as referenced in the PG&E Phase I Final Report.

(c) See 2(c) above.

(d) H. Polk, P. T. Kuo.

Interrogatory 21

With respect to contention 3(b), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that it failed to verify that the stress and load factors for steel used in the containment building were within code values and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (See 19 above)

Interrogatory 22

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved staff criteria.

- See 2(b) and 12(b).

(b) Standard Review Plan 3.8.3.; FSAR and amendments; PG&E Phase I Final Report.

(c) See 2(c) above.

(d) P. T. Kuo and H. Polk.

Interrogatory 23

With respect to contention 3(c), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that it failed to specify all damping values used in various seismic modes in the containment and auxiliary buildings and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo and H. Polk)

Interrogatory 24

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved NRC criteria and methodology.

(b) - Reg. Guide 1.61 FSAR and Amendments.

- SRP 3.9.2.

- PG&E Phase 1 Final Report.

(c) See 2(c) above.

(d) P. T. Kuo, H. Polk, C. Miller.

Interrogatory 25

With respect to contention 3(d), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that it failed to verify that PG&E's use of the double algebraic sum method of calculation (rather than the sum of the squares method) was acceptable as a substitution and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk)

Interrogatory 26

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved NRC criteria and methodology. The ITP used both SRSS and DAS. The SRSS is the previously approved staff acceptance criterion.

- (b) - PG&E Phase I Final Report
- FSAR and Amendments
- August 30, 1983, PG&E Response to SER Supplement 18.

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk.

Interrogatory 27

With respect to contention 3(e), do you deny that the ITP used improper engineering standard sot determine whether design activities met

license criteria in that it used time-history modeling techniques for some accelerations, displacements and shell forces in the containment structure and Blume response spectra for other accelerations, displacements and shell forces in the same structure and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk)

Interrogatory 28

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved staff acceptance criteria.

(b) - FSAR and amendments  
- PG&E Phase I Final Report.

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk, C. Miller, A. J. Philippopoulos.

Interrogatory 29

With respect to contention 3(f), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria with respect to its modeling of the soil properties for the containment and auxiliary buildings and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk)

Interrogatory 30

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) Parametric studies were performed by the ITP and were reviewed and accepted by the IDVP.

(b) See 2(b) and 12(b) above, specifically see ITR-55 and Staff trip report May 16, 1983.

(c) Same 2(c) above.

(d) P. T. Kuo, H. Polk, C. Costantino.

Interrogatory 31

With respect to contention 3(g), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria with respect to its modeling of the crane in the turbine building and that the IDPV either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk)

Interrogatory 32

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved staff acceptance criteria.

(b) See PG&E Phase I Final Report, IDVP Final Report and FSAR and Amendments. See 2(b) and 12(b) above, specifically.

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk, P. C. Wang, A. J. Philippacopoulos.

Interrogatory 33

With respect to contention 3(h), do you deny that the ITP used improper engineering standards to determine whether design activities met

license criteria by virtue of its modeling of the torsion factors for different buildings by differing techniques and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk).

Interrogatory 34

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved Staff acceptance criteria with the exception of the turbine building which is still under review.

(b) See 32(b) above.

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk, C. Miller.

Interrogatory 35

With respect to contention 3(i), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria with respect to its modeling of hydrodynamic forces for

the intake structures and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (H. Polk, P. T. Kuo)

Interrogatory 36

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The sloshing effect of the water was considered and hydrodynamic pressures outside the structure were considered.

(b) - PG&E Phase I Final Report

- FSAR and amendments

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk, C. Costantino, C. Miller.

Interrogatory 37

With respect to contention 3(j), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that for its modeling of the intake structure it used

different models for horizontal and vertical seismic loadings and combined the results of these different models for vertical and horizontal responses and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk).

Interrogatory 38

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) For the intake structure a nonlinear analysis was not performed by PG&E. A nonlinear analysis was performed on the crane for the vertical direction. The analysis will be reviewed by the staff.

(b) PG&E Phase 1 Final Report.

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(c) Same as 2(c), above.

(d) P. T. Kuo, H. Polk, C. Miller, A. J. Philippopoulos.

Interrogatory 39

With respect to contention 3(k), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that for its modeling of the intake structure it used improper ductility factors for steel and concrete and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk).

Interrogatory 40

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ductility factors meet the previously approved criteria.  
The intake structure is still under staff review.

(b) FSAR and amendments

PG&E Phase I Final Report

ITR-58

IDVP Final Report

(c) Same as 2(c) above.

(d) P. T. Kuo, H. Polk, C. Miller

Interrogatory 41

With respect to contention 3(1), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria with respect to its computations of modes in the containment building having frequencies between 20 and 33 HZ and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (P. T. Kuo, H. Polk).

Interrogatory 42

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The ITP used previously approved methodology. The generation of floor response spectra in the Containment building accounted for model frequencies up to 33 Hertz.

(b) FSAR and amendments

IDVP Final Report

PG&E Phase I Final Report

- (c) Same as 2(c) above.
- (d) P. T. Kuo, H. Polk, C. Miller.

Interrogatory 43

With respect to contention 3(m), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria in that in modeling the containment building it failed to use two horizontal components for the DE and DDE and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (H. Polk, P. T. Kuo).

Interrogatory 44

If your answer to the preceding interrogatory is a denial of the contention stated therein:

- (a) Please state each and every fact on which you rely in support of your denial.
- (b) Please identify each and every document on which you rely in support of your denial.
- (c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.
- (d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) The ITP used previously approved criteria.
- (b) - FSAR and amendments
- PG&E Phase I Final Report.

- (c) Same as 2(c) above.
- (d) H. Polk, P. T. Kuo.

Interrogatory 45

With respect to contention 3(n), do you deny that the ITP used improper engineering standards to determine whether design activities met license criteria by virtue of the stress values it used for concrete in shear walls in modeling the auxiliary building and that the IDVP either used or approved the use of such an improper standard or did not verify it at all?

Response

Yes. (H. Polk, P. T. Kuo).

Interrogatory 46

If your answer to the preceding interrogatory is a denial of the contention stated therein:

- (a) Please state each and every fact on which you rely in support of your denial.
- (b) Please identify each and every document on which you rely in support of your denial.
- (c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.
- (d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) The ITP used previously approved criteria. However, applicability of the use of the provisions of the code is under review.
- (b) FSAR and amendments.

PG&E Phase 1 Final Report

IDVP Final Report

(c) Same as 2(c) above

(d) P. T. Kuo, H. Polk, C. Miller

Interrogatory 47

With respect to contention 4, do you deny that the IDVP has accepted deviations from the licensing criteria without providing adequate engineering justification?

Response

Yes. However, in the course of staff resolution of open items identified in Supplement 18 to NUREG-0675, there may be areas where the IDVP accepted deviations which would require further justification.

(J. Wermiel, P. T. Kuo, H. Polk).

Interrogatory 48

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) Pertinent facts are related to the open issues enumerated in NUREG-0675, Supplement 18. The ITP used previously approved criteria as appropriate.

(b) SER Supplement 18 concludes that with the exception of the identified open items, the staff concurs with the results of the IDVP.

- See FSAR and amendments
- August 30, 1983 PG and E letter to the NRC.

(c) Same as 2(c) above.

(d) J. Wermiel, M. Hartzman, T. Dunning, P. T. Kuo, J. Knox, H. Polk, D. Kubicki and R. LaGrange.

Interrogatory 49

With respect to contention 5, do you deny that the verification program has not verified that Diablo Canyon Units 1 and 2 "as built" conform to the design drawings and analyses?

Response

Yes, with respect to Unit 1; with respect to Unit 2 see response to Interrogatory 18 above. (P. Morrill).

Interrogatory 50

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are

inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The denial is based upon the facts stated in the documents listed in (b) below.

(b) Region V Inspection Reports for 1982 and 1983 as appropriate.

(c) Same as 2(c) above.

(d) P. Morrill.

Interrogatory 51

With respect to contention 6, do you deny that the verification program failed to verify that the design of safety related equipment supplied to PG&E by Westinghouse met licensing criteria?

Response

Yes. (J. P. Knight, H. E. Schierling)

Interrogatory 52

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) - The design methodology employed by Westinghouse was not brought into question during the verification program for Diablo Canyon.
  - The scope of design verification was expanded to include verification of the design interface between PG&E and Westinghouse.
  - The IDVP confirmed the transfer of the correct Hosgri spectra from PG&E to Westinghouse and the correct application of those spectra by Westinghouse.
  - The IDVP confirmed the implementation of effective controls to assure that revised information from the verification program was transmitted to Westinghouse and employed by Westinghouse to assure that Westinghouse supplied equipment met applicable licensing requirements.
- (b) See 2(b) and 12(b) above.
- (c) Same as 2(c) above.
- (d) J. P. Knight and H. E. Schierling.

Interrogatory 53

With respect to contention 7, do you deny that the verification program failed to identify the root causes for the failures in the PG&E design quality assurance program and failed to determine if such failures raise generic concerns?

Response

Yes. (J. P. Knight, H. E. Schierling)

Interrogatory 54

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

- (a) - The IDVP identified root causes for the failures in the PG&E design quality assurance program, in the IDVP's Final Report.
  - PG&E identified root causes for the failures in the PG&E design quality assurance program in its Phase I and Phase II Final Reports.
  - The Staff reviewed and evaluated the above and presented its conclusions in SER Supplement 18.
- (b) IDVP Final Report  
Diablo Canyon Project Phase I and Phase II Final Reports

NRC SER Supplement 18.

- (c) Same 2(c) above.
- (d) J. P. Knight and H. E. Schierling.

Interrogatory 55

With respect to contention 8, do you deny that the ITP failed to develop and implement in a timely manner a design quality assurance program in accordance with 10 C.F.R. Part 50, Appendix B to assure the quality of the recent design modifications to the Diablo Canyon facility and that the IDVP failed to ensure that the corrective and preventative action programs implemented by the ITP are sufficient to assure that the Diablo Canyon facilities will meet licensing criteria?

Response

Yes. (W. Haass, P. Morrill).

Interrogatory 56

If your answer to the preceding interrogatory is a denial of the contention stated therein:

(a) Please state each and every fact on which you rely in support of your denial.

(b) Please identify each and every document on which you rely in support of your denial.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your denial.

(d) Please identify each and every person you intend to call as a witness whom you expect to testify concerning your denial of this contention or the facts on which you rely in support of the denial of this contention.

Response

(a) The facts of the denial are based upon the facts stated in the documents listed in (b) below. PG&E and its contractor, Bechtel as

Completion Manager, committed to the implementation of the NRC approved QAP's that satisfy Appendix B requirements for the performance of the recent design modifications to the Diablo Canyon facility. Additional facts are stated in Region V inspection reports (see 50(b) above).

1. FSAR for Diablo Canyon, Change 17, through Amendment 85 (9/3/80).
2. Bechtel Topical Report on Quality Assurance, BQ-TOP-1, Rev. 3A.
3. Letter, W. P. Haass to R. M. Collins, "NRC Acceptance of Revised Bechtel Topical Report on Quality Assurance" dated October 16, 1980.
4. Commitment by PG&E to apply the QA program for operations, approved by NRC as satisfying Appendix B, to the modifications requirement for Diablo Canyon, PG&E/IDVP/NRC meeting transcript, September 3, 1981.
5. Letter, PG&E to NRC, describes commitment to establish and implement the PG&E and Bechtel QA programs, NRC-approved, for the Diablo Canyon completion effort; dated June 18, 1982.
6. Memorandum, W. V. Johnston to T. Novak, "Acceptability of QA Program for Diablo Canyon (PG&E-Bechtel)," dated September 1, 1982.
7. See 50(b) above.
  - (c) Same as 2(c) above.
  - (d) W. Haass, P. Morrill.

Interrogatory 57

Do you contend that the design quality of all the safety related equipment supplied to PG&E by Westinghouse was assured by a quality

assurance program or programs which met each and every requirement of each and every criterion of Appendix B to 10 C.F.R. Part 50?

Response

No. The construction permit for Diablo Canyon, Unit 1, was issued in 1968. At that time, undoubtedly design work on safety related equipment supplied by Westinghouse was already underway. Governing this work were the quality assurance commitments then contained in the PSAR (Supplement No. 5). In mid-1970, Appendix B was issued and the staff required it to be applied to all new and ongoing activities underway for safety related equipment. From that point onward, the Appendix B criteria were applicable to all safety related activities.

Interrogatory 58

If your answer to the preceding interrogatory is in the affirmative?

(a) Please state each and every fact on which you rely in support of your answer.

(b) Please identify each and every document on which you rely in support of your answer.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your answer.

Response

Not applicable.

Interrogatory 59

Do you contend that the design quality for all the safety related equipment supplied to PG&E by Westinghouse was assured by a quality assurance program or programs whose implementation met each and every requirement of each and every criterion of Appendix B to 10 C.F.R. Part 50?

Response

See response to 57 above. (W. Haass, P. Morrill)

Interrogatory 60

If your answer to the preceding interrogatory is in the affirmative?

(a) Please state each and every fact on which you rely in support of your answer.

(b) Please identify each and every document on which you rely in support of your answer.

(c) Please identify each and every document known to you or believed by you to contain facts or allegations that contradict, are inconsistent with, or tend to cast doubt upon the validity of your denial or upon those facts on which you base your answer.

Response

See Response to 58 above. (W. Haass, P. Morrill)

Interrogatory 61

For each and every person identified in your answers to the preceding interrogatories as a prospective witness in these proceedings, please state:

(a) Whether he or she will be offered as an expert witness.

(b) If the witness will be offered as an expert, the specific subject matter about which the witness will be expected to testify.

(c) If the witness will be offered as an expert, the specific qualifications of the witness that you contend would qualify the witness to give opinion testimony on each specific subject matter about which the witness will testify.

(d) Each and every professional article, book, or the like, if any, the witness has authored or co-authored concerning each specific subject matter set forth in your answer to subpart (b), above.

(e) The identity of each and every document the witness will rely on to reach any opinion testimony and specifically correlate each such document (by page and paragraph number) to each specific subject matter on which the witness will render an opinion.

(f) As to each specific subject matter identified in your answer to subpart (b), above, the identity by docket number and case name of each case (court or administrative agency) where the witness has previously given expert testimony concerning each specific subject matter.

(g) As to each such case,

(i) the date(s) the expert testimony was given;

(ii) whether you have a copy of the testimony given;

(iii) whether you have a copy of the transcript covering any or all of the witness's examination or cross-examination for each such proceeding;

(iv) whether you have a copy of any notes which the witness made in preparation for, or utilized during, the witness's examination or cross-examination in each such proceeding.

Response

The names set forth below along with specific references to the Governor's and Joint Intervenors' contentions represent the NRC Staff's present witness list.

- Walter P. Haass Contention 8

- Professional Qualifications attached.
- Previous testimony includes: Newbold Island (1971); Harris (1980); Shoreham (July, 1982); Diablo Canyon (July 1983)
- Documents relied upon in review of Diablo Canyon include: WASH-1248, October 26, 1973; Division Reactor, "Quality Assurance Program Review Check List for Nuclear Power Plants", October 27, 1970; documents referenced in response to Interrogatory 56(b).

- Publications include: "Upgrading Quality Assurance Programmatic Guidance for Operating Nuclear Power Plants", Nuclear Safety, Vol. 23, No. 3, May-June 1982.
  
- Dennis J. Kubicki Contentions 4(i)-(k)
  - Professional Qualifications attached
  - Previous testimony includes: Indian Point Units 2 and 3 Special Proceeding (January 10, 1983). Documents relied upon in review of Diablo Canyon include: ITR No. 18; PG&E Phase II Final Report; IDUP Final Report; Supplements Nos. 8 and 9 to the Safety Evaluation of the Diablo Canyon Nuclear Power Station Units 1 and 2.
  
- T. G. Dunning Contentions 4(d)-(f), 4(u)
  - Professional Qualifications attached.
  - Previous testimony includes: Comanche Peak (June 16, 1983).
  - Documents relied upon in review of Diablo Canyon include: ITR 27, Rev. 1, EOI (8018, 8032, 8047, 8051, 8052, 8058), ITR 28, Rev. 1, EOI (8053, 8056), Diablo Canyon FSAR, IDVP Final Report, PG&E letter to NRC dated November 13, 1978 ("Response to NRC Fire Protection Review"); PG&E letter to NRC dated October 9, 1980 ("AFW System Flow Requirements").

- John L. Knox Contentions 4(b), 4(c), 4(g), 4(o), 4(t), 4(u)
  - Professional Qualifications attached.
  - Previous testimony includes: Diablo Canyon (February 7, 1979).
  - Documents relied upon in review of Diablo Canyon include: Diablo Canyon FSAR and amendments, USNRC Standard Review Plan with associated referenced documents, IDVP Final Report, ITRs (20, 22, 24, 25, 26, 27, 28, 34, 45 and 49), NRC Safety Evaluation Report and supplements on Diablo Canyon.
  
- Pao-Tsin Kuo Contentions 1(a)-(e), 2(a)-(d), 3(a)-(n), 4(n)
  - Professional Qualifications attached.
  - Previous testimony includes: Diablo Canyon (December 1978, October, 1980), Summer (January 1982).
  - Publications include: "Seismic Analysis of Structures and Equipment for Nuclear Power Plants", Bechtel Topical Report, Bc-TOP-4, coauthored in August, 1974; "Response of Structures to Propagating Ground Motions", paper coauthored and presented at 5th European Conference on Earthquake Engineering, Turkey, September, 1975.
  
- Harold E. Polk Contentions 3(a)-(n), 4(n)
  - Professional Qualifications attached.
  - Previous testimony includes: Hartsville (February 1977), Black Fox (October 1978 and February 1979) McGuire (March 1979).
  - Documents relied upon in the Diablo Canyon Review see 2(b) and 12(b) above.

- James P. Knight Contentions 1(a)-(e), 2(a)-(d), 6, 7
  - Professional Qualifications attached.
  - Previous testimony includes:
    - OL Prairie Island (Pipe Rupture Design, Steam Generator Tubes, Pipe Rupture, Valves) (1974-1976),
    - OL Fort Calhoun (Pipe Rupture, Isolation Valves),
    - CP Hartsville (Turbine Building - Seismic),
    - OL Diablo Canyon (Seismic and non-seismic design),
    - OL North Anna (Primary system dynamic loads - fracture toughness),
    - Seabrook (Seismic design) (April 1982),
    - V. Summer (Seismic design) January 11-16, 1982,
    - OL National Bureau (Dynamic loads (as applicant)) (1967) of Standards Reactor
    - OL Beaver Valley 1 (Primary system supports - steam generator tubes)
    - OL H. B. Robinson (Reactor Vessel)
    - OL Cooper (Pipe rupture design - Isolation Valves)
  
- Jared S. Wermiel Contentions 1(a)-(e), 2(a)-(d), 4(a), 4(p)-(s), 6, 7
  - Professional Qualifications attached.
  - Previous testimony includes: North Anna Unit 2 (Pump House Settlement - June 1979-ASLAB), Three Mile Island - Restart (November, 1981, March 1982 (ASLB), March 1983 (ASLAB).

- Documents relied upon in review of Diablo Canyon include: See 2(b) and 12(b) as well as the Standard Review Plan NUREG-0800.
  
- Professional Qualifications for the following witnesses are attached. These witnesses rely on documents set forth in 2(b) and 12(b) for the Diablo Canyon review.
  
- P. J. Morrill Contention 5, 8.
  
- R. G. LaGrange Contentions 4(f), 4(g), 4(o).
  
- C. Miller Contentions 3(c), (e), (f), (h)-(1), (n).
  
- C. J. Costantino Contentions 3(f), (i).
  
- P. C. Wang Contention 3(g).
  
- H. Schierling Contentions 1(a)-(e), 2(a)-(d), 6, 7.
  
- A. J. Philippacopoulos Contentions 3(e), (g), (j).

(The Professional Qualifications of M. Hartzman will be provided at a later date) Contentions 4(1), (m).

Interrogatory 62

Please identify each and every document--excluding the IDVP and DCP Final Reports, the Interim Technical Reports, and supplement 18 to the Safety Evaluation Report--that:

(a) Describes how the DCP, the IDVP, or the staff drew inferences from sample observations of design activities and products concerning the quality of design of Diablo Canyon.

(b) Discusses the validity of the methods used to draw inferences about the quality of design of Diablo Canyon from sample observations.

(c) Discusses the validity of the inferences about the quality of design of Diablo Canyon drawn from sample observations.

(d) Discusses the method by which any one or more sample was drawn for the purpose of assessing the quality of design of Diablo Canyon.

(e) Discusses the validity of the sampling methods used.

Response (J. P. Knight, H. E. Schierling)

Throughout the course of the Diablo Canyon design verification effort numerous documents have been submitted to the NRC by the IDVP and by PG&E and further documentation was produced by the NRC Staff such as letters to PG&E and the IDVP, NRC internal reports, inspection reports and transcripts of all meetings that were open to the public. Our response to interrogatories 2(b) and 12(b) are intended to be responsive in this regard and to include all of above cited documents. Most of this information has been made publicly available directly or through the Board Notification process. The Staff is currently reviewing these lists to ensure that they are complete and that all information and documents are available through the public document room.

Name: Carl J. Costantino, Senior Consultant Structural Analysis Division, BNL.

Title: Professor, Department of Civil Engineering, CCNY.

Experience:

Teaching:

The City College of the City University of New York 1967 to present.

Research:

From June 1959 to August 1967, at IIT Research Institute, Chicago, Illinois, conducting research studies for both government and industry. From Assistant Research Engineer to Manager of Nuclear Weapons Effects and Structural Dynamic Section of the Mechanics Research Division.

Project Engineer on programs involving site hardening for missile guidance systems. Principal investigator in theoretical and experimental investigations of soil-structure interaction problems for use in hardening analyses.

Principal investigator in the development of large computer programs to study two-dimensional stress wave propagation problems in general nonlinear media. Application of the finite element methods to stress wave problems.

Major participant in studies involving investigations of structural response to shock loadings and analysis of reactor containment shell structures to large plastic deformations.

From September 1967 to date, at The City College, Department of Civil Engineering.

Conducting research studies in stress-wave propagation; finite strain and medium-structure interaction effects. Development of three-dimensional finite element programs to study stress wave problems.

Other:

Summers of 1956, and 1957 and 1958, with Tippetts, Abbott, McCarthy and Stratton, Consultant Engineers, as Soils Engine

Resident engineer on earth moving program involving soil stabilization and compaction for foundation of a large industrial site.

2

Field supervision of soils exploration programs for large earth dams, flood control projects and river erosion problems.

Education:

B.C.E., City College of New York, 1956  
M.S. in Civil Engineering, Columbia University,  
Major in Soil Mechanics and Foundation Engineering,  
1958  
Ph.D. in Civil Engineering at Illinois Institute of  
Technology, 1966

Societies:

American Society of Civil Engineers  
American Society of Mechanical Engineers  
Chi Epsilon  
Sigma Xi  
Tau Beta Pi  
Chairman, Applied Mechanics Division, Chicago Section,  
ASME (1964-1965)  
Reviewer, Applied Mechanics Reviews, ASME  
Reviewer, Structures Division, ASCE  
Reviewer, Pressure Vessel and Piping Division, ASME

Publications:

1. "Representative Triaxial Testing", Thesis, Department of Civil Engineering, Columbia University, 1958.
2. "Stresses in the Vicinity of Deep Underground Shelters", Proceedings, 32nd Symposium on Shock, Vibration and Associated Environments, Part II, Bulletin No. 32, Off. of the Director of Defense Research and Engineering.
3. "Approximate Burst Strength of Thin-Walled Cylinders with Hemispherical Caps", with N.A. Veil, M.A. Salmon, Journal AIAA, Vol. 1, No. 9, pp. 2088, September 1963.
4. "Comparison of Approximate Theories for the Burst Strength of Finite Cylinders", with N.A. Veil, Transactions, American Nuclear Society, Vol. 6, No. 1, pp. 115, June 1963.
5. "The effect of End Conditions on the Burst Strength of Finite Cylinders", with N.A. Veil, M.A. Salmon, Journal of Applied Mechanics, Vol. 3, No. 1, pp. 97, March 1964.

6. "The Strength of Thin-Walled Cylinders Subjected to Dynamics Internal Pressures", Journal of Applied Mechanics, Vol. 32, No. 1, pp. 104, March 1965.
7. "A Simplified Soil-Structure Interaction Model to Investigate the Response of Buried Silos and Cylinders", with R. R. Robinson, M. A. Salmon, Proceedings, Symposium on Soil-Structure Interaction, pp. 303, University of Arizona, September 1964.
8. "Experiments on Circular Cylinders with Flexible Roof Plates Buried in Sand", with A. Longinow, Proceedings, Symposium on Soil-Structure Interaction, pp. 423, University of Arizona, September 1964.
9. "The Theory of Limiting Equilibrium for Axisymmetric Problems: A Comparison with Experiment on Silo Skin Friction", with A. Longinow, Proceedings, Symposium on Soil-Structure Interaction, pp. 583, University of Arizona, September 1964.
10. "Crushable Materials for Structural Blast Shields", Journal, Structures Division, ASCE, Vol. 91, pp. 229, June 1965.
11. "Response of Buried Silos and Internal Systems to Ground Shock", with A. Wachowski, Proceedings, International Symposium on the Use of Electronic Digital Computers in Structural Engineering. University of Newcastle upon Tyne, 1966.
12. "Response of Crushable Foam Encased Buried Cylinders", Thesis, Illinois Institute of Technology, June 1966.
13. "Finite Element Approach to Stress Wave Problems", Journal, Engineering Mechanics Division, ASCE, April 1967.
14. "Finite Element Solution for Wave Propagation in Layered Media Caused by a Nuclear Detonation", with A. Wachowski, and U. L. Barnwell, presented at the International Symposium on Wave Propagation and Dynamic Properties of Earth Materials, Albuquerque, New Mexico, 1967.
15. "Response of Crushable Foam Encased Buried Cylinders", with E. Vey, Journal, Soil Mechanics Division, Vol. 95, No. SM5, September 1969.
16. "Two-Dimensional Wave Propagation Through Nonlinear Media" Journal of Computational Physics, Vol. 4, No. 2, August 1969.

- 5
17. "Structure-Foundation Interaction of a Nuclear Power Plant with a Seismic Disturbance", with C. A. Miller, Nuclear Eng. & Design, December, 1970.
  18. "Analysis of Soil-Structure Interaction Effects Under Seismic Excitation", First Inter. Conf. on Structural Mechanics in Reactor Technology, Berlin, September 1971.
  19. "Dynamic Response of Nonlinear Media at Large Strains", with J. Heifitz, Journal, Eng. Mechanics Division, ASCE, pp 1511-1528, Vol. 98, EM6, December 1972.
  20. "Seismic Analysis of Liquid Sodium Storage Tanks", with C. A. Miller, Proceedings, 5th World Conference on Earthquake Engineering, Rome, June 1973.
  21. "Rocking Effects in a Nuclear Power Plant Subjected to a Seismic Disturbance", with C. A. Miller, Proceedings, 5th World Conference on Earthquake Engineering, Rome, June 1973.
  22. "Influence of Soil-Structure Interaction Parameters on Floor Response Spectra", with C. A. Miller, Proceedings, 2nd Inter. Conf. on Struct. Mechanics in Reactor Technology, Berlin, September 1973.
  23. "Finite Element Analysis for Soil Amplification Studies", with L. A. Lufvano, Proceedings, ASCE Specialty Conference on Structural Design at Nuclear Plant Facilities, Vol. II, Chicago, December 1973.
  24. "Mesh Size Criteria for Soil Amplification Studies", C.J. Costantino, C.A. Miller, and L. Lufvano, Proceedings 3rd Structural Mechanics in Reactor Technology Symposium, September 1975.
  25. "Facility Design Constraints for Combined Seismic and Thermal Loading", C.A. Miller and C.J. Costantino, Technology Symposium, September 1975.
  26. "Soil-Structure Interaction Parameters from Finite Element Analysis", C.J. Costantino, C.A. Miller and L. Lufvano, Proceedings Conference on Extreme Load Conditions and Finite Analysis Procedure, September 1975.
  27. "Seismic Analysis", C.A. Miller and C.J. Costantino, Shock and Vibration Computer Programs, Reviews and Summaries, edited by W. & E. Pilkey, The Shock and Vibration Information Center, United States Department of Defense, 1975.

THOMAS G. DUNNING

PROFESSIONAL QUALIFICATIONS

INSTRUMENTATION AND CONTROL SYSTEMS BRANCH

DIVISION OF SYSTEMS INTEGRATION

I have been employed by the Nuclear Regulatory Commission since November 1976. From June 1979 to the present time, I have been a Section Leader in the Instrumentation and Controls Systems Branch, Division of Systems Integration. Prior to my present assignment, I served as a Senior Engineering Systems Analyst in the Plant Systems Branch, Division of Operating Reactors. I have participated in the review of instrumentation, control, and electrical systems of numerous nuclear power stations and in the formulation of related standards and Regulatory Guides. I am duly registered as a Professional Engineer in Control Systems Engineering in the state of California, holding Certificate No. 752 conferred the 13th day of October 1976.

The Instrumentation and Control Systems Branch performs an indepth technical review of the design, fabrication, qualification, and operation of nuclear power plant instrumentation and control systems important to safety. This review includes a comprehensive assessment of the systems for all power reactors, for adherence to appropriate codes and standards implementing the Commission's requirement and encompasses the complete evaluation of the applicant's safety analysis reports, generic topical reports, and other design information. Further, the Branch develops the bases for Regulatory Guides for instrumentation and control systems designs; evaluates experience obtained during the construction and operation of nuclear power plants and relates this information to future evaluations and acceptance criteria; and participates in the development of Regulatory Guides and regulations pertaining to instrumentation and control systems and other systems in the Branch area of responsibility. As a Section

Leader, I supervise the work of six staff members in carrying out the responsibilities of the Branch.

I hold a Bachelor of Science degree in Electrical Engineering and a Master of Science degree in Nuclear Engineering which were conferred by the University of Wisconsin; Madison, Wisconsin. In addition, I have taken post graduate courses in controls systems analysis as well as specialized training in nuclear power plant design and operations, engineering analysis, and fire protection.

My nuclear engineering experience background derives from my current employment at the Nuclear Regulatory Commission and at General Atomic Company, San Diego, California from June 1960 to November 1976. While assigned to the Division of Operating Reactors I participated in the review and evaluations of instrumentation and control systems design changes for operating reactors. In addition, I was assigned as a group leader in a team review effort of fire hazards analysis reports, including onsite inspections for 13 operating reactors. During the 16 years plus at General Atomic, I held various positions in the area of instrumentation and control systems design for High Temperature Gas Cooled Reactors. I was involved in the preparation of specifications for radiation and process monitoring and control systems for the Peach Bottom Unit 1 nuclear plant and subsequently spent two years as a startup engineer at this facility. On the Fort St. Vrain project I was assigned as a Section Leader for the NSSS process control systems and was responsible for the analysis, design and specifications for control and protection systems. This work included safety analysis and equipment qualification of safety systems in support of operating license requirements. For one year I was assigned to the Fort St. Vrain site engineering office as lead instrumentation and controls engineer, responsible for all design changes to instrumentation, control and protection systems. I

THOMAS G. DUNNIN

subsequently held positions as Project Engineer for nuclear power plant projects.

WALTER P. HAASS

PROFESSIONAL QUALIFICATIONS  
DEPUTY CHIEF, QUALITY ASSURANCE BRANCH  
DIVISION OF QUALITY ASSURANCE,  
SAFEGUARDS, AND INSPECTION PROGRAMS  
OFFICE OF INSPECTION AND ENFORCEMENT  
U.S. NUCLEAR REGULATORY COMMISSION

My name is Walter P. Haass. I am the Deputy Chief, Quality Assurance Branch, Division of Quality Assurance, Safeguards, and Inspection Programs in the Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission (NRC). I am also the Section Chief (Acting) of the Licensing Section within the Quality Assurance Branch. My duties and responsibilities are to direct, supervise, and coordinate the review of nuclear power plant license applications and topical reports to determine compliance with the Commission's quality assurance criteria stated in Appendix B to 10 CFR Part 50 for plant design, construction, and operation to assure protection of the public health and safety.

I received a Bachelor of Science degree in Mechanical Engineering from Stevens Institute of Technology in 1952.

Upon graduation, I joined the Westinghouse Electric Corporation with an initial assignment on the Graduate Student Training Program. As part of this program, I spent one year at the Oak Ridge School of Reactor Technology. My next assignment was at the Atomic Power Division where I was engaged in the thermal-hydraulic and systems analysis aspects for the design of proposed nuclear power plants.

In 1959, I accepted a position at the Martin Marritta Corporation, Nuclear Division. My activities included project engineering work on the mechanical design aspects of the PM-1 and PM-3A portable nuclear power plants at Sundance, Wyoming and McMurdo Sound, respectively; and program management work for several radioisotopic SNAP programs including SNAP-11 and SNAP-13.

In 1968, I joined the Atomic Energy Commission's regulatory staff (now NRC) as a licensing program manager (LPM) responsible for overall management of the staff's review of several nuclear power plant applications for construction

permits. I was also involved in the development of guidance for the review of quality assurance program descriptions based on the QA criteria given in Appendix B. In 1972, I became the Technical Assistant for Boiling Water Reactors (BWRs), reporting to the Assistant Director for BWRs. In 1974, I was assigned to the position of Special Assistant for Standardization with the responsibility for developing the programmatic requirements for the licensing of standardized nuclear power plants.

In June 1978, I was appointed to the position of Chief, Quality Assurance Branch in the Division of Engineering, Office of Nuclear Reactor Regulations. My duties and responsibilities were to direct, supervise, and coordinate the review of nuclear power plant license applications and topical reports to determine compliance with the Commission's quality assurance criteria stated in Appendix B to 10 CFR Part 50 for plant design, construction, and operation to assure protection of the public health and safety.

## Professional Qualifications

James P. Knight

U. S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of Engineering

I am Assistant Director for Components and Structures Engineering responsible for the review and evaluation of design criteria to ensure the integrity of structures, systems and mechanical components, including the dynamic analyses and testing of safety related structures, systems and components, the geological, geotechnical and seismological characteristics of reactor sites, the seismic design bases, criteria for protection against the dynamic effects associated with natural environmental loads and postulated failures of fluid systems for nuclear facilities and the stability of soils and foundation systems. In this capacity I am responsible for the activities of the Structural and Geotechnical Engineering Branch, the Mechanical Engineering Branch, the Geosciences Branch (geology and seismology), and the Equipment Qualification Branch.

I received a B.S. Degree in Mechanical Engineering from Northeastern University in 1957. Since that time, I have completed the equivalent of approximately 35 semester hours at the graduate level in structural dynamics, nuclear engineering and fracture mechanics at the Massachusetts Institute of Technology, Lehigh University and the George Washington University.

From June 1957 to September 1959 I served as a commissioned officer with the U. S. Army Corps of Engineers.

From September 1959 to October 1963 I was employed by the Special Products Division of the American Machine & Foundry Company, Alexandria, Virginia.

In the latter period of this experience, I had full responsibility for design concept, material selection and analytical review for critical components of high speed spin test equipment, re-entry simulation systems and spin stabilization test systems for manned and un-manned spacecraft.

In October 1963, I joined the Reactor Radiations Division at the National Bureau of Standards. During this period, I was responsible for the mechanical and structural design, testing and certification of the NBSR core elements, control rod drive mechanisms, high level radiation handling equipment and structures to support reactor components and major experimental facilities. I was also fully responsible for the analytical review and experimental certification of the NBSR reactor vessel and a variety of experimental equipment to the requirements of the ASME Boiler and Pressure Vessel Code. In early 1967, I was appointed Chief of the Engineering Services Section responsible for all structural, mechanical and electrical engineering design services for both the NBSR facility and experimental equipment development. Following receipt of the NBSR operating license, I was appointed Vice-Chairman of the NBSR Hazards Committee responsible for review of the mechanical and structural hazards for all experiments proposed for insertion in the NBSR.

In September 1968, I joined the U. S. Atomic Energy Commission and have remained with this organization through the transition to the U. S. Nuclear Regulatory Commission. In 1973 I was appointed Chief of the Mechanical Engineering Branch. In 1976 I was appointed to my present position. During this time, I have participated in the review and evaluation of over fifty

construction permit and operating license applications and participated in the review and planning activities for Government and industry sponsored programs such as the Heavy-Section Steel Technology Program, development of the B31.7 Nuclear Power Piping Code and the ASME Nuclear Component Code.

I have served as a member of numerous industry code and standards writing bodies including: the ASME Section III Subgroup on Pressure Relief, the ASME Section III Working Group for Design of Valves, the ASME Section III Working Group for Design of Pumps, ANSI B16 Subcommittee N - Steel Valves, ANSI B16 Subcommittee H - Valve Operability and ASME Subcommittee on Qualification of Nuclear Plant Equipment.

John L. Knox  
Professional Qualifications  
Power Systems Branch  
Division of System Integration  
Office of Nuclear Reactor Regulation

I am a Senior Reactor Systems Engineer (Electrical) in the Power Systems Branch in the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission. In this position I perform technical reviews, analyses, and evaluations of reactor plant features pursuant to the construction and operation of reactors.

Education

In 1962, I received an Associates of Arts degree in Electrical Power System Technology from Montgomery College. In 1971, I received a Bachelor of Science degree in Electronic Systems Engineering from the University of Maryland. Since 1974, I have taken a number of courses on PWR and BWR system operation, equipment qualification, and reactor safety.

Experience

From 1971-1974, I worked for Potomac Electric Power Company in Washington, D.C. I was assigned to the underground power Transmission Engineering Group and my duties included relocation and restoration of underground power and transmission cables due to the subway construction project. (Prior to this, I spent four years in the Air Force working on the F4 aircraft electronic weapons control systems.)

From 1974 to the present, I have worked for the Nuclear Regulatory Commission involved in the technical review of electrical systems (onsite and offsite power, instrumentation and control). Through 1976, I was a member of the Electrical Instrumentation and Control Systems Branch. This branch was split in January 1977 into an I&C branch and a power branch. Since this split, I have been a member of the Power Systems Branch. My present responsibilities include review and evaluation of onsite and offsite electric power systems.

PROFESSIONAL QUALIFICATIONS OF  
DENNIS J. KUBICKI  
CHEMICAL ENGINEERING BRANCH  
DIVISION OF ENGINEERING

I am a Fire Protection Engineer in the Chemical Engineering Branch of the Division of Engineering, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission. In my present position, I have responsibility for performing safety reviews and evaluations of the fire protection programs of nuclear power plants. This includes the determination of the degree of conformance of the plants with applicable NRC fire protection guidelines and requirements.

I graduated from Illinois Institute of Technology in 1974 with a B.S. degree in Fire Protection and Safety Engineering. I have a Master's Degree in Business Administration from the University of Maryland, and I am working toward a Master's Degree in Safety from the University of Southern California (Eastern Division).

From 1974 to 1977 I was employed by Insurance Services Office of Maryland as a Fire Protection Engineer, responsible for the evaluation of the fire protection for diverse building types and occupancies. My work also included surveying municipalities to assess the adequacy of local fire departments, water systems, municipal fire alarm systems, and city-wide structural conditions as they related to fire risk.

From 1977 to 1978 I was employed by the Maryland State Fire Marshal's Office as a Fire Protection Engineer, responsible for evaluating the fire safety of health care facilities, such as hospitals, nursing homes and state mental institutions.

From 1978 to 1980 I was employed by the General Services Administration of the U.S. Government where I was responsible for the fire protection of nearly 150 buildings that were owned or leased by the Government. This included the design and testing of fire protection systems, the evaluation of structural conditions and occupancy hazards as they related to life and fire safety, the investigation of fires, and the development of fire protection policy.

From 1980 to 1982 I was the Assistant Manager, Industrial and Fire Safety, in the NASA Safety Office. My responsibilities included the development of fire protection and life safety policies for NASA field installations; the evaluation of the safety programs at NASA field installations; the review of proposed fire protection projects, equipment and apparatus; participation in fire and accident investigation boards; and research to provide solutions to unique fire protection problems.

I have attended numerous fire protection and industrial and life safety seminars.

I am a member in the National Fire Protection Association, the Society of Fire Protection Engineers, and the American Society of Safety Engineers.

I have had several articles published in Professional Journals. The two most recent were published in the May 1982 and July 1981 issues of Fire Journal entitled: "Life Safety for Buildings, Passenger Vessels and Transport Aircraft, A Comparative Analysis" and "Fire Protection and Emergency Rescue Planning for the NASA Space Shuttle," respectively.

PROFESSIONAL QUALIFICATIONS  
PAO-TSIN KUO  
U.S. NUCLEAR REGULATORY COMMISSION  
STRUCTURAL AND GEOTECHNICAL ENGINEERING BRANCH  
DIVISION OF ENGINEERING

I am a Section Leader in Division of Engineering, responsible for review and evaluation of design criteria for structural systems, static and dynamic analyses, design, and testing of safety-related structures, and the criteria for protection against the adverse effects associated with natural environmental loads and postulated failures of fluid systems for nuclear facilities.

I received an Engineering Diploma in Civil Engineering from Taipei Institute of Technology in 1958, a M.S. degree in Civil Engineering from North Dakota State University in 1966, and a Ph.D. degree in Civil Engineering from Rice University in 1974. I completed my graduate studies all under scholarships and fellowships. My major fields of studies included structural dynamics, engineering mechanics and earthquake engineering in particular. I was elected to be a member of Sigma Xi honor society in 1970. Currently, I am a member of both Earthquake Engineering Research Institute and American Society of Civil Engineers. I am also a registered Professional Engineer in the State of Maryland.

From September 1958 to June 1960, I served as a commissioned lieutenant officer with Chinese Marine Corps. During the last eight months of this period I also served as a field engineer involved in the reconstruction of a reinforced concrete dam destroyed by a record flood.

From June 1960 to June 1961, I was employed by Taiwan Water Conservancy Bureau as a civil engineer involved in embankment line layout.

From July 1961 to March 1965, I joined Keelung Harbor Bureau in Taiwan, China. I served as a field structural engineer responsible for

construction of a number of harbor structures including both steel and reinforced concrete structures.

From April 1965 to September 1965, I was employed by John A. Mackel and Associates in Los Angeles, California as a Designer responsible for analysis and design of highrise commercial buildings.

Immediately after I received my MSCE degree, I was employed as a Senior Design Engineer by Cushing and Nevell Technical Design Corporation on contract to Ebasco Services, Inc. in New York City from July 1966 to August 1967. During this period I was primarily concerned with the structural analysis and design for a commercial nuclear power plant.

From March 1971 to May 1975, I was associated with Bechtel Power Corporation in Gaithersburg, Maryland. Between the years of 1971 and 1973, I served as a Senior Engineer in charge of seismic analyses for a commercial nuclear power plant. I was also responsible for reviewing and approving the seismic qualifications of mechanical and electrical equipment by either analytical means or laboratory testing. During this period I was also engaged in impact analysis for cask drop and aircraft impact and in developing design criteria and methods for pipe whip restraint design.

Between the years of 1973 to 1975, I served as an Engineering Specialist responsible for reviewing and establishing criteria for seismic analyses of structures, performing specialized investigative studies in the seismic analysis area, and advising the Chief Engineer concerning problems related to seismic analyses and design.

Representing the Gaithersburg Division, I also served as a member of the Bechtel Seismic Task Force Committee during the period from 1972 to 1975. The Committee had the responsibility of establishing the corporate standards related to seismic analyses and design. We co-authored the Bechtel topical report, BC-TOP-4A, entitled "Seismic Analyses of

Structures and Equipment for Nuclear Power Plants" which is widely referenced by the nuclear industry.

In June 1975, I joined the Nuclear Regulatory Commission and have remained with this organization since. During this time, I have participated in the review and evaluation of many construction permits and operating licenses and in the generic review of topical reports, seismic analysis methodology, and structural aspects of suppression pool dynamics. I have also participated in the NRC sponsored confirmatory research activities related to seismic analyses.

I have also served as a member of AISC Nuclear Specification Task Committee III responsible for writing the nuclear specification (ANSI N690).

PROFESSIONAL QUALIFICATIONS

OF

ROBERT G. LaGRANGE

I am Section Leader of the Environmental Qualification Section of the Equipment Qualification Branch, Division of Engineering, Office of Nuclear Reactor Regulation, United States Nuclear Regulatory Commission. I am responsible for planning, organizing and directing the activities of the section in performing technical reviews, analyses and evaluations of the adequacy of the environmental qualification of electrical and mechanical equipment whose failure, due to such environmental conditions as temperature, humidity, pressure and radiation, could adversely affect the performance of safety systems. I was previously a Senior Mechanical Engineer in the Seismic and Dynamic Loads Qualification Section of the Equipment Qualification Branch. My duties and responsibilities involved the review and evaluation of the structural integrity, operability and functional capability of safety related mechanical and electrical equipment under all normal, abnormal, and accident loading conditions, and in the event of seismic occurrences and other pertinent dynamic loads. Prior to my positions in the Equipment Qualification Branch, I was an Applied Mechanics Engineer in the Engineering Branch, Division of Operating Reactors. My duties and responsibilities included the review, analysis and evaluation of structural and mechanical aspects of safety issues related to reactor facilities licensed for power operation.

I have a B.S. degree in Mechanical Engineering from the University of Maryland (1972) and have done graduate work at both the University of Maryland and George Washington University.

Prior to my joining the NRC, I was associated with Bechtel Power Corporation as a Group Leader in the piping stress analysis group. My duties and responsibilities included performing and supervising stress analyses of nuclear power plant piping, and related activities, with emphasis on seismic analysis.

is: Charles A. Miller, Senior Consultant Structural Analysis Division, ENL.

is: Professor, Department of Civil Engineering, CUNY.

erience:

Teaching:

The City College of the  
City University of New York

1966 to Present

Research:

From December 1957 to August 1968, at IIT Research Institute conducting research studies for both industry and government. From Assistant Engineer to Assistant Director of the Engineering Mechanics Division responsible for a group of twenty-five engineers engaged in solid mechanics research.

Project engineer on studies dealing with the vulnerability of military and industrial facilities to the effects of nuclear weapons; the design of hardened radar antennas; and the conceptual design and cost trade off of alternate approaches for superhard missile launch facilities.

Principal investigator on studies related to the: mathematical modeling of the dynamic response of structural/mechanical systems; the development of minimum cost designs for prestressed concrete structures; the creep behavior of reinforced concrete structures; and the application of large scale structural computer codes to analyze the response of complex structures to both static and dynamic loading.

Other:

From June 1953 to May 1954, at M. W. Kellogg Co. involved in the hydraulic design of petrochemical plants.

Registration:

Registered professional engineer in New York State.

Education:

- B.S. in Civil Engineering, Manhattan College. (1953)  
M.S. in Civil Engineering, Illinois Institute of Technology. (1960)  
Ph.D. in Civil Engineering, Illinois Institute of Technology. (1966)

Publications:

1. "Dynamic Analysis of Two Hinged Arches", M.S. Thesis, Illinois Institute of Technology, January 1960.
2. "Response of Electronic Equipment to Nuclear Blast", C. A. Miller and J. A. Granath, Proceedings, 29th Symposium on Shock, Vibration and Associated Environments.
3. "Influence Coefficients for Two-Hinged Arches", C. A. Miller and S. A. Guralnick, Proceedings, ASCE, Journal of the Structural Division, August 1962.
4. "Dynamic Response of Slab Structure Exhibiting Coulomb Friction to Combined Air and Shock Loading", E. Sevin, C. A. Miller and R. H. Robinson, Proceedings, Symposium on Use of Computers in Civil Engineering, September 1962.
5. "Computers in Structural Engineering", Frontier, Autumn, 1965.
6. "An Investigation of the Behavior of Reinforced Concrete Beams Subjected to Repeated Cycles of Loadings", Ph.D. Thesis, Illinois Institute of Technology, January 1966.
7. "Educational Problems of New Computer Users", Presented at Civil Engineering Program Application Group (CEPA) March, 1966.
8. "The Response of Plain Concrete to Repeated Loads", C. A. Miller and S. A. Guralnick, Proceedings of the RESEARCH International Symposium on the Effects of Repeated Loading of Materials and Structures, Mexico City, September 1966.
9. "The Dynamic Analysis of Non-Orthogonal Grid Systems", C. A. Miller and R. E. Krauss, International Conference on Space Structures, London, September 1966.

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10. "Opportunities in Continuing Education in Computer Sciences", presented at ASCE sponsored Symposium on Computer Applications for Civil Engineers at Illinois Institute of Technology, November 1966.
  11. "A Reinforced Concrete Beams Subjected to Repeated Loads", Proceedings ASCE, Journal of the Structural Division, October 1967.
  12. "Creep Deformations of Thick Prestressed Rings"; C. A. Miller, Nuclear Engineering and Design (7) 1968, 87-93.
  13. "Interior Structure Motion Environment", Presented at DASA Long Range Planning Meeting, Albuquerque, N.M., January 1968.
  14. "Creep of Reinforced Concrete Beams", Presented at ASCE Joint Specialty Conference on Optimization and Non Linear Problems, Chicago, Illinois, April 1968.
  15. "Creep Effects in Continuous Reinforced Concrete Beams", C. A. Miller, Proceedings IASSR Symposium on Design of Concrete Structures for Creep, Shrinkage and Temperature Changes, September 1970.
  16. "Creep Deflection of Reinforced Concrete Beams", C.A. Miller and S. A. Guralnick, Proceedings ASCE, Journal of the Structural Division, December 1970.
  17. "Structure-Foundation Interaction of a Nuclear Power Plant with a Seismic Disturbance", C. A. Miller and C. J. Costantino, Nuclear Engineering and Design, December 1970.
  18. "Redistribution of Internal Forces in Concrete Beams as a Result of Creep", Presented at AGI annual meeting, March 1971.
  19. "Seismic Analysis of Liquid Sodium Storage Tanks", C. A. Miller and C. J. Costantino, Proceedings 5th World Conference on Earthquake Engineering, June 1973.
  20. "Rocking Effects in a Nuclear Power Plant Subjected to a Seismic Disturbance", C. A. Miller and C. J. Costantino, Proceedings 5th World Conference on Earthquake Engineering, June 1973.
  21. "Influence of Soil-Structure Interaction Parameters on Floor Response Spectra", C. J. Costantino and C. A. Miller Proceedings 2nd Structural Mechanics in Reactor Technology Symposium, September 1973..

- 9
22. "Mesh Size Criteria for Soil Amplification Studies", C.J. Costantino, C.A. Miller, and L. Lufrano, Proceedings 3rd Structural Mechanics in Reactor Technology Symposium, September 1975.
  23. "Facility Design Constraints for Combined Seismic and Thermal Loading", C.A. Miller and C.J. Costantino, Proceedings 3rd Structural Mechanics in Reactor Technology Symposium, September 1975.
  24. "Soil-Structure Interaction Parameters from Finite Element Analysis", C.J. Costantino, C.A. Miller and L. Lufrano, Proceedings Conference on Extreme Load Conditions and Finite Analysis Procedure, September 1975
  25. "Seismic Analysis", C.A. Miller and C.J. Costantino, Shock and Vibration Computer Programs, Reviews and Summaries, edited by W. & B. Filkey, The Shock and Vibration Information Center, United States Department of Defense, 1975.

References:

American Concrete Institute  
American Society of Civil Engineers  
Chi Epsilon  
Sigma Xi

PHILIP J. MORRILL  
PROFESSIONAL QUALIFICATIONS  
REGION V - WALNUT CREEK, CALIFORNIA  
U.S. NUCLEAR REGULATORY COMMISSION

My name is Philip J. Morrill. I am employed by the United States Nuclear Regulatory Commission as a Reactor Inspector in the Division of Resident, Reactor Projects and Engineering Programs, Region V, Walnut Creek, California. My primary responsibility in this position is the inspection of nuclear power plants during the operating phase to determine compliance with NRC rules and regulations and thereby verify safety of operations.

I received a Bachelor of Science degree from the U.S. Naval Academy in 1966. I was employed by the U.S. Navy in the Naval Nuclear Power Submarine program from 1966 until 1971. During this time, I became qualified as Engineering Officer of the Watch for the AIW pressurized water nuclear propulsion plant prototype and was later qualified as Engineering Officer of the Watch on board the USS John Marshall (SSBN 611 (C)), a nuclear powered polaris missile submarine (1969 through 1971). I was also the ship's Main Propulsion Assistant (responsible for maintenance and administration of the nuclear reactor and power generation equipment) for one and one-half years of this time. In 1971, I joined the Bechtel Corporation in San Francisco, California and was assigned to the Susquehanna Steam Electric Station project mechanical group. From August 1971 through September 1972, I was responsible for the design and development of the radioactive waste disposal system. From September 1972 through January 1974, I was promoted to the position of project licensing engineer. From January 1974 through March 1976, I was again promoted to the position of Project Nuclear Group Leader, responsible for managing and supervising the efforts of six to fourteen engineers.

In March 1976, I was hired by the U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Region V, in Walnut Creek, California, as a reactor inspector for the Reactor Construction and Engineering Support Branch. In this position, I participated in construction inspections of the San Onofre Nuclear Generating Station and successfully completed a nondestructive examination school at Convair Division of General Dynamics, (San Diego, California). I also completed NRC sponsored schools in quality assurance and Inspection Techniques in Bethesda, Maryland. In January 1977, I transferred to the Reactor Operations and Nuclear Support Branch of Region V, Office of Inspection and Enforcement and was assigned as back-up inspector for the Trojan Nuclear Plant. In succeeding months I participated in inspections of the Rancho Seco, Humboldt, and Trojan nuclear plants in addition to completing five weeks of pressurized water reactor systems and operations training. For one year I was then assigned as Principal Inspector for the Trojan Plant. In the fall of 1978, my assignment was changed to follow-up the preoperational testing of the Diablo Canyon Nuclear plant and to conduct operations inspections at the Rancho Seco Nuclear Plant. In 1980 my duties were modified to include conducting the portions of the NRC inspection program conducted by the regional office staff related to preoperational testing, power ascension testing, and plant operations of the Diablo Canyon Plant. After the discovery of significant design deficiencies with the Diablo Canyon Plant in the Fall of

1981, I was tasked to monitor and inspect the activities of an Independent Design Verification Program managed by Teledyne Engineering Services. This program is being conducted to determine the adequacy of design and construction of the Diablo Canyon Plant and to determine the adequacy of any modifications which result from that program. Although these have been my principle assignments, I have also participated in a variety of power, and research reactor inspections during the last five years.

I am presently a registered Professional Mechanical Engineer and Nuclear Engineer in the State of California.

RESUME

PERSONAL DATA

Name : A.J. Philippopoulos  
Home Address : 11 Vernon St., Farmingdale, NY 11735  
Date and Place of Birth : July 18, 1950. Greece. U.S. Permanent  
Resident.  
Marital Status : Married. One child

EDUCATION

Doctor of Philosophy in Civil Engineering, Polytechnic Institute of New York,  
May 1980. Major for doctorate: Civil Engineering. Minor for doctorate:  
Applied Mechanics, Mathematics.

Master of Science in Civil Engineering, Polytechnic Institute of Brooklyn,  
June 1976.

Bachelor of Science in Civil Engineering, Aristotelion University of  
Thessaloniki, School of Engineering, June 1975.

AWARDS

Research Fellowship, Senior Grade. Received during graduate studies at  
Polytechnic Institute of New York. Research grants sponsored by the National  
Science Foundation.

MEMBERSHIPS

Sigma Xi, The Scientific Research Society of North America, Associate Member,  
May 1977.

American Society of Civil Engineers, Associate Member, November 1976.

Technical Chamber of Greece, Member, June 1975.

PRESENT EMPLOYMENT

Brookhaven National Laboratory, Department of Nuclear Energy, Structural  
Analysis Division, Upton, NY 11973. Position: Assoc. Scientist.

## PUBLICATIONS

1. "An Assessment of Soil-Structure Interaction Effects Based on Simple Models", Philippacopoulos, A.J. and Miller, C.M., 7th International Conference on Structural Mechanics in Reactor Technology, Chicago, IL, Paper K 10/3.
2. "Site-Structure Dependent Excitations", Philippacopoulos, A.J., Journal of Nuclear Engineering and Design, Vol. 74, 1982, pp. 153-163.
3. "Critical Seismic Assessment of Life Line Structures", Wang, P.C. and Philippacopoulos, A.J., Proceedings of the 7th World Conference on Earthquake Engineering, Istanbul, Turkey 1980, pp. 257-264.
4. "Application of Reduction Methods to Nuclear Power Plant Structures", Miller, C.M. and Philippacopoulos, A.J., Report NUREG/CR-3074, prepared for the U.S. Nuclear Regulatory Commission, October 1982.
5. "Evaluation of Simultaneous Action of Earthquake, LOCA and SRV on Mark III Containment and Drywell Structures", Philippacopoulos, A.J. and Reich, M., 6th International Conference on Structural Mechanics in Reactor Technology, Paris, France, 1981, Paper J 2/2.
6. "Critical Seismic Response of Nuclear Reactors", Drenick, R.F., Wang, P.C., Yun, C.B. and Philippacopoulos, A.J., Journal of Nuclear Engineering and Design, Vol. 59, 1980, pp. 427-439.
7. "Behavior of Basic Soil-Structure Interaction Parameters", Philippacopoulos, A.J., submitted to the American Society of Civil Engineers for review and possible publication in the Journal of the Engineering Mechanics Division, December 1982.
8. "Evaluation of Concured Peak Responses", Wang, P.C., Curreri, J., Shooman, M., Wang, Y.K., Philippacopoulos, A.J., Reich, M. and Subudhi, M., Report NUREG/CR-2685, prepared for the U.S. Nuclear Regulatory Commission, May 1982.

PUBLICATIONS (Cont'd)

9. "Dynamic Combinations for Mark II Containment Structures", Philippacopoulos, A.J. and Reich, M., Report NUREG/CR-2039, prepared for the U.S. Nuclear Regulatory Commission, June 1982.
10. "Critical Response Spectra for Linear and Nonlinear Structures", Wang, P.C. and Philippacopoulos, A.J., International Conference for Protection from Natural Disasters, Asian Institute of Technology, Bangkok, 1980, pp. 427-435.
11. "ABS, SRSS and CDF Response Combination Evaluations for Mark III Containment and Drywell Structures", Philippacopoulos, A.J., Report NUREG/CR-1930, prepared for the Nuclear Regulatory Commission, June 1982.
12. "Errors Resulting from Reduction Methods", Miller, C.M. and Philippacopoulos, A.J., 7th International Conference on Structural Mechanics in Reactor Technology, Chicago, IL, Paper K 3/4.
13. "Large Scale Polymer Concrete Vessels for the Direct Utilization of Geothermal Processes", Philippacopoulos, A.J., Koplik, B. and Reich, M., Report BNL-29027, August 1980.
14. "Probability Based Load Criteria for the Design of Nuclear Structures: A Critical Review of the State-of-the-Art", Shinozuka, M., Ellingwood, B.R., Wang, P.C., Meyer, C., Wen, Y.K., Kao, S., Shooman, M.L. and Philippacopoulos, A.J., Report NUREG/CR-1979, prepared for the U.S. Nuclear Regulatory Commission, April 1981.
15. "High Soil-Structure Damping Combined with Low Structural Damping", Miller, C.M., Costantino, C.J. and Philippacopoulos, A.J., 7th International Conference on Structural Mechanics in Reactor Technology, Chicago, IL., Paper K 10/10.
16. "Review of Load Combinations for NSSS and BOP Piping and Equipment of Mark III Plants", Philippacopoulos, A.J., Reich, M. and Wang, P.C. Report NUREG/CR-2686, prepared for the U.S. Nuclear Regulatory Commission, May 1982.

PUBLICATIONS (Cont'd)

17. "Design of Prestressed Polymer Concrete Vessels for Use in Geothermal Power Plants", Koplík, B., Philippacopoulos, A.J. and Reich, M., Report BNL-31127, February 1982.
18. "Upper Bound Floor Response Spectra", Philippacopoulos, A.J., Wang, P.C., Miller, C.M. and Reich, M., accepted for the 8th World Conference on Earthquake Engineering, San Francisco, California.
19. "Independent Seismic Evaluation of the Diablo Canyon Unit 1 Containment Annulus Structure and Selected Piping Systems", Philippacopoulos, A.J., Reich, M., Bezler, P., Miller, C.M., Wang, Y.K., Subudhi, M., Shteyngart, S. and Brown, P., Report NUREG/CR-2834, prepared for the U.S. Nuclear Regulatory Commission, August 1982.
20. "Prediction of Earthquake Resistance of Structures", Wang, P.C. with contributions from Philippacopoulos, A.J., Polytechnic Institute of New York, Final Report to NSF, Grant No. PFR 76-14893, January 1980.
21. "Statistically Evaluated Critical Response Spectra", Wang, P.C., and Philippacopoulos, A.J., submitted for the 8th World Conference on Earthquake Engineering, San Francisco, California.
22. "Seismic and Dynamic Qualification of Safety Related Electrical and Mechanical Equipment in Operating Nuclear Power Plants", Curreri, J., Costantino, C., Reich, M. and Philippacopoulos, A.J., Report NUREG/CR-3266, prepared for the U.S. Nuclear Regulatory Commission, April 1983.

HAROLD E. POLK  
PROFESSIONAL QUALIFICATIONS  
STRUCTURAL AND GEOTECHNICAL ENGINEERING BRANCH  
DIVISION OF ENGINEERING  
OFFICE OF NUCLEAR REACTOR REGULATION

I am a Senior Structural Engineer in the Structural and Geotechnical Engineering Branch, Division of Engineering, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission, Washington, D. C.. I am responsible for reviewing safety analysis reports with regard to structures and seismic analysis for nuclear power plants assigned to me.

I joined the Division of Engineering in November 1974. I have served as Structural Reviewer for the safety reviews of many plants including Hartsville Nuclear Power Station, Black Fox Station, Arkansas Nuclear One Unit 2, Yellow Creek Nuclear Plant, New England Power 1 and 2 and St. Lucie 2.

I hold a Bachelor of Civil Engineering (1958) from North Carolina State College, and did graduate study at North Carolina State College in Structural Engineering. My 25 years experience includes 8 years of aircraft stress analysis and flight performance with the Boeing Company on the Minuteman Missile Program and the Apollo Project which landed the first men on the moon. I joined the NRC staff after completing over 4 years of seismic dynamic analysis of nuclear power plants with the Bechtel Power Corporation of which the last 2 years was a Supervisor of a Seismic Analysis Group.

I am currently a member of the American Nuclear Society, ANS2.2/2.10 Working Group on Seismic Instrumentation and a member of American Institute of Steel Construction, AISC Nuclear Specification Task Committee III.

I am a registered Professional Engineer in the states of Maryland (PE 8075) and Florida (18643).

Professional Qualifications  
Hartmut E. H. Schierling  
U. S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of Licensing

I am currently employed by the U. S. Nuclear Regulatory Commission, Office of Reactor Regulation, as a Senior Project Manager responsible for all licensing aspects associated with the safety and environmental review of the Diablo Canyon Nuclear Power Plant. I assumed this position in August 1983. Prior to this date and since December 1981 I had the responsibility for all licensing aspects related to the NRC staff review and evaluation of the Diablo Canyon Unit 1 verification effort.

I have been employed by the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation since 1969. During this time I have held positions as Project Manager, Systems Analyst, Principal Nuclear Engineer and Senior Project Manager. My assignments were in licensing project management, including a standard balance of plant design and fuel densification task force; in the technical review of nuclear power plants, including containment analysis and systematic evaluation program effort, radiation dose calculations and risk assessment. I was briefly assigned to the NRC Three Mile Island response team and later to the NRC review and evaluation by the Rogoin Task Force. I was temporarily assigned to the NRC Office of Inspection and Enforcement for the development and implementation of guidelines for the systematic assessment of licensee performance (SALP). During these assignments I frequently was designated as acting branch chief and section leader. Throughout my employment I was responsible for the preparation of reports on the specific assignments and for providing input to and issuing safety evaluation reports. My current responsibilities include the coordination of licensing and technical NRC efforts, preparation of internal memorandua and external letters and, preparation of Commission papers.

I studied mechanical engineering at the Institute of Technology in Aachen, West Germany (1955 to 1957) and at South Dakota State College (1957 to 1959) where I received a BSME degree in 1959. From 1960 to 1963 I studied (part-time) Nuclear Engineering at the Catholic University of America and received a MNE degree in 1963. From 1963 to 1970 I continued my graduate studies towards a Doctor of Engineering degree on a part-time and full-time basis. I completed all course requirements comprehensive examinations and research requirements on the subject of two phase flow. I attended various short courses on nuclear reactor safety, two phase flow measurements and probabilistic safety and reliability analysis. I am a member of the Sigma Tau and Sigma Xi engineering and research societies.

I have not sponsored any publication related to any matters of the Diablo Canyon verification effort except for SER Supplement 18, dated August 5, 1983.

I have previously not testified in any NRC hearings.

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Biographical Information

PING-CHUN, Senior Engineer, Structural Analysis Group, Department of Nuclear Energy, Brookhaven National Laboratory, Upton, NY.  
Assistant Professor, Civil Engineering Department, Polytechnic Institute of New York. Born March 10, 1929 Kiangsu, China, Citizenship, USA.

College Degrees: B.S., National Central University of China, 1943; M.S., University of Illinois, 1946; Ph. D., University of Illinois, 1951.

Fields of Interest: Structural Mechanics.

Courses Taught 1981-82 Academic Year: CE 331 Steel Structures; CE 609 Matrix Analysis of Structures I; CE 610 Matrix Analysis of Structures II; CE 616 Finite Elements and Applications.

Professional Activities, Societies and Honors

Professional Society Memberships: American Society of Civil Engineers—Fellow; American Concrete Institute—Member; Chinese Institute of Engineers—Member; Geological Society of America—Member; Earthquake Engineering Research Institute—Member.

Honorary Society Memberships: Sigma Xi, Chi Epsilon.

Positions Held: 1943-1947, Junior Engineer, China Bridge Company; 1950-51, Designer, Sverdrup and Whitney, New York; 1951-1960, Supervising Engineer, Seelye, Stevenson, Vachut, New York; 1960-1963, Associate Professor, Stevens Institute, Hoboken, New Jersey; 1963-Present, Professor, Polytechnic Institute of New York.

Consulting:

The office of Irving Cantor, Consulting Engineers

Publications:

"Composite Action of Concrete Slab and Open Web Joists," by D. J. Kaley and P. C. Wang. Engineering Journal, A.I.S.C., January 1967.

"Elastic-Plastic Analysis and Design of Flexible Arches," by G. Granik, P.C. Wang and S.F. Borg, Trans., New York Academy of Science, March 1967.

"Design and Analysis of Frames for Stability," by H. Switky and P.C. Wang, Journal of Structural Division, A.S.C.E., Vol. 94, No. ST4, April 1969.

"Volume Minimization of Thin Plates Subject to Constraint," by Z. Sherman and P.C. Wang. Journal of Structural Division, A.S.C.E., Vol. 97, EM3, June 1971.

"Minimum Weight Design of Finite Element Structures," by H. Switky and P.C. Wang. Journal of AIAA, Vol. 12, No. 2, February 1974.

"The Behavior of Reinforced Concrete Columns in Flat Plate Structures," by P.C. Wang and Y.W. Lin. Reinforced Concrete Columns, A.C.I. Publication SP-20, pp. 115-120.

ications (continued):

"Critical Excitation and Response of Free Standing Chimneys," by P.C. Wang, W. R. Drenick and J. Vallozzi. Proceedings of the International Symposium on Earthquake Structural Engineering. August 19-21, 1976.

"Critical Seismic Excitation and Response of Structures," by P.C. Wang and R. Drenick. Proceedings of the Sixth World Conference of Earthquake Engineering, New Delhi, January 10-14, 1977.

"Asymptotic Solution for Thermal Stress and Deformation in Orthotropic Non-homogeneous Shells of Revolution," O.A. Fettalloglu and P.C. Wang. Third International Congress on Pressure Vessel, Tokyo. April 18-22, 1977.

"Transient Response of Orthotropic Plates," by P.C. Wang and A.V. duBouchet. Revue des Sciences Techniques. Mécanique Appliquée, Tome 22, No. 1, pp. 149-155, Paris, 1977.

"Seismic Assessment of High-Rise Buildings," by P.C. Wang, Rudolf F. Drenick and J. Vallozzi. Journal of Engineering Mechanics Division, A.S.C.E. EM2, April 1978.

"System Reliability Assessments Using Critical Excitations," by R.F. Drenick and P.C. Wang. The Shock and Vibration Digest. Vol. 10, No. 6, January 1978.

"Subcritical Excitation and Dynamic Response of Structures in Frequency Domain," L.M. Abdelrahman, C.B. Yun and P.C. Wang. Computers and Structures, Vol. 10, pp. 761-771, October 1978.

"Site-Dependent Critical Design Spectra," by P.C. Wang and C.B. Yun. Earthquake Engineering and Structural Dynamics, Vol. 7, pp. 569-578, 1979.

"Effective Duration of Seismic Acceleration and Occurrence of Maximum Response," P.C. Wang and P.C. Wang. Nuclear Engineering & Design, Vol. 52, March 1979.

"Along-Wind Gust Effect on Elevated Structures," by C.B. Yun, A.M. Abdelrahman and P.C. Wang. Engineering Structures, Vol. 1, April 1979.

"Critical Seismic Response of Nuclear Reactors." R.F. Drenick, P.C. Wang, C.B. Yun and A.J. Philippopoulos. Transaction of the 5th International Conference on Structural Mechanics in Reactor Technology, Vol. 13/4, August 1979.

"Critical Response Spectra for Linear and Non-linear Structures," by P.C. Wang and A.J. Philippopoulos. Proceedings of the International Conference of Engineering Structures from Natural Disasters, Bangkok, Thailand, January 1980.

"Critical Seismic Assessment of Lifeline Structures," by P.C. Wang and A.J. Philippopoulos. Proceedings of the 7th World Conference in Earthquake Engineering, Mexico, September 1980.

"Critical Seismic Response of Nuclear Reactors," by R.F. Drenick, P.C. Wang, C.B. Yun and A.J. Philippopoulos. Nuclear Engineering and Design, 59 (1980) pp. 425-434.

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rs:

"Discrete Systems Concepts in Civil Engineering Applications," Part I and Part C. Wang and J.F. Warner, Report to National Science Foundation, Under Grant 46, 1964.

"Review of the Building Requirements of Reinforced Concrete." by P.C. Wang. orded by the Institute of Applied Technology National Bureau of Standards. October

"A Study of Concrete Spalling Conditions of Sidewalks, Center Malls and Bus Stop", sponsored by Asphalt Products Association of Metropolitan New York, by P.C. 1969.

"Case Study of Critical Excitation and Response of Structures," Interia Report by P.C. Wang, W. Wang and R.F. Drenick, under grant AZ72-00219 A01, November 197

"Review of Methods and Criteria for Dynamic Combination in Piping Systems," by M, P.C. Wang, J. Curreni, S. Hou and H. Coradia. Report prepared for U.S. Nuclea Intory Commission, March 1980.

"Prediction of Earthquake Resistance of Structures," by P.C. Wang. Final Report under Grant No. FE2 76-14893, January 1980.

ooks:

"Numerical and Matrix Methods in Structural Mechanics," with Application to al Computers," John Wiley and Sons, 1966.

strations:

P.E., New York and New Jersey.

rs:

Who's Who in America.

Jared S. Wermiel

Professional Qualifications

Auxiliary Systems Branch  
Division of Systems Integration  
Office of Nuclear Reactor Regulation

I am a Section Leader in the Auxiliary Systems Branch in the Division of Systems Integration, Office of Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission. In this position I supervise a group of engineers in performing technical reviews, analyses, and evaluations of reactor plant features within the Auxiliary Systems Branch areas of responsibility pursuant to the construction and operation of reactors.

I received a Bachelor of Science Degree in Chemical Engineering from Drexel University in 1972. Since 1972, I have taken courses in PWR and BWR System Operation, Reactor Safety, Fire Protection, and Systems Reliability.

My experience includes seven years with the Bechtel Power Corporation as a Systems Design Engineer engaged in the design of various nuclear power plant auxiliary and balance of plant systems. These have included cooling water systems, water treatment systems, and fire protection systems.

I joined the Auxiliary Systems Branch of the Commission in March, 1978. Since joining the Commission I have performed safety evaluations on nuclear power plant auxiliary systems and Auxiliary Systems Branch areas of responsibility for a number of operating nuclear power plants and license

applicants including the Virgil C. Summer Nuclear Station, Palo Verde Nuclear Generating Station, Waterford Steam Electric Station, Grand Gulf Nuclear Station, Byron/Braidwood Stations, and Diablo Canyon Nuclear Power Plant. I have also reviewed various topical reports and provided comments on proposed ANSI Standards dealing with various auxiliary systems.

I have had responsibility for the review of the following nuclear power plant auxiliary systems and Auxiliary Systems Branch concerns: new and spent fuel storage, spent fuel pool cooling, fuel handling, service water, component cooling water, condensate storage, ultimate heat sink, instrument air, main steam isolation valve leakage control, heating ventilating and air conditioning, portions of the main steam system, main feedwater, auxiliary feedwater, tornado and internal missile protection, pipe break protection outside containment, flood protection, reactor coolant pressure boundary leakage detection, and post-fire safe shutdown capability.

I am a registered Professional Engineer in the State of Maryland.

I am an Associate Member of the American Institute of Chemical Engineers.

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