CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS
COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2
(PHASE II-DRAFT)
Docket No. 50-445, 50-446

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ABSTRACT

The Nuclear Regulatory Commission (NRC) has requested that all nuclear plants, either operating or under construction, submit a response of consistency with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." EG&G Idaho, Inc., has contracted with the NRC to evaluate the responses of those plants presently under construction. This report contains EG&G's evaluation and recommendations for Comanche Peak Steam Electric Station (CPSES) for the requirements of Sections 5.1.2, 5.1.3, 5.1.5, and 5.1.6 of NUREG-0612 (Phase II). Section 5.1.1 (Phase I) was covered in a separate report [1].

EXECUTIVE SUMMARY

Comanche Peak Units 1 and 2 are not totally consistent with the guidelines of NUREG-0612. In general, inconsistencies exist in the following areas:

- o Single-failure-proof lifting devices and interacting lifting points are not evaulated.

- o Some other items, though less essential, require attention.

The main report contains recommendations which will aid in making the above items consistent with the appropriate guidelines.

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1. INTRODUCTION

1.1 Purpose of Review

This technical evaluation report documents the EG&G Idaho, Inc., review of general load-handling policy and procedures at Comanche Peak Steam Electric Station. This evaluation was performed with the objective of assessing conformance to the general load-handling guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" [2], Sections 5.1.2, 5.1.3, 5.1.5, and 5.1.6. This constitutes Phase II of a two-phase evaluation. Phase I assesses conformance to Section 5.1.1 of NUREG-0612 and was documented in a separate report [1].

1.2 Generic Background

Generic Technical Activity Task A-36 was established by the U.S. Nuclear Regulatory Commission (NRC) staff to systematically examine staff licensing criteria and the adequacy of measures in effect at operating nuclear power plants to assure the safe handling of heavy loads and to recommend necessary changes to these measures. This activity was initiated by a letter issued by the NRC staff on May 17, 1978 [3], to all power reactor applicants, requesting information concerning the control of heavy loads near spent fuel.

The results of Task A-36 were reported in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The staff's conclusion from this evaluation was that existing measures to control the handling of heavy loads at operating plants, although providing protection from certain potential problems, do not adequately cover the major causes of load-handling accidents and should be upgraded.

In order to upgrade measures for the control of heavy loads, the staff developed a series of guidelines designed to achieve a two-phase objective using an accepted approach or protection philosophy. The first portion of the objective, achieved through a set of general guidelines identified in NUREG-0612, Article 5.1.1, is to ensure that all load-handling systems at nuclear power plants are designed and operated such that their probability of failure is uniformly small and appropriate for the critical tasks in which they are employed. The second portion of the staff's objective, achieved through guidelines identified in NUREG-0612, Articles 5.1.2 through 5.1.5, is to ensure that, for load-handling systems in areas where their failure might result in significant consequences, either (a) features are provided, in addition to those required for all load-handling systems, to ensure that the potential for a load drop is extremely small (e.g., a single-failure-proof crane) or (b) conservative evaluations of load-handling accidents indicate that the potential consequences of any load drop are acceptably small. Acceptability of accident consequences is quantified in NUREG-0612 into four accident analysis evaluation criteria as follows:

- "Releases of radioactive material that may result from damage to spent fuel based on calculations involving accidental dropping of a postulated heavy load produce doses that are well within 10 CFR Part 100 limits of 300 rem thyroid, 25 rem whole body (analyses should show that doses are equal to or less than 1/4 of Part 100 limits);

- "Damage to fuel and fuel storage racks based on calculations involving accidental dropping of a postulated heavy load does not result in a configuration of the fuel such that k_{eff} is larger than 0.95;

- "Damage to the reactor vessel or the spent-fuel pool based on calculations of damage following accidental dropping of a postulated heavy load is limited so as not to result in water leakage that could uncover the fuel, (makeup water provided to overcome leakage should be from a borated source of adequate concentration if the water being lost is borated); and

- "Damage to equipment in redundant or dual safe shutdown paths, based on calculations assuming the accidental dropping of a postulated heavy load, will be limited so as not to result in loss of required safe shutdown functions."

The approach used to develop the staff guidelines for minimizing the potential for a load drop was based on defense in depth. This plan includes proper operator training, equipment design, and maintenance coupled with safe load paths and crane interlock devices restricting movement over critical areas.

Staff guidelines resulting from the foregoing are tabulated in Section 5 of NUREG-0612.

1.3 Plant-Specific Background

On December 22, 1980, the NRC issued a letter [4] to Texas Utilities Services Inc. (TUSI) the applicant for Comanche Peak requesting that the applicant review provisions for handling and control of heavy loads at Comanche Peak Units 1 and 2, evaluate these provisions with respect to the guidelines of NUREG-0612, and provide certain additional information to be used for an independent determination of conformance to these guidelines. TUSI provided responses to this request on August 7, 1981, October 8, 1981 and March 1, 1982 [5, 6, 7]. A revised response was submitted on June 8, 1983 [8].

2. EVALUATION AND RECOMMENDATIONS

2.1 Overview

The following sections summarize TUSI's review of heavy load handling at Comanche Peak Units 1 and 2 accompanied by EG&G's evaluation, conclusions, and recommendations to the applicant for making the facilities more consistent with the intent of NUREG-0612.

2.2 Heavy Load Overhead Handling Systems

Table 2.1 presents the applicant's list of overhead handling systems which are subject to the criteria of NUREG-0612. The applicant has indicated that the weight of a heavy load for the facilities as has been changed to 2150 lbs. [8] per the NUREG-0612 definition.

2.3 Guidelines

2.3.1 Spent-Fuel Pool Area [NUREG-0612, Article 5.1.2]

(1) "The overhead crane and associated lifting devices used for handling heavy loads in the spent-fuel pool area should satisfy the single-failure-proof guidelines of Section 5.1.6 of this report.

OR

(2) "Each of the following is provided:

(a) Mechanical stops or electrical interlocks should be provided that prevent movement of the overhead crane load block over or within 15 feet horizontal (4.5 meters) of the spent-fuel pool. These mechanical stops or electrical interlocks should not be bypassed when the pool contains "hot" spent fuel, and should not be bypassed without approval from the shift supervisor or other designated plant management personnel). The mechanical stops and electrical interlocks should be verified to be in place and operational prior to placing "hot" spent fuel in the pool.

TABLE 2.1. NONEXEMPT HEAVY LOAD HANDLING SYSTEMS--COMANCHE CREEK UNITS 1 AND 2

Crane/Hoist Name	Crane/Hoist I.D. Number	Capacity (Tons)	Location	Elevation
1. Fuel Building overhead crane	CPX-MESCFC-01	130-17-5	Fuel Building	Above 860 ft
2. Containment auxiliary upper cranes	CP1-MESCCA-01 CP2-MESCCA-01	5	Containment Building	905 ft-6 in.
3. Containment polar cranes	CP1-MESCPP-01 CP2-MESCPP-01	175-20	Containment Building	950 ft-7 in.
4. Moderating HX and letdown chiller HX hoist	CP1-MEMHCH-16 CP2-MEMHCH-16	2	Safeguards Building	831 ft-6 in.
5. Component cooling water pump hoist	CPX-MEMHCH-01	4	Auxiliary Building	810 ft-6 in.
6. Safety related chiller hoist (Single-Failure-Proof)	CP1-MEMHCH-04A CP2-MEMHCH-04A	3	Auxiliary Building	778 ft
7. Centrifugal charging pumps hoist	CP1-MEMHCH-01, 02 CP2-MEMHCH-01, 02	4	Auxiliary Building	810 ft-6 in.
8. Containment fuel handling bridge crane	CP1-MESCCF-01 CP2-MESCCF-01	1	Containment Building	Above 860 ft
9. Auxiliary feedwater pump hoist (electric motor driven pump)	CP1-MEMHCH-13, 14 CP2-MEMHCH-13, 14	4	Safeguards Building	790 ft-6 in.
10. Auxiliary feedwater pump hoist (turbine driven pump)	CP1-MEMHCH-12 CP2-MEMHCH-12	3	Safeguards Building	790 ft-6 in.
11. Auxiliary filter hoist	CPX-MEMHWR-04	8	Auxiliary Building	852 ft-6 in.
12. Reactor coolant pumps hoist	CP1-MEMHCH-42 CP2-MEMHCH-42	45	Containment Building	905 ft-9 in.
13. Diesel generator (piston) hoist	CP1-MEMHCH-37, 38 CP2-MEMHCH-37, 38	1	Safeguards Building	810 ft-6 in.
14. Spent fuel pool HX hoist	CPX-MEMHCH-43, 44	8	Fuel Building	838 ft-9 in.
15. Service water traveling screen hoist and jib crane	CPX-MEMHCH-12 CPX-SWEHSG-01	20 3	Outside of service water intake structure	838 ft

TABLE 2.1. (continued)

	Crane/Hoist Name	Crane/Hoist I.D. Number	Capacity (Tons)	Location	Elevation
16.	Residual heat removal HX and containment spray system hoist	CP1-MEMHCH-47, 59	10	Safeguards Building	831 ft-6 in.
17.	Main steam safety valves hoist	CP1-MEMHCH-48, 49, 50, 51 CP2-MEMHCH-48, 49, 50, 51	1	Safeguards Building	880 ft-6 in.
18.	Service water intake structure crane	CPX-MESCSW-01	7 1/2	Service water intake structure	Above 796 ft
19.	Containment dome access rotating platform hoist	CP1-MESCRP-01 P2-MESCRP-01	1	Containment Building	1000 ft
20.	Fuel handling bridge crane (Fuel Building)	TBX-FHSCFB-01	2	Fuel Building	Above 860 ft
21.	Refueling machine (Containment Building)	TBX-FHSCMC-01 TCX-FHSCMC-01	2	Containment Building	Above 860 ft
22.	Service water intake stop gate hoist	X-MEMHCH-61	8	Service water intake structure	789 ft-9 in.
23.	Auxiliary filter hoist (Single-Failure-Proof)	CPX-MEMHWR-04A	8	Auxiliary Building	852 ft-6 in.
24.	Miscellaneous hoist	CPX-MEMHCH-72	2	Fuel Building	838 ft-9 in.
25.	Residual heat removal pump hoist	CP1-MEMHCH-08 CP2-MEMHCH-09	3	Safeguards Building	773 ft

(b) The mechanical stops or electrical interlocks of 5.1.2(2)(a) above should also not be bypassed unless an analysis has demonstrated that damage due to postulated load drops would not result in criticality or cause leakage that could uncover the fuel.

(c) To preclude rolling if dropped, the cask should not be carried at a height higher than necessary and in no case more than six (6) inches (15 cm) above the operating floor level of the refueling building or other components and structures along the path of travel.

(d) Mechanical stops or electrical interlocks should be provided to preclude crane travel from areas where a postulated load drop could damage equipment from redundant or alternate safe shutdown paths.

(e) Analyses should conform to the guidelines of Appendix A.

OR

(3) "Each of the following are provided (Note: This alternative is similar to (1) above, except it allows movement of a heavy load, such as a cask, into the pool while it contains "hot" spent fuel if the pool is large enough to maintain wide separation between the load and the "hot" spent fuel.):

(a) "Hot" spent fuel should be concentrated in one location in the spent-fuel pool that is separated as much as possible from load paths.

(b) Mechanical stops or electrical interlocks should be provided to prevent movement of the overhead crane load block over or within 25 feet horizontal (7.5 m) of the "hot" spent fuel. To the extent practical, loads should be moved over load paths that avoid the spent-fuel pool and kept at least 25 feet (7.5 m) from the "hot" spent fuel unless necessary. When it is necessary to bring loads within 25 feet of the restricted region, these mechanical stops or electrical interlocks should not be bypassed unless the spent fuel has decayed sufficiently as shown in Table 2.1-1 and 2.1-2, or unless the total inventory of gap activity for fuel within the protected area would result in off-site doses less than 1/4 of 10 CFR Part 100 if released, and such bypassing should require the approval from the shift supervisor (or other designated plant management individual). The mechanical stops or electrical interlocks should be verified to be in place and operational prior to placing "hot" spent fuel in the pool.

(c) Mechanical stops or electrical interlocks should be provided to restrict crane travel from areas where a postulated load drop could damage equipment from redundant or alternate safe shutdown paths. Analyses have demonstrated that a postulated load drop in any location not restricted by electrical interlocks or mechanical stops would not cause damage that could result in criticality, cause leakage that could uncover the fuel, or cause loss of safe shutdown equipment.

(d) To preclude rolling, if dropped, the cask should not be carried at a height higher than necessary and in no case more than six (6) inches (15 cm) above the operating floor level of the refueling building or other components and structures along the path of travel.

(e) Analyses should conform to the guidelines of Appendix A.

OR

(4) "The effects of drops of heavy loads should be analyzed and shown to satisfy the evaluation criteria of Section 5.1 of this report. These analyses should conform to the guidelines of Appendix A."

A. Summary of Applicant's Statements

Two load handling systems are located in the vicinity of two spent fuel pools:

- Fuel Building Overhead Crane
- Fuel Building Bridge Crane

The Fuel Building Bridge Crane was designed for moving a single fuel assembly within the spent fuel pools, refueling canal and cask handling pit. Lift-limiting features will prevent the fuel assemblies from being lifted above the safe shielding level of water in the transfer canal, cask loading pit and spent fuel pools.

The Fuel Building Overhead Crane is the primary means of transporting nuclear fuel in and out of the fuel handling area. The crane's main hoist has been equipped with single-failure proof features.

The two auxiliary hoists of the Fuel Building Overhead crane are used to handle new fuel assemblies and miscellaneous loads. Neither of these hoists can physically travel any closer than 6 ft 3 in. from nearest spent fuel pool. The spent fuel cask will be handled exclusively by the main hoist. In answer to EG&G's query concerning the weight of the failed fuel assembly and lifting tool [8], the applicant has indicated that, after review, the lifting tool was found unnecessary [9, Attachment B]. The failed fuel assembly was deleted from the list of heavy loads carried by the Fuel Building Bridge Crane.

B. EG&G Evaluation

As stated, the Fuel Building Bridge Crane only moves the fuel assembly within the spent fuel pool, transport canal and fuel loading pit. This crane carries no heavy load that can fall into the spent fuel pool. As a matter of fact, the maximum listed load to be carried by this crane weighs only 2088 lbs which is less than the specified weight of the "heavy load," 2150 lbs. Thus, this crane need not be classified as a nonexempt crane.

In view of the single-failure proof features of the Fuel Building Overhead Crane and its main hoist, they will be evaluated in Section 2.3.4. Both auxiliary hoists of the Fuel Building Overhead Crane are capable of carrying heavy loads to 6 ft 3 in. from the boundary of the spent fuel pool. The 6 ft 3 in. clearance may not be adequate. This question has been left unaddressed in the applicant's submittal [8]. The heavy loads to be lifted by each auxiliary hoist are not specified in the applicant's Table A-4. The miscellaneous loads mentioned in the context do not appear in this table.

C. EG&G Conclusions and Recommendations

The applicant's information indicates a partial consistency with the intent of this guideline. The applicant should take following actions:

1. Specify the heavy loads, including the miscellaneous loads, to be handled by each auxiliary hoist of the Fuel Building Overhead crane.

2. Provide information to demonstrate that a load drop from either of the auxiliary hoists would have no unacceptable consequences.

2.3.2 Reactor Building [NUREG-0612, Article 5.1.3]

(1) "The crane and associated lifting devices used for handling heavy loads in the containment building should satisfy the single-failure-proof guidelines of Section 5.1.6 of this report.

OR

(2) "Rapid containment isolation is provided with prompt automatic actuation on high radiation so that postulated releases are within limits of evaluation Criterion I of Section 5.1 taking into account delay times in detection and actuation; and analyses have been performed to show that evaluation criteria II, III, and IV of Section 5.1 are satisfied for postulated load drops in this area. These analyses should conform to the guidelines of Appendix A.

OR

(3) "The effects of drops of heavy loads should be analyzed and shown to satisfy the evaluation criteria of Section 5.1. Loads analyzed should include the following: reactor vessel head; upper vessel internals; vessel inspection platform;

cask for damaged fuel; irradiated sample cask; reactor coolant pump; crane load block; and any other heavy loads brought over or near the reactor vessel or other equipment required for continued decay heat removal and maintaining shutdown. In this analysis, credit may be taken for containment isolation if such is provided; however, analyses should establish adequate detection and isolation time. Additionally, the analysis should conform to the guidelines of Appendix A."

A. Summary of Applicant's Statements

Six load handling systems are located in the containment building. The first two systems presented in the following are incapable of carrying heavy loads over the reactor vessel.

- Containment Fuel Handling Bridge Crane

  "This crane is used for handling fuel assemblies and components within the containment by means of a long-handled tool suspended from the hoist. The hoist travel range and tool length are designed to limit the maximum lift of a fuel assembly to a safe shielding depth."

  "The heaviest load to be handled by this crane is approximately 2150 lbs. This load is not considered a 'heavy load' as defined."

- Refueling Machine

  "The Containment Building Refueling Machine is used for lifting a fuel assembly during refueling and transporting it between the reactor vessel and the containment fuel transfer area. . . . This machine is also equipped with a 1-1/2 ton hoist. This hoist is used during the inspection of a control rod drive shaft. This load is excluded from consideration as a 'heavy load' as defined. The maximum load to be lifted by this hoist over the reactor vessel will be administratively limited to 2150 lbs."

- <u>Containment Polar Crane</u>

  "The Containment Polar Crane was used during the plant construction phase for lifts up to 475 tons (for handling the reactor vessel and steam generators) prior to its intended normal service."

  "During refueling or maintenance operations, the Containment Polar Crane handles a maximum non-critical load of 175 tons. The heaviest load expected to be lifted is the reactor vessel head assembly."

  "The Containment Polar Cranes' main hoists have been equipped with single-failure-proof features. A detailed analysis of the features of the Containment Polar Crane has been made against the guidelines of NUREG-0554."

- <u>Containment Auxiliary Upper Crane</u>

  "The area covered by this crane includes most of the reactor refueling cavity area and, therefore, the potential exists for a heavy load drop into the reactor vessel when the vessel head is removed. This crane can safely traverse its entire load handling area when the vessel head is set on the reactor vessel.

Mechanical stops will be utilized during reactor vessel head removal to physically prevent this crane from traversing over the open reactor vessel. Administrative controls addressing the installation and removal of the mechanical stops will be included in the reactor vessel head removal and installation procedure."

- <u>Reactor Coolant Pump Hoist</u>

  "This hoist is an auxiliary hoist which is attached to the Polar Crane main hook when lifting the reactor coolant pump and motor out of the steam generator . . . compartments in the Containment Building."

  "This hoist will be used only during cold shutdown and refueling modes when lifting the reactor coolant pump and motor. In these modes, the steam generators are not used for decay heat removal which, in this case, will be provided by the Residual Heat Removal (RHR) System. If a load drop occurred in a steam generator compartment and damaged the reactor coolant system piping in that compartment, core cooling could still be maintained by use of the separate and redundant RHR loop.

  Specific load paths will be developed for each reactor coolant pump and motor removal and will not allow the load to traverse over or near the reactor vessel."

- <u>Containment Access Rotating Platform Hoist</u>

  "This one ton hoist is used for lifting miscellaneous tools up to the Containment Rotating Access Platform and to the Polar Crane. . . . Administrative controls will be utilized which will restrict the use of this hoist only within the safe load areas. This will ensure that an accidental load drop will not damage safe shutdown equipment or spent fuel."

B. <u>EG&G Evaluation</u>

As pointed in [1], the Containment Fuel Handling Crane, the Fuel Machine and the Containment Access Rotating Platform should be categorized as exempt cranes, if the listed weights of loads (Table A-4) carried by these cranes are accurate and the "heavy load" of 2150 lbs is correctly specified per NUREG-0612 definition.

The polar crane and its main hoist are single-failure proof. The specific single-failure proof features of this crane and its main hoist will be evaluated in Section 2.3.4 of this report. In applicant's Table A-4, the loads listed under Polar Crane are not specified as to which loads are carried by the main hoist or by the auxiliary hoists. The effects of a postulated load drop from either of the auxiliary hoists are not analyzed.

The applicant listed only the reactor vessel as the safety related equipment in the path of the containment auxiliary upper crane (Table A-1). The proposed mechanical stops may effectively reduce the probability of a load dropping into the reactor vessel. However, the applicant should indicate if any equipment (e.g., piping attached to the reactor vessel) for maintaining safe shutdown can be endangered. For the case of the covered reactor vessel, the applicant provided no information to justify that damage to the reactor vessel head and its appurtenances resulting from a load drop would not adversely affect the irradiated fuel and safe shutdown equipment.

The Reactor Coolant Pump Hoist operates only during cold shutdown and the safety related equipment (Table A-1 [8]) in the load path is not required to maintain cold shutdown. Evaluation in accordance NUREG-0612, Section 5.1.3(2) or (3) is not necessary.

The Containment Fuel Handling Bridge Crane, the Fuel Machine and the Containment Access Rotating Platform Hoist carry no heavy loads. Unless the specified "heavy load" of 2150 lbs is further revised, an evaluation of the hazard of a load drop from any one of these load handling systems is not required.

C. EG&G Conclusions and Recommendations

The applicant's information is not sufficient for meeting all the requirements of this guideline. Further actions are recommended:

1. Provide information to demonstrate that a load drop over the reactor vessel from the Containment Auxiliary Upper Crane or the Polar Crane Auxiliary Hoists would not endanger the irradiated fuel and safe shutdown of the reactor.

2. Reexamine the nonexempt status of the three load handling systems mentioned above. Delete them from the nonexempt cranes if they do not carry any heavy loads.

2.3.3 Other Areas [NUREG-0612, Article 5.1.5]

(1) "If safe shutdown equipment are beneath or directly adjacent to a potential travel load path of overhead handling systems, (i.e., a path not restricted by limits of crane travel or by mechanical stops or electrical interlocks) one of the following should be satisfied in addition to satisfying the general guidelines of Section 5.1.1:

(a) The crane and associated lifting devices should conform to the single-failure-proof guidelines of Section 5.1.6 of this report;

<u>OR</u>

(b) If the load drop could impair the operation of equipment or cabling associated with redundant or dual safe shutdown paths, mechanical stops or electrical interlocks should be provided to prevent movement of loads in proximity to these redundant or dual safe shutdown equipment. (In this case, credit should not be taken for intervening floors unless justified by analysis.)

<u>OR</u>

(c) The effects of load drops have been analyzed and the results indicate that damage to safe shutdown equipment would not preclude operation of sufficient equipment to achieve safe shutdown. Analyses should conform to the guidelines of Appendix A, as applicable.

(2) "Where the safe shutdown equipment has a ceiling separating it from an overhead handling system, an alternative to Section 5.1.5(1) above would be to show by analysis that the largest postulated load-handled by the handling system would not penetrate the ceiling or cause spalling that could cause failure of the safe shutdown equipment."

A. <u>Summary of Applicant's Statements</u>

The applicant's statements related to the load handling systems are not organized to appear in any particular sequence. In the following, the number in the parentheses after each crane name is the assigned crane number in Table 2.1 and applicant's Tables A-1 and A-4.

Two of the load handling systems were identified as single-failure proof:

- Safety Related Chiller Hoist, CP 1 and 2 MENHCH-04A(6)

  This hoist is being procured to replace the existing hoist.

- Auxiliary Filter Hoist, CPX-MENHWR-04A (23)

  This hoist, in conjunction with the existing hoist (CPX-MENHWR-04) which is not single-failure proof, is used during removal and transfer of radioactive filter elements. The single-failure proof hoist is being procured for handling the transfer cask.

These two single-failure proof systems are designed and fabricated in accordance to the generic report EDR-1(P)-A, "Ederer's Nuclear Safety Related X-Sam Cranes."

Other hoists and cranes which operate over safe shutdown or decay heat removal equipment not addressed in Sections 2.3.1 and 2.3.2 of this report are presented in Table 2.2, which has been prepared with the information in applicants Table A-6.

The following describes the basis of hazard elimination criterion for each crane listed in Table 2.2.

Service Water Intake Structure (SWIS) Crane (18)

"[This] crane is . . . used to install and maintain the service water pumps, fire pumps and associated piping and equipment inside the service water structure during the maintenance operation of the pumps.

The station Service Water System consists of two separate and independent full-capacity, safety related trains.

TABLE 2.2 COMANCHE PEAK STEAM ELECRIC STATION LOAD/IMPACT AREA MATRIX

Crane	Location/Impact Area	Loads	Elevation	Safety-Related Equipment	Hazard Elimination Category
Service Water Intake Structure Crane (18)	See load drop analysis discussion in Section 2.3.3 related to applicant's Table A-5	--	--	--	Note B
Safety Related Chiller Hoise (2) (CP1&2-MENHCH-04A)	Area directly below Safety Related Chiller Hoist. This includes both "Train A" and "Train B" Safety Chillers. Rooms 115 A and 115 B.	Cooler HX. Tube Bundle; Chilled Water Circ. Pump, motor; Potential Transformers	738 ft	Safety Chiller Package--"Train A" and "Train B"	Note A
Moderating and Letdown Chiller Heat Exchanger Hoist (4)	Electrical cable tray, "Train A," located near end of hoist monorail. Safeguards building Rooms 93 and 99.	Moderating Heat Exchanger Channel Head, Tube Bundle, Shell; Letdown Chiller HX. Channel Head, Tube Bundle, Shell	831 ft	"Train A" cables for Aux. Feedwater Component Cooling Water Motor Operated Valves	Note B
Component Cooling Water Pump Hoist (5)	Area directly below each Component Cooling Water Pump Hoist. Auxiliary Building Rooms 204, 205, 196, and 197	Component Cooling Water Pump, Base	810 ft-6 in.	Component Cooling Water Piping	Note B
		Component Cooling Water Pump Motor		Component Cooling Water Pump and Piping	
		Valves - 24 in.; Emergency Fan/Coil Unit Motor		Component Cooling Water Pump, Motor, and Piping	
Centrifugal Charging Pumps Hoist (7)	Area directly below each Centrifugal Charging Pump Hoist. Auxiliary Building Rooms 194, 195, 200, and 201	Centrifugal Charging Pump (CCP), Gear Assembly, Motor, Motor Rotor	810 ft-6 in.	Chemical Volume and Control System (CVCS) Piping and Valves	Note B
		Lube Oil Cooler (Shell)		CCP and CVCS Piping and Valves	

TABLE 2.2 (Continued)

Crane	Location/impact Area	Loads	Elevation	Safety-Related Equipment	Hazard Elimination Category
Residual Heat Removal Pumps Hoist (25)	Area directly below Residual Heat Removal (RHR) Pump Hoist. Safeguards Building Rooms 52 and 53.	Residual Heat Removal (RHR) Pump, Casing, Rotor	773 ft	RHR Piping	Note B
		RHR Pump Motor		RHR Pump and Piping	
Auxiliary Feedwater Pump Hoist (electric motor driven pump) (9)	Area directly below each electric motor driven Auxiliary Feedwater Pump Hoist. Safeguard Building Rooms 72, and 73.	Auxiliary Feedwater Pump, Motor, Rotor, Upper Casing	790 ft-6 in.	Auxiliary Feedwater Piping	Note B
Auxiliary Feedwater Pump Hoist (turbine driven pump) (10)	Area directly below each turbine driven Auxiliary Feedwater Pump Hoist. Safeguard Building Room 74.	Auxiliary Feedwater Pump, Rotor, Casing, Turbine Driver	790 ft-6 in.	Auxiliary Feedwater Piping	Note B
Diesel Genreator (Piston) Hoist (13)	Area directly below Diesel Generator Hoists. Safeguards Building Rooms 84 and 85.	Various Diesel Generator Parts and Components	810 ft-6 in.	Diesel Generator	Note B
Spent Fuel Pool Heat Exchanger Hoists (14)	Area directly below Spent Fuel Pool Heat Exchanger Hoist. Fuel Building	Spent Fuel Cooling Pump, Motor	810 ft-6 in.	Spent Fuel Pool Heat Exchanger and Piping	Note B
		Spent Fuel Heat Exchange Shell, Tube Bundle; Concrete Floor Plugs	810 ft-6 in.	Spent Fuel Pool Heat Exchanger Pump, and Piping	Note B
Residual Heat Removal Heat Exchanger and Containment Spray System Heat Exchanger Hoist (16)	Area directly below load path of Residual Heat Removal (RHR) and Containment Spray Heat Exchanger Hoists. Rooms 68 and 69.	Containment Spray Hoist: Shell Body, Tube Bundle; Compartment Concrete Floor Plugs	790 ft-10 in.	RHR Heat Exchanger and Piping	Note B
		RHR Hoist; Shell Body, Tube Bundle		RHR Piping	

TABLE 2.2 (Continued)

Crane	Location/Impact Area	Loads	Elevation	Safety-Related Equipment	Hazard Elimination Category
Main Steam Safety Valve Hoist (17)	Area directly below the Main Steam Safety Valves Hoist. Safeguards Building Room 109	Main Steam Safety Valves	873 ft-6 in.	Main Steam Safety Valves	Note B
Service Water Intake Stop Gate Hoist (22)	Area directly below the Service Water Intake Stop Gate Hoist. Room 274 (lower elevation of Service Water Structure).	Service Water Pump Compartment Stop Gates	7[illegible]5 ft	Service Water Pump Shaft	Note B
Service Water Traveling Screen Hoist (15)	Area directly below Service Water Traveling Screen Hoist.	Misc. Parts, Trays, Chains, etc.	810 ft-6 in.	Service Water Traveling Screens	Note B
Auxiliary Filter Hoist (CPX-MENHWR-04A) (23)	Area at Elevation 810 ft-6 in. below open hatch at 852 ft-6 in. East side of Room 234	Spent Filter Transfer Cask	765 ft-6 in.	Units 1 and 2 "Train A" and "Train B" Service Water Inlet/Discharge Piping	Note A
Auxiliary Filter Hoist (CPX-MEMHWR-04) (11)	Area below monorail. Spent Filter West side and south side of Room 234	Spent Filter Transfer Cask	852 ft-6 in.	Radioactive filter cavity	Note A
Miscellaneous Hoist (24)	Area below monorail. Room 264	Spent Fuel Pool Cooling Pump Inlet Isolation Valve	838 ft-9 in.	"Train A" and "Train B" spent fuel pool cooling piping	Note B

Note A: Single-failure proof or to be replaced by single-failure proof system.

Note B: System redundancy and physical separation precludes loss of the system's [illegible] its safety-related function following the load drop in this area.

Service water pumps inside the pump house are physically separated from each other by reinforced concrete walls. The SWIS crane is required to handle occasional non-critical loads and operate during normal operation of the plant.

The safety related equipment which may be affected by the movement of loads with this crane is the service water pumps and associated piping. Because of the physical separation and the cross connections between both the train and unit, a load drop from the SWIS crane will not preclude safe shutdown through the use of the redundant SSW pump."

The applicant demonstrated with a detailed load drop analysis (Table A-5) that, if one service water loop is inoperable, redundant service water can be made available by opening a cross-connect valve.

<u>Safety Related Chiller Hoist, CP 1 & 2 MENHCH-04, (not listed)</u>

"This hoist is used for handling the cooler heat exchanger, chilled water circulation pump, pump motor, and associated piping and equipment in the . . . Auxiliary Building.

The safety chilled water system is designed to remove heat rejected by engineered safety feature pump motors and electrical switchgear. Administrative controls and special precautions will be taken when using this hoist prior to its replacement with the single failure proof hoist."

<u>Moderating and Letdown Chiller Heat Exchanger Hoist (4)</u>

"The safety related equipment, which may be affected by the movement of loads with this hoist, is a small section of

Class 1E (Train A) cable tray which is used for auxiliary feedwater and component cooling water motor operated valves. Since all of the cables are for TRAIN A only, TRAIN B equipment will be available to perform the safety functions should a load drop damage the cables in the tray.

It should be noted that this hoist does not travel directly over the cable tray. Considering the remote possibility that a load could accidentally swing out and damage the cable tray, the redundant tray would still be available. Therefore, operation of the hoist will not preclude safe shutdown of the reactor following a load drop."

Component Cooling Water Pump Hoist (5)

"Unit 1 and Unit 2 are equipped with redundant Component Cooling Water (CCW) systems consisting of two trains per unit. Each CCW train is located in a separate room and serviced with a separate hoist that can only traverse that particular CCW train. Therefore, due to horizontal physical separation, it is not possible for a load drop of one CCW Pump Hoist to preclude the operation of the redundant CCW train.

A load drop analysis has been performed and the result indicates that there will be no consequential damage to the floor directly below the monorail."

Centrifugal Charging Pump Hoist (7)

"Each Centrifugal Charging Pump Hoist services one centrifugal charging pump (CCP). There are two redundant 100% capacity CCP's per unit, each physically and electrically separated in different rooms.

Due to the physical separation and redundancy of the CCP safety trains, a load drop from one hoist would not preclude safe shutdown of the reactor.

A load drop analysis has been performed and the result indicates that there will be no consequential damage to the floor directly below the monorail."

Auxiliary Feedwater Pump (Motor Driven) Hoist (9)

"These hoists service each of the electric motor driven auxiliary feedwater pumps. If a load drop were to occur over one of these feedwater pumps, the redundant 100% capacity turbine driven auxiliary feedwater pump would be available to supply the required feedwater since this pump is physically separated in a different room."

Auxiliary Feedwater Pump (Turbine Driven) Hoist (10)

"This hoist services only the turbine driven auxiliary feedwater pump. If a load drop were to occur above this pump and result in damage, the separate and redundant motor driven auxiliary feedwater pumps would be available to supply the required feedwater for decay heat removal."

Diesel Generator (Piston) Hoist (13)

"Each hoist services an area directly above each of the two 100% capacity redundant diesel generators. Since each diesel generator and associated hoist are located in different rooms and, therefore, physically and electrically separated, a load drop from one hoist would not preclude the use of the redundant diesel generator to provide emergency power if required."

Spent Fuel Pool Heat Exchanger Hoist (14)

"The safety-related equipment for TRAIN A and TRAIN B spent fuel pool cooling systems are located in separate rooms and serviced by separate Spent Fuel Pool Heat Exchanger Hoists. The hoists are positioned above the train which it services and can only traverse above that particular train. Therefore, due to physical separation, it is not possible for a load drop from one Spent Fuel Pool Heat Exchanger Hoist to preclude the operation of the other train."

Residual Heat Removal (RHR) Heat Exchanger and Containment Spray (CS) Heat Exchanger Hoists (16)

"There are two RHR and CS Heat Exchanger Hoists per unit with each hoist servicing one RHR and CS heat exchanger. Each of the two safety trains of RHR and CS heat exchangers are physically separated from the other train. Therefore, due to sufficient physical separation and redundancy of the systems, the operation of these hoists will not preclude safe shutdown or decay heat removal should a load drop occur and damage result to safety equipment."

Main Steam Safety Valve Hoist (17)

"The primary function of these hoists is to remove and install main steam safety valves from each main steam line. There is one hoist per main steam line. The installation and removal of the safety valves will be performed while the unit is on residual heat removal, and therefore, a load drop would not adversely effect continued decay heat removal.

However during safety valve testing, the hoist may be used to lift testing equipment over the valves. In the unlikely event a load drop causes a main steam line break, safe shutdown and decay heat removal could be achieved via the use of the other three steam generators (if the steam generators were being used for reactor heat removal). This steam break accident scenario is bounded by the main steam line rupture analysis presented in the CPSES FSAR Section 15.1."

Service Water Intake Stop Gate Hoist (22)

"The Service Water Intake Stop Gate Hoist is used for removal and installation of the service water pump compartment stop gates. The remote possibility exists for a load drop of the Service Water Intake Stop Gate Hoist to affect the operation of one service water pump (one pump per train) by damaging the pump shaft casing. However, since TRAIN A and TRAIN B compartments of the service water intake structure are physically separated by a concrete wall, a load drop on one train of the service water intake will not preclude the operation of the redundant service water train."

Service Water Traveling Screen Hoist and Jib Crane (15)

"These hoists are used for handling the service water traveling screens and stop gates during maintenance operations. A load drop from this hoist would not impact any safety-related equipment.

A load drop analysis has been performed for the screens and stop gates and the result indicates that there will be no consequential damage to the floor directly below the monorail and jib crane."

Auxiliary Filter Hoist (11)

"This hoist is used for handling miscellaneous spent filters and the transfer cask. . . . Until the single failure proof hoist [Crane 23] . . . is installed, this hoist will cover the entire monorail area. Special precautions will be taken when handling any heavy load over the equipment hatch area. By inspection, there is no safety related safe shutdown equipment directly below this hoist's permanent service area. Load handling procedures will be established to ensure that any load drop will not result in a safety concern."

Miscellaneous Hoist (24)

"This hoist is used for handling the spent fuel pool cooling system isolation valves during maintenance operations. In the event of a load drop and damage to one train, the separate and redundant train would be available to supply the required cooling for decay heat removal."

Residual Heat Removal Pump Hoist (25)

"This hoist is designed for use during maintenance on each of the RHR pumps. The RHR pumps provide decay heat removal capabilities during cold shutdown and refueling modes. There are two redundant 100% capacity RHR pumps per unit, each located in a separate room with its associated monorail. The hoist will be used for maintenance when the associated RHR pump is removed from service. Since the redundant train is still available, a load drop from one monorail will not prevent the RHR system from performing its safety function."

B. EG&G Evaluation

Table 2-1 of this report includes all the nonexempt overhead load handling systems reported in applicant's Tables A-1 and A-4. Some discrepancies appear to exist between the information in these tables and the applicant's statement:

- Two Safety Related Chiller Hoists (CP 1 & 2 MENHCH-04A) are listed in the tables, but the other two hoists (CP 1 & 2 MENHCH-04) mentioned in the applicant's statements are not.

- One Auxiliary Chiller Filter Hoist (CPX-MENHWR-04) is listed in the tables, but according to the applicant's statements, there exists another hoist (CPX-MENHWR-04A) which does not appear in the tables.

The Safety Injection Pump Hoist (carrying loads up to 3 tons) was reported previously as a nonexempt crane [7], but was omitted in the latest submittal [8] without explanation.

As indicated by the applicant, analysis of a load drop from the CCW Pump Hoist, the CCP Hoist or the Service Water Traveling Screen Hoist verifies that the drop would cause no consequential damage to the intervening floor. Since the applicant has listed no safety-related equipment under the floor, the analysis may not be required.

The single-failure-proof features of Safety Related Chiller Hoist and Auxiliary Filter Hoist being procured will be evaluated in Section 2.3.4. The applicant needs to state when these two hoists will be available for service.

C. EG&G Conclusions and Recommendations

The applicant has expended considerable effort towards meeting the requirements of this guideline. Further effort in the following areas should help the applicant to achieve full consistency with the intent of NUREG-0612, Section 5.1.5:

1. Update Tables 2.1 and 2.2 to ensure their completeness.

2. Indicate when the single-failure-proof Safety Related Chiller Hoist and Auxiliary Filter Hoist will be available for service.

2.3.4 Single-Failure-Proof Handling Systems [NUREG-0612, Article 5.1.6]

(1) "Lifting Devices:

(a) Special lifting devices that are used for heavy loads in the area where the crane is to be upgraded should meet ANSI N14.6 1978, "Standard For Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More For Nuclear Materials," as specified in Section 5.1.1(4) of this report except that the handling device should also comply with Section 6 of ANSI N14.5-1978. If only a single lifting device is provided instead of dual devices, the special lifting device should have twice the design safety factor as required to satisfy the guidelines of Section 5.1.1(4). However, loads that have been evaluated and shown to satisfy the evaluation criteria of Section 5.1 need not have lifting devices that also comply with Section 6 of ANSI N14.6.

(b) Lifting devices that are not specially designed and that are used for handling heavy loads in the area where the crane is to be upgraded should meet ANSI B30.9-1971, "Slings" as specified in Section 5.1.1(5) of this report, except that one of the following should also be satisfied unless the effects of a drop of the particular load have been analyzed and shown to satisfy the evaluation criteria of Section 5.1:

(i) Provide dual or redundant slings or lifting devices such that a single component failure or malfunction in the sling will not result in uncontrolled lowering of the load;

<u>OR</u>

(ii) In selecting the proper sling, the load used should be twice what is called for in meeting Section 5.1.1(5) of this report.

(2) "<u>New cranes</u> should be designed to meet NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants." For operating plants or plants under construction, the crane should be upgraded in accordance with the implementation guidelines of Appendix C of this report.

(3) "<u>Interfacing lift points</u> such as lifting lugs or cask trunions should also meet one of the following for heavy loads handled in the area where the crane is to be upgraded unless the effects of a drop of the particular load have been evaluated and shown to satisfy the evaluation criteria of Section 5.1:

(a) Provide redundancy or duality such that a single lift point failure will not result in uncontrolled lowering of the load; lift points should have a design safety factor with respect to ultimate strength of five (5) times the maximum combined concurrent static and dynamic load after taking the single lift point failure.

<u>OR</u>

(b) A non-redundant or non-dual lift point system should have a design safety factor of ten (10) times the maximum combined concurrent static and dynamic load."

A. Summary of Applicant's Statements

Four load handling systems are identified as single-failure-proof:

Load Handling System	Location	Design Criteria
Polar Crane and Main Hoist	Containment Building	NUREG-0554
Fuel Building Overhead Crane and Main Hoist	Fuel Building	Report EDR-1(P)-A
Safety Related Chiller Hoist (CP 1 and 2 MENHCH-04A	Auxiliary Building	Report EDR-1(P)-A
Auxiliary Filter Hoist (CPX-MENHWR-04A)	Auxiliary Building	Report EDR-1(P)-A

"The Polar Crane was built prior to issuance of NUREG-0554, it is in essential compliance with NUREG-0554. There are some minor differences between the main hoist and the requirements of NUREG-0554. These differences are described in detail in Table A-7 ~~and~~ of Reference 1. The special safety features incorporated into the design of the main hoisting system of the Containment Polar Crane precludes a load drop accident by preventing a load drop in the event of a single failure in the hoisting or braking systems."

"Preconstruction static and dynamic load testing of the polar crane was performed with a 499 ton load. Subsequently the polar was de-rated to 175 tons for operations. A static and dynamic test of 125% of Maximum Critical Load (MCL) was performed." [9]

"Detailed information regarding the design of the Fuel Building Overhead Crane's compliance with single-failure-proof provisions of Regulatory Guide 1.104 "Single-Failure-Proof Overhead Crane Handling System for Nuclear Power Plants" (Draft 3, Revision 1, October 1978), may be found in the generic topical report entitled "Ederer's Nuclear Safety Related X-Sam Cranes" EDR-1 (P)-A and its Non-proprietary version EDR-1(NP)-A. See FSAR Sections 9.1.4.2.3 and 9.1.4.3 for supplemental information." The regulatory positions addressed by the applicant are summarized in applicant's Table C-2.

It is anticipated that special lifting devices will be used on the main hoist of Fuel Building Overhead Crane for lifting the spent fuel cask, and on the main hoist of Polar Crane for lifting the reactor vessel head and reactor internals (Table A-4 [8]).

"Detailed information on the [Polar Crane] lifting fixtures' compliance with ANSI N14.6-1978 and NUREG-0612 is provided in Reference 2. See FSAR Sections 9.1.4.2.3 and 9.1.4.3 for supplemental information." No information on the special lifting device to be used for lifting the spent fuel cask is given.

The requirements for lifting devices that are not specially designed and the interfacing lift points are not addressed.

B. EG&G Evaluation

The Polar Crane was built before the promulgation of NUREG-0554. The applicant can be excused for not performing the pre-construction fracture toughness testing of the materials and postweld heat treatment required by

NUREG-0554. The planned pre-construction static and dynamical load testing of the polar crane, mentioned in Table A-7 [8] was successfully completed [9]. The deviations from the guidelines of NUREG-0554 as listed in Table A-7 do not appear to affect the safe operation of the polar crane to any considerable extent.

All other single-failure proof cranes were designed and fabricated in accordance with the requirements of the report EDR-1(P)-A. As the generic report EDR-1(P)-A takes into account the essential requirements of NUREG-0554, the single-failure-proof load handling systems designed in accordance with the criteria of this report are acceptable.

No evaluation of the interfacing lifting points, the lifting devices that are not special designed and the special lifting fixtures for lifting the spent fuel cask is possible because of the lack of information.

C. EG&G Conclusions and Recommendations

The applicant's information in some areas is not sufficient to be consistent with the intent of this guideline. The following actions are recommended:

1. Provide information for all the lifting devices and interfacing lifting points required to satisfy the criteria of this guideline.

3. CONCLUDING SUMMARY

3.1 Guideline Recommendations

In a number of areas, the applicant's information is not fully consistent with the intent of NUREG-0612. Table 3.1 summarizes the conclusions from this evaluation. Specific recommendations for further effort are provided in the following:

Guidelines		Action
Section 5.1.2	(a)	Provide evaluation of a postulated load drop from the auxiliary hoists of the Fuel Building Overhead Crane for heavy loads, including the unidentified "miscellaneous loads."
Section 5.1.3	(a)	If heavy loads are carried over reactor vessel, provide evaluation for postulated load drops over the reactor vessel head and in the proximities of reactor vessel.
	(b)	Reexamine the nonexempt status of three cranes mentioned in Section 2.3.2B and revise Tables 2.1, if necessary.
Section 5.1.5	(a)	Update Tables 2.1 and 2.2 to ensure that all cranes carrying heavy loads are categorized as nonexempt cranes.
Section 5.1.6	(a)	Evaluate all single-failure-proof lifting devices and interfacing lift points.

TABLE 3.1. COMANCHE PEAK UNITS 1 AND 2 NUREG-0612 OBJECTIVES COMPLIANCE MATRIX

Handling System	Single-Failure-Proof System	Off-site Radioactive Release	Damaged Fuel Criticality	Fuel Cover Water Inventory Loss	Safe Shutdown Equipment Loss
1. Fuel building overhead crane	C	--	--	I	I
2. Containment auxiliary upper cranes	--	--	--	C	I
3. Containment polar cranes	C	--	--	--	--
4. Moderating HX and letdown chiller HX hoist	--	--	--	--	C
5. Component cooling water pump hoist	--	--	--	--	C
6. Safety related chiller hoist (Single-Failure-Proof)	C	--	--	--	I
7. Centrifugal charging pumps hoist	--	--	--	--	I
8. Containment fuel handling bridge crane	--	--	--	--	--
9. Auxiliary feedwater pump hoist (electric motor driven pump)	--	--	--	--	C
10. Auxiliary feedwater pump hoist (turbine driven pump)	--	--	--	--	C
11. Auxiliary filter hoist	--	--	--	--	I
12. Reactor coolant pumps hoist	--	--	--	--	I
13. Diesel generator (piston) hoist	--	--	--	--	C
14. Spent fuel pool HX hoist	--	--	--	--	C
15. Service water traveling screen hoist and jib crane	--	--	--	--	I
16. Residual heat removal HX and Containment Spray System hoist	--	--	--	--	C
17. Main steam safety valves hoist	--	--	--	--	C
18. Service water intake structure crane	--	--	--	--	C
19. Containment dome access rotating platform hoist	--	--	--	--	--
20. Fuel handling bridge crane (Fuel Building)	--	--	--	--	C

TABLE 3.1. (Continued)

Handling System	Single-Failure-Proof System	Off-site Radioactive Release	Damaged Fuel Criticality	Fuel Cover Water Inventory Loss	Safe Shutdown Equipment Loss
21. Refueling machine (Containment Building)	--	--	--	--	--
22. Service water intake stop gate hoist	--	--	--	--	C
23. Auxiliary filter hoist (Single-Failure-Proof)	C	--	--	--	I
24. Miscellaneous hoist	--	--	--	--	C
25. Residual heat removal pump hoist	--	--	--	--	C

C = Applicant active consistent with NUREG-0612 Risk Reduction Objective.

NC = Applicant action not consistent with NUREG-0612 Risk Reduction Objective.

-- = Risk Reduction Objective is not applicable to this handling system.

I = Insufficient Information was provided to determine consistency.

4. REFERENCES

1. EG&G, Control of Heavy Loads, Comanche Peak Units 1 and 2, Phase 1-Draft, February 1984.

2. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, NRC.

3. V. Stello, Jr. (NRC), Letter to all applicants. Subject: Request for Additional Information on Control of Heavy Loads Near Spent Fuel, NRC, 17 May 1978.

4. USNRC, Letter to Texas Utilities Services Inc. Subject: NRC Request for Additional Information on Control of Heavy Loads Near Spent Fuel, NRC, 22 December 1980.

5. H. C. Schmidt, Texas Utilities Services Inc. (TUSI) Letter to S. Burwell (NRC). Subject: "Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612," 7 August 1981.

6. H. C. Schmidt, Texas Utilities Services Inc. (TUSI), Letter to S. Burwell (NRC). Subject: "Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612," 8 October 1981.

7. H. C. Schmidt, Texas Utilities Services Inc. (TUSI), Letter to S. Burwell (NRC). Subject: "Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612," 1 March 1982.

8. H. C. Schmidt, Texas Utilities Services Inc. (TUSI), Letter to B. J. Youngblood (NRC). Subject: "Comanche Peak Steam Electric Station Final Response to NUREG-0612," 8 June 1983.

9. H. C. Schmidt, Texas Utilities Services Inc. (TUSI), Letter to S. Burwell (NRC). Subject: "Comanche Peak Steam Electric Station Containment Polar Crane Testing," 21 November 1983.