DIABLO CANYON NUCLEAR POWER PLANT
INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT:

PACIFIC GAS & ELECTRIC - WESTINGHOUSE SEISMIC INTERFACE REVIEW

TR-5511-2

REVISION 0

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Docket No. 50-275
Diablo Canyon Unit 1
License No. DPR-76

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PROGRAM MANAGER'S PREFACE

DIABLO CANYON NUCLEAR POWER PLANT - UNIT 1
INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT

This is the eleventh of a series of Interim Technical Reports prepared by the DCNPP IDVP for the purpose of providing a conclusion of the program.

This particular report provides the results and conclusions of the IDVP review of the Pacific Gas and Electric Co. (PG&E) to Westinghouse seismic interface related to Hosgri response spectra data. This review was performed by the IDVP in accordance with Section 8.0 of the Phase I Engineering Program Plan (DCNPP-IDVP-PP-001) and consisted of a check of Hosgri spectra transmittals to Westinghouse and a verification of Westinghouse's use of correct spectra in its qualification calculations on a sampling basis.

TES has prepared this report in their role as IDVP Program Manager.

ITR Prepared and Approved
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Interim Technical Report
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1.0 INTRODUCTION

1.1 Purpose and Scope

This Interim Technical Report (ITR-11) summarizes the results of the IDVP audit of Westinghouse at their Monroeville, PA offices on May 7, 1982. As stated in the Phase I Program Plan, the audit focused on transmittal and utilization of the correct Hosgri spectra data in the qualification of Westinghouse supplied DCNPP-1 equipment. To verify that Westinghouse had used correct Hosgri data, the IDVP audit team reviewed the calculation packages for selected equipment. However, it should be emphasized that this audit was not intended to be a detailed review of the Westinghouse qualification documentation and the IDVP only reviewed to the extent necessary to verify use of proper seismic inputs.

Prior to the Westinghouse visit, PG&E had supplied TES, in the Reference 1 letter, both a listing of Hosgri spectra packages transmitted from PG&E to Westinghouse and an actual copy of these spectra packages. The listing of these Hosgri seismic transmittals to Westinghouse are contained in Appendix A of this report. The transmittals cover a time span from September 7, 1976 to November 23, 1981. TES reviewed the transmittals and compared the seismic spectra curves in them to those presented in the Hosgri Report (Reference 2).

TES determined that the seismic spectra curves in PG&E transmittals 1958, 1959 and 1969 of Appendix A for the Containment Structure, Auxiliary Building and Annulus Structure-Vertical, respectively, are identical to those in the Hosgri Report.

1.2 Summary

The IDVP Audit Team selected and audited a relatively broad sample of Westinghouse equipment and systems, but with few exceptions, was able to complete the audit in one day . This was due in part to Westinghouse's complete cooperation and their ability to provide both the necessary documentation and the responsible personnel on short notice. The selection of the sample is discussed in 2.0 .

The exceptions noted involved the vertical seismic quailification of both the Reactor Coolant Pump and the Pressurizer. The qualification documentation for these items were located at other Westinghouse facilities. The IDVP had given Westinghouse and PG&E no advance notice of the sample of equipment or systems to be audited and, therefore, Westinghouse was unable to provide it during the audit. At the IDVP request, Westinghouse indicated it would transmit the appropriate seismic qualification data to PG&E who, in turn, would arrange for the IDVP to review it.

Westinghouse did transmit the appropriate data for the Reactor Coolant Pump and the Pressurizer to PG&E, who arranged for TES to review the data at the TES Waltham office on May 25, 1982.

The results of the audit on the full sample are discussed in 3.0, Sample Results. The conclusions which are contained in 6.0, can be summarized as follows: (1) the transfer of appropriate Hosgri seismic spectra from PG&E to Westinghouse was accomplished through numbered correspondence and (2) except for the vertical ground spectra issue raised in EOI File 978, the sample results indicate that Westinghouse has used the correct Hosgri seismic spectra in their qualification and evaluation process.

1.3 Background

The Robert L. Cloud and Associates, Inc. (RLCA) preliminary report of November 12, 1981 (Reference 3) on the seismic reverification program that was initiated after the discovery of the diagram error noted a deficiency in the Hosgri qualification input for the Regenerative Heat Exchanger. Specifically, Westinghouse, who performed the seismic analysis, stated in a report that the spectrum used for the vertical direction was two-thirds of the tau filtered horizontal spectrum. However, the Hosgri Report (Reference 2) states that the vertical spectrum should be two-thirds of the unfiltered horizontal spectra.

PG&E independently went back to Westinghouse and consequently uncovered one more case, the SIS accumulators, where the same Hosgri vertical spectrum error was made. In order to address the concerns over the seismic interface between PG&E and Westinghouse that stemmed from this finding and other potential deficiencies in Hosgri seismic data transmission, the IDVP included requirements in the Phase I Engineering Plan to (1) check the interface between PG&E and Westinghouse for transmittal of Hosgri spectra and (2) on a sampling basis, check Westinghouse calculations to verify that the applicable seismic input spectra were actually used in the qualification calculations.

The NRC approved the Independent Design Verification Program Phase I Engineering Program Plan (Reference 4) on April 27, 1982.

On May 7, 1982, TES (with RLCA also participating) conducted an audit at the Westinghouse offices in Monroeville, PA, for the sole purpose of verifying that PG&E had transmitted the appropriate Hosgri seismic spectra data to Westinghouse and the latter had used the appropriate Hosgri data in their qualification of Westinghouse supplied equipment for DCNPP Unit 1.

2.0 SAMPLE SELECTION

A very broad sample involving various systems and various types of equipment and components was selected for the Westinghouse audit by the IDVP team from the Hosgri Report just prior to the audit; Westinghouse and PG&E had no prior notification or knowledge of the sample to be reviewed.

The sample consisted of the following systems, equipment and components:

- Seal Water Injection Filter
- RHR Heat Exchanger
- Charging Pump
- 1 Crane (see selection discussion below)
- 2 Piping Models attached to RCS (see discussion below)
- Nuclear Instrumentation System
- Valve 8147 - Charging Pump Discharge to Loop 3
- Reactor Coolant Pump with supports
- Pressurizer with supports

All of the above equipment, components, and piping samples are located in either the Containment Building or Auxiliary Building. Westinghouse had no Turbine Building Scope as far as equipment or piping were concerned.

The specific crane and piping samples were selected after initial discussions with Westinghouse about their scope of work in these areas. For cranes, the Westinghouse scope included the Spent Fuel Pit Bridge Crane and the Manipulator Crane. Although Westinghouse performed an analysis of the Polar Crane, it was not the analysis of record. Consequently, the Spent Fuel Pit Bridge Crane was selected for the crane sample.

The Westinghouse piping scope, in addition to the Reactor Coolant System (RCS), consisted of all lines 6-inch and over which are attached to the RCS but only segments of those lines out to the first structural anchor. This attached piping represented only 8 separate piping problems or analyses as follows:

- one 14-inch Surge line to Pressurizer
- four 10-inch Accumulator lines, each of which include a segment of 6-inch RHR line
- one 14-inch RHR line with 6-inch Safety Injection System (SIS) line to Loop 4.
- combined 6-inch SIS lines to Loops 1 and 2
- one 6-inch SIS line to Loop 3

Two of the piping models, the 14-inch RHR line and the 10-inch Accumulator Line to Loop 1, were selected for the piping sample.

A brief discussion of the audit results and documents reviewed for each sample is contained in 3.0.

3.0 SAMPLE RESULTS

3.1 VALVE 8147; Charging Pump to Loop 3 Cold Leg

Masoneilen Valve: Dwg. 3IA58DGP

The qualification history on Valve 8147 is summarized below:

DATE	SOURCE	LEVELS, g's
2/19/78	Original Vendor Analysis (Documentation questionable)	4.2 Horizontal 3 Vertical
12/6/78	Vendor Analysis (Masoneilen Report 1030)	2.7 Horizontal 1.8 Vertical
8/24/79	Vendor Testing (Acton Environmental Test Report 13763) (Document 1043)	4.5 to 5 g's

The acceleration values in the Hosgri Report (Table 7-7A) are 4.2 g and 3.0 g. It has been determined from the AETC qualification testing (8/24/79) that this valve can withstand the 4.2 g horizontal and 3 g vertical qualification levels specified in the Hosgri Report. Since this valve is an in-line supported valve, the acceleration results from the appropriate PG&E piping seismic analyses were to be reviewed and evaluated against these qualification levels by the IDVP.

The IDVP reviewed the valve accelerations from the PG&E piping system and determined that the results were below the qualification levels (Reference 5).

3.2 Centrifugal Charging Pump

Westinghouse Equipment Specification: 677125 Rev. 0

Westinghouse documents referenced the Hosgri requirements as:

H_{E-W} = .68 g, H_{N-S} = .702g, and vertical = .42g.

This vertical value, representing 2/3 of the horizontal filtered spectra, is incorrect and should have been .5 g or 2/3 of the horizontal unfiltered spectra. In the case of the charging pump, this is academic because the pump is qualified to the conservative umbrella levels of 3 g horizontal and 2 g vertical.

Westinghouse personnel indicated that upon PG&E notification of the incorrect vertical base spectra being used for the Regenerative HX qualification, qualification acceleration loads for all other Containment equipment were checked. Westinghouse committed to reviewing this effort to ensure that it had encompassed equipment in both the Containment Structure and Auxiliary Building and to report on the results.

The Westinghouse review (Reference 6) of the tau-related vertical spectra problem did identify one additional area to the already identified equipment in the Containment Building. The new area involves the auxiliary pumps located below ground level in the Auxiliary Building. The particular pumps affected are the centrifugal charging (part of the Westinghouse audit sample), positive displacement charging safety injection, containment spray, gas stripper feed, and liquid hold-up tank recirculation pumps.

In the case of these auxiliary pumps, however, the difference between filtered versus unfiltered vertical response spectra turns out to be insignificant because of the following reasons:

(1) all these pumps are rigid (f_n greater than 33 Hz)
(2) all were qualified to generic seismic levels much greater than the Diablo Canyon requirements.

The above data for the auxiliary pumps is substantiated by the equipment summary presented in Tables 7.5 and 7.6 of Reference 2. Since this new area represented no additional significant concern or problem beyond that already identified, TES did not issue an EOI.

The charging pumps were also tested for determination of natural frequencies by Edward Zezula and Associates for Pacific Pump Inc. The results indicated the following lowest frequencies.

Pump Housing: Transverse 40.16 Hz; Axial 50.80 Hz
Gears: Transverse 72.0 Hz; Axial 31.8 Hz
Motor: Transverse 30. 5 Hz; Vertical 73 Hz.

3.3 RHR Heat Exchanger

Westinghouse Documents: Calculation Sheet 3-21A-0
and Report No. 3-21A-01

The Westinghouse calculation package was in agreement with Hosgri Table 7.5. The seismic qualification levels used by Westinghouse are:

Frequency Hz	Accelerations
30 Horizontal	.78 g
33 Vertical	.70 g

The RHR HX is anchored at its base at 73' with additional lateral supports at 83' and 100'. The appropriate Hosgri accelerations levels cited in the Westinghouse calculations are:

Vertical:	.70 g at elevation 100'
Horizontal:	.72 g at elevation 85'
N-S Torsion:	.06 rad/sec^2 at elevation 100'
E-W Torsion:	.04 rad/sec^2 at elevation 100'

The horizontal spectra at 100 ft. was not used or judged appropriate by Westinghouse. A cursory look by the IDVP at the RHR drawing indicated that the equipment center of gravity (C.G.) was probably close to elevation 85 ft. which would justify the horizontal spectra values used. Westinghouse committed to providing PG&E with the justification for this and the IDVP reviewed this response.

The Westinghouse response (Reference 6) stated the justifications for using the 85 ft. horizontal spectra. These were:

(1) base support is the primary support for the RHR Heat Exchanger

(2) The C.G. location is closer to the base support

To further demonstrate the acceptability of using the lower elevation spectra, Westinghouse performed supplemental analyses in which they used both an umbrella horizontal response spectra of all support elevations and a multiple response spectra analyses on the equipment. Based on the results that show some minor increase in stress, e.g. less than 10% for the multiple spectra approach, Westinghouse concluded that their design qualification analyses was adequate.

TES is in agreement with this conclusion.

3.4 Seal Water Injection Filter

Westinghouse Documents Reviewed: Report 49-8A-0 and Calculation 49-8A-01 (11/2/77)

Westinghouse documents agree with Hosgri Table 7.5 in respect to the following:

ELEVATION/BLDG.	FREQ. Hz	ACCELERATIONS g's
100'/Auxiliary	26 Horizontal	1.15
	264.6 Vertical	0.60

These acceleration values were verified to be identical to the Hosgri values.

3.5 Nuclear Instrument System

The documents reviewed were WCAP 8021 with generic seismic test inputs for electrical and control equipment and File PG&E 149-13 "Corrections to Hosgri: Seismic Reevaluation Report." A preliminary comparison of generic test spectra to the applicable Hosgri horizontal spectra was made at Westinghouse and a more detailed check was subsequently made by the IDVP team at their own offices. The IDVP verified that the required Hosgri horizontal spectra (Auxiliary Building-140 ft.) for the Nuclear Instrumentation System is conservatively enveloped by the Westinghouse Generic Test Spectra.

The vertical spectra comparison in Westinghouse Document ST-SDT-522-1 revealed that the Generic Test Vertical Spectra, which was taken as 2/3 of the Generic Horizontal Spectra, enveloped the Hosgri vertical spectra for all natural frequencies except as noted below. For the vertical direction, Westinghouse had actually used a Hosgri Spectra which had been increased by 50%. The Generic Test Spectra did not envelop the Hosgri vertical spectra between the frequency range of 22-30 Hz, where a spectral peak exists.

The Westinghouse results from a sine sweep test up to 35 Hz indicated that there were no vertical natural frequencies below the 35 Hz level, therefore the component is considered rigid in the vertical direction. The zero period acceleration (ZPA) for the Generic Test Spectra conservatively envelops the Hosgri Control Room Slab ZPA; hence, TES considers the qualification procedure used by Westinghouse to be adequate.

3.6 Piping Sample #1 - 14 inch RHR Line

Westinghouse used the PG&E Design Review Isometrics 446500 Rev. 18 with 79-14 field inspection markups dated 10-4-79 and 437990 Rev. 21 with 79-14 markups dated 10-24-79. The 14-inch RHR line attaches to the RCS and runs out to a Containment Penetration anchor at elevation 103'-6".

This model also includes a 6-inch branch line which runs out to a structural anchor. The highest line elevation is approximately 107 feet. A review of Westinghouse file PGE-145-256 indicated Westinghouse had used an envelope spectra of the following Hosgri spectra curves:

Horizontal Direction

1. Interior Structure at 140 ft including torsion, 2% damping
2. Exterior Structure at 109 ft, 3% damping

Vertical Direction

1. Interior Structure at 114 ft, 2% damping
2. Exterior Structure at 109 ft., 3% damping

The two different damping values used for the Interior and Exterior Structures are justified because the model inside containment includes both large and small diameter piping, but only the large 14-inch pipe (3% damping) is anchored at the exterior structure. This

model contained no vertical supports which are attached to the annulus steel structure. This was verified by a review of support details for 56N/2R, 12/SL, 56N/IV, 12/133SL and 12/136 SL, which are in the annulus area.

The spectra inputs in the Westinghouse piping package were sampled and found to agree with the correct Hosgri spectra.

3.7 Piping Sample #2 - Accumulator Discharge Loop #1

The Accumulator Loop #1 model is defined by PG&E Design Review Isometric 445882 Rev 10 with 79-14 markups dated 10/26/79 and 437983 Rev. 18 with 79-14 markups dated 9/26/79. The highest line elevation is 136 ft. and Westinghouse considered 140 ft. spectra. The correct Hosgri spectra, including the new 81/82 annulus model vertical spectra, was attached to the revised Westinghouse file PGE-145-15C dated November 23, 1981.

3.8 Reactor Coolant Pump (RCP) and Supports

The RCP analysis was located at the Electro Mechanical Division in Cheswick, PA and could not be reviewed during the visit. The IDVP did review a Westinghouse Document DCN 77-4 showing the comparison between the RCP design horizontal spectra used for DDE and the 5/9/77 Hosgri spectra for the Containment Interior at 114 ft. The IDVP confirmed that the Hosgri values in DAN 77-4 agreed with the PG&E Transmittal 1958 containing the 5/9/77 Hosgri Spectra for the Containment Structure. The comparison revealed that the DDE spectra (2% damping) enveloped the Hosgri spectra (4% damping) except in the rigid range. Frequency results indicated that the rocking and bending modes for the RCP are in the flexible range, where the DDE values exceed the

Hosgri values. It is only for the axial translational mode at 21.81 Hz that the Hosgri value of .9g exceeds the DDE value of .6g. However, Westinghouse results indicated that pump stresses are actually reduced by 3.8% for the Hosgri case; a similar reduction exists for all forces and moments except for the F_x load in the motor stand which increased by approximately 12%.

The comparison of the DDE vertical spectra and Hosgri vertical spectra was not immediately available but Westinghouse committed to providing this comparison evaluation to PG&E who would arrange for TES to review it. The RCP supports were analyzed by PG&E.

The Westinghouse vertical spectra package for the RCP was reviewed by TES in Waltham on May 25, 1982. This package consisted of Westinghouse document PG&E 160/2A "Primary Equipment Vertical Spectra Comparison" dated April 15, 1978. This document indicated the following:

- In general, the Westinghouse vertical spectra envelops the Hosgri vertical ground spectra. Only over the frequency range of 18 to 25 Hz does the vertical qualification spectra fall below the Hosgri vertical spectra and then only slightly, e.g. at the RCP vertical mode of 21 Hz, the qualification value is .62 g compared to the Hosgri value of .66 g.

- the Hosgri vertical spectra used in this Westinghouse comparison evaluation was the correct unfiltered Hosgri spectra.

3.9 Pressurizer and Supports

The Westinghouse analysis for the Pressurizer was located in their Florida facility and hence, was unavailable for IDVP review during the visit. A comparison of the Generic SSE and the Hosgri spectra contained in Westinghouse File PGE 160-2A4 was reviewed. The horizontal Hosgri curve in this comparison was verified to be the correct Hosgri curve. The Generic Horizontal SSE curve for which the pressurizer was qualified completely enveloped the Hosgri over the frequency range from 1-30 Hertz. Beyond this range the two curves essentially converged.

As in the case of the RCP, the vertical comparison evaluation for the Pressurizer could not be provided on short notice but Westinghouse did commit to transmit it to PG&E, who arranged for TES to review it.

On May 25, 1982, TES reviewed the vertical comparison evaluation which was part of the same document listed above for the RCP. This comparison evaluation showed that the generic vertical spectra used by Westinghouse to qualify the Pressurizer enveloped the unfiltered Hosgri vertical spectra for all frequencies.

The pressurizer supports were analyzed by PG&E.

3.10 Spent Fuel Pit Bridge (SFPB) Crane

In the case of the SFPB crane, Westinghouse had used the existing Hosgri floor spectra curves for damping values up to 4% and, by extrapolation, constructed a spectra for 7% damping. The Hosgri spectra

data used in this process were spot checked by the IDVP team and found to be correct. A spot check of the torsional offsets and torsional contributions indicated that they were considered by Westinghouse in computing the appropriate spectra for this crane. These calculations were contained in Westinghouse File 1045 /8 dated 3/6/78.

3.11 Regenerative Heat Exchanger

The Regenerative Heat Exchanger was outside the sample of this Westinghouse audit, but the IDVP Team reviewed the revised Westinghouse analysis because of EOI 978. This EOI was opened up because of the use of incorrect base spectra. The Westinghouse analysis package 1-4A-0 which was revised 12/10/81 to reflect the correct unfiltered vertical spectra was reviewed. The IDVP is satisified that the correct spectra were used in this reanalysis and that no modifications were required as a result of the reanalysis. Westinghouse did issue a letter to PG&E to this effect.

A check of correspondence did show that Westinghouse provided the requested letter (Reference 7). In addition, the Westinghouse Summary Report, "Seismic Evaluation of Westinghouse Equipment for Postulated 7.5 M Hosgri Earthquake" was revised to reflect the reanalysis results (Reference 8).

4.0 EOI REPORTS

TES did not identify any new areas of concern and, hence, did not issue any EOI files as a result of the Westinghouse audit. There were a number of EOI files opened because of findings or concerns that were reported in RLCA's Preliminary Seismic Reverification Report of November 12, 1981 (Reference 3).

EOI 976 addresses a concern over the PG&E/Westinghouse seismic design interface dealing with the transmittal of current spectra for the Exterior Containment Structure. This Open Item was subsequently closed because the Phase I Program Plan called for the IDVP to verify the transmittal of spectra from PG&E to Westinghouse. The IDVP audit indicated that PG&E did transmit all required Hosgri seismic response spectra, which are contained in the Hosgri Report, to Westinghouse.

EOI 978 was issued because Westinghouse used tau filtered spectra for the vertical direction in their qualification analysis of the Regenerative Heat Exchanger. EOI 978 was classified an Error Class C. The analysis and documentation have been revised to reflect the correct vertical acceleration and the IDVP has issued a completion report. As a result of this finding, Westinghouse had also discovered that filtered spectra were used for base slab accelerations for the qualification of the accumulators as well.

EOI 1004 was issued because of the concern noted in Reference 3 about the incomplete transmittal of Hosgri seismic information. Like EOI 976, the IDVP review of seismic transmittals and the audit of Westinghouse has verified that the required Hosgri spectra had been transmitted. This file was closed out and a completion report issued.

5.0 EVALUATION

On the basis of this review of a relatively broad sample of structures, systems, and components, TES was satisified that 1) Westinghouse had been receiving from PG&E the applicable Hosgri spectra information and 2) with the exception of the vertical ground spectra problem, Westinghouse had correctly utilized that data in their Hosgri qualification process. In the case of the incorrect vertical ground spectra, i.e., 2/3 of filtered rather than unfiltered horizontal ground spectra, TES determined that the incorrect vertical spectra had been considered or at least been referenced in the qualification of the charging pumps, but Westinghouse had actually used more conservative seismic loads in the qualification of these pumps. Nonetheless, Westinghouse committed to reviewing all items within their scope related to this problem in both the Containment and Auxiliary Buildings and to report on the results.

The Westinghouse review (Reference 6) identified two areas where the incorrect vertical spectra issue arises. One area which had already been identified earlier as a result of the RLCA findings in Reference 3 was in the Containment Building and involved the accumulator tanks, regenerative heat exchanger and excess letdown heat exchanger. The second area is a newly identified area involving the auxiliary pumps in the Auxiliary Building. The family of auxiliary pumps consists of the centrifugal charging (part of the TES audit), positive displacement charging, safety injection, containment spray, gas stripper feed, and liquid hold-up tank recirculation pumps.

In the case of the auxiliary pumps, however, the difference in filtered versus unfiltered vertical response spectra turns out to be

insignificant because (1) all these pumps are rigid (f_n greater than 33 Hz) and (2) all were qualified to generic seismic levels much greater than the Diablo Canyon requirements.

The vertical Hosgri evaluation for the Reactor Coolant Pump and Pressurizer, which were not reviewed by TES at the Westinghouse Offices, were subsequently reviewed by TES at our Waltham Office on May 25, 1982.

Based on the review of both the vertical and horizontal qualification results, TES determined that Westinghouse had used appropriate seismic inputs in the qualification of both the RCP and Pressurizer.

6.0 CONCLUSIONS

In summary, TES found no evidence of deficiencies or errors in the transmittal of the appropriate Hosgri spectra from PG&E to Westinghouse or in Westinghouse's use of the Hosgri data other than those isolated cases already identified above. Consequently TES issued no EOI files as a result of the audit and was able to resolve EOI files 978 and 1004.

Based on the IDVP audit, it is concluded that no further review or verification within Westinghouse on the transmittal and use of revised Hosgri spectra is necessary.

In response to the IDVP verification program recommendation, PG&E has assembled all the Hosgri seismic response spectra and issued them in a controlled document, Design Criteria Memorandum C-17 (DCM-C-17). The IDVP will verify that (1) the DCM C-17 contains the most current Hosgri spectra for the DCNPP including any changes resulting from reanalyses of the structures performed in the DCP Internal Technical Program and (2) that the DCP has transmitted all revisions of DCM C-17 to Westinghouse.

7.0 REFERENCES

1. PG&E letter DCVP-TES-72 to TES, April 29, 1982 with Enclosures

2. PG&E Report "Seismic Evaluation for Postulated 7.5M Hosgri Earthquake" (through Amendment 83)

3. RLCA Report "Preliminary Report, Seismic Reverification Program", November 12, 1981

4. Diablo Canyon Nuclear Power Plant - Unit 1 Phase I Program Management Plan Rev. 0 dated March 29, 1982

5. RLCA Letter P105-4 to TES dated October 29, 1982

6. DCP Letter DCVP-TES-404 to TES, September 29, 1982 with attached Westinghouse Letter MDQ-TE-247

7. Westinghouse Letter PGE-4493 dated December 3, 1981.

8. Westinghouse Letter PGE-4081 dated March 12, 1982.

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APPENDIX A

INDEX OF PG&E - WESTINGHOUSE

HOSGRI SEISMIC TRANSMITTALS

(REFERENCE 1)

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INDEX OF HOSGRI SPECTRA TRANSMITTAL

FROM PG&E TO WESTINGHOUSE

1. Project Letter, 1919, D.V. Kelly to W. C. Gangloff, "10 Figures used by Dr. Blume on His 9/7/1976 Presentation at NRC Office in Bethesda." (See Note 1).

2. Project Letter, 1928, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Auxiliary Building-Comparison of the DDE and Hosgri 7.5M Results," dated October 19, 1976.

3. Project Letter, 1929, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Structure-Torsional Response Analysis for Hosgri 7.5M" (Preliminary 10/25/76).

4. Project Letter, 1934-11/22/76, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Structure Translational Floor Response Spectra."

5. Project Letter, 1936-12/2/76, D.V. Kelly to W.C. Gangloff, "Title Page and Description of Diablo Canyon Containment Floor Response Spectra."

6. Project Letter, 1939-12/7/76, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment-Torsional Response Spectra Due to Torsional Input."

7. Project Letter, 1940, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Auxiliary Building-Floor Response Spectra for Hosgri 7.5M Blume and Newmark" (Preliminary 12/10/76).

8. Project Letter, 1942-12/22/76, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment-Floor Response Spectra Nodal Point 24-Hosgri 7.5 Blume and Newmark."

9. Project Letter,1944, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Structure-Floor Response Spectra-Interior Structure-Hosgri 7.5M Newmark" (Preliminary 1/12/77).

10. Project Letter, 1946, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Structure-Floor Response Spectra-Newmark 7.5M Hosgri-Peak Response Amplitude Unmodified - Tau =0" (Preliminary 1/7/77).

11. Project Letter, 1948, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Auxiliary Building-Comparison of the DDE, 0.75g Translational, and Combined Translational and Torsional Spectra" (Preliminary 1/31/77).

12. Project Letter, 1950-3/2/77, D.V. Kelly to W.C. Gangloff, "Digitized Spectra for Auxiliary Building."

13. Project Letter, 1952, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Exterior Structure Horizontal and Vertical Floor Response Spectra 7.5M Hosgri Earthquake," dated March 16, 1977.

14. Project Letter, 1953, D.V. Kelly to W.C. Gangloff, "Probability of Peak Grid Accelerations," by John Blume, dated March 16, 1977, and "Seismic Design Criteria for Diablo Canyon Design Class I Piping Systems," by Allen Chan, dated 3/21/77.

15. Project Letter, 1955-4/11/77, D.V. Kelly to W.C. Gangloff, "Auxiliary Building-Dynamic Seismic Analysis for Hosgri Criteria," dated 2/8/77.

16. Project Letter, 1956, D.V. Kelly to W.C. Gangloff, Three Attachments, A) Diablo Canyon Containment Interior Structure-Horizontal and Vertical Floor Response Spectra, and the Extra Structure Spectra Title Pages; B) Second page of text for, Diablo Canyon Containment Interior Structure-Horizontal and Vertical Floor Response Spectra; and C) Diablo Canyon Intake Structure Horizontal and Vertical Floor Response Spectra.

17. Project Letter, 1958, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Nuclear Power Plant Unit 1-Containment Structure Dynamic Seismic Analysis for the 7.5M Hosgri Criteria" (Preliminary May 9, 1977).

18. Project Letter, 1959, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Nuclear Power Plant, Auxiliary Building-Dynamic Seismic Analysis for the 7.5M Hosgri Criteria" (Preliminary May 9, 1977).

19. Project Letter, 1969, D.V. Kelly to W.C. Gangloff, "Diablo Canyon Containment Interior Structure-Annulus Vertical Floor Response Spectra-7.5M Hosgri Earthquake," dated August 1, 1977.

20. Project Letter, 2064, D.V. Kelly to W.C. Gangloff, "Defined Hosgri Spectra for the Containment Annulus Structure, " dated July 1, 1977.

21. Project Letter, 2144, J.V. Rocca to L.R. Benson, "Diablo Canyon Unit 2 Containment Annulus Structure-Vertical Floor Response Spectra," dated November 10, 1981 (see Note 2).

22. Project Letter, 2146, J. V. Rocca to L.R. Benson, "Diablo Canyon Unit 2 Containment Annulus Structure-Vertical Floor Response Spectra, used for Unit 1," dated 11/23/81.

NOTES:

1. Copy sent to TES did not have figures as noted in Reference 1.

2. Copy sent to TES did not include computer printout as noted in Reference 1.