MISSISSIPPI POWER & LIGHT COMPANY
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P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

January 16, 1981

NUCLEAR PRODUCTION DEPARTMENT

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
File 0260/L-380.0/L-371.0
NRC/INEL Audit Action Items
AECM-81/30

In response to the NRC's request for additional action and pursuant to closing the action items identified by the NRC/Idaho National Engineering Laboratories (INEL) structural audit, conducted March 17-21, 1980, of our agent Bechtel Power Corporation, MP&L is submitting the following attached information.

Each action item identified by NRC/INEL is listed with its response in a format similar to NRC question responses. This submittal represents all but eleven of the action items. Eight of these open items will be submitted by the end of this month. We expect the remaining items to be submitted in February, 1981.

All calculations requested are confidential and proprietary to our agent, Bechtel Power Corporation, and will be submitted directly to you by Bechtel.

Yours truly,

L. F. Dale
Nuclear Project Manager

JGC/JDR:lm
Attachments

cc: (See Next Page)

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8101220294 Member Middle South Utilities System

cc: Mr. N. L. Stampley
Mr. G. B. Taylor
Mr. R. B. McGehee
Mr. T. B. Conner

Mr. Victor Stello, Jr., Director
Division of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. T. R. Thompson
EG&G Idaho, Inc.
P.O. Box 1625 (TSB-6)
Idaho Falls, Idaho 83901

NRC/INEL STRUCTURAL AUDIT

RESPONSES

TO

ACTION ITEMS

(As identified in enclosures 2 and 3 to NRC letter,

Thomas C. Houghton, NRC, to Mr. N. L. Stampley, MP&L, undated.*)

* This letter was received by MP&L on June 10, 1980, and assigned MP&L letter serial MAEC-80/113.

AUDIT ACTION ITEMS

Enclosure 2

1. Select a critical section of a Category I structure, other than containment, and compare, on a quantitative basis, the existing design criteria and loading combinations with those of the Standard Review Plan.

   RESPONSE:

   Response to this action item will be provided later.

AUDIT ACTION ITEMS

Enclosure 2

2. Evaluate in quantitative terms the effect on a critical structure of increasing the vertical earthquake from 2/3 of the horizontal to 3/3 (i.e., equal in intensity to the hosizontal earthquake).

RESPONSE:

An SSE vertical load analysis of the auxiliary building was performed in accordance with the methods described in FSAR Section 3.7, using Regulatory Guide 1.60 vertical design response spectra scaled to the same peak ground acceleration as the horizontal earthquake, 0.15g. Damping assumed in this analysis is consistent with recommendations in Regulatory Guide 1.61. FSAR Figure 3.7-75 shows the results of the analysis. This may be compared with FSAR Figure 3.7-42, which provides vertical SSE loads of the auxiliary building using the design response spectra of FSAR Subsection 3.7.1.1 (the vertical earthquake peak ground acceleration 2/3 of that established for the horizontal direction, i.e., 0.10g).

AUDIT ACTION ITEMS

Enclosure 2

3. Select a representative floor system supporting heavy equipment and quantify the effect of coupled subsystems (floors and floor beams) on a response spectra basis for a vertical earthquake.

RESPONSE:

Response to this action item will be provided later.

AUDIT ACTION ITEMS

Enclosure 2

4. Generate the response spectra per RG 1.60 and by calculating the percentage of seismic contribution to overall load conditions, assess the impact of the use of Grand Gulf's response spectra as compared to those corresponding to RG 1.60.

RESPONSE:

Regulatory Guides 1.60 and 1.61 were applied to the Grand Gulf Auxiliary Building seismic model (FSAR Figures 3.7-19 and 3.7-20) to yield the SSE horizontal and vertical response loads. (The horizontal and vertical design response spectra were scaled to .15g peak ground acceleration). FSAR Figures 3.7-73, 3.7-74, and 3.7-75 provide the results of this analysis. These may be compared with FSAR Figures 3.7-38, 3.7-40, and 3.7-42, which are based on the design response spectra of FSAR Subsection 3.7.1.1, scaled to .15g and .10g maximum ground acceleration for horizontal and vertical directions, respectively.

An OBE analysis of the Auxiliary Building applying Regulatory Guides 1.60 and 1.61, although not performed, would yield an increase in the response loads of FSAR Figures 3.7-39, 3.7-41, and 3.7-43 proportional to the SSE analysis described above.

To examine the effects of seismic loads based on Regulatory Guides 1.60 and 1.61 on overall load combinations, a typical Auxiliary Building interior wall and floor were studied. The critical load combinations in FSAR Tables 3.8-37 through 40 include the effects of an OBE, based on the design response spectra of FSAR Figure 3.7-2. The contribution of E (including load factor) to the total actual design stress ranges from 6 to 90 percent. Conservatively, increasing design basis earthquake loads by 20 percent to account for the influence of imposing Regulatory Guides 1.60 and 1.61, would, by inspection, yield an actual stress level well below allowable values. Therefore, the impact of the Regulatory Guides is not of sufficient magnitude to affect the structural integrity of the areas evaluated.

NOTE:

Figures 3.7-73, 3.7-74, and 3.7-75 were provided in the response to NRC question 130.14. Tables 3.8-37 through 40 were provided in the response to NRC question 130.40.

These respones were incorporated into the FSAR by Amendment 44, submitted November 29, 1980.

AUDIT ACTION ITEMS

Enclosure 2

5. Categorize the loads defined in GE Report 22A4365, "Interim Containment Loads Report - Mark III Containment," Revision 2, in accordance with the Structural Engineering Branch Technical Position, "BWR Mark III Containment Pool Dynamics."

RESPONSE:

As stated in FSAR Section 3.8.1.3, the containment is designed in accordance with the loads defined in FE Topical Report, NEDO 11314-08 (GESSAR Appendix 3B) (previously GE Document 22A4365 Rev. 2, Interim Containment Loads Report (ICLR)). These load combinations, to which we committed in Item 130.12 of MP&L letter, AECM-76/18, to Mr. W. F. Butler, NRC, dated March 30, 1976, and subsequently updated in FSAR Subsection 3.8.1.3.8, conform to the NRC Structural Engineering Branch position for BWR Mark III Containment Pool Dynamics as follows:

Pool swell loads (R_B, R_{BA}, R_D, R_p, R_F, R_C, R_{Co}, R_W as defined in FSAR Subsection 3.8.1.3.5) are treated as abnormal pressure loads with load factors of 1.5 for abnormal plant design conditions, 1.25 for abnormal plant plus severe environmental design conditions, and 1.0 for abnormal plant plus extreme environmental design conditions (SEB Position 1.a.).

Pool swell loads and accident pressures are conservatively combined using maximum values from an envelope of their actual time histories of occurance (SEB Position 1.b.).

Safety Relief Valve (SRV) loads (C_1, C_2, C_A, C') are treated as live loads with similar load factors applied. In the combinations that contain 1.5 times an abnormal pressure load, a load factor of 1.25 is applied to concurrent SRV loads (SEB Position 2.a.).

Loads from a single SRV discharge (C_1) are considered to act concurrently with pool swell loads resulting from a design basis accident (DBA) (SEB Position 2.b.).

Loads from multiple SRV discharges (C_2, C_A, C') are considered to act concurrently with loads associated with small break (SBA) and intermediate break (IBA) accidents (SEB Position 2.c.).

Thermal loads due to SRV discharge are treated as T_O for normal operating conditions and as (T_O+T_A) for accident conditions (SEB Position 2.d.).

The suppression pool liner plate was found to conform to the criteria of ASME Boiler and Pressure Vessel Code, Division 1, Section III, Subsection NE, as discussed in FSAR Subsection 3.8.1.4.2. (SEB Position 2.e.).

Attachment to AECM-81/30

AUDIT ACTION ITEMS

Enclosure 3

1. General

Live load drawings

RESPONSE:

Live load drawings were transmitted via VDT-80/0386, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho Inc., dated April 14, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Representative generic calculations for tornadic missiles considering 12" dia pipe and automobile.

RESPONSE:

Proprietary calculation C-E020.0 for tornado missiles has been submitted to NRC/EG&G in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/0230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Copy of civil design criteria.

RESPONSE:

Proprietary civil design criteria has been submitted to NRC/EG&G in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/230 dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Provide rationale on seismic structure-soil-structure analyses using lumped mass.

RESPONSE:

FSAR Section 3.7 and Bechtel Topical Report BC-TOP-4 have been submitted to the NRC/EG&G under cover of the following letter:

VDT-80/0156, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho Inc., dated February 1, 1980.

Attachment to AECM-81/30

AUDIT ACTION ITEMS

Enclosure 3

Give stiffness properties for rodofoam used between buildings.

RESPONSE:

See attached information sheets from W. R. Grace & Co. for Rodofoam.

RODOFOAM® II

CELLULAR PLASTIC JOINT FILLER

TOTAL CAPABILITY ENGINEERED®

For SEISMIC MOVEMENT
- MINIMUM LOAD TRANSFER
- MAXIMUM RADIATION RESISTANCE
- JOINT FORMER TO BE LEFT IN PLACE

DESCRIPTION

Cellular cross linked polyethylene in sheet form. Sizes available: Thickness up to 3", in sheets 48" by 48". May be laminated for greater thickness.

USE

Designed especially for seismic separation joints in nuclear power plants, nuclear fuel reprocessing plants, fossil fuel generating plants, and pumped storage plants.

With the Rodofoam II adhered to a vertical concrete surface with special adhesive, the second concrete placement may be made against the Rodofoam to form the seismic separation joint.

DESIGN CRITERIA

SEISMIC MOVEMENT

Subjected to seismic movement of 1.76 Hz, 0.9 g acceleration, 31"/sec. velocity for 150 cycles with no damage to the Rodofoam or to the adjacent concrete.

MINIMUM LOAD TRANSFER

Under seismic testing, load transfer at 50% compression was 17.8 psi.

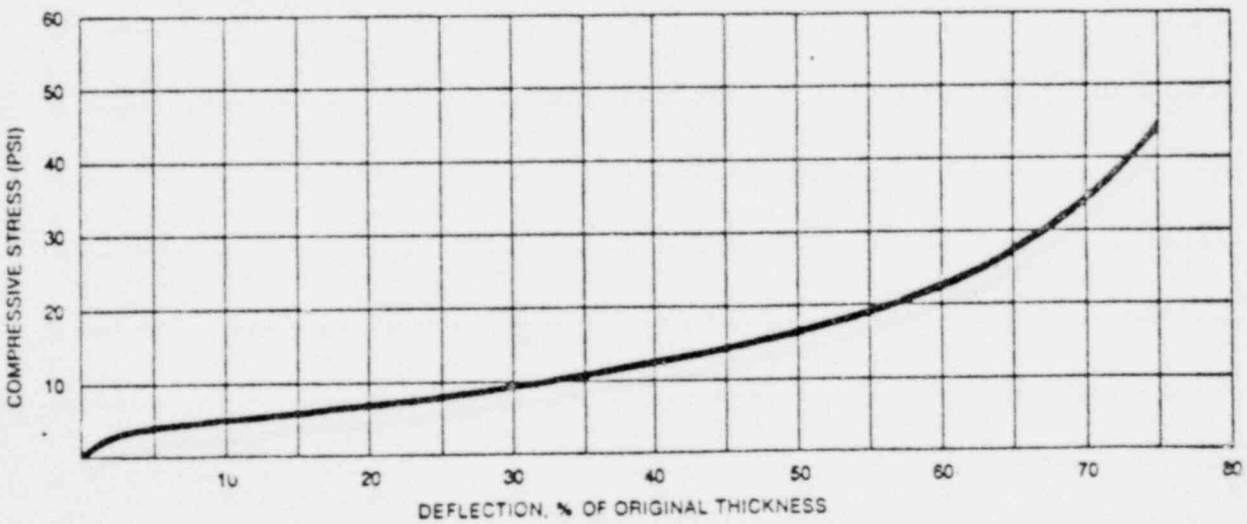
RADIATION RESISTANCE

Exposure to 5×10^4 Rads before threshold damage and to 1×10^7 Rads before 25% damage.

JOINT FORMING

At 2.8 psi lateral pressure of concrete (placed at 2 ft. vertical lift per hour at 70°F.) deflection of Rodofoam II will be 2.5%.

RODOFOAM II COMPRESSION DEFLECTION



PHYSICAL PROPERTIES

Density, lb/ cu. ft.	2 ± 0.4
Recovery, after 50% Compression	90% Min.
Tensile Strength, psi	40
Elongation at Break, %	275
Water Absorption, % by volume, 24 hrs.	0.1
Application Temperature Range	−40°F to 175°F
Dimensional Stability @ 200°F, 72 hrs.	3.5% Change, Max.

HOW TO SPECIFY

The premolded filler used in all seismic separation joints shall be Rodofoam II as manufactured by Construction Products Division, W.R. Grace & Co., or equal subject to specific written approval, and meeting the conditions of service as listed below.

CONDITIONS OF SERVICE

The manufacturer shall furnish evidence as to the maximum radiation dosage to which the seismic joint filler may be exposed over the service life of the project without damage, and evidence that the seismic filler will withstand the maximum designed earthquake conditions of the project without damage to the adjacent concrete.

AUDIT ACTION ITEMS

Enclosure 3

Artificial seismic time history development.

RESPONSE:

The artifical seismic time history development is discussed in FSAR Subsection 3.7.1.2. This subsection, in response to NRC Question 130.16, has been revised to reflect the following information.

The modification of the El Centro earthquake stated in FSAR Subsection 3.7.1.2 consists of an iterative process whereby the actual earthquake time history is manipulated to raise or suppress its response spectrum until the design spectrum is satisfactorily enveloped for a specified value of damping. The above technique is described in Section 2.5 of BC-TOP-4-A, Rev. 3.

AUDIT ACTION ITEMS

Enclosure 3

Containment

Define "new loads" pressure fields spatially and temporally by figures. These are time varying loads on suppression pool.

RESPONSE:

The response to this action item is provided in the following table.

LOAD	GESSAR II, APPENDIX 3B*	FSAR SECTION 3.8**
General Information	Tables 3B-2; Figures 3b-9, 3B-10, 3B-36, 3B-37, 3B-42 to 3B-44, 3B-51, 3B-57, 3B-58, 3B-64 to 3B-72, 3B-75, 3B-76	Figures 3.8-46, 48, 49, 52
Condensation Oscillation	Figures 3B-16, 3B-17, Attachment F to Appendix 3B	
Chugging	Table 3B-4; Figures 3B-20 to 3B-35, 3B-39, 3B-41, 3B-45 to 3B-50, 3B-53	Figures 3.8-48a, 50
Pool Swell	Figures 3B-7, 3B-11, 3B-56, 3B-73	Figures 3.8-47
SRV	Table 3BA-6 to 3BA-11, 3BA-13, 3BA-14, 3BA-21; Figures 3B-8, 3BA-8 to 3BA-25, 3BA-30	Figures 3.8-16a, 16b, 17-20, 21a to 25a, 25b, 26a to 28a, 29, 30, 30a to 35a, 35b, 36a to 40a, 40b, 41a to 45a, 45b

* Tables and Figure Numbers are as contained in GESSAR II, Appendix 3B, which has been incorporated into the Grand Gulf FSAR by Amendment 43 as Appendix 6D.

** Figure Numbers are as contained in the Grand Gulf FSAR.

AUDIT ACTION ITEMS

Enclosure 3

Provide summary f stiffness and mass matrix used to model the enclosure building.

RESPONSE:

Proprietary calculation G-C-712 has been submitted to the NRC/EG&G in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980 and VB-80/230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Justify or account for failure to consider torsional effect on drywell from filter demineralization room.

RESPONSE:

The response to this audit item will be provided later.

AUDIT ACTION ITEMS

Enclosure 3

Verify statements on concrete stress from pages 77-78 of G102 of analysis calculations.

RESPONSE:

Pages 77-78 of proprietary calculation C-G102 contain stress calculations for the following load combinations:

$U = 1.00 + 1.0L + 1.0\ (T_0 + T_A) + 1.0P_{DS}$.

This equation has since been superseded by the following equations:

$U = 1.0D + 1.0L + 1.0\ (T_o + T_a) + 1.0\ (P_{DS}$ or $P_{DN}) + 1.0C_1(\pm) + 1.0R_C + 1.0E'$
$U = 1.0D + 1.0L + 1.0\ (T_o + T_a) + 1.0\ (P_{DS}$ or $P_{DN}) + 1.0C_2(\pm) + 1.0R_C + 1.0E'$
$U = 1.0D + 1.0L + 1.0\ (T_o + T_a) + 1.0\ (P_{DS}$ or $P_{DN}) + 1.0C_A(\pm) + 1.0R_C + 1.0E'$

(See FSAR Subsection 3.8.1.3.8.7.) Building stresses are being determined for these combinations as part of the new loads adequacy evaluation requalification program. Analysis methods used are those outlined in FSAR Subsection 3.8.1.4.1.2 and controlling stresses will be reported in the FSAR when available.

AUDIT ACTION ITEMS

Enclosure 3

Request sample calculations for determining governing steel and concrete stresses at characteristic points through foundation and containment shell.

RESPONSE:

See Proprietary Calculations G-102.0 and G-125.0.

Request tangetial rebar calculations.

RESPONSE:

See Proprietary Calculation G-351.0.

Request sample calculations for resolving element forces to sectional forces (Finite element stress distribution).

RESPONSE:

See Proprietary Calculation G-350.2.

Pool swell loads on Elevation 135'-4".

RESPONSE:

See Proprietary Calculation G-200.0.

Sample of enclosre building bracket.

RESPONSE:

See Proprietary Calculations G-181.0 and G-120.0.

Stiffness summary table for containment and internals.

RESPONSE:

See Proprietary Calculation G-712.0.

NOTE: The above Proprietary Calculations G-102.0, G-125.0, G-351.0, G-350.2, G-200.0, G-181.0, G-121.0, and G-712.0 have been submitted to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/0230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Compare liner plate stresses to ACI-359 requirements.

RESPONSE:

In response to NRC Question 130.30, FSAR Subsection 3.8.1.4.2 has been revised to reflect the following:

The liner plate was included in the linear elastic computer model used to analyze the containment concrete cylinder wall for all associated load cases. Based on this linear elastic analysis, the computer program results obtained show stresses in the liner plate in excess of the material yield stress for certain containment load cases. These stresses are not considered significant because the plate stresses will be limited by the material yield stress, and the plate functions as a leak tight barrier instead of a stress carrying element. For these reasons, and because no allowable stresses are stated in any of the documents used for this design, the yield stress of the material has been chosen for comparison in Tables 3.8.4 and 3.8.5. Although it has not been used for design, the limits for strain from the ASME Boiler and Pressure Vessel Code, Section III, Division 2, have also been used for comparison. (Grand Gulf Units 1 and 2 are not designed to comply with the requirements of ASME Section III, Division 2).

The results of the analysis show that the liner plate does yield for some critical load cases but that the strains are within the limits of those specified in ASME Section III, Division 2. For construction loads the plate remains within the stress limits specified in ASME Section III, Division 2.

AUDIT ACTION ITEMS

Enclosure 3

Locations in containment and auxiliary building for which spectra are generated.

RESPONSE:

Containment:

For N-S, E-W or vertical OBE or SSE, response spectra are generated at the following locations as shown on the containment mathematical model shown in FSAR Figure 3.7-18.

Nodes 1, 2, 3, 4, 5, 6, 7, 9, 11, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32.

Auxiliary Building:

For N-S, E-W or vertical OBE or SSE, response spectra are generated at the following locations as shown on the auxiliary building mathematical model shown in FSAR Figures 3.7-19 and 3.7-20.

Nodes M1, M2, M3, M4, M5, M6, M7, and M8.

AUDIT ACTION ITEMS

Enclosure 3

Need explanation of modified working stress design with sample calculations.

RESPONSE:

The response to this item is Bechtel proprietary and will be submitted to NRC by separate letter.

AUDIT ACTION ITEMS

Enclosure 3

Explain 21.2 ksi shear allowable for 38 ksi material (FSAR for shield wall).

RESPONSE:

Response to this action item will be provided later.

AUDIT ACTION ITEMS

Enclosure 3

Control Building

Sample design calculation for Seismic Category I concrete masonry walls.

RESPONSE:

Sample proprietary calculations for concrete masonry walls have been submitted to NRC by the following letter:

AECM-80/206, L. F. Dale, MP&L, to Harold R. Denton, NRC, dated October 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Floor framing calculations.

RESPONSE:

See Proprietary Calculation T-180.0.

Shear wall calculations.

RESPONSE:

See Proprietary Calculation T-335.0.

Column calculations.

RESPONSE:

See Proprietary Calculation T-200.0.

NOTE: The above proprietary calculations have been submitted to NRC/EG&G Idaho, Inc., in the following letters

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/0230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Damping ratio for soil.

RESPONSE:

The response to this action is Bechtel proprietary and will be submitted to the NRC by separate letter.

Attachment to AECM-81/30

AUDIT ACTION ITEMS

Enclosure 3

Displacement of structure-structure interaction.

RESPONSE:

The response to this action item is Bechtel proprietary and will be submitted to the NRC by separate letter.

AUDIT ACTION ITEMS

Enclosure 3

Auxiliary Building

Comparison of two dimensional and three dimensional seismic models and results.

RESPONSE:

In response to the above item, see following discussion of the seismic models used in the analysis of the auxiliary building. Additional information is included in Bechtel Proprietary Calculation C-H003.0 submitted to NRC by a separate letter. (Note that the following information was provided in the response to NRC Question 130.19.)

Auxiliary Building

FSAR Figures 3.7-19 and 3.7-20 show the mathematical models for the auxiliary building. Also shown in FSAR Figure 3.7-21 is a 3-dimensional mathematical model for the auxiliary and the control buildings, used to study the effect of structure-structure interaction between the two buildings.

In considering the location of the center of gravity of the 3-dimensional model in the E-W direction, torsional effects, if any, due to N-S ground movement input, are studied. Shown also in the mathematical model are springs TR1 to TR6 representing the air gaps between the auxiliary and control buildings which are filled with foam rubber compressive material.

Comparison of the floor response spectra, based on this model and FSAR Figure 3.7-19 and FSAR Figure 3.7-20, indicates that the torsional effect as well as structure-structure interaction due to the compressible material are not significant enough to alter the seismic design based on FSAR Figures 3.7-19 and 3.7-20.

Since the control building was shown to have an insignificant impact on the response of the auxiliary building, a three dimensional model of the auxiliary building alone was developed as shown in attached Figure 3.7-21A, to further evaluate the effects of building eccentricities on total response. This evaluation is further discussed in FSAR Subsection 3.7.2.11.

Method Used to Account for Torsional Effects (For Other Than NSS Systems)

The dynamic analysis of structures is covered in FSAR Subsection 3.7.2.1. The effects of torsion are considered in the analyses as described in the following paragraphs.

AUDIT ACTION ITEMS

Enclosure 3

RESPONSE (Continued)

When a horizontal load is applied to an asymmetric structure (where the center of mass does not coincide with the center of resistance), coupling between the two horizontal motions occurs. The degree of coupling depends on the amount of eccentricity and the ratio of the uncoupled torsional frequency to the uncoupled lateral frequency. If the uncoupled torsional frequency is high with respect to the uncoupled lateral frequency, and if the eccentricities are small, the coupling between translation and torsion can be neglected and the structure can be treated as a symmetric structure.

In the three dimensional finite element modeling of structures, the geometry of the structures is preserved, thus, the torsion effects are automatically taken into consideration.

For three-dimensional lumped-mass models which have translation-torsion coupling, the locations of the centers of mass (CM) and centers of rigidity (CR) are determined. Each idealized element is considered to run through the CR and is connected at its ends to the CM by a rigid bar. However, the couplings between vertical and horizontal responses are very small and can be neglected Therefore, the vertical and horizontal model can be separated.

When torsional effects are taken into account for the dynamic analysis through the use of three-dimensional mathematical models, the need for statis factors and accidental torsion is eliminated.

To assure that torsional effects of all Category I buildings have been adequately considered, a three dimensional model of the auxiliary building, shown in Figure 3.7-21A, was developed. The auxiliary building was chosen because it is the most non-symmetric Category I building. This three-dimensional lumped mass model accounts for the actual locations of the centers of mass and centers of rigidity at each elevation. The response spectra generated using a 3-D model were then compared with those based on the mathematical models used for seismic design, shown in FSAR Figures 3.7-19 and 3.7-20. This comparison showed that the effects of torsion had a negligible effect upon the floor response spectra used as the basis for piping and equipment analysis in the auxiliary building.

The structural response accelerations calculated from the CE-800 response spectrum analysis were compared with those calculated using the mathematical models shown in FSAR Figures 3.7-19 and 3.7-20. This comparison also showed that the effects of torsion had a negligible effect upon the response loads shown in FSAR Figures 3.7-38 to 3.7-43, which were used in the structural design of the auxiliary building.

AUDIT ACTION ITEMS

Enclosure 3

RESPONSE (Continued)

An additional consideration related to the torsional response of symmetrical structures has not been considered in seismic design; however, this subject will be examined and appropriate measures will be taken, if found necessary.

AUDIT ACTION ITEMS

Enclosure 3

Example of three dimensional stiffness and mass calculations.

RESPONSE:

Response to this action item is Bechtel proprietary and will be submitted to NRC by separate letter.

AUDIT ACTION ITEMS

Enclosure 3

Calculations for hydrodynamic analysis for spent fuel pool using TID 7024.

RESPONSE:

See proprietary calculation H-013.0.

The proprietary calculation H-013.0 has been submitted to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/230, A. Zaccaria, Bechtel to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Sample of calculations for west wall.

RESPONSE:

See Proprietary Calculation H-013.0.

The Proprietary Calculation H-013.0 has been submitted to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Beam and girder framing calculations.

RESPONSE:

See Proprietary Calculation H-024.0.

The Proprietary Calculation H-024.0 has been submitted to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Sample of composite column under Unit 2 pool.

RESPONSE:

See Proprietary Calculation H-130.0.

The Proprietary Calculation H-130.0 has been submitted to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Containment and auxiliary building relative deflection.

RESPONSE:

Response to this action item is Bechtel proprietary and will be submitted to NRC by separate letter.

AUDIT ACTION ITEMS

Enclosure 3

Example floor response spectra.

RESPONSE:

Response to this action item will be provided later.

AUDIT ACTION ITEMS

Enclosure 3

Design calculations for 150 ton crane.

RESPONSE:

The response to this action item is Bechtel proprietary and will be submitted to NRC by separate letter.

Attachment to AECM-81/30

AUDIT ACTION ITEMS

Enclosure 3

Strain in fuel pool liner plate as related to ACI 359 criteria.

RESPONSE:

Response to this action item will be provided later.

AUDIT ACTION ITEMS

Enclosure 3

Standby Service Water Cooling Tower Basin

Sample calculation showing loads and load combination (pages, C-C200).

RESPONSE:

Proprietary calculations showing loads and load combinations have been submitted to NRC and EG&G Idaho, Inc. in the following letters:

L. F. Dale, MP&L, to T. C. Houghton, NRC, letter number AECM-80/112, dated May 29, 1980 and VB-80/230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Standby Service Water Cooling Tower Basin

Sample of SSWCTB supply pipe attachment to building.

RESPONSE:

Proprietary calculations of SSWCTB supply pipe attachment to the building have been submitted to NRC and EG&G Idaho, Inc. in the following letters:

L. F. Dale, MP&L, to T. C. Houghton, NRC, letter number AECM-80/112, dated May 29, 1980 and VB-80/0330, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Standby Service Water Cooling Tower Basin

Do both Finite Element and Elastic Half Space analyses for the generation of design response spectra and evaluate the effect of the envelope of above on equipment and piping design.

RESPONSE:

The response to this request is presently being evaluated in response to NRC Question 130.25. The requested information will be forwarded upon completion of the response to Q130.25.

AUDIT ACTION ITEMS

Enclosure 3

Electrical Duct Banks

Sample of calculations at building and in free field.

Combination of stresses.

Bond between conduit and concrete.

RESPONSE:

See Proprietary Calculation C-X051.0 sent to NRC/EG&G Idaho, Inc., in the following letters:

D. E. Huffman, Bechtel, to E. C. Shomaker, NRC, dated June 6, 1980, and VB-80/0230, A. Zaccaria, Bechtel, to T. R. Thompson, EG&G Idaho, Inc., dated July 2, 1980.

AUDIT ACTION ITEMS

Enclosure 3

Concrete shear stress in free field.

RESPONSE:

Response to this item will be provided later.

AUDIT ACTION ITEMS

Enclosure 3

Underground Category I Piping and Tanks

Analysis of buried diesel oil storage tank (to be requested from the vendor).

RESPONSE:

See Proprietary Design Report submitted to Bechtel by Bethlehem Steel Corporation, Buffalo Tank Division (Report No. AAD-76-101). This report will be submitted to NRC by separate letter.

AUDIT ACTION ITEMS

Enclosure 3

Calculations of the underground piping analysis.

Relative displacement calculations between tank and piping and between building and piping.

RESPONSE:

Responses to these two action items will be provided later.