



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

OCT 02 1984

Docket No. 50-275

MEMORANDUM FOR: ~~George Knighton~~, Chief  
Licensing Branch #3  
Division of Licensing

FROM: George Lear, Chief  
Structural and Geotechnical Engineering Branch  
Division of Engineering

SUBJECT: DIABLO CANYON - MASONRY WALL DESIGN

Reference: Letter from J. O. Schuyler of Pacific Gas and Electric (PG & E)  
to G. W. Knighton of NRC, dated August 7, 1983.

We have reviewed the information provided by the licensee in the referenced letter.

Our review indicates the licensee's re-evaluation criteria contains two basic elements: (1) working stress design approach; and (2) a non-linear analysis method, "energy balance approach". As noted in the enclosure, we have identified some outstanding issues with both elements of the criteria.

In order to expedite the resolution of the issues related to the working stress design approach, we suggest that we audit the licensee's design calculations to assess whether the differences between the staff's working stress criteria and those of the licensee's have any significant impact on the re-evaluation program. It has been our past experience that such differences are quite often efficiently resolved through a direct audit review rather than via time consuming debates of technical merit and adequacy of a particular criterion.

The second item pertains to the use of energy balance method. As noted in the enclosure, use of this method may require a test verification program. SONGS-1 completed a test program to qualify their walls and the results of this program are currently under review. Construction techniques at SONGS-1 and Diablo Canyon appear to be different in some significant aspects; therefore, a plant unique test verification program may be needed for Diablo Canyon. We suggest that we discuss this issue with the licensee during the audit. If possible, we suggest that you make arrangements for the audit in the first week of October 1984.

George Lear, Chief  
Structural and Geotechnical  
Engineering Branch  
Division of Engineering

cc: See next page.

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Knighton

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Enclosure: As stated

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MASONRY WALL REVIEW  
PACIFIC GAS AND ELECTRIC CO.  
DIABLO CANYON POWER PLANT, UNIT 1  
DOCKET NO. 50-275  
STRUCTURAL AND GEOTECHNICAL ENGINEERING BRANCH  
STRUCTURAL ENGINEERING SECTION A

WORKING STRESS APPROACH

The staff has reviewed the information provided by the licensee in a letter dated August 17, 1983. For the wall qualified by the working stress design approach, the staff has noted several differences between its acceptance criteria and the licensee's re-evaluation criteria. The licensee should assess the program and provide this information for the staff's review.

1. The licensee's criteria specify 5% damping for uncracked situation while the staff's criteria allow 4% damping for OBE evaluation.
2. The staff criteria specify the increase factor of 1.3 for the shear carried by the masonry, the licensee's criteria includes a factor of 1.67.
3. The staff criteria permit the maximum rebar stress of 0.9  $f_y$ , while licensee's allowable stress is the tested average  $f_y$ .

ENERGY BALANCE TECHNIQUE

With regards to the use of energy-balance technique, the NRC staff with the assistance of Franklin Research Center and its consultant have conducted an exhaustive review of the available information on this technique over the last two years. It is the staff's position that the mere use of the energy balance technique in qualifying walls without test verification is

not acceptable. This is due to the lack of the test data to establish the load-deflection hysteretic behavior, ductility ratios and the post yield envelopes for different material properties and also due to the known differences in construction details as well as available experimental data between masonry walls and reinforced concrete walls in nuclear power plants.

The staff may, therefore, require a confirmatory testing program of a sufficient scope and specificity such that the applicability of the energy-balance technique to the masonry walls at Diablo-Canyon can be demonstrated.

For detail discussion and definition of such a testing program, if the applicant wishes to pursue the testing approach, we suggest that direct meetings between the NRC staff and the applicant be arranged to expedite resolution of the issue.

## Diablo Canyon, Unit 1

AEOD found 51 LERs and six revisions in the NRC Document Control System for the January 1, 1983 to June 30, 1984 assessment period. Fifty-two percent of the events were attributed to personnel errors. Four percent were due to design, manufacturing, or construction errors. Twelve percent were a result of deficient or erroneous procedures, and twenty percent were due to component failure. Twelve percent were placed in the "other" category and none were due to external causes. Twenty-six preliminary notification of occurrence reports (PNOs) were submitted and four special reports were found. Based on our review of the available reports, our findings are as follows:

### 1. LER Completeness

- a. Was the information given sufficient to provide a good understanding of the event?

Yes, enough information was given to clearly and adequately describe each event.

- b. Were the LERs coded correctly?

Yes, all of the entries reviewed appeared to be correct. No discrepancies or inconsistencies were found.

- c. Was supplementary information provided when needed?

Thirty-seven of the fifty-one LERs submitted included supplemental information. In each case, the additional information added to the clarity and completeness of the LER.

- d. When follow-up reports are promised, are they delivered?

Follow-up information was promised for three events and in each case it was delivered.

- e. Were similar occurrences adequately referenced?

Yes, similar occurrences were always referenced.

### 2. Multiple Event Reporting in a Single LER

No cases of reporting multiple occurrences in an LER when separate reports should have been submitted were found.

### 3. Prompt Notification Follow-up Reports

No Prompt Notification reports were found. Twenty-six PNOs were found and three were followed-up by LERs. It does not appear that follow-up reports were required for the others.

Diablo Canyon, Unit 2

AEOD found seven PNOs applicable to Unit 2 and no LERs. Unit 2 is still under construction.

In conclusion, our review indicates that, based on the stated criteria, the licensee provided adequate event reports during the assessment period. Although the licensee reported a very large percentage of events due to personnel errors compared to other plants, no specific areas which required improvement were found.