PDR

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

NOV 3 1978

Docket No.: STN 50-584

Mr. Charles Gogolick
GIBBSSAR Project Manager
Gibbs & Hill, Inc.
393 Seventh Avenue
New York, New York 10001

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - ROUND TWO QUESTIONS AND STAFF POSITIONS

Dear Mr. Gogolick:

Enclosed are requests for additional information that is needed in order to continue our review. Also, you are requested to respond to the staff positions included which are designated by the notation "RSP." We need a completely adequate response to these areas by December 15, 1978. As you requested, we have arranged a meeting on November 7, 1978 between Gibbs & Hill and staff representatives cognizant in the areas addressed in the attached enclosures, in order to expedite your evaluation and response in that regard. Please contact us if there are any questions.

Sincerely,

C. J. Heltemes, Jr., Chief
Standardization Branch
Division of Project Management

Enclosures:
Q-2's/Positions by
Structural Engineering
Branch

cc: Mr. Fredrick W. Gettler, Vice President
Power Engineering
Gibbs & Hill, Inc.
393 Seventh Avenue
New York, New York 10001

GIBBS AND HILL STANDARD BALANCE OF PLANT

GIBBSSAR

Structural Engineering Branch

SSAR Second Request for Information

131.56 (3.3.2) (RSP) Your response to Item 131.3 is not adequate, since you did not specify the non-Category I equipment which may become a missile. In view of the fact that the Gibbssar plant will utilize blow-out panels for venting, you are requested to state your intentions to either of the two:

1. Identify the non-Category I equipment which may become a tornado generated missiles, if any, and assess its damage potential and show that the damage potential is less than the damage which would result from the tornado missiles contained in the Standard Review Plan Section 3.5.1.4 or,

2. Commit to secure all non-Category I equipment in the blow-out areas which may become tornado generated missiles to their supports so that there will be no tornado generated missiles resulting from the venting due to the blow-out panels.

131.57 (3.5) (RSP) Your response to Item 131.6 is not adequate. The allowable ductility ratios to be used in the SSAR do not reflect the regulatory staff position. The staff's position is provided in the Enclosure. Indicate your compliance with this position.

131.58 (3.8.1) Your response to Item 131.36 requires additional information. Describe in more detail the following:

1. Material, physical characteristics and thickness of the "protection course" shown in Waterproofing Detail (Figure 3.8-2).

2. Describe in more detail the "reinforced concrete mat" (RCM). Provide details of the reinforcement and thickness. Indicate the difference between the "reinforced concrete mat" and the "foundation mat".

3. Provide the pertinent information regarding the material and physical characteristics of the membrane waterproofing.

131.59 (3.7.1) (RSP) Your response to Item 131.8 is not satisfactory in that it lacks a commitment that the plant will be designed for the peak ground SSE acceleration of 0.3g. It is the regulatory staff position that the standard plants should be designed for one peak ground acceleration regardless of the site. Express your intentions regarding this commitment.

131.60 (3.7.1) (RSP) Your response to Item 131.7 did not address the issue. Examination of Fig. 3.7-2 shows that the high frequency end of the response spectra is not in accordance with the Regulatory Guide 1.60. Indicate your intent to comply with R.G. 1.60 or provide technical justification for the deviation.

131.61 (3.7.2) Your response to question 130.21 is not clear. Indicate how much of the live loads is included in the mathematical model and clarify if the mathematical model used for structural response analysis is different from that used for in-structure response spectrum generation.

If so, provide the basis.

131.62 (3.7.2) Your response to Question 131.29 is not satisfactory. Clarify the following:

1. How are lateral earth pressure and hydrostatic pressure considered in your analysis?

2. An upward vertical acceleration will reduce the weight of a structure. Is this considered in the definition of W indicated in Equation '4) on Page 3.7-29?

131.63 (3.7A) Your response to Item 131.34 is not complete. Referencing benchmark calculations is not enough. You are requested to submit sample problems comparing the computer code solution with a solution obtained by either hand calculations or other computer code solution, which is in public domain, so that the reviewer has opportunity to review the results of the two solutions. In case that the computer code has been verified by means of tests, the test report should be submitted together with the computerized solution for review.

131.64 (3.7.2) The reference to R.G. 1.22 on P. 3.7-24 appears to be erroneous. The correct Regulatory Guide should be R.G. 1.122.

131.65 (3.7.2) On page 3.7-15 a statement is made that the stresses are within the elastic limit and in accordance with "appropriate codes". Define the codes to which reference is being made.

131.66 (3.7.2) (RSP) Your response to the Regulatory staff's position stated in Item 131.16 is contradictory to a statement made in Section 3.7.2.1. In the response, you stated that you intend to comply with the Regulatory Staff position, which allows local yielding due to impactive and impulsive loads. Yet, in the Section 3.7.2.1, you stated that yield stresses may exceed the secondary stresses "to the extent set forth in the appropriate design standards and codes". Remove the ambiguity by specifying the codes and standards and indicate your compliance with the staff's position, which allows stresses in excess of yield only when the impactive or impulsive loads are present.

131.67 (3.7.2) Your response to Item 131.17 is not satisfactory in that instead of responding to the original question you eliminated the pertinent information from the PSSAR. In view of the above, provide information and a satisfactory justification pertinent to the treatment of the mass moment of inertia of each structure. In addition, Figure 3.7-18 referred to in your response is not a complete mathematical model. In Sections 3.7.2.1, 3.7.2.11 and other places, mention was made of using finite element techniques in modeling the structures. Figure 3.7-18 does not reflect such a representation. Provide the complete model used in your seismic analysis.

131.68 (3.7.2) Explain and justify the following statements on page 3.7-17 of the SSAR:

1. What are the "appropriate computer programs to be used to develop flexibility matrix for containment structure".

2. What do you mean by "beam history" (SIC) and how it relates to the containment structure.

3. Justify the use of the computer programs based on "beam history" as applicable to the containment structure and those based on the finite element method as applicable to the other Category I Structures such as the auxiliary building and the internal structure.

131.69 (3.7.2) In Section 3.7.2.4, you indicated that the methods of analysis of Category I structures for the soil-structure interaction to be used in future confirmatory analyses will be according to those specified in Table 2.7-3 of the SSAR. It is the regulatory staff position that each utility applicant referencing GIBBSSAR perform confirmatory soil-structure interaction analysis to demonstrate design adequacy of Category I structures and the acceptability of such confirmatory analysis will be reviewed on a case by case basis in the future site related applications. Therefore, the discussion pertaining to future confirmatory analysis methods together with the Table 3.7-3 referenced should be deleted and a commitment to comply with the above stated staff position be provided in its place by the applicant.

131.70 (3.8.1) Your response to Item 131.17 is not satisfactory in that you failed to describe:

1. The method of calculating the loads resulting from the buckled liner plate.

2. The buckling criteria applied to the liner plate analysis and design.

Provided the above information.

131.71 (3.8.1) Your response to Item 131.39 is not satisfactory. Section 3.8.1.4 (f) refers to Section 3.8.1.5 (c) for information on the allowable anchor loads. Examination of Section 3.8.1.5 (c) reveals that this information is missing. Discuss in detail the method of analysis to prevent the "zipper effect" stating the test data, and the allowable loads on the anchors and the liner plate.

131.72 (3.8.1) Your response to Item 131.40 is not adequate. The question did not state that you must combine the effects of peak temperature and pressure effects, but simply asked you how are you combining such effects. This you did not answer. Describe the method of analysis to account for temperature gradient in the containment. Also, justify the increase in allowable strain of tensile reinforcing to 1.5 times the yield strain.

131.73 (3.8.1) The revised Sections 3.8.1.3 (a) and (b), which you provided in response to Item 131.42, do not contain load combination equations in accordance with the Standard Review Plan. The Extreme Environmental Category Equation should include the R_o, as defined in Section 3.8.1.3 (a) (8) of the SSAR. Please correct the equation accordingly.

131.74 (3.8.1) Your response to Item 131.46 is not acceptable. The revised Fig. 3.8-13 does not answer the original question. Please provide pertinent answer to this question.

131.75 Your response to the Interface requirements (General Comments of Q1) is too general to be considered satisfactory. For example, by making a statement that the "check will be made to ensure consistency at the interface between the BOP structures and the NSSS components", you did not address the specific requests of the staff. Indicate your compliance to the specific requirements of the NSSS/BOP interface as requested by the staff.

131.76 It is noted that you did not respond to Items 131.37 and 131.52. For your convenience these items are repeated below. Please respond to the original questions.

Original Question 131.37 (3.8.1)

Describe the provisions to be taken to prevent corrosion of the liner plate in case of buckling towards the inside of the containment and the surveillance measures to be used to detect such condition.

Original Question 131.52 (3.8.6)

GIBBSSAR is intended to accommodate a large number of sites within the continental United States. Naturally, the site soil conditions affecting design of foundations will vary from site to site. In order to proceed with the comprehensive design of the plant, the design parameters of soil conditions must be defined that will cover all possible situations for which the plant will be designed. You are requested to specify such design parameters in the SSAR. These parameters should cover pertinent aspects of structural engineering and design of foundations, such as the allowable soil bearing pressure, ground water level, cohesion, soil stratification, etc.

Enclosure

SEB INTERIM POSITIONS FOR REVIEW AND ACCEPTABLE OF DUCTILITY OF REINFORCED CONCRETE AND STEEL STRUCTURAL ELEMENTS SUBJECTED TO IMPACTIVE OR IMPULSIVE LOADS

INTRODUCTION

In the evaluation of overall response of reinforced concrete structural elements (e.g., missile barriers, columns, slabs, etc.) subjected to impactive or impulsive loads, such as impacts due to missiles, assumption on non-linear response (i.e., ductility ratios greater than unity) of the structural elements is generally acceptable provided that the safety functions of the structural elements and those of safety-related systems and components supported or protected by the elements are maintained. The following summarizes specific SEB interim positions for review and acceptance of ductility ratios for reinforced concrete and steel structural elements subjected to impactive and impulsive loads.

SPECIFIC POSITIONS

1. REINFORCED CONCRETE MEMBERS

1.1 For beams, slabs, and walls where flexure controls design, the permissible ductility ratio under impactive and impulsive loads should be taken as

$$\frac{0.05}{\rho - \rho'} \leq 10$$

where ρ and ρ' are the ratios of tensile and compressive reinforcing as defined in ACI-318-71 Code.

1.2 If use of a ductility ratio greater than 10 (i.e., $\mu > 10$) is required to demonstrate design adequacy of structural elements against impactive or impulsive loads, e.g., missile impact, such a usage should be identified in the plant SAR. Information justifying the use of this relatively high ductility value shall be provided for SEB staff review.

1.3 For beam-columns, walls, and slabs carrying axial compression loads and subject to impulsive or impactive loads producing flexure, the permissible ductility ratio in flexure should be as follows:

(a) When compression controls the design, as defined by an interaction diagram, the permissible ductility ratio shall be 1.3.

(b) When the compression load does not exceed $0.1f_c' A_g$ or one-third of that which would produce balanced conditions, whichever, is smaller, the permissible ductility ratio can be as given in Section 1.1.

(c) The permissible ductility ratio shall vary linearly from 1.3 to that given in Section 1.1 for conditions between those specified in (a) and (b). (See Fig. 1.)

1.4 For structural elements resisting axial compressive impulsive or impactive loads only, without flexure, the permissible axial ductility ratio shall be 1.3.

1.5 For shear carried by concrete only

$\mu = 1.0$

For shear carried by concrete and stirrups or bent bars

$\mu = 1.3$

For shear carried entirely by stirrups

$\mu = 3.0$

2. STRUCTURAL STEEL MEMBERS

2.1 For flexure compression and shear

$\mu = 10.0$

2.2 For columns with slenderness ratio (l/r) equal or less than 20

$\mu = 1.3$

where l = effective length of the member
r = the least radius of gyration

For columns with slenderness ratio greater than 20

$$\mu = 1.0$$

2.3 For members subjected to tension

$$\mu = .5 \frac{\varepsilon_u}{\varepsilon_y}$$

where ε_u = ultimate strain
ε_y = yield strain

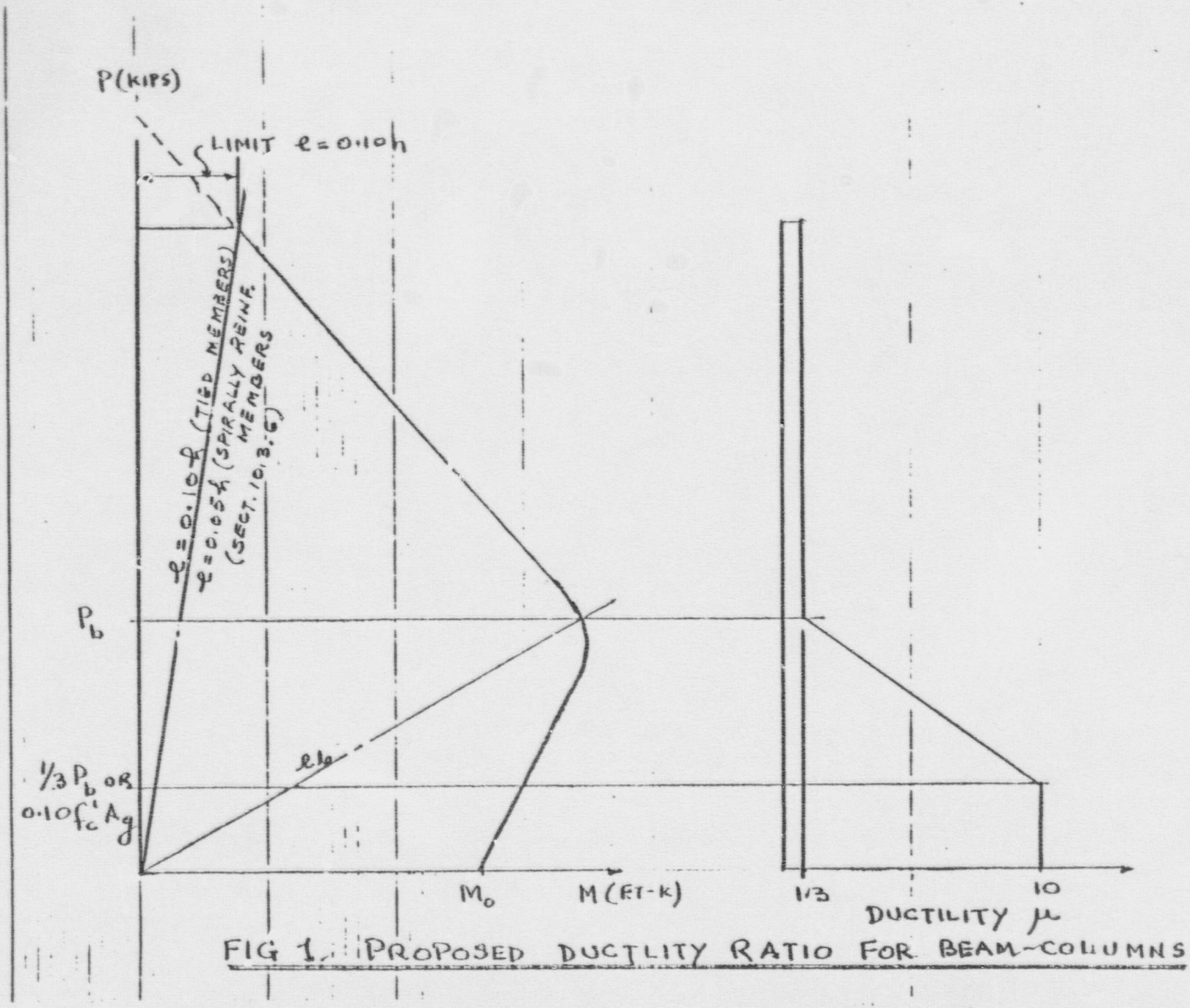

FIG 1. PROPOSED DUCTILITY RATIO FOR BEAM-COLUMNS