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May 16, 1984

Mr. Louis Gibson
Manager, Engineering
Midland Project
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Subject: TERA Comments on Bechtel Response to Confirmed Items C-101, C-117-2,3

Dear Lou:

TERA has reviewed Bechtel's April 23, 1984 letter (No. 148825) which contains the response to Confirmed Items C-101 and C-117-2,3. Our comments, which define our additional information needs, are attached.

Should you require any clarification of our discussion, please contact Mr. Joseph Martore at our Bethesda office. Information pertaining to the disposition of this item may either be discussed at our next review meeting in mid-June or via correspondence.

Sincerely,

Howard A. Levin
Project Manager
Midland IDCVP

Attachment

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TERA COMMENTS ON BECHTEL RESPONSES
TO OCR ITEMS (C-101, C-117-2,3)

1. C-101

Comparison of the auxiliary building finite element and seismic stick models represents good practice and serves as a verification tool during the design/analysis process. While comparison is also useful as a verification tool within the IDVP, the need for comparison is somewhat different. Accordingly, IDVP reviewers have not raised the issue simply on the basis of good practice or that a more rigorous comparison may have enhanced the project's design verification effort. IDVP reviewers have focused on this comparison to gain insight into the significance of noted items documented in a series of civil/structural and civil/soils Confirmed Items.

The response indicated that several parameters had been compared to verify consistency between the stick model and the finite element model. With respect to verifying the consistency of building stiffnesses representation, a significant parameter to be evaluated is building fundamental mode shapes or displacement. To assure that the two models accurately and consistently represent the building response, the relative difference in building displacements for similar loading should be small. However, displacement comparisons provided in the Bechtel response do not at this time support this conclusion. The reasons presented to explain the differences require clarification and additional detail. For example, the fundamental differences in the two models (e.g., cracked vs. uncracked properties, differences in soil springs, location of compared displacements, amount of slab rotation, etc.) should be specified and evaluated, in terms of the impact they may have on the response inconsistencies.

2. C-117-2,3

While the Bechtel response adequately describes the physical pheonomenon and existence of stress redistribution, it does not describe how this physical behavior is accounted for in the methodology used to perform the redistribution for overstressed elements. Nor does the response provide any clarification of the guidance or procedures given to engineers which would describe when and where stress redistribution may be used and to what extent. It is not clear how the limits on the amount of acceptable stress redistribution are specified.

We believe that such procedures should be founded on accepted methods or on special sensitivity studies. Furthermore, the extent of the redistribution should be considered to assess its potential impact on the behavior of the model.

In addition, the initial response indicated that "for a limited number of structural elements where the tensile and shear stresses exceeded the values of $4\sqrt{f'c}$ and $3\sqrt{f'c}$, respectively, concrete elements were assumed to crack, resulting in reduction in stiffness and redistribution of forces in localyzed areas." It is unclear whether or not a reduction in stiffness is applied in all cases where element concrete stresses exceed these threshold values. If this stiffness reduction is not consistently applied, the basis for selective element stiffness reduction should be specified. This would also imply that should additional concrete element overstress exist after the initial stiffness reduction, a subsequent stiffness reduction/stress redistribution is appropriate. Therefore, the number of redistribution iterations should be specified, along with the number of overstressed elements resulting from each run.