5805

Filed: March 10, 1988

DOCKETED
USNRC

'88 MAR 10 P1:20

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

before the

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of TEXAS UTILITIES GENERATING COMPANY et al. (Comanche Peak Steam Electric Station, Units 1 and 2)	Docket Nos. 50-445-OL 50-446-OL (Application for an Operating License)

ANSWERS TO BOARD'S 14 QUESTIONS
(Memo; Proposed Memo of April 14, 1986)
Regarding Action Plan Results Report II.d

In accordance with the Board's Memorandum; Proposed Memorandum and Order of April 14, 1986, the Applicants submit the answers of the Comanche Peak Response Team ("CPRT") to the 14 questions posed by the Board, with respect to the Results Report published by the CPRT in respect of CPRT Action Plan II.d, "Control Room Ceiling."

Opening Request:

Produce copies of any CPRT-generated checklists that were used during the conduct of the action plan.

Response:

Three checklists were used during implementation of this Action Plan. The first checklist (Attachment 1) was used in review of the Gibbs and Hill design of the control room ceiling.

DS03

The second (Attachment 2) was used in review of the concrete slab above the control room ceiling. The third (Attachment 3) was the Source/Interaction Evaluation Checklist, used as a limited-purpose checklist to aid in engineering evaluation of the original Damage Study Program.

Question No. 1:

1. Describe the problem areas addressed in the report. Prior to undertaking to address those areas through sampling, what did Applicants do to define the problem areas further? How did it believe the problems arose? What did it discover about the QA/QC documentation for those areas? How extensive did it believe the problems were?

Response:

An allegation was made that field run conduit, drywall, and lighting fixtures installed in the area above the ceiling panels in the control room were classified as non-seismic, were supported only by wires, and might fail as a result of a seismic event. The TRT investigation generally supported the allegation but was more specific in identifying commodities with either inadequate or nonexistent seismic calculations.

As a result of the allegation, three problem areas were addressed in this Action Plan. The first was the control room ceiling. An attempt was made to demonstrate that all portions of the control room ceiling, including those commodities attached to and above the ceiling, satisfied the provisions of Regulatory Guide 1.29. Although a preliminary design assessment of the control room ceiling by the Project concluded that the design complied with Regulatory Guide 1.29, this conclusion relied on the assumption that potential failures of

architectural features with small masses would not be adverse to equipment in or occupants of the control room. Rather than develop further confirmatory analysis to support the above position, the Project elected to remove and replace the original ceiling, which also completed the structural evaluation. Subsequent activities involved design and installation of a new ceiling by the Project and third-party review of the new design.

The second problem area addressed was non-safety-related conduit two inches or less in diameter in the control room. The action was to demonstrate that the conduit satisfied the provisions of Regulatory Guide 1.29, which was referred to larger-scope actions involving such conduit, addressed in ISAP I.c, "Train C Conduit and Supports."

The third problem area addressed was applicability of the problems identified in the control room to other commodities in the plant that are not Seismic Category I. Addressing this problem area resulted in an extension of the original Damage Study Program by the Project to include as potential sources all commodities identified as architectural features; i.e., items purchased under architectural specifications and specifically identified on architectural drawings. This activity identified many potential seismic interactions, the resolution of which is ongoing and involves some hardware modifications.

The third-party review of the original Damage Study Program as well as the review of the extension of that program indicated that implementation was generally in conformance with

procedures. However, several areas of concern were identified involving the adequacy of the original Damage Study Program procedures, the adequacy of some of the supporting documentation developed by other engineering disciplines as input to the program, and the completeness of the program extension. In all cases, procedure revisions or commitments to revise procedures have been made by the Project to address these concerns.

Sampling was used by the third party to investigate: (1) Project activities involving the original Damage Study Program process (Attachment 3 was used for this effort), (2) use of engineering judgment during that process to resolve potential interactions, and (3) the process by which architectural features were included for consideration in the Damage Study Program extension. In each case, sampling was used to aid in the overview effort to identify potential concerns, not to identify the extent of known problem areas.

Sampling was used by the Project in two cases: first, to assess the potential for unacceptable interactions caused by horizontal sway for the more than 2,000 suspended light fixtures in Seismic Category I buildings and, second, as part of a test program to qualify existing handrail connections.

The problems with the original Damage Study Program arose because of inadequate Damage Study Program procedures, less-than-desirable experience among Damage Study Program personnel, and weakness in the design control elements of the engineering program. The Results Report includes additional discussion of

problem areas, third-party investigations, and Project corrective actions.

QA/QC documentation was not explicitly reviewed for adequacy during ISAP II.d implementation. However, where such documentation was involved, no observations of QA/QC procedural inadequacies were noted.

Question No. 2:

2. Provide any procedures or other internal documents that are necessary to understand how the checklists should be interpreted or applied.

Response:

Attachments 4 and 5 are copies of the sections of the Engineering Evaluation Report, "ISAP II.d, Control Room Ceiling" (Reference 9.25 of the Results Report), that describe application of the control room ceiling design review checklist and the concrete slab design review checklist, respectively. Attachment 6 describes application of the Source/Interaction Evaluation checklist.

Question No. 3:

3. Explain any deviation of checklists from the inspection report documents initially used in inspecting the same attributes.

Response:

The three checklists were developed and used by the third party specifically to investigate the process of the control room ceiling design and the original Damage Study Program. Consequently, they did not duplicate any related QC inspection checklists, nor were they intended to do so.

Question No. 4:

4. Explain the extent to which the checklists contain fewer attributes than are required for conformance to codes to which Applicants are committed to conform.

Response:

The three checklists contain the attributes necessary to assess the Project's compliance with the applicable codes and FSAR commitments.

Question No. 5:

5. (Answer Question 5 only if the answer to Question 4 is that the checklists do contain fewer attributes.) Explain the engineering basis, if any, for believing that the safety margin for components (and the plant) has not been degraded by using checklists that contain fewer attributes than are required for conformance to codes.

Response:

This question is not applicable by reason of the response to question 4.

Question No. 6:

6. Set forth any changes in checklists while they were in use, including the dates of the changes.

Response:

No changes were made to the checklists while they were in use.

Question No. 7:

7. Set forth the duration of training in the use of checklists and a summary of the content of that training, including field training or other practical training. If the training has changed or retraining occurred, explain the reason for the changes or retraining and set forth changes in duration or content.

Response:

The control room ceiling and concrete slab checklists were prepared by the Issue Coordinator and used by an experienced engineer who worked closely with him. Therefore, specific training in the use of these checklists was not required. The Source/Interaction Evaluation checklist was used only by the Issue Coordinator, who prepared it. As a consequence, a specific training program to apply this checklist was also not necessary.

Question No. 8:

8. Provide any information in Applicants' possession concerning the accuracy of use of the checklists (or the inter-observer reliability in using the checklists). Were there any time periods in which checklists were used with questionable training or QA/QC supervision? If applicable, are problems of inter-observer reliability addressed statistically?

Response:

Because of the limited use and controlled application of the three checklists (i.e., only the individuals who prepared the checklist or the reviewer who worked in close coordination with the preparer applied them), establishing the accuracy of each checklist application was not considered necessary, nor was QA/QC supervision of any checklist applications. Inter-observer reliability is not an issue.

Question No. 9:

9. Summarize all audits or supervisory reviews (including reviews by employees or consultants) of training or of use of the checklists. Provide the factual basis for believing that the audit and review activity was adequate and that each concern of the audit and review teams has been

resolved in a way that is consistent with the validity of conclusions.

Response:

No audits were performed regarding training or use of the checklists or the overall implementation of this action plan.

Question No. 10:

10. Report any instances in which draft reports were modified in an important substantive way as the result of management action. Be sure to explain any change that was objected to (including by an employee, supervisor, or consultant) in writing or in a meeting in which at least one supervisory or management official or NRC employee was present. Explain what the earlier drafts said and why they were modified. Explain how dissenting views were resolved.

Response:

No substantive modifications were made to the Results Report as a result of management action.

Question No. 11:

11. Set forth any unexpected difficulties that were encountered in completing the work of each task force and that would be helpful to the Board in understanding the process by which conclusions were reached. How were each of these unexpected difficulties resolved?

Response:

Early in the investigation of the control room ceiling issue, the conclusion was reached that engineering evaluation and analysis could probably demonstrate the structural integrity of the ceiling, but it would involve modeling assumptions or test configurations for which published literature or regulatory communications were not available to support the assumptions and tests. In view of the concern that this could delay obtaining the technical consensus required to resolve the issue, a

decision was made by the Project to replace the original design with one that could readily be qualified and to subject the design to third-party review.

Question No. 12:

12. Explain any ambiguities or open items in the Results Report.

Response:

Several ongoing TU Electric activities related to corrective actions have been established to meet commitments made to the third party in support of the Results Report conclusions. These activities are associated with the original Damage Study Program itself and the extension to encompass architectural features, and each such activity is identified in Section 5.6 of the Results Report. To the best of our knowledge, no ambiguities exist in the Results Report.

Question No. 13:

13. Explain the extent to which there are actual or apparent conflicts of interest, including whether a worker or supervisor was reviewing or evaluating his own work or supervising any aspect of the review or evaluation of his own work or the work of those he previously supervised.

Response:

No actual or apparent conflicts of interest were associated with implementation of this Action Plan. Investigatory activities not performed by third-party personnel were closely monitored by third-party personnel.

Question No. 14:

14. Examine the report to see that it adequately discloses the thinking and analysis used. If the language is ambiguous

or the discussion gives rise to obvious questions, resolve the ambiguities and anticipate and resolve the questions.

Response:

The Issue Coordinators and others who aided in the preparation and approval of the Results Report have reviewed and checked the report for clarity and believe that it contains no ambiguities.

Respectfully submitted,

P. Streeter
Action Plan II.d
Issue Coordinator

J. K. Arros
Action Plan II.d
Issue Coordinator

H. A. Levin
Review Team Leader

The CPRT Review Team has reviewed the foregoing responses and concurs in them.

BEAMS

Description	Elevation	G&H Drawing No.	Calculation Sheet No.	Bending	Compression/ Tension	Interaction	Shear	Torsion
			SAB-171C	AISC 1.5.1.4	AISC 1.5.1.3 /1.5.1.1	AISC 1.6.1 & 1.6.2	AISC 1.5.1.2	(1)
W10s in main framing (central area)	842'-6"	2323-S-706-01	133-159 (Set 2) 49-54 (Set 4)	x	x	x	x	x
W6s in main framing @ north & south ends	842'-6"	2323-S-706-01	63-69, 207-209, 310, 315-319, 324 (Set 2)	x	x	x	x	N/A
2L3x2x5/16 in louver ceiling	839'-4"	2323-S-706-07 2323-S-706-08	4-7, 86-95, (Set 1)	x	x	x	N/A	N/A
W6x16 edge beam all around louver ceiling	839'-4"	2323-S-706-07	8-13, 52, 53 67, 68 (Set 1)	x	x	x	x	x
W10s in main framing, north & south areas	842'-6"	2323-S-706-01	191-193, 351 (Set 2) 49-54 (Set 4)	x	x	x	x	N/A
TS 2x2x3/16 (lighting fixture support)	841'-8"	2323-S-706-02	4-7 (Set 2)	x	x	x	x	x (Shear due to torsion)
TS 5x2x3/16 (emergency lighting support)	841'-8"	2323-S-706-02	8, 53-55 (Set 2)	x	x	x	x	x (Shear due to torsion)
C6x8.2 & L 3x2x5/16	839'-10⅝"	2323-S-706-08	63-66 (Set 1)	x	x	x	N/A	N/A

(1) AISC, "Torsional Analysis of Steel Members"

ATTACHMENT 1
1 of 6

HANGERS

Description	Elevation	G&H Drawing No.	Calculation Sheet No.	Bending	Compression/ Tension	Interaction	Shear	Torsion
			SAB-171C	AISC 1.5.1.4	AISC 1.5.1.3 /1.5.1.1	AISC 1.6.1 & 1.6.2	AISC 1.5.1.2	(1)
L 3x3x¼ in truss all around & above the louver ceiling	839'-5" to 841'-8"	2323-S-706-07 Sections 20-20, 21-21, 22-22, 23-23, 24-24.	15, 49, 54 (Set 1)	N/A	x	N/A	N/A	N/A
W4x13 interior hangers	839'-8" to 841'-8"	2323-S-706-07 2323-S-706-08 Secs. 51A-51A, & 51B-51B.	16, 17, 41, 42 (Set 1)	x	x	x	N/A	N/A
W6x20 end hangers all around Louver Ceiling	839'-4" to 841'-8"	2323-S-706-07 Secs. 20-20, 21-21 2323-S-706-08 Sec. 57-57	25, 26, 50, 51, 55 (Set 1)	x	x	x	N/A	N/A
2 L 3x3x5/16 (not back-to-back) above main framing	842'-6" to 848'-7"	2323-S-706-01 2323-S-706-04 Secs. 1-1, 2-2 3-3 2323-S-706-03 Secs. 8-8 to 12-12	186, 187 (Set 2)	x	x	x	N/A	N/A
2 L 3½x2½x5/16 (back-to-back) above main framing	842'-6" to 848'-7"	2323-S-706-03 Sec. 4-4 to 7-7 & 13-13 to 16-16	160, 161, 183-185, 201, 202, 214, 325, 326, 331-333 (Set 2)	x	x	x	N/A	N/A
TS 2x2x¼ TS 3x3x¼ in north & south ends	842'-6" to 853'-1"	2323-S-706-03 Secs. 4-4, 5-5 6-6, 14-14, 15-15, 16-16	264, 265, 277-282 321-325, 337-346, 357, 358 (Set 2)	x	x	x	N/A	N/A

(1) AISC, "Torsional Analysis of Steel Members"

ATTACHMENT 1
2 of 2

BRACES

Description	Elevation	G&H Drawing No.	Calculation Sheet No.	Bending	Compression/ Tension	Interaction	Shear	Torsion
			SAD-1) ;C	AISC 1.5.1.4	AISC 1.5.1.3 /1.5.1.1	AISC 1.6.1 & 1.6.2	AISC 1.5.1.2	(1)
2 L 3x2x5/16 in plane of main framing	842'-6"	2323-S-706-01	168-173 (Set 2)	x	x	x	x	x (Shear due to) torsion)
L 3x3x1/4 in N-S trusses @ east & west side of the louver ceiling	839'-5" to 841'-8"	2323-S-706-07 Secs 20-20, 21-21, 22-22, 23-23	14, 47, 89, 54 (Set 1)	N/A	x	N/A	N/A	N/A
2 L 3½x2½x5/16 in E-W trusses	842'-6" to 848'-7" or 852'-10"	2323-S-706-03 secs. 7-7 to 13-13	162-167, 174, 175, 188-190 (Set 2)	x	x	x	N/A	N/A
2 L 3½x2½x5/16 in N-S trusses, secs. 1-1 to 3-3	842'-6" to 848'-7"	2323-S-706-04	176-178 (Set 2)	x	x	x	N/A	N/A
2 L 6x4x3/8 in N-S truss, Section 3-3	842'-6" to 852'-10"	2323-S-706-04 Sec. 3-3	179-182 (Set 2)	x	x	x	N/A	N/A
TS 3x3x¼ in E-W trusses @ north & south ends	842'-6" to 848'-7" or 852'-10"	2323-S-706-03 Secs. 4-4, 5-5, 6-6, 14-14, 15-15, 16-16	261-263, 266-276, 321-326, 347-350 (Set 2)	x	x	x	N/A	N/A

(1) AISC, "Torsional Analysis of Steel Members"

ATTACHMENT 1
3 of 6

CONNECTIONS

Description	Gusset Plate			Bolts		Prying		Welds	Calculation Sheet No.	
	Tension	Shear	Bending	Tension	Shear					
	AISC 1.5.1.1	AISC 1.5.1.2	AISC 1.5.1.4	AISC 1.5.2	AISC 1.6.3	Bolts	Flange	AISC 1.5.3	SAB-171C	G&H Drawing No.
2 L 3x2x5/16 aluminum louver support	x	N/A	x	x	x	N/A	N/A	x	21, 41, 42 (Set 1)	2323-S-706-08 Secs. 51A-51A, 51B-51B, 51C-51C, 51D-51D
W4x13 hanger to louver ceiling	x	N/A	x	N/A	N/A	N/A	N/A	x (complete penetration)	41, 42 (Set 1)	2323-S-706-08 Secs. 51A-51A, 51B-51B, 51C-51C, 51D-51D
W4x13 hanger to main steel frame	N/A	N/A	N/A	x	x	x	x	x	17-19, 42 (Set 1)	2323-S-706-08 Secs. 51A-51A, 51B-51B
	Connection Plate									
W6x20 hanger to W6x16 in louver ceiling	x	x	x	N/A	x	N/A	N/A	x	22-24, 57 (Set 1)	2323-S-706-08 Section 57-57
W6x20 hanger to main steel frame	N/A	N/A	x	x	x	x	x	x	26-28, 43, 56, 57 (Set 1)	2323-S-706-08 Section 57-57
Diagonal W6x16 to W6x16 in north & south ends of louver ceiling	x	N/A	N/A	N/A	x AISC P.4-4	N/A	N/A	x	68 (Set 1)	2323-S-706-08 Detail 52 & 52A
	Web and flange plates									
Splice of W6x16 in louver ceiling	x	x	N/A	N/A	x AISC P.4-4	N/A	N/A	x	59-62 (Set 1)	2323-S-706-08 Splice detail for W6x16

DIDCHIEZI 1 4 of 9

CONNECTIONS (Cont.)

Description	Gusset Plate			Bolts		Prying		Welds	Calculation Sheet No.	
	Tension	Shear	Bending	Tension	Shear					
	AISC 1.5.1.1	AISC 1.5.1.2	AISC 1.5.1.4	AISC 1.5.2	AISC 1.6.3	Bolts	Flange	AISC 1.5.3	SAB-171C	G&H Drawing No.
L 3x3x¼ brace and hangers in truss all around louver ceiling	Note 1	Note 1	N/A	Note 1	Note 1	N/A	N/A	N/A	14-15 (Set 1)	2323-S-706-09 Typ. bracing conn.
Bent plate to concrete	N/A	N/A	x	x SS-30	x SS-30	N/A	N/A	x	29-31 (Set 1)	2323-S-706-07 & 08 (Sect. 25-25)
W10 to W10 in main frame	x Splice or continuity plate @ north and south ends of central main frame	x	N/A	x	x	x	x Bending of clip angle	x	216-221, 309 (Set 2)	2323-S-706-01 Sec. A-A & B-B typ. & alternate conn. detail (W10 to W10)
W10 to W6 in main frame	x	x	N/A	N/A	x	N/A	N/A	x	311 (Set 2)	2323-S-706-01 Section C-C
W10 to skewed W6 in main frame	N/A	N/A	N/A	x	x	N/A	N/A	N/A	238-243 (Set 2)	2323-S-706-02 Detail 20
TS 2x2x3/16 to W10	N/A	N/A	N/A	x	x	x	x	x	49-52 305 (Set 2)	2323-S-706-02
TS 5x2x3/16 to W10	N/A	N/A	N/A	x	x	x	x	x	56-60 (Set 2)	2323-S-706-02
Braces and hangers to WT 12x58.5 @ anchorage points	x	N/A	N/A	x	x AISC P.4-6	N/A	N/A	x	80, 320 (Set 2)	2323-S-706-09 Sec. 1A-1A, 1B-1B

Note 1: Loads are small, connection not analyzed.

CONNECTIONS (Cont.)

Description	Gusset Plate			Bolts		Prying		Welds	Calculation Sheet No.	
	Tension	Shear	Bending	Tension	Shear					
	AISC 1.5.1.1	AISC 1.5.1.2	AISC 1.5.1.4	AISC 1.5.2	AISC 1.6.3	Bolts	Flange	AISC 1.5.3	SAB-171C	G&H Drawing No.
WT 12x58.5 to base plate on side of conc. beam	N/A	N/A	N/A	x	x	x	x	x	76-80 (Set 2)	2323-S-706-09 Sec. 1A-1A, 1B-1B
Type 1 anchorage	x	x (Web Shear in WT 12)	x	x Spec SS-30 (Hilti)	x Spec SS-30 (Hilti)	x	x	x	74-95, 334 (Set 2)	2323-S-706-09 Sec. 1A-1A, 1B-1B
Splice of W10x22 in main frame	Web & Flange Plates x	x	N/A	x	x AISC P.4-4	N/A	N/A	N/A	211-213 (Set 2) detail	2323-S-706-01 Typical splice
2 L 3½x2½x5/16 horizontal bracing in main frame	x	N/A	N/A	x	x	N/A	N/A	x	320 (Set 2)	2323-S-706-04
Type 3 anchorage	x	N/A	x	x Spec SS-30 Rev 1 (Hilti)	x	x	N/A	x	104-121, 301, 327, 335, 354 (Set 2)	2323-S-706-09
Type 3A anchorage	x	N/A	x	x Spec SS-30 Rev 1	x	x	N/A	x	122, 302, 335 (Set 2)	2323-S-706-09
Type 4 & 4A anchorage	x	N/A	x	x Spec SS-30 Rev 1	x	x	N/A	x	126, 335 (Set 2)	2323-S-706-09
Type 5 or 5B anchorage	x	N/A	x	x Spec SS-30 Rev 1	x	x	N/A	x	127, 303, 336, 356 (Set 2)	2323-S-706-09
Type 2, 2A & 2B anchorage	x	N/A	x	x Spec SS-30 Rev 1	x	x	N/A	x	223-233, 258-260, 334 (Set 2)	2323-S-706-09
TS hanger or brace in end sections	x	x	x	x & bending of bolt	x	N/A	N/A	x	283, 284 (Set 2)	2323-S-706-03

DIDIENT 1 6 of 9

CHECKLIST OF REEVALUATION OF CONCRETE FLOOR AT EL. 854'-4"

	BEAM NO.	BEAMS ANALYZED AS:	BENDING	SHEAR ACI[1] 11.4 11.6, 11.10	CALCULATION* PAGE NO.
12 EAST-WEST BEAMS DIRECTLY SUPPORTING CONTROL ROOM CEILING	65, 83	T-Beam	X	X	6, 7, 42
	68, 79	T-Beam	X	X	7, 8, 24, 53-55
	71, 77	T-Beam	X	X	9, 30-32
	74	T-Beam	X	X	10, 36
	62, 86	T-Beam	X	X	5, 6, 47
N-S BEAMS	49 - 52, 55, 56	Rectangular Beam	X	X	61 - 63
	Slab at El. 854'-4"	Rectangular Beam	X	X	58 - 60

*Calculation No. SAB-171C Set 3, Rev. 1

[1] ACI 318-71

ATTACHMENT 2
1 of 1

ATTACHMENT 3
1 of 3

Source/Interaction Evaluation Checklist

I. Source Identification

I.1 Brief source description:

Source:
Room:
Bldg:
Approx Elev:

I.2 Does the documented source identification match the physical situation?

I.3 Has the source been selected in conformance with the scope of the DSF procedures?

I.4 Are the "boundaries" of the source (length of pipe, equipment mountings, structural connections, etc.) in conformance with DSF procedures? Or where the procedures are not specific in this regard, are boundaries reasonable with respect to general engineering principles?

II. Interaction Identification

II.1 Are the "boundaries" of the potential interaction region (e.g., vertical/horizontal "falling" distance) in conformance with DSF procedures' failure "envelopes"? Or where the procedures are not specific in this regard, are the boundaries reasonable with respect to general engineering principles?

II.2 Is any interaction documented?

II.3 If no interaction is documented, does this match the physical situation, i.e., are there no targets within the potential interaction region per the scope and documentation requirements of the DSF procedures?

II.4 If an interaction is documented, provide brief description:

II.5 Does the documented interaction description match the physical situation?

II.6 Has the target been identified in conformance with the scope of the DSF procedures?

24A002

Source/Interaction Evaluation Checklist (continued)

III. Interaction Resolution

III.1 What method of resolution was used for the interaction? (proceed as appropriate to A, B, C, or D below)

III.A Use of FMEA to Resolve

III.A.1 Were all SSE-concurrent plant conditions appropriately considered?

III.A.2 Are the target's (system/component) functional requirements completely defined?

III.A.3 Is the assessment of the target's (system/component) failure modes and consequential effects complete and reasonable?

III.A.4 Is documentation (i.e., assumptions, references, conclusions) complete?

III.B Use of Calculations to Resolve

III.B.1 Does calculation input (dimensions, distances, weights, etc.) adequately describe the physical situation?

III.B.2 Have appropriate seismic spectra and/or acceleration levels been used with respect to location, direction, and damping?

III.B.3 Are the calculation methods used consistent with FSAR commitments for similar items which are SCI? Or are the methods otherwise consistent with accepted engineering principles/practice?

III.B.4 Do the calculation results adequately resolve the interaction?

III.B.5 Is the calculation prepared in accordance with appropriate CPSES procedures? And is the resolution otherwise adequately documented?

III.C Use of Physical Modifications to Resolve

III.C.1 Briefly describe modification design:

III.C.2 Has justification been provided in the form of a new calculation or reference to existing calculations that the modification will preclude the need to postulate the interaction under consideration?

ATTACHMENT 3
3 of 3

Source/Interaction Evaluation Checklist (continued)

III.C.3 Where a new calculation has been prepared specifically for the interaction, review per III.B above.

III.C.4 Where reference has been made to existing calculations, are such calculations applicable to the interaction in question? Where necessary, review the calculations per III.B above.

III.C.5 Where no calculation is performed or referenced, is the modification sufficient to preclude postulation of the interaction? Provide rationale.

III.C.6 Is the resolution adequately documented?

III.D Other Resolution Methods

III.D.1 Briefly describe method of resolution:

III.D.2 Does the method adequately resolve the interaction?

III.D.3 Is the resolution adequately documented?

IV. Resolution Follow-up

(Proceed to A or B below as appropriate)

IV.A Resolution without Physical Modification

IV.A.1 For those interaction resolutions requiring action by groups **other than** the DSG, is documentation adequate to "close out" the interaction?

IV.B Resolution with Physical Modification

IV.B.1 For those interaction resolutions requiring action by groups **other than** the DSG, is documentation adequate to "close out" the interaction?

IV.B.2 Does the actual modification adequately match what was intended? (refer to III.C above)

V. Program Maintenance

V.1 Subsequent to the initial identification of the source/interaction, has there been adequate surveillance to insure that the initial conclusions and/or resolution are still valid?

V.2 Is there adequate documentation of this surveillance? (refer to Ref [4])

24A004

ATTACHMENT 4
Pg 1 of 1

4.0 EVALUATION PROCESS AND EXTENT OF REVIEW

The process of evaluating the design of the control room ceiling structure was initiated by reviewing the design procedure (DP-3) prepared by Gibbs & Hill specifically for the design of the control room ceiling steel frame, followed by the review of all existing Gibbs & Hill design calculations pertinent to this subject. All hand calculations performed were reviewed line-by-line for methodology and for compliance with the acceptance criteria of Section 5.0. Input for the equivalent static computer analysis (STRUDL program) was checked line-by-line for consistency with the Gibbs & Hill design drawings identified in Table 1. The items checked included geometry input, material properties, section properties, load input, and member end conditions. The computer analyses for the response spectrum analyses (NASTRAN program) were spot checked for inputs and reasonableness of results. The hand calculation for the analyses of the concrete structure at elevation 854'-4" was reviewed line-by-line.

Numerous questions or discrepancies as documented in Attachment 1 were identified in the initial review by TERA. These were transmitted to Gibbs & Hill for resolution or clarification. The concerns that could not be resolved were documented in DIR D-2252. Gibbs & Hill responded to this DIR by revising the calculations or generating new calculations to resolve the discrepancies.

The review and evaluation of the design calculations based on equivalent static analysis was documented on checklists prepared for the this purpose. These checklists identify the appropriate acceptance criteria for the ceiling components and connections, and provide a mechanism for assuring that the criteria have been addressed and met. The checklists are included in Appendix 1. A x in a column indicates that the criteria was addressed and met.

ATTACHMENT 2
pg 1 of 1

6.2 Calculations and Computer Analyses for the Equivalent Static Analysis

In the review of the original calculations and computer analyses questions were raised by TERA. Some of the questions required only a clarification, whereas in other cases, the questions resulted in identification of discrepancies in the calculations and in the computer model Documentation of the communication between TERA and Gibbs & Hill is included in Attachment 1. The identified discrepancies were documented on the DIR D-2252.

Subsequently the discrepancies were resolved and corrected by Gibbs & Hill in new revisions of drawings and calculations. The following discussions reflect the Gibbs & Hill analyses as presented in the calculations listed in Table 2.

The equivalent static analyses are performed in two parts: (1) the main frame by computer analyses (STRUDL program; Calculations SAB-171 C Set 2; SAB-171 P), and (2) the portion below main horizontal frame, i.e., the lower frame with the hangers by hand calculations (SAB-171 C, Set 1). Documentation of the review of these equivalent static analyses are contained in the checklists of Appendix 1. These checklists list on their vertical axis the components and connections of the ceiling frame and on their horizontal axis the applicable acceptance criteria for which the components were checked. A cross mark (x) indicates that the applicable criterion is met.

ATTACHMENT 6
1 of 4

2.4 DSP Implementation

2.4.1 Evaluation Objective

The primary objective of this evaluation was to assess the overall implementation of the DSP. A secondary objective was an extension of this assessment for those particular interactions that were resolved using the Dynamic Impact Criteria (Ref [6]). This second effort resulted from the criteria evaluation of 2.3.

2.4.2 Evaluation Process

The evaluations described below specifically addressed implementation of the following procedures and criteria:

"Control of Seismic/Non-Seismic Component Interaction Evaluations" (Ref [3])

"Maintenance of Damage Study Analyses" (Ref [4])

"Design Control of Calculations and Failure Mode & Effects Analysis (FMEA's) for Damage Study" (Ref [5])

"Comanche Peak Seismic Interaction Criteria" (Ref [6])

In addition to the DSP documentation associated with the above procedures, several discipline-specific calculations were reviewed where such calculations formed the basis for interaction resolution.

2.4.2.1 Overall DSP Seismic/Non-Seismic Implementation

On the basis of the summary of interaction resolutions presented in Ref [24] (which didn't include architectural features since the summary was prepared prior to initiation of ISAP II.d), a limited number of source commodities, with and without interactions, were selected in accordance with Table 2.4-1.

The existing DSP documentation (interaction matrices, evaluation forms, etc.) for these commodities were provided by the DSG with the only provision being that the sources be selected as much as possible from different rooms or areas. Additional documentation was provided as necessary by other discipline groups on site (e.g., calculations, designs for physical modifications). Each package was evaluated against a standard checklist to assure adequate consistency of the implementation efforts and compatibility with DSP seismic/non-seismic procedures. A blank checklist is included at the beginning of Appendix 2.4A.

2.4.2.2 Use of Dynamic Impact Criteria

On the basis of the total number of interactions that were resolved using the DIC, a sample of interactions was selected (see Appendix 2.4D). Appendix 2.4C contains a listing of all DIC

interactions along with interaction matrices for each of the selected interactions. Each of the selected interactions was independently resolved by quantitative means based on engineering principles. It was not intended that this effort specifically evaluate whether the appropriate DIC (of the nine given) was selected to resolve an interaction. Instead, each of the selected interactions was quantitatively assessed so as to measure the acceptability of interaction resolution whenever any of the qualitative DIC was employed.

2.4.3 Acceptance Criteria

2.4.3.1 DSP Implementation

Acceptability of DSP implementation was based on reasonable checklist responses for each of the sources and/or interactions evaluated. Because the FSAR (Ref [8]) doesn't generally include criteria specific enough for the level of methodology reviewed here, comparisons were primarily to accepted engineering principles. Where it was clearly indicated in available documentation that SCI criteria were applied, such was considered acceptable without further review.

2.4.3.2 Dynamic Impact Criteria

Acceptability of the DIC was based on satisfactory conclusions being reached for each of the selected interactions. This involved performing independent calculations to verify the DSG evaluation results. The calculations were not intended to insure strict compliance with FSAR criteria for seismic category I items but rather to provide reasonable assurance either that source failure would not occur or that if it did, target function would not be impaired.

2.4.4 Evaluation

2.4.4.1 DSP Implementation

Based on physical walkdowns and review of documentation, evaluation checklists were completed for twenty-two (22) sources for which there were fourteen (14) identified interactions. Completed checklists are included in Appendix 2.4A. Also included are photographs where such would facilitate a better physical understanding of the sources/interactions. The checklists are sequential by room number. In each case, copies of the associated completed interaction matrix and interaction evaluation & resolution form (if applicable) are included.

One area common to all items evaluated involved program maintenance to insure that interaction evaluation results remained valid during and after subsequent construction activities. Initially, such activities were carried out by visual inspections as per paragraph 3.3.5.5 of Ref [4]. Third party review of visual inspection forms attached to Ref [54]

indicated that this approach was used until about mid-1984 (June to August period). Review also indicated that by this time, there were very few changes being made that were affecting DSF results. Accordingly, the maintenance effort changed from complete physical inspections to a review of change documentation (e.g., DCA's) to determine whether there was a need for physical inspection. This paper review was done in accordance with Ref [95]. The methods described were considered adequate by the third party to insure that potential changes to DSF results were appropriately identified. Documentation of the results of this process were also considered adequate by the third party.

The criteria review of 2.3.4.1D addressed the acceptability of target definition and indicated that the DSF implementation evaluation would provide further substantiation of target definition adequacy. As indicated above, fourteen interactions were reviewed as part of this effort. In all cases, DSF-identified targets were confirmed by the third party. For the eight source commodities without DSF-identified interactions, the third party confirmed that there were no targets within potential interaction zones.

The criteria review of 2.3.4.2E specifically addressed the use of intervening barriers during the interaction identification process. It was noted that this would need to be assessed during the CIA portion of this evaluation. However, it was also addressed here (at least in part). Three cases are discussed below (specific details can be found in Appendix 2.4A):

Room 93 -- It was noted in the checklist response in II.3 that the only interactions were with walls and the floor although these were not identified during the DSG walkdowns. Without the surrounding walls, the ladder likely would be the source for other potential interactions. However, none were identified because judgement was applied at the time of the DSG walkdowns to the extent that such interactions were not considered credible. The third party concurs with this judgement.

Room 151 -- It was noted in the checklist response in II.3 that a large motor control center was in close proximity to a safety-related target (emergency lighting conduit) but that this was not identified as a potential interaction. This was a case where judgement was used during the DSG walkdowns; it was considered by the third party to have been appropriately applied.

Room 205 -- It was noted in the checklist response in II.4 that an interaction was postulated with a nearby conduit. Review of the associated interaction matrix also shows that one other interaction was postulated with the valve operator to which the conduit is attached. Physical inspection also showed it might be possible to postulate interactions with the adjacent ASME chemical additive tank and/or attached

piping (see photo). However, a judgement was made at the time of the DSG walkdowns, that the platform to which the ladder attached would provide sufficient capacity as a barrier to preclude such interactions. As such, no interactions were postulated between the ladder and the tank/piping. The third party concurs that this was a reasonable judgement.

The barriers described above are of the first group discussed in 2.3.4.2E. As was indicated there, the third party concludes that such applications of judgement were practical necessities in order for the DSF to focus on those interactions that are of significance.

The criteria review of 2.3.4.3B indicated that use of FMEA would be assessed during the DSF implementation review. Two of the interactions included in this review were resolved on the basis of FMEA (refer to the completed checklists for rooms 162 and 189 in Appendix 2.4A). Third party review indicated that acceptable methodology had been used but that the FMEA calculations were not based on the current (at the time of third party review) FSAR. Because of this, the Project commited to updating periodically the FMEA calculations to assure that FSAR changes are incorporated as necessary. This commitment was included in Ref [116] and has also been incorporated into the new SIP procedures.

The criteria review of 2.3.4.3C indicated that acceptability of resolution calculations would be assessed during the DSF implementation review. Ten of the interactions included in this review involved resolution calculations (two of the ten were resolved strictly on the basis of calculations while the remaining eight were resolved using physical modifications which themselves required supporting calculations). Third party review of the calculations indicated that, in general, SCI methods were used, but this was not always the case. The third party considered that the methods and conclusions were reasonable (for more detailed discussion, refer to the completed checklists for rooms 58, 117, 178, 174, 205, 206, 207-1, 207-4 [both interactions], and 220 in Appendix 2.4A).

It finally should be noted that there were a few discrepancies identified between recorded equipment numbers and actual numbers, but these were minor in nature and had no effect on interaction resolution.

In summary, the DSF implementation process provided reasonable assurance that potential source commodities and interactions were identified in accordance with DSF criteria, and that reasonable resolutions were made.

2.4.4.2 Dynamic Impact Criteria

As indicated in 2.4.2.2, several interactions that had been

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

before the

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of TEXAS UTILITIES GENERATING COMPANY et al. (Comanche Peak Steam Electric Station, Units 1 and 2	Docket Nos. 50-445-OL 50-446-OL (Application for an Operating License)

CERTIFICATE OF SERVICE

I, Thomas A. Schmutz, hereby certify that the foregoing Answers To Board's 14 Questions was served this 10th day of March 1988, by mailing copies thereof (unless otherwise indicated), first class mail, postage prepaid to:

*Peter B. Bloch, Esquire
Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

*Alan S. Rosenthal, Esq.
Chairman
Atomic Safety and Licensing Appeal Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

*B. Paul Cotter, Jr., Esq.
Chairman
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Assistant Director for Inspection Programs
Comanche Peak Project Division
U.S. Nuclear Regulatory Commission
P.O. Box 1029
Granbury, TX 76048

*/ Asterisk indicates service by hand or overnight courier.

*Juanita Ellis
President, CASE
1426 South Polk Street
Dallas, TX 75224

William R. Burchette, Esquire
Heron, Burchette, Ruckert,
& Rothwell
Suite 700
1025 Thomas Jefferson St., N.W.
Washington, D.C. 20007

*William L. Clements
Docketing & Service Branch
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

*Billie Pirner Garde
Government Accountability
Project
Midwest Office
104 E. Wisconsin Avenue - B
Appleton, WI 54911-4897

Susan M. Theisen
Assistant Attorney General
Attorney General of Texas
Environmental Protection
Division
P.O. Box 12548
Austin, Texas 78711-1548

Robert A. Jablon, Esquire
Spiegel & McDiarmid
1350 New York Avenue, N.W.
Washington, D.C. 20005-4798

*Elizabeth B. Johnson
Oak Ridge National Laboratory
P.O. Box X Building 3500
Oak Ridge, Tennessee 37830

*Dr. Walter H. Jordan
881 West Outer Drive
Oak Ridge, Tennessee 37830

Robert D. Martin
Regional Administrator,
Region IV
U.S. Nuclear Regulatory
Commission
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Dr. Kenneth A. McCollom
Administrative Judge
1107 West Knapp
Stillwater, Oklahoma 74075

Joseph Gallo, Esquire
Hopkins & Sutter
Suite 1250
1050 Connecticut Avenue, N.W.
Washington, D.C. 20036

*Janice E. Moore, Esquire
Office of the General Counsel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

*Anthony Roisman, Esquire
1401 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005

Lanny A. Sinkin
Christic Institute
1324 North Capitol Street
Washington, D.C. 20002

Nancy Williams
CYGNA Energy Services, Inc.
2121 N. California Blvd.
Suite 390
Walnut Creek, CA 94596

David R. Pigott
Orrick, Herrington & Sutcliffe
600 Montgomery Street
San Francisco, CA 94111

*Robert A. Wooldridge, Esquire
Worsham, Forsythe, Sampels
& Wooldridge
2001 Bryan Tower, Suite 3200
Dallas, Texas 75201

*W. G. Counsil
Executive Vice President
Texas Utilities Electric -
Generating Division
400 N. Olive, L.B. 81
Dallas, Texas 75201

Thomas A. Schmutz

Dated: March 10, 1988