REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8310170517 DOC.DATE: 83/10/06 NOTARIZED: NO DOCKET #
FACIL:50-275 Diablo Canyon Nuclear Power Plant, Unit 1, Pacific Ga 05000275
AUTH.NAME AUTHOR AFFILIATION
SCHUYLER,J.D. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards clarifications &/or addl info re 830830 & 0906 & 09 responses to SSER 18 open items.Items 3,4,7,10 & 19 resolved.Encl info resolves Items 1,16,17,18,23,24 & 27.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 16
TITLE: Licensing Submittal: PSAR/FSAR Amdts & Related Correspondence

NOTES:J Hanchett 1cy PDR Documents. 05000275

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	NRR/DL/ADL	1	0	NRR LB3 BC	1	0
	NRR LB3 LA	1	0	SCHIERLING,H 01	1	1
INTERNAL:	ELD/HDS2	1	0	IE FILE	1	1
	IE/DEPER/EPB 36	3	3	IE/DEPER/IRB 35	1	1
	IE/DEQA/QAB 21	1	1	NRR/DE/AEAB	1	0
	NRR/DE/CEB 11	1	1	NRR/DE/EHEB	1	1
	NRR/DE/EQB 13	2	2	NRR/DE/GB 28	2	2
	NRR/DE/MEB 18	1	1	NRR/DE/MTEB 17	1	1
	NRR/DE/SAB 24	1	1	NRR/DE/SGEB 25	1	1
	NRR/DHFS/HFEB40	1	1	NRR/DHFS/LQB 32	1	1
	NRR/DHFS/PSRB	1	1	NRR/DL/SSPB	1	0
	NRR/DSI/AEB 26	1	1	NRR/DSI/ASB	1	1
	NRR/DSI/CPB 10	1	1	NRR/DSI/CSB 09	1	1
	NRR/DSI/ICSB 16	1	1	NRR/DSI/METB 12	1	1
	NRR/DSI/PSB 19	1	1	NRR/DSI/RAB 22	1	1
	NRR/DSI/RSB 23	1	1	REG FILE 04	1	1
	RGN5	3	3	RM/DDAMI/MIB	1	0
EXTERNAL:	ACRS 41	6	6	BNL(AMDTS ONLY)	1	1
	DMB/DSS (AMDTS)	1	1	FEMA-REP DIV 39	1	1
	LPDR 03	2	2	NRC PDR 02	1	1
	NSIC 05	1	1	NTIS	1	1
NOTES:		1	1			

TOTAL NUMBER OF COPIES REQUIRED: LTTR 55 ENCL 48

PACIFIC GAS AND ELECTRIC COMPANY

PG and E 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

October 6, 1983

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Regulatory Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275, OL-DRP-76
Diablo Canyon Unit 1
Safety Evaluation Report, Supplement No. 18

Dear Mr. Eisenhut:

The Diablo Canyon Safety Evaluation Report, Supplement No. 18 (SSER 18) identified items which the Staff considered unresolved as of June 30, 1983. PGandE provided responses to these items on August 30, September 6, and September 9, 1983.

Pursuant to discussions between the Staff and PGandE resulting from the September 28, 1983 meeting, enclosed are clarifications and/or additional information on some of the SSER 18 open items. As a result of the September 28 meeting, PGandE considers SSER 18 open items numbered 3, 4, 7, 10, and 19 (as listed in SECY-83-366, Enclosure 5) to be resolved. PGandE considers the enclosed information to resolve SSER 18 open items (numbered similarly) 1, 16, 17, 18, 23, 24, and 27.

Sincerely,

For J. O. Schuyler

Enclosures

cc: R. L. Cloud, RLCA
W. E. Cooper, TES
J. B. Martin, NRC
H. E. Schierling, NRC
F. Sestak, Jr., S&W
Appeal Board
Service List

B001
1/1

ENCLOSURE 1

Freehand Averaging of Spectra (SECY-83-366, Enclosure 5, Item 1)

ITEM 1: "Free-hand averaging of spectra for containment annulus structure should be in accordance with staff approved technique." (C.3-9)

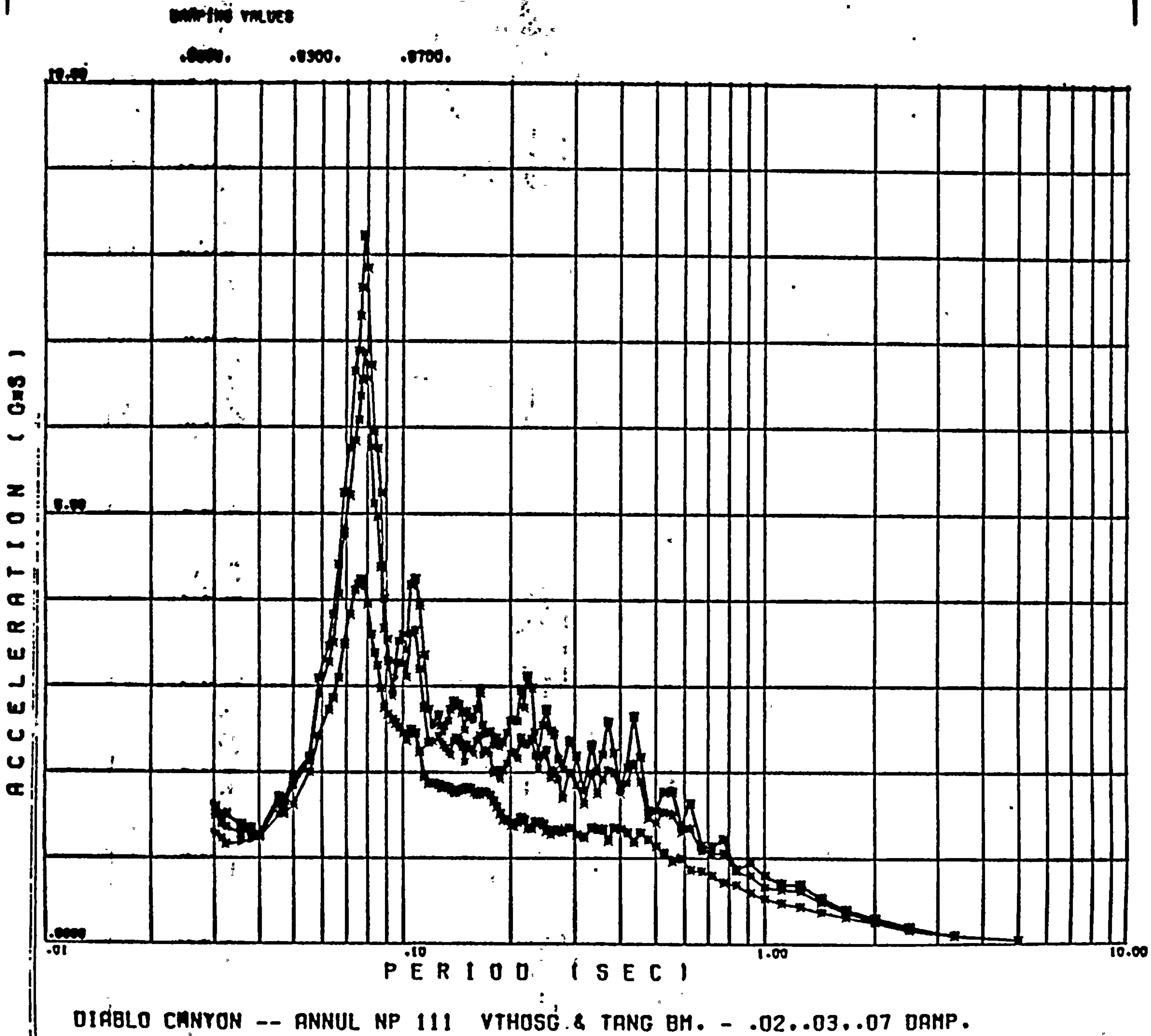
DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

Pursuant to discussions between the Staff and the Project, the Staff requested that a comparison be made between raw and averaged spectra.

Enclosed are three figures showing the evolution of raw floor spectra into the final spectra. Figure 1 is the raw spectra; Figure 2 is the same spectra after it has been smoothed at frequencies below 5 cps. Notice there is no change in the spectra above 5 cps and that the curve below 5 cps in Figure 2 is indeed an average and not a lower bound of the comparable portion of the curve shown in Figure 1. Figure 3 shows the broadened spectra with the ground spectra for comparison. This comparison is for one location in the structure. The same process was used for all other vertical spectra for the annulus steel structures.

PGandE considers this additional information to resolve this SSER No. 18 open item.



CE002/02-0 X9287 03/09/83 Figure 1 Raw Response Spectra FRAME 4

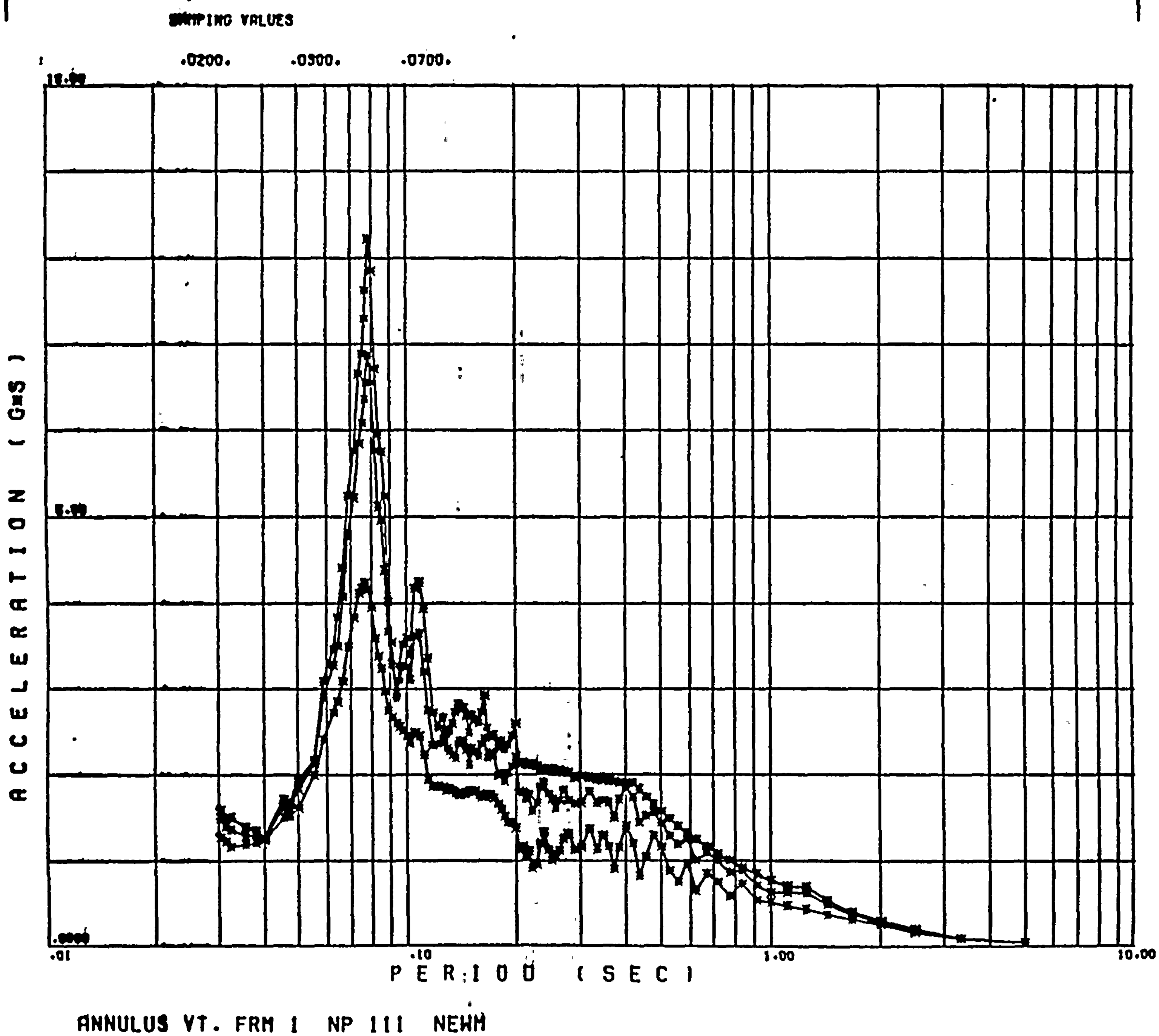
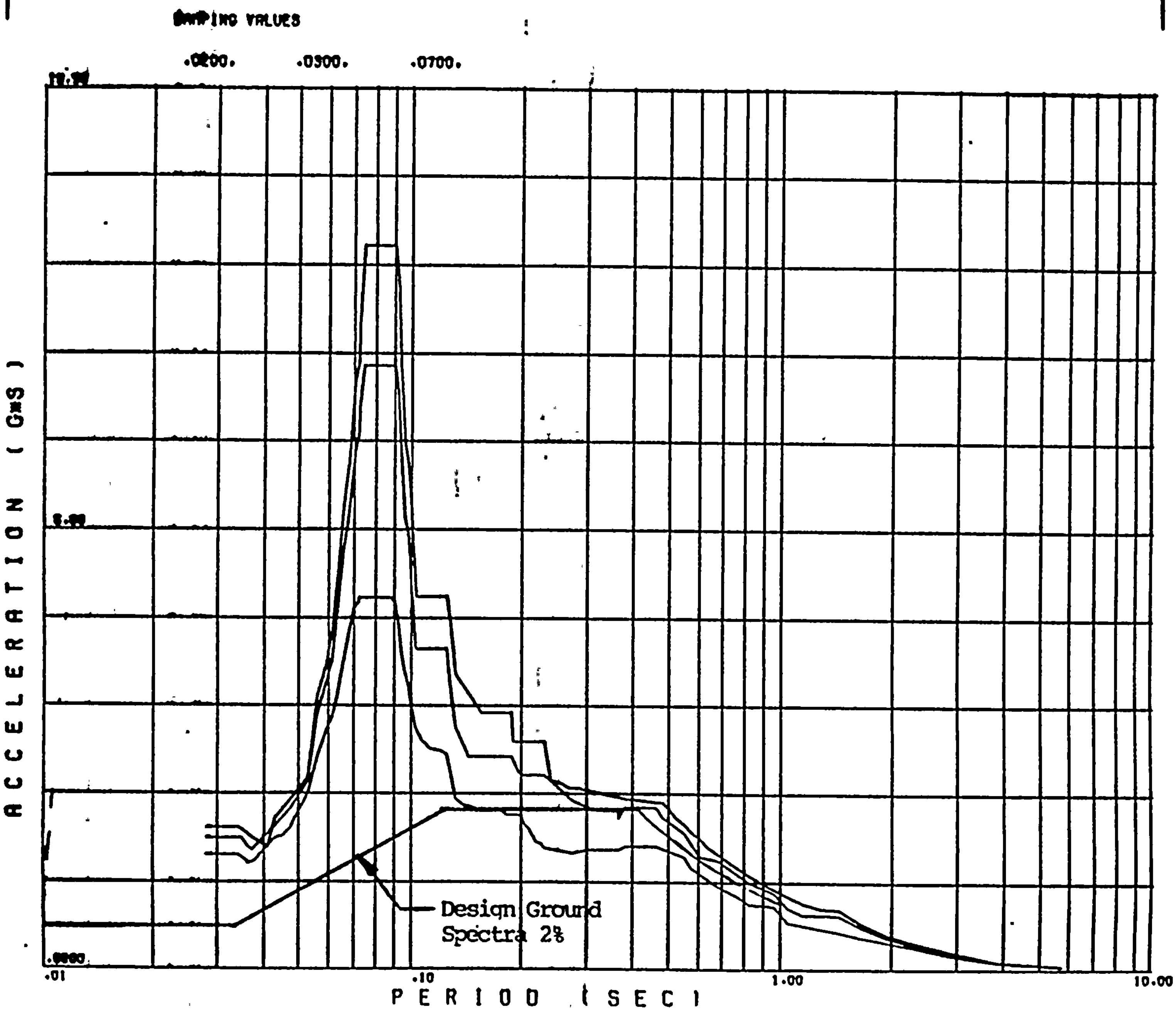


Figure 2 Raw-Smoothed Response Spectra



ANNULUS VT. FRM 1 NP 111 NEHM

CE802/02-8 X8102 10/06/83

Figure 3 Broadened Response Spectra

FRAME 4

ENCLOSURE 2

Large Bore Piping Supports/Buckling Criteria (SECY-83-366, Enclosure 5, Item 16 and 17)

ITEM 16: "Results of analysis of large bore piping supports should be verified (C.3-48)"

ITEM 17: "Buckling criteria for linear supports, specifically the Euler buckling equation for calculating critical buckling loads for all slenderness ratios, should be evaluated and justified (C.3-48)"

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

The Diablo Canyon Project (DCP) position on the buckling criteria is discussed below.

Buckling criteria for piping supports was stated in the FSAR in the Hosgri amendment. Since the B31.1 Code does not address buckling, the Project criteria document for pipe supports, DCM M-9, states rules for the design of pipe supports and provides additional stipulations that increase the conservatism of the FSAR commitments for standard components. This criteria for faulted conditions require that members be capable of sustaining a load of 2/3 of critical buckling or 1.2 F_y, whichever is smaller. (Critical buckling is defined as Euler buckling.) This criteria is in agreement with Appendix F of the ASME Code Section III.

*Critical buckling in this case will be defined as the AISC curve without safety factors (curve C in Attachment 1).

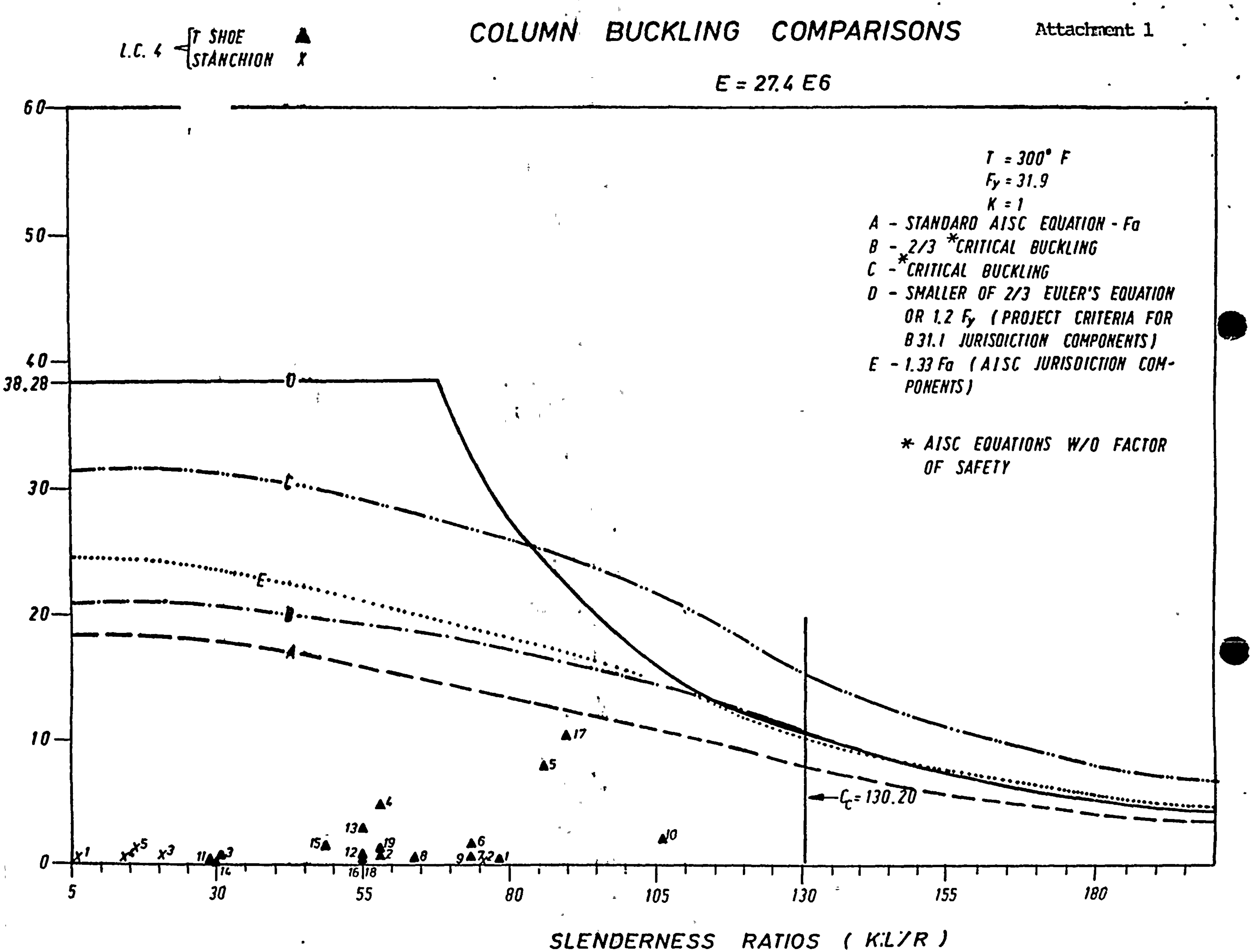
In a meeting with Staff on September 28, 1983, this criteria was discussed in light of a new interpretation and pending revision to Appendix F. Dr. Hartzman explained that the new revision to Appendix F will require 2/3 critical buckling* with an allowed increase for very small slenderness ratios.

In that meeting, DCP explained that this allowable most probably would not govern the design. Bending stresses usually govern; further, combined axial and bending stresses use an interaction equation. However, in order to bring the concern into perspective, the DCP has selected for study 24 typical cases of standard components where the slenderness ratio is below C_c. The results of that study are presented in Attachment 1, where the cases are designated by number. The cases where $KL/R < C_c$ are virtually limited to short stanchions and "T shoes". As can be seen from the graph, case 17 is the limiting case and is approximately 60% of 2/3 critical buckling (AISC without safety factors).

We believe that this study demonstrates that the critical buckling issue is not a concern regardless of the criteria chosen for the allowable. We further believe that the Project criteria as stated in the FSAR is consistent with interpretations applied to Appendix F as it now exists. For these reasons we believe the Project criteria as it now stands is adequate to control buckling in the pipe supports at Diablo Canyon.

PGandE considers this additional information to resolve this SSER No. 18 open item.

Attachment 1



ENCLOSURE 3

ITR-12/17--Confirmatory Analyses of Piping Calculations (SECY-83-366, Enclosure 5, Item 18)

ITEM 18: "Calculations for selected piping systems analyzed previously in ITR 12 and ITR 17 should be repeated with revised support configurations and current loadings to verify that piping and supports satisfy corresponding design criteria. Results of piping system reevaluation with high thermal load should be verified. (C.3-48)"

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

Pursuant to discussions between the NRC Staff and the Project, two piping problems have been selected by the Staff for independent analyses. The two problems are Project piping analyses 8-111 and 7-101. These analyses will be completed prior to full power operation.

PGandE considers this additional information to resolve this SSER No. 18 open item for fuel load.

ENCLOSURE 4

Cable Tray Qualification (SECY-83-366, Enclosure 5, Item 23)

NRC QUESTION:

Discuss the two methods used to verify the adequacy of the raceway supports.

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

The methodology used to verify the adequacy of the raceway supports is described in the Diablo Canyon Project Phase I Final Report. This methodology, which is described below, is in conformance with the Final Safety Analysis Report commitments and is the licensing basis.

Specifically, the supports are evaluated using a response spectrum analysis. The support frequency is calculated by lumping the tributary mass of the raceway onto the support structure. Hand computation or the STRUDL computer program is used to calculate the support frequency. Seismic accelerations are then found from the applicable seven percent damped response spectra. Seven percent damping is in conformance with NRC Regulatory Guide 1.61 recommendations for bolted structures. This method was used in the original qualification of the raceway supports (prior to October, 1981) and is typical of most analyses of this type of support system. This approach is the licensing basis for the raceway systems. This methodology has been reviewed and accepted by the IDVP.

As is the case for most engineering analyses, alternate methods of evaluation are available. In order to provide additional confidence in the adequacy of the raceway supports, the Diablo Canyon Project has evaluated

these supports by a second method. This second method treats the raceway and its supports as a system. The conduit or cable tray are considered structural elements spanning between adjacent supports. The flexibility of the raceway is then combined analytically with the flexibility of the supports. A system frequency results.

Extensive testing of raceway support systems was performed under the direction of Bechtel Power Corporation (ref. 1). One important conclusion of this testing program was that the cable tray exhibit high damping. This is primarily due to movement of the cables inside the trays. A minimum damping value of 15% was measured, and in most tests the damping was much higher.

The 15% damping value was used in the Diablo Canyon Project's second (system) methodology for evaluation of supports carrying cable trays. For supports with conduit, 7% damping was used as in the initial analysis. The response spectrum analysis was then completed in the same manner as in the first method of support evaluation.

In summary, the raceway supports are verified using the methodology described in the Phase I Final Report (the licensing basis) as well as by a second "system" evaluation. Any supports that did not qualify by both methods of evaluation were appropriately modified.

PGandE considers this additional information to resolve this SSER No. 18 open item.

NRC QUESTION:

Provide sample calculations comparing the results of a system frequency computation made by 1) interaction equation and 2) by computer modeling.

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

Determination of the fundamental frequency of raceway support "systems" was accomplished using the two following methods:

(1) Individual computations were made of the support and of the raceway (conduit or cable tray) spanning between two adjacent supports. These individual frequencies were then combined to arrive at a system frequency using the following equation:

$$f_{system} = \sqrt{\frac{1}{(1/f_{support})^2 + (1/f_{raceway})^2}}$$

(2) Alternately, the supports and the raceway were modeled using a computer program (STRUDL). The computer program computed the system frequency by the Rayleigh-Ritz method.

Both methods were used in the raceway support design verification. However, no calculations could be found that used both methods on the same support type. Therefore, two calculations were randomly selected and amended to include both computational methods. The results of these comparisons are as follows:

	First Calculation		Second Calculation	
	Vertical	Horizontal	Vertical	Horizontal
Interaction Equation (Method 1)	13.5 cps	24.1 cps	21.3 cps	29.4 cps
STRUDL Model (Method 2)	17.9 cps	25.6 cps	30.3 cps	32.3 cps

The comparisons show that the interaction equation calculations provided lower frequencies than the computer models. This generally leads to calculation of higher response spectra accelerations by the interaction equation method, indicating that the interaction equation method provides conservative results.

PGandE considers this additional information to resolve this SSER No. 18 open item.

4449a

Initially, support types with factors of safety less than 1.1 were selected for review. This resulted in review of 35 calculations: 23 of the A1202 members, 8 of the E1202, and 4 of the H1202. All of these supports were found to be acceptable when reviewed against the acceptance criteria resulting from the spot-weld test program. It was obvious that the rest of the support types would also be found acceptable. Therefore, no further calculations were reviewed for flexural shear flow.

In order to address the second area of concern, direct shear, the back-to-back support types were all reviewed again. Any support type that was judged to be susceptible to direct shear was selected for review. This resulted in the addition of 11 calculations to the review set. When all of these supports were found to be acceptable, it was concluded that no further investigation of direct shear was required.

PGandE considers this additional information to resolve this SSER No. 18 open item.

NRC QUESTION:

What is the definition of a raceway support "type"?

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

Nominally, a "type" is any design issued under a unique drawing detail number. The intention of issuing different support types is to provide construction with enough details for supporting raceway, so that all configurations required in the field are backed up with an engineering calculation.

Functionally, all support types are identical. They all are required to support the dead weight of the raceway during normal plant operation as well as seismic loads without loss of electrical function in the cables.

Physically, support types differ in the size, number, and member cross-section and geometry. The support types may be cantilevers, trapezes, or braced frames. Support types also differ in the size and quantity of conduits and/or trays that they support, as well as in the location on the support where the raceway may be attached.

Limitations are placed on some types, restricting the weight of raceway that may be attached to a support type or restricting the location in the plant where the type may be installed.

A specific support type will contain a unique combination of the parameters described above.

PGandE considers this additional information to resolve this SSER No. 18 open item.

ENCLOSURE 5

Superstrut Welds (SECY-83-355, Enclosure 5, Item 24)

NRC QUESTION:

What criteria was used to select the 46 raceway support calculations that were reviewed for spot-weld shear strength?

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

Design of the Diablo Canyon raceway supports relies on shear capacity of spot welds in back-to-back Superstrut channels in two areas. The first area is flexural shear. In order to develop the flexural capacity of the composite channels, shear flow must be resisted by the spot welds. The second area is direct shear. Some supports have configurations in which the composite channels are subjected to direct shear from the conduits or trays they support.

In order to determine which supports needed to be reviewed, all supports were screened. The approximately 22,000 raceway supports have been grouped into 420 support types. Each of these types has been addressed in a unique Diablo Canyon Project reverification calculation.

The screening procedure started by eliminating all support types that did not contain back-to-back channels. In order to address the first area of concern, flexural shear flow, the back-to-back support type calculations were reviewed to determine the factors of safety in bending in the composite struts; the lower the factor of safety, the more reliance was placed on composite action of the strut and, therefore, the more critical the spot-weld strength.

ENCLOSURE 6

Control Circuits (SECY-83-366, Enclosure 5, Item 27)

ITEM 27: "Control circuits for isolation valves in steam supply line for turbine driven auxiliary feedwater pump should be classified as safety-related. (C.4-11)"

DCP RESPONSE:

This response supplements information provided in PGandE letters to the NRC dated August 30 and September 9, 1983, and information provided in the September 28, 1983 meeting.

The control circuits for FCV-37 and FCV-38 have been classified as instrument Class IA, which is a safety-related classification.

PGandE considers this additional information to resolve this SSER No. 18 open item.