



Log # TXX-92063  
File # 10010  
923.7  
Ref. # 10CFR50.34(b)

March 4, 1992

William J. Cahill, Jr.  
Group Vice President

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES) - UNIT 2  
DOCKET NO. 50-446  
ADVANCE FSAR SUBMITTAL  
SEISMIC CATEGORY II PIPING AND SUPPORTS  
LOCATED IN A NON-CATEGORY I BUILDING

REF: NUREG-0797, "Safety Evaluation Report," Supplement 22 (SSER 22)

Gentlemen:

Attached is an advance FSAR change to reclassify a portion of the eight (8) inch Steam Generator Blowdown piping and pipe supports in the Turbine Building from non-seismic to seismic Category II. This change permits the relocation of postulated breaks that could adversely interact with safety-related ventilation ducts in Electrical Control Building Room 113.

The reclassified portion of the Steam Generator Blowdown piping and pipe supports are completely supported by a Seismic Category I wall which separates Room 113 from the non-Category I Turbine Building. An analysis and an engineering evaluation have been performed which demonstrated that the Turbine Building will not have unacceptable interactions with the reclassified piping during and after a seismic event.

The attachment is organized as follows:

1. A marked-up copy of the revised FSAR pages (additional pages immediately preceding and/or following the revised pages are provided if needed to understand the change).
2. A description/justification of each FSAR change.
3. A copy of related SER/SSER sections.

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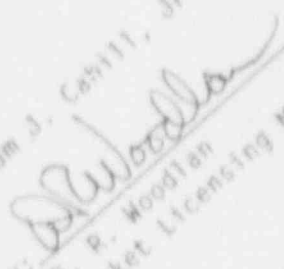
AD52

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Page 2 of 2

This change will be included in a future FSAR Amendment. If you have any questions regarding this submittal, please contact David Bize at (214) 812-8879.

Sincerely,

William J. Cahill, Jr.

By:   
D. R. Woodlan  
Docket Licensing Manager

DNB/dnb  
Attachment

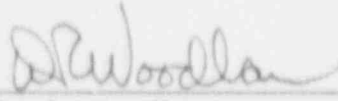
C - Mr. R. D. Martin, Region IV  
Resident Inspectors, CPSE5 (2)  
Mr. M. B. Fields (NRR)

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Page 2 of 2

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ATTACHMENT TO TXX-92063

- |    |                              |                     |
|----|------------------------------|---------------------|
| 1  | Marked-up copy of FSAR pages | pages 2 through 7   |
| 2. | Description/justification    | pages 8 and 9       |
| 3. | Related SSER sections        | pages 10 through 14 |

35. Miscellaneous Handling Equipment		52
40. Plant Gas System		7
42. Tornado Venting Components		7
45. Potable and Sanitary Water System		12
49. Pipe Whip Restraints		12
51. Uninterruptible Power Supply (UPS) Area Air-Conditioning System		66
3.2.1.1.3 Seismic Category I Electrical Systems and Components		7
All, or portions, of the following electrical systems or components are seismic Category I as described in Appendix 17A and Table 17A-1:		
17A SYSTEM		7
<u>NO.</u>		<u>SYSTEM</u>   7
37. Electrical Equipment		7
38. Radiation Monitoring System		7
41. Instrumentation and Control Equipment		7
3.2.1.1.4 Structures and Systems of Mixed Category		
None of the plant structures are classified as partially seismic Category I; however, certain structural items within seismic Category I structures are classified as seismic Category II or non-seismic as appropriate. See Table 17A-1, item 36, for typical structural classifications. The boundaries of seismic Category I portions of systems are shown on the piping and instrumentation diagrams in appropriate sections of the FSAR.		59

INSERT A

CPSES/FSAR

- b. Control outside the reactor containment airborne radioactivity released in an accident, or
- c. Remove decay heat from spent fuel
- d. Non-Nuclear-Safety

Non-nuclear-safety (NNS) applies to portions of the nuclear power plant not covered by Safety Classes 1, 2, or 3 that can influence safe, normal operation or that may contain radioactive fluids. Design of non-nuclear-safety components shall be to applicable industry codes and standards.

The piping Class G designation is used to identify those non-nuclear safety related (NNS) piping and plumbing lines which are not located in Seismic Category I structures. | 66

The piping Class 5 designation is used to identify those non-nuclear safety (NNS) piping and plumbing lines which are located in Seismic Category I structures. Class 5 piping is designed as seismic Category II or non-seismic. Based on specific routing all non-seismic Class 5 lines larger than 2" (larger than 4" for air filled copper tubing) are evaluated for their capability to reduce the functioning of Seismic Category I systems and components as defined in position C.1.a through C.1.q of Regulatory Guide 1.29 to an unacceptable level as the result of an SSE and are seismically supported where required. In some special cases as noted in Table 17A-1, Class 5 lines 2" and smaller are designated as NNS, seismic Category II and seismically supported. As such, all activities affecting the design and construction of Seismic Category II systems are subject to the pertinent quality assurance requirements of Appendix B to 10CFR50. | 66  
| 46  
| 12

INSERT B

3.7B.2.8 Interaction of Non-Category I Structures  
with Seismic Category I Structures

A number of structures such as the Turbine Building, the Switchgear Buildings, the Circulating Water Intake and Discharge Structures, the Maintenance Building, and the Administration Building are designated as non-Category I.

The only non-Category I structures which are adjacent to any seismic Category I structure are the Turbine Building and the Switchgear Buildings. These structures do not share a common mat with the adjacent seismic Category I structure, and all structures are founded on firm rock. Therefore, there is no possible interaction of non-Category I structures with seismic Category I structures resulting from seismic motion. Sufficient space is provided between the Turbine and Switchgear Buildings and the adjacent seismic Category I structure so as to prevent contact because of deformations occurring in the structures during a seismic event.

78 | The possibility of structural failure during a seismic event is considered for the Turbine Building. Structural failure in the direction of the adjacent seismic Category I structure is prevented by the bearing of the mezzanine and operating floor slabs on the concrete turbine generator pedestal. The Switchgear Buildings are design to withstand a seismic event equal to the SSE.

INSERT C

54 | Non-Category I equipment and components located in seismic Category I buildings are investigated by analysis or testing, or both, to ensure that under the prescribed earthquake loading, structural integrity is maintained, or the non-Category I equipment and components do not adversely affect the integrity or operability, or both, of any

CPRES/FSAR  
TABLE 17A-1  
(Sheet 14)

LIST OF QUALITY ASSURED STRUCTURES, SYSTEMS AND COMPONENTS

System and Components	Safety Class (1)	Applicable Code or Standard (2)	Code Class	Seismic Category	Quality Assurance Note 32.A	Reference Section	Remarks Note 79
Check valves for accumulator tanks	3	ASME III	3	I	Note 32.A	10.3	
Tubing and supports (between check valves upstream of air accumulator and MOV)	3	ASME III	3	I	Note 32.A	3.9B	Note 41
Steam generator blowdown system piping	2	ASME III	2	I	Note 26.A	10.3	
Steam flow restrictor (integral to steam generator)	2	ASME III	2	I	Note 4.A	10.3, 5.4.4	
Main steam isolation valves	2	ASME III	1	I	Note 26.A	10.3	Notes 8, 79
Main steam isolation bypass valves and bypass valve piping	2	ASME III	1	I	Note 26.A	Q260.1	
Reflective insulation assemblies	NON	MFRS Stds	-	II	Note 27.B	Q260.2	
F piping and valves	2	ASME III	2	I	Note 26.A	10.3	Note 79
F piping and valves	3	ASME III	3	I	Note 26.A	Q260.1	Note 79
Orifices	3	ASME III	3	I	Note 26.A	10.3	
Supports for Class 2 Piping	2	ASME III	2	I	Note 27.A	3.9B	
Supports for Class 3 Piping	3	ASME III	3	I	Note 27.A	3.9B	
Class 5 Piping and supports	NON	ASME B31.1	-	II/NONE	Note 44.B	3.7B	
13. Auxiliary Feedwater System							
Motor-driven auxiliary feedwater pumps	3	ASME III	3	I	Note 26.A	10.4.9	Note 1a
Turbine-driven auxiliary feedwater pump	3	ASME III	3	I	Note 26.A	10.4.9	Note 1a

Note 91



LIST OF QUALITY ASSURED STRUCTURES, SYSTEMS AND COMPONENTS

80. Cables and heat shrinkable cable insulation sleeves are not seismically qualified. However, the basic standards to which cables and heat shrinkable cable insulation sleeves are procured and their associated installation requirements assure their functioning following a seismic event.

INSERT D

Insert A - Page 3.2-5

A seismic Category II pipe located inside a non-seismic building is described in Section 3.2.2.d.

Insert B - Page 3.2-11

A portion of the Steam Generator Blowdown high energy line piping located in the Turbine Building is designated class 5 piping and classified as seismic Category II. This piping is seismically analyzed for break postulation. Additional analysis and engineering evaluations are performed to demonstrate that unacceptable interactions of this piping with non-Category I structures or components will not occur during and after a seismic event.

Insert C - Page 3.7B-42

The seismic Category II portion of the Steam Generator Blowdown high energy line (B-SB-2-060-1302-5), located inside the Turbine Building and attached to a seismic Category I structure, is shown by analysis and engineering evaluations to remain undamaged by non-Category I structures and components during and after a seismic event.

Insert D - Table 17A-1, Sheet 60

81. A portion of the Steam Generator Blowdown piping located in the Turbine Building is designated class 5 piping and classified seismic Category II although it is located in a non-Seismic building. Additional analysis and engineering evaluations are performed to demonstrate that unacceptable interactions of this piping with non-Category I structures or components will not occur during and after a seismic event. This piping is seismically analyzed for break postulation.

FSAR Page  
(as amended)

Group Description

- 3.2-5                    1    Add Seismic Category II Piping in a Non-Seismic Building to Structures and Systems of Mixed Category  
Revision:  
Added to this paragraph because the combination of seismic piping in a non-seismic building is a new combination not addressed in this paragraph.  
FSAR Change Request Number: 91-201.01  
Related SER Section: 3.2  
SER/SSER Impact: No
- 3.2-11                   1    Add Seismic Category II Piping in a Non-Seismic Building as an Exception to Class 5 Piping in Seismic Category I Structures  
Revision:  
The specific exception concerning the Steam Generator Blowdown piping in the Turbine Building has been added. The Steam Generator Blowdown piping has been reclassified as Class 5 and redesignated as Seismic Category II to eliminate an unacceptable interaction postulated for a high energy line break.  
FSAR Change Request Number: 91-201.02  
Related SER Section: 3.2  
SER/SSER Impact: No
- 3.7-42                   1    Add Discussion of Seismic Category II Piping in the Turbine Building to the Discussion of Interaction of Non-Category I Structures with Seismic Category I Structures  
Revision:  
The specific exception concerning the Steam Generator Blowdown piping in the Turbine Building has been added. The Steam Generator Blowdown piping has been reclassified as Class 5 and redesignated as Seismic Category II to eliminate an unacceptable interaction from a postulated high energy line break. Analyses have been performed that demonstrate that the non-Category I structures and components within the Turbine Building will not unacceptably interact with Steam Generator Blowdown piping during and after a seismic event.  
FSAR Change Request Number: 91-201.03  
Related SER Section: 3.7; SSER22 3.7  
SER/SSER Impact: No
- Table 17A-1            1    See Sheet No(s):14  
Add Note B1 to List of Quality Assured Structures, Systems and Components  
Revision:  
The specific exception concerning the Steam Generator

FSAR Page  
(as amended)

Group Description

Blowdown piping in the Turbine Building has been added to Table 17A-1 via Note 81. The quality assurance requirements for this piping will be the same as for any Class 5, Seismic Category II piping except that the piping is not located in a Seismic Category I structure.  
FSAR Change Request Number: 91-201.04  
SER/SSER Impact: No

Table 17A-1

1

See Sheet No(s):60  
Add Note 81 to List of Quality Assured Structures, Systems and Components  
Revision:  
The specific exception concerning the Steam Generator Blowdown piping in the Turbine Building has been added to Table 17A-1 via Note 81. The quality assurance requirements for this piping will be the same as for any Class 5, Seismic Category II piping except that the piping is not located in a Seismic Category I structure.  
FSAR Change Request Number: 91-201.055  
SER/SSER Impact: No

### 3 DESIGN CRITERIA FOR STRUCTURES, SYSTEMS, AND COMPONENTS

#### 3.1 Conformance With General Design Criteria and NRC Regulations

In Section 3.0 of the FSAR, the applicant presented an evaluation of the design bases against the GDC. In a letter dated February 20, 1981, the NRC staff asked the applicant to provide a compilation which documents that the Comanche Peak Steam Electric Station Units 1 and 2 will comply with the regulations given in 10 CFR Parts 20, 50, and 100. The applicant has not responded to this request for information and this matter remains an open issue.

The staff review of structures, systems, and components relies extensively on the application of industry codes and standards that have been used as accepted industry practice. These codes and standards, as cited in this report, have been reviewed and found acceptable by the staff, and they have been incorporated into the SRP.

#### 3.2 Classification of Structures, Systems, and Components

##### 3.2.1 Seismic Classification

GDC 2, in part, requires that nuclear power plant structures, systems, and components important to safety be designed to withstand the effects of earthquakes without a loss of capability to perform their safety function. These plant features are those necessary to ensure (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe-shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to 10 CFR Part 100 guideline exposures. The earthquake for which these plant features are designed is defined in 10 CFR Part 100, Appendix A as the safe-shutdown earthquake (SSE). The SSE is based on an evaluation of the maximum earthquake potential and is that earthquake which produces the maximum vibratory ground motion for which structures, systems, and components important to safety are designed to remain functional. Those plant features that are designed to remain functional if an SSE occurs are designated seismic Category I in Regulatory Guide 1.29. This Regulatory Guide is the principal document used in the staff review for identifying those plant features important to safety which, as a minimum, should be designed to seismic Category I requirements. The staff review of the seismic classification of structures, systems, and components (excluding electrical features) of Comanche Peak Units 1 and 2 was performed in accordance with the guidance in SRP Section 3.2.1.

The structures, systems, and components important to the safety of Comanche Peak that are required to be designed to withstand the effects of an SSE and remain functional have been identified in an acceptable manner in Table 17A-1 of the FSAR. Table 17A-1, in part, identifies major components in fluid systems, mechanical systems, and associated structures designated as seismic Category I. In addition, piping and instrumentation diagrams in the FSAR

identify the interconnecting piping and valves and the boundary limits of each system classified as seismic Category I. The staff has reviewed Table 17A-1 and the fluid system piping and instrumentation diagrams and has concluded that the structures, systems, and components important to safety of Comanche Peak Units 1 and 2 have been properly classified as seismic Category I items in conformance with Regulatory Guide 1.29, Revision 2. In the review of Section 3.9 of the FSAR, the staff confirmed that acceptable interfaces exist between seismic Category I and nonseismic portions of piping systems. All other structures, systems, and components that may be required for operation of the facility are not required to be designed to seismic Category I requirements. This exclusion includes those portions of Category I systems such as vent lines, fill lines, drain lines, and test lines on the downstream side of isolation valves and portions of these systems that are not required to perform a safety function.

The staff concludes that the Comanche Peak structures, systems, and components important to safety that are designed to withstand the effects of an SSE and remain functional are properly classified as seismic Category I items in accordance with Regulatory Guide 1.29. This constitutes an acceptable basis for satisfying, in part, the requirements of GDC 2, and is, therefore, acceptable.

### 3.2.2 System Quality Group Classification

GDC 1 requires that nuclear power plant systems and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. These fluid-system, pressure-retaining components are part of the reactor coolant pressure boundary and other fluid systems important to safety, where reliance is placed on these systems: (1) to prevent or mitigate the consequences of accidents and malfunctions originating within the reactor coolant pressure boundary, (2) to permit shutdown of the reactor and maintain it in a safe-shutdown condition, and (3) to retain radioactive material. Regulatory Guide 1.26 is the principal document used in the staff review for identifying, on a functional basis, the components of those systems important to safety that are Quality Groups B, C, and D. Section 50.55a of 10 CFR Part 50 identifies those American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section III, Class 1 components that are part of the reactor coolant pressure boundary (RCPB). Conformance of these RCPB components with Section 50.55a of 10 CFR Part 50 is discussed in Section 5.2.1.1 of this report. These RCPB components are designated in Regulatory Guide 1.26 as Quality Group A. Certain other RCPB components which meet the exclusion requirements of footnote 2 of the rule are classified Quality Group B in accordance with Regulatory Guide 1.26. The staff review of the quality group classification of pressure-retaining components of fluid systems important to safety for Comanche Peak Units 1 and 2 was performed in accordance with the guidance in SRP Section 3.2.2.

FSAR Table 17A-1, in part, identifies the major components in fluid systems such as pressure vessels, heat exchangers, storage tanks, pumps, piping, and valves, as well as mechanical systems such as cranes, refueling platforms, and other miscellaneous handling equipment. In addition, the piping and instrumentation diagrams in the FSAR identify the classification boundaries of the interconnecting piping and valves. The applicant has utilized the American Nuclear

Based on the review described above, the staff concludes that the applicant has not met the requirements of GDC 4 regarding pipe breaks. The staff will provide the resolution to the open items described above in a supplement to this report.

### 3.7 Seismic Design

#### 3.7.1 Seismic Input

The input seismic design response spectra (operating-basis earthquake (OBE) and safe-shutdown earthquake (SSE)) applied in the design of seismic Category I structures and components were developed from numerous real records, following the procedures recommended by Newmark, Blume, and Kapur<sup>2</sup> and conform to the requirements of Regulatory Guide 1.60, Revision 1, with the exception of those in the 33-Hz to 50-Hz frequency range. In this range, the vertical response spectrum of Regulatory Guide 1.60, Revision 1, differs from the vertical response spectrum used by the applicant. Because this deviation only affects the modes that have low amplification, the effect of this deviation on the results of the analyses of structures and systems is negligible. Similarly, the method recommended by Newmark and his colleagues for the construction of vertical response spectra leads to a slight deviation from the Regulatory Guide 1.60, Revision 1, recommendations for accelerations corresponding to 3.5 Hz. The magnitude of these differences is negligible.

The horizontal and vertical design response spectra are scaled to the maximum ground acceleration of 0.12g and 0.08g selected for the SSE. For the OBE, a scaling factor of 0.5 is applied to the SSE design spectra. The site design response spectra are applied at the various foundations of seismic Category I structures.

The specific percentage of critical damping values used in the seismic analysis of Category I structures, systems, and components is based on material, stress levels, and type of connections of the particular structure or component. These values are determined in accordance with the recommendations of Regulatory Guide 1.61 and those in Newmark's work. The synthetic time history used for the seismic design of Category I structures, systems and components is adjusted in amplitude and frequency content to obtain response spectra that enveloped the response spectra specified for the site.

#### 3.7.2 Seismic Structural System and Subsystem Analyses

The review of the seismic system and subsystem analysis for the plant included the seismic analysis methods for all Category I structures, systems, and components, in addition to procedures for modeling, seismic soil-structure interaction, development of floor response spectra, inclusion of torsional effects, evaluation of Category I structure overturning, and determination of composite damping. The review included design criteria and procedures for evaluation of interaction of non-Category I structures and piping with Category I

<sup>2</sup>"Design Report Spectra for Nuclear Power Plants" presented by N. B. Newmark, J. A. Blume, and K. K. Kapur, at the ASCE Structural Engineering Meeting, San Francisco, April 1973.

structures and piping and the effects of parameter variations on floor response spectra. The review also included criteria and seismic analysis procedures for reactor internal and Category I buried piping outside the containment.

The system and subsystem analyses were performed by the applicant on an elastic basis. Modal response spectrum multidegree of freedom and time-history methods form the basis for the analyses of all major Category I structures, systems and components. When the modal response spectrum method is used, governing response parameters will be combined by a method that is generally more conservative than the square-root-of-the-sum-of-the-squares rule adopted as the staff position. However, the absolute sum of the modal response was used for modes with closely spaced frequencies. The square root of the sum of the squares of the maximum codirectional responses was used in accounting for three components of the earthquake motion for both the time history and response spectrum methods. Floor spectra input for design and test verification of structures, systems, and components was generated from the time-history method, taking into account variation of parameters by peak widening. Peaks were broadened  $\pm 10\%$  and connected without leaving valleys. When the peak broadening is less than  $\pm 15\%$ , the smoothing method is conservative and acceptable. A vertical seismic system dynamic analysis was employed for all structures, systems, and components where analysis showed significant structural amplification in the vertical direction. Torsional effects and stability against overturning were considered. The applicant has demonstrated to the staff that the eccentricities used in the analysis of Category I structures for the evaluation of torsional effects exceed the minimum value of  $\pm 5\%$  recommended by the staff. The staff finds the eccentricity values considered in the design acceptable.

The lumped-mass-spring approach is used to evaluate soil-structure interaction and structure-to-structure interaction effects and seismic responses.

For the analysis of Category I dams, a finite element approach that takes into consideration the time history of forces, the behavior and deformation of the dam caused by the earthquake, and applicable stress-strain relations is used.

The staff concludes that the seismic system and subsystem analysis procedures and criteria proposed by the applicant provide an acceptable basis for the seismic design.

### 3.7.3 Seismic Mechanical Subsystem Analyses

The review under SRP Section 3.7.3 included the applicant's seismic analysis of the reactor coolant system; reactor internals, core, and control rod drive mechanisms; and seismic Category I piping systems (excluding the reactor coolant system). Each of these areas is discussed below.

#### 3.7.3.1 Reactor Coolant System

The reactor vessel, pumps, steam generators and their supports, and the interconnecting piping system were evaluated as a coupled system. The mathematical model provides a three-dimensional representation of the dynamic response of the coupled components to seismic excitations in both the horizontal and



### 3.7.2 Seismic Structural System and Subsystem Analyses

FSAR Figures 3.7B-41 through 3.7B-49, documenting response spectra, were deleted from the FSAR. In the August 16, 1989 submittal, the applicant confirmed that these spectra were not used for design of any Category I structures. However, in a letter dated January 3, 1990, the applicant committed to include sample base and top level response spectra used for the design of the CPSES Category I structures in a future FSAR revision (Amendment 78) prior to Unit 1 fuel loading. This issue is considered resolved, contingent on staff verification that the appropriate FSAR changes are made before Unit 1 fuel loading.

The applicant has agreed to revise the FSAR to document that the peaks of the floor response spectra were widened by  $\pm 10$  percent rather than by only +10 percent. The applicant will also revise the FSAR to reflect that the effect of the structural backfill on the soil spring stiffness values for the service water intake structure (SWIS) was calculated based on rock and then for soil media, and that average spring stiffness was used. The staff reviewed relevant documents during the site audit on September 6-8, 1989. The results of the parametric study performed for the generation of the floor response spectra were also discussed during the audit. The parametric variation of the soil-spring stiffness had been considered in generating the original floor response spectra. The validation study considered the soil-structure interaction by modeling the soil along with the foundation. The CLASSI and FLORA computer programs were used in this validation process. The parametric variation was not considered for the new response spectra used for validation purposes. However, for the SWIS and three exterior storage tanks, new response spectra were developed considering the parametric variation. In addition, the staff verified that an average value of soil-spring stiffness between rock and soil media was used in the calculations for response spectra for the SWIS. The staff finds these approaches to be acceptable.

The FSAR did not include a discussion on the method of analysis for Category I tanks. In the meeting on July 31, 1989, the applicant agreed to revise the FSAR to provide such a discussion, including information related to the geometry of tanks at CPSES. The August 16, 1989 submittal provides the information requested by the staff. This information is also in FSAR Section 3.8.4.1.6. This information describes the method of analysis which complies with the provisions of U.S. Atomic Energy Commission Technical Information Document TID-7024, and is acceptable to the staff.

FSAR Amendment 68 stated that the structural failure of the turbine building is prevented by internal bracing. During the meeting with the staff on July 31, 1989, the applicant stated that the structural failure of the turbine building is prevented by the bearing of the mezzanine and operating floor slabs on the concrete turbine pedestal. The applicant has revised FSAR Section 3.7B.2.8 to reflect the actual support mechanism for the turbine building. During its site visit on September 6-8, 1989, the staff reviewed the assumptions and methods used in the development of the loads on the support mechanism for the turbine building, and concluded that the analysis had been performed correctly. The staff, therefore, considers this issue to be resolved.

The applicant has revised the FSAR to include missing terms and the definition of two analysis parameters in Sections 3.7N.2.1.2 and 3.7N.2.1.5. Also, since the power spectral density (PSD) function was not used to characterize the input motion, FSAR Section 3.7B.2.1.3 has been revised to delete the term PSD. In