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AUTH.NAME AUTHOR AFFILIATION
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MANEATIS,G.A. Pacific Gas & Electric Co.

SUBJECT: Identifies concerns resulting from review of URS/Blume containment annulus structure model evaluation.Concerns resulted in issuance of EOI Files 3006 & 3007.

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[illegible] Teledyne Engineering Services
RECIP.NAME RECIPIENT AFFILIATION
[illegible] Pacific Gas & Electric Co.

SUBJECT: Identifies concerns resulting from review of [illegible] containment annulus structure [illegible] evaluation. Concerns resulting in issuance of [illegible] Files [illegible].

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October 15, 1982
5511-170

50-275

Mr. G. A. Maneatis, Senior Vice-President
Facilities Development
Pacific Gas and Electric Co.
77 Beale Street
San Francisco, California 94106

Dear Mr. Maneatis:

Our review of the URS/Blume evaluation is sufficiently far along to have identified two concerns which have resulted in the issuance of two EOI files, 3006 and 3007. It is important to mention that these concerns arose primarily on the basis of the TES review of the URS/Blume model, however, the TES review of the BNL results only tended to reinforce these concerns. The concerns are summarized as follows:

1. Whether the URS/Blume consolidation of radial beams at the two lower levels, i.e., the 101 ft. and 106 ft. elevation, can realistically or conservatively represent the structural stiffness and, hence, response of the radial beam members at those levels.

2. Whether the structural response developed from the condensed frame models used by URS/Blume can account for the local amplified response for the three lower levels at locations on the tangential beams that span between the main radial beams or on secondary radial beams which connect to tangential beams rather than span between the polar crane wall and outer columns.

Before elaborating on the above items, some clarification concerning the URS/Blume model is necessary. TES in its review effort has focused on the most up-to-date URS/Blume analytical model of the Containment Annulus structure, which PG&E refers to as the 1981/1982 URS/Blume model.

The URS/Blume vertical annulus model, which is comprised of five equivalent frames that correspond to the locations of the five fan coolers supported on the concrete floor at elevation 140 ft., appears to produce conservative dynamic response characteristics for the concrete floor at the 140 ft. elevation and for the systems and components attached to it. This is borne out both by TES's own review and the results contained in the BNL report. Based on our current review, TES considers the Blume model to be a reasonable representation for

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computing the 140 ft. floor response. This is principally due to the fact that the concrete floor is very stiff, its inner boundary is continuously supported and the principal response mode for this floor is associated with column action in the steel column members which support the floor along its outer perimeter. The TES concerns, as mentioned at the outset, are associated with the lower frame levels where the floor system is less continuous and inherently more flexible. Therefore, it is improbable that the five frames can provide response results which are representative of the entire annulus structure.

For both the 101 ft. and 106 ft. levels there are significant circumferential gaps or sections where there are neither radial beams nor tangential beams, or where only partial radial beams exist or where the radial beams run from the crane wall to an outer tangential beam between two columns. In computing the stiffness of the representative radial beam at these lower levels for the equivalent frame model, URS/Blume has given the same credit in the summation process to some of these partial radial beams and radial beams which tie into tangential beams as they have given the full radial beams which span from the crane wall to an outer column. The concern is that the representative stiffness may be over estimated and this in turn could have a significant effect on relevant frequency and response. For example, the stiffness used for the radial beam in frame number 5 (five) at elevation 101 ft., was the sum of 4 (four) actual beams none of which extended from an outer column to the crane wall. In the model, this equivalent beam was assumed to be supported by the crane wall and rigidly connected to the outer column. This concern is not applicable to the 117 ft. level because there is relative symmetry with respect to the full radial beams and only the full radial beams were used to compute the equivalent stiffness. The significance of this concern has not been fully assessed to date but hopefully will be at the completion of the TES review.

The second concern addresses the local amplification associated with both the partial radial beams and with the tangential beams. Preliminary calculations and comparisons of individual member stiffnesses indicate that local tangential beam responses could be significantly higher than are experienced by the full radial beams. For example, Members between column lines 11 to 12 at elevation 117 ft. were evaluated to determine the overall effect of tangential beam flexibility to local response spectra. A calculation was performed for a single-degree-of-freedom system representing 1 (one) radial beam (21WF96) and a mass M. When reevaluating the problem with the stiffness of 1 (one) radial beam (21WF96) and 1 (one) tangential beam (21WF96) in series with several variations in mass distribution, it was determined that the two-degree-of-freedom system could result in a considerable increase in response. Our concern is reinforced by the TES review of the BNL mode shapes and floor spectra results. These show significant differences in peak acceleration values between nodes on radial beams and nodes on tangential beams.

While our review is not complete, it was important to identify these concerns early so that the Diablo Canyon Project could also review and address them where necessary. TES will continue its review to assess the significance of these concerns on the qualification of piping systems and other components supported from the annulus structure. TES has not as yet undertaken a review of the annulus structure under horizontal earthquake, and therefore, do not know whether the above concerns are also significant for the horizontal case.

Very truly yours,

TELEDYNE ENGINEERING SERVICES

W. E. Cooper for

Ronald Wray
Manager, Engineering Analysis

RW:cjr

cc: H.E. Schierling (NRC)(2)
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Date October 15, 1982

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1	Ltr	5511-174		BNL Annulus	
1	Ltr	5511-175		Region 5 Comments on Phase II	

ACKNOWLEDGEMENT OF RECEIPT BY H. Schierling TITLE PM DATE 10/18/82

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