February 25, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

APPLICANTS' PROPOSED FINDINGS OF FACT IN THE FORM OF A PARTIAL INITIAL DECISION

In accordance with 10 C.F.R. §2.754, Texas Utilities Generating Company, et al. ("Applicants") hereby submit proposed findings of fact in the form of a partial initial decision on Intervenor's Contentions 5 and 22, Board Question 2 and deletion of the Boron injection tank. Applicants intend to modify or supplement these findings in reply to the proposed findings of the other parties in accordance with the Board's direction in its December 21, 1982 Order.

Respectfully submitted,

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[Applicants' Proposed Findings of Fact on Intervenor's Contentions 5 and 22, Board Question 2 and Deletion of the Boron Injection Tank In The Form of a]

PARTIAL INITIAL DECISION

I. BACKGROUND

A. General

1. This initial decision concerns the application filed with the Nuclear Regulatory Commission ("NRC" or Commission") by Texas Utilities Generating Company, et al. ("Applicants") for facility operating licenses which would authorize the operation of the Comanche Peak Steam Electric Station, Units 1 and 2 ("the facility"). The facility is comprised of two pressurized water nuclear reactors, each designed to operate at a core power level up to 3411 megawatts thermal with a net electrical output of 1159 megawatts. The facility is located in Hood and Somervell Counties, Texas, approximately 50 miles southwest of Fort Worth, Texas. Commercial operation is projected for 1984 for Unit 1 and 1985 for Unit 2.

2. On June 5, 1973, Applicants filed with the Atomic Energy Commission, now the NRC,[1] an application for permits to construct the Comanche Peak facility. Following evidentiary hearings, the Atomic Safety and Licensing Board ("Board") issued a Partial Initial Decision on October 11, 1974, addressing the environmental issues, the question of the suitability of the proposed site, and whether there were any unresolved safety issues relating to the design and below-grade work on the Safe Shutdown Impoundment Dam. The general background of the proceeding to that point is set forth in detail in that Initial Decision, which is incorporated herein by reference. 8 AEC 673 (1974). In accordance with the Partial Initial Decision, the Director of Regulation on October 17, 1974, authorized the Applicants to engage in certain limited work activities at the site of the facility.

3. Following further evidentiary hearings, the Board issued an Initial Decision on December 12, 1974, in which it addressed radiological health and safety considerations. 8 AEC 1047 (1974). In that Initial Decision, the Board authorized the issuance of construction permits for the Comanche Peak facility. Pursuant thereto, Construction Permit Nos. CPPR-126 and CPPR-127 were issued on December 19, 1974.

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1 Pursuant to the Energy Reorganization Act of 1974, 42 U.S.C. §5801 et seq., the Nuclear Regulatory Commission succeeded to the licensing and regulatory functions of the Atomic Energy Commission.

4. On January 26, 1979, the Commission issued a notice of receipt of an application by the Applicants for facility operating licenses for the Comanche Peak facility and of opportunity for intervention and hearing on the operating license application.[2] On June 27, 1979, this Board issued an Order granting the petitions to intervene of Citizens Association for Sound Energy ("CASE"), Texas Association of Community Organizations for Reform Now ("ACORN") and Citizens for Fair Utility Regulation ("CFUR"). In that Order, we admitted a single contention concerning the quality assurance/quality control ("QA/QC") issues raised by all petitioners in their petitions to intervene. On April 30, 1980, a prehearing conference was held to hear the positions of the parties on those proposed contentions yet to be ruled upon by the Board. On June 16, 1980, we issued an Order in which we admitted an additional twenty-four (24) contentions and posed three Board questions. Discovery on all contentions began at that time.

B. Contentions

1. ACORN Contentions

5. Of the 25 contentions admitted on June 16, 1980, 12 (Contentions 10-21) were solely sponsored by ACORN, and three (Contentions 4, 5 and 23) and portions of two other (Contentions 22(f) and 24(a)) were jointly sponsored by ACORN and another Intervenor. On June 16, 1981, Intervenor ACORN filed a motion

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2 44 Fed. Reg. 6995 (February 5, 1979).

for voluntary dismissal from the proceeding. By Order dated July 24, 1981, we dismissed ACORN from the proceeding but retained, pending completion of appropriate Staff review, eight of ACORN's contentions pursuant to our sua sponte authority under 10 C.F.R. §2.760a. The Commission reviewed that Order on its own initiative[3] and subsequently determined that there was insufficient justification for retaining those contentions under 10 C.F.R. §2.760a.[4] Accordingly, on January 12, 1982, this Board issued an Order dismissing ACORN's remaining contentions.

2. CFUR Contentions

6. Of the 25 contentions admitted, seven (Contentions 1-3 and 6-9) were solely sponsored by CFUR and two (Contentions 4 and 5) were jointly sponsored by CFUR and other Intervenors. On July 23, 1981, we granted Applicants' motion and dismisssed CFUR's Contention 8 for failure to comply with the Board's Order compelling discovery. On November 20, 1981, Applicants submitted a Stipulation entered into by Applicants and CFUR regarding Contention 9. That Stipulation provided for the voluntary withdrawal of Contention 9 by CFUR in consideration of certain agreements between the parties. At the prehearing conference on December 1, 1981, the Board accepted the request for dismissal of the contention, and indicated that the Board

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3 Texas Utilities Generating Company, et al. (Comanche Peak Steam Electric Station, Units 1 and 2), CLI-81-24, 14 NRC 614 (1981).

4 Texas Utilities Generating Co., et al. (Comanche Peak Steam Electric Station, Units 1 and 2), CLI-81-36, 14 NRC 1111 (1981).

would not involve itself in agreements between the parties. Tr. at 21, 24; Order Subsequent to Prehearing Conference of December 1, 1981, at 2.

7. On January 19, 1982, CFUR filed a motion with the Board requesting the withdrawal for all purposes of its Contentions 4 and 6. Also, on January 19, 1982, CFUR and Applicants filed a joint motion to dismiss Contention 1 from the proceeding following negotiation of an agreement between those parties. By Order dated January 25, 1982, the Board granted those motions and dismissed Contentions 1, 4 and 6 from the proceeding.

8. On January 26, 1982, Applicants filed a motion for summary disposition of CFUR Contentions 2 and 7. The Staff supported the Applicants' motion. CFUR filed no answer to it. On February 23, 1982, CFUR filed a motion for voluntary withdrawal of its remaining contentions (Contentions 2, 3 and 7) but urged the Board to adopt those contentions for resolution during this proceeding. On March 5, 1982, the Board granted the motion for summary disposition with respect to Contentions 2 and 7, and declined to adopt those contentions as Board issues. By Order dated April 2, 1982, the Board also declined to adopt Contention 3 and dismissed it. Nonetheless, we requested that the NRC Staff (and the Applicants if they desired) file pertinent information with the Board with respect to the deletion of the Boron Injection Tank ("BIT") at the Comanche Peak facility. This matter was raised by CFUR in its February 23, 1982 motion for

voluntary withdrawal, and was retained by the Board as a matter of interest but not as a sua sponte issue under 10 C.F.R. §2.760a.

3. CASE Contentions

9. On July 24, 1981, in its Memorandum and Order regarding ACORN's motion for voluntary dismissal, the Board designated CASE as lead party on Contention 23 (which as originally admitted combined proposed contentions of both ACORN and CASE) and requested that CASE indicate whether it would take the lead party role on that contention in light of ACORN's withdrawal. On August 10, 1981, CASE informed the Board that it would not assume that role. Accordingly, we dismissed Contention 23 by our Order of August 21, 1981.

10. On October 17, 1981, CASE filed a motion requesting that Contention 24 be deferred from consideration at the evidentiary hearings scheduled for December of that year, or in the alternative, that it be permitted to voluntarily withdraw the contention. The Board declined to defer consideration of Contention 24 on the grounds offered by CASE, and granted CASE's motion to withdraw the contention. Memorandum and Order, October 23, 1981, at p. 6.

11. On December 1-3, 1981, the Board conducted hearings on CASE Contention 25, concerning the Applicants' financial qualifications to operate the facility. Applicants introduced both documentary evidence and testimony under oath which demonstrated that they are well-qualified financially to operate

Comanche Peak (Applicants' Exhibits 1-7; Tr. 384-502). However, on March 31, 1982 the Commission published a final rule eliminating the reviews of financial qualifications of electric utilities in licensing hearings for nuclear power plants. The rule was immediately effective upon publication in the Federal Register (47 Fed. Reg. 13750). It amended 10 C.F.R. §50.33(f) to provide that

> No information on financial qualifications...is required in any application, nor shall any financial review be conducted, if the applicant is an electric utility applicant for a license to... operate a production or utilization facility.... [NEW 10 C.F.R. §50.33(f)(1)].

Each of the Applicants for the Comanche Peak facility is an electric utility. Accordingly, in our Order of April 2, 1982, we directed that no further consideration be given to such issues in this proceeding.

12. As a result of the foregoing proceedings, the only contentions which remained to be litigated were Contention 5 (QA/QC) and Contention 22 (emergency planning), and the remaining parties were the Applicants, NRC Staff, and intervenor CASE. Contention 5 was the subject of the hearings on June 7-11, July 26-30 and September 13-16, 1982. Contention 22 was litigated on September 16-17, 1982. This Initial Decision addresses those issues raised in conjunction with Contentions 5 and 22, Board Question 2 (see Part I.C, infra) and the deletion of the Boron Injection Tank.

C. Board Questions

13. In its June 16, 1980 Order, the Board adopted three "Board questions" which the Applicants and Staff were required to address during the evidentiary hearings. These questions were, as follows:

> Board Question No. 1
>
> Describe in detail the planned method for handling any hydrogen gas in the CPSES containment structure.
>
> Board Question No. 2
>
> Applicant and Staff should describe in detail the operating quality assurance program for CPSES. A description of the provisions for conduct of QA audits should be provided, including a description of how reactor operations and reactor operator training will be audited.
>
> Board Question No. 3
>
> Describe the status of resolution of Safety Issue TAP A-9 (ATWS) as it relates to CPSES 1 and 2.

14. In its April 2, 1982 Order, the Board indicated that while summary disposition is not appropriate for Board questions, the Applicants or the Staff could file written information with the Board responding to these questions. The Board indicated that it would evaluate any such information to determine whether it would be necessary to take evidence on Board Questions 1 and 3 at evidentiary hearings. (Evidence on Board Question No. 2 was presented at the December, 1981 hearings, as discussed below.)

15. On April 19, 1982, Applicants submitted detailed information regarding Board Question 1 in the form of an affidavit of Fred W. Madden, Jr. (Board Exhibit 1). Further, the Atomic Safety Licensing and Appeal Board issued a decision in October, 1981, in which it discussed the Commission's generic considerations of hydrogen control. Sacramento Municipal Utility District (Rancho Seco Nuclear Generating Station), ALAB-655, 14 NRC 799 (1981). The Appeal Board noted in Rancho Seco, as follows:

> The Commission now has under consideration the consequences of the generation of large amounts of hydrogen within the containment following a TMI-2 event. In this circumstance we rely on our prior holding that "licensing boards should not accept in individual license proceedings contentions which are (or about to become) the subject of general rulemaking by the Commission." Potomac Electric Power Co. (Douglas Point Station, Units 1 and 2), ALAB-218, 8 AEC 85 (1974). We thus leave the matter of hydrogen control at Rancho Seco to the Commission's consideration in the ongoing rulemaking and refrain from any explicit comment or judgement on this portion of the [licensing] Board's decision. [Footnote omitted. 14 NRC at 816-7.]

On May 7, 1982, the NRC Staff submitted its response to Applicants' answer to Board Question 1. The Staff's response included affidavits of David Shum and Robert L. Palla (Board Exhibit 1). In both the Applicants' and Staff's responses to Board Question 1 it was noted that the Comanche Peak facility utilizes a large dry containment. The Commission has stated that PWR's with large dry containments are likely not to be required to install new hydrogen control systems. 46 Fed. Reg. at 62283.

Based on its analysis, the Staff stated that licensing and interim operation of facilities with large dry containments pending the outcome of the Commission's rulemaking will not jeopardize the health and safety of the public. Affidavit of Palla, Answers 12 and 14-16.

16. On May 7, 1982, the NRC Staff submitted its answer to Board Question 3. With its answer the Staff submitted the affidavits of Messrs. David W. Pyatt, James W. Clifford, and Marvin W. Hogges (Board Exhibit 3). In addition, the Staff noted that the Commission has given generic approval for nuclear power plant operation pending implementation of a final rule on Anticipated Transients Without Scram ("ATWS"). The Commission has concluded that there is reasonable assurance that nuclear power reactors may continue to operate safely pending final implementation of the Commission's ATWS rule. 46 Fed. Reg. 57521 (November 24, 1981).

17. Based upon our assessment of the information provided by the Applicants and the Staff, we determined that it was unnecessary to receive further information on the matters presented in Board Questions 1 and 3. Accordingly, prior to the June, 1982 hearing session, we informed the Applicants and Staff that it would be unnecessary to present witnesses or file testimony with respect to Board Questions 1 and 3. The Board concluded then, and reaffirms now, that the information presented by Applicants and the NRC Staff regarding Board Questions 1 and 3 is sufficient for the purposes for which the Board had raised

those questions. Tr. 693, 730-31. Accordingly, we did not request that proposed findings of fact be submitted with respect to Board Questions 1 and 3.

18. Both Applicants and the NRC Staff presented testimony regarding Board Question 2 on December 2-3, 1981. Applicants' five witnesses were the principal management and supervisory personnel responsible for the operational quality assurance program for Comanche Peak. The NRC Staff witness was a Senior Quality Assurance Engineer (Nuclear) with extensive experience in the review of QA programs for nuclear power reactors. In addition to a detailed description of the operational QA program for Comanche Peak, the witnesses presented testimony regarding the conduct of QA audits, including audits of reactor operations and reactor operator training. Based on the testimony and information adduced through Board questioning, we have satisfied ourselves that Applicants' operational QA program will satisfy applicable NRC requirements. Our findings of fact regarding Board Question 2 are presented in Section II.C, infra.

D. Boron Injection Tank

19. By our Order of April 2, 1982, we requested in light of information presented in CFUR's February 23, 1982 motion for voluntary withdrawal that the NRC Staff and the Applicants, if they so desired, present pertinent information regarding deletion of the BIT for Comanche Peak. In that Order, we indicated that we were seeking a description of the system which is to be deleted, the purpose of the system, its status with regard to the

Comanche Peak facility, the basis for its deletion, and the means by which its functions will be performed if there is not to be a BIT. The NRC Staff submitted on May 7, 1982 a response to our request for information concerning the BIT. With its response the Staff presented the affidavit of Mr. Sammy Diab. At the hearing on June 7, 1982 the Applicants presented two witnesses on this subject, Mr. Fred W. Madden, Jr. and Ms. Nelita P. Osborne, and the Staff presented Mr. Diab as a witness. (Tr. 734-83.) Although this matter is raised neither as a sua sponte issue nor as a Board Question, we requested that the parties submit proposed findings of fact on the subject.

E. Additional Issues

20. On June 3, 1982, CASE filed with the Appeal Board a motion to stay our telegraphic Order dated May 25, 1982, denying a CASE motion to reschedule the June 7, 1982 commencement of hearings on Contention 5. That motion was denied by the Appeal Board on June 4, 1982. Attached to CASE's motion was a newspaper article which discussed shrinkage cracks in a concrete pour within the Comanche Peak Unit 1 containment in a portion of the reactor vessel support structure. The article indicated that certain descriptions of the cracks placed them in the basemat for the reactor foundation. In addition, CASE had raised in its response to Applicants' motion for summmary disposition an allegation that the excavation for the project (which resulted in overbreak of certain rock surrounding the foundation) was connected to the cracks in the basemat (CASE's Answer to

Applicants' Motion for Summary Disposition at pp. 28-37). Although it normally does not permit the litigation of issues based upon allegations contained in newspaper articles, the Board felt that sufficient information had been presented to warrant consideration of this matter (Tr. 694-95). Recognizing that the matter of rock overbreak had been summarily disposed of by the Board (Contention 7), that the matter was not strictly within the scope of Contention 5, and was not a sua sponte issue or a formal Board Question, the Board nonetheless took the extraordinary step of taking evidence on the subject (Tr. 784-89). Accordingly, both the Applicants and the Staff presented testimony on the matter, and we requested that proposed findings be submitted.

II. FINDINGS OF FACT - CONTESTED ISSUES

A. Contention 5

1. History and Scope of Contention

21. On June 27, 1979, the Board issued an Order Relative to Standing of Petitioners to Intervene, 9 NRC 728, in which it admitted a contention pursuant to 10 C.F.R. §2.714(b) which was determined to encompass all "the various quality assurance/quality control contentions" of the petitioners CASE, CFUR and ACORN. The contention as admitted provided, as follows:

> The Applicants have failed to establish a program which adheres to the criteria in 10 C.F.R. 50, Appendix B. [9 NRC at 733.]

22. Following issuance of that Order, the parties entered into negotiations in an attempt to reach a stipulation as to, inter alia, the language of the admitted QA/QC contention. However, no agreement was reached between all the parties.

23. At the prehearing conference of April 30, 1980, the parties presented their positions on the wording of the QA/QC contention. The intervenors sought to maintain the wording of the contention in a broad manner in order to permit examination of "the overall QA/QC program of the Applicants" (ACORN, Tr. 233). The intervenors (including CASE) sought, therefore, to retain the wording of the contention as originally stated by the Board, viz., as a general QA/QC contention (CFUR, Tr. 205, 207; CASE, Tr. 522). The position of the Applicants and the NRC Staff was that, as worded by the Board, the contention was too broad, and that further specification was needed to establish the bounds of the issues to be litigated (Applicants, Tr. 205-206, 236; Staff, Tr. 206-207). The Staff and Applicants submitted proposed language for the contention which itemized certain construction practices, within the bounds of which the contention would be litigated (Applicants, Tr. 208; Staff, see Tr. 210). In view of the divergent positions on this matter, the Board afforded the parties an opportunity following the prehearing conference to file memoranda setting forth their positions.

24. On May 12, 1980, the parties filed their pleadings on the wording of the QA/QC contention. In CASE's "Motion In Support of Retaining Present Wording of Quality Assurance/Quality Control Contention," it stated that it believed that the

> wording of the contention regarding the quality assurance/quality control at CPSES must be broad enough to encompass the concerns of CASE which include not just the nuts and bolts type of problem, but the design, testing, managerial and administrative controls to be used to assure safe operation, and others -- in short, all aspects of the quality assurance/quality control of the plant as set forth in 10 C.F.R. 50, Appendix B. [CASE Motion at 2 (emphasis added).]

CASE's position was that 10 C.F.R. Part 50, Appendix B, addressed other matters besides construction practices and it believed that the contention should be broadly worded to include such matters. CASE Motion at 5-6. CASE proposed language for the contention which was similar to the broad language originally adopted by the Board. CASE Motion at 9.

25. ACORN took a position similar to that taken by CASE in stating that the specific items which the Applicants and Staff wished to include in the text of the contention "are merely symptoms of the overall failure of the QA/QC program." ACORN's May 12, 1980 Statement of Position With Regard to Wording of QA/QC Contention, at 2. ACORN also proposed general language for the contention. ACORN Statement at 1.

26. In its Statement of Position on the contention, CFUR stated that Applicants' proposed wording would limit the contention to particular areas of QA/QC, and urged retention of

the Board's wording of the contention (CFUR Position at 1). In support of its position, CFUR cited the criteria listed in 10 C.F.R. Part 50, Appendix B, as being areas which must be included within the scope of the contention (CFUR Position at 2-3).

27. Upon evaluation of the arguments presented at the prehearing conference and the pleadings of the parties setting forth their positions on the wording of the QA/QC contention, the Board adopted in its June 16, 1980 Order Subsequent to the Prehearing Conference of April 30, 1980 language proposed by the NRC Staff, and noted its belief that such language is "sufficiently broad to encompass the subject matter of each Intervenor's QA/QC contention" (Order at 4). The wording adopted by the Board specifies particular areas in which instances of alleged failures in the Applicants' QA/QC program have occurred. In adopting that language, the Board specified a QA/QC contention in which particular areas of construction might be examined to determine whether Applicants' QA/QC program functioned properly so as to assure that appropriate procedures in those areas were followed, deviations were identified and approved corrective action implemented and verified by the QA/QC program.

28. As admitted Contention 5 provided, as follows:

> The Applicants' failure to adhere to the quality assurance/quality control provisions required by the construction permits for Comanche Peak, Units 1 and 2, and the requirements of Appendix B of 10 CFR Part 50, and the construction practices employed, specifically in regard to concrete work, mortar blocks, steel, fracture toughness testing, expansion joints, placement of the reactor vessel for Unit 2, welding,

> inspection and testing, materials used, craft labor qualifications and working conditions (as they may affect QA/QC), and training and organization of QA/QC personnel, have raised substantial questions as to the adequacy of the construction of the facility. As a result, the Commission cannot make the findings required by 10 CFR §50.57(a) necessary for issuance of an operating license for Comanche Peak.

29. The Applicants submitted a "Brief" regarding the scope of the hearing on Contention 5, on June 6, 1982. Applicants urged the Board to determine prior to the taking of evidence on Contention 5, that the contention concerned the adequacy of Applicants' QA/QC program to identify construction deficiencies, to assure that appropriate procedures are followed, deviations identified, evaluations performed and corrective action implemented in accordance with 10 C.F.R. Part 50, Appendix B. Applicants urged the Board to conclude that the contention did not raise as an issue the technical adequacy of engineering and construction for Comanche Peak, there being no basis presented by the intervenors to support such a broad contention.

30. Prior to the commencement of the evidentiary phase of the hearing the Board ruled that in pursuit of its responsibilities as Administrative Judges and in consideration of the public interest, we would interpret the contention in a broader scope than advocated by Applicants (Tr. 714). We did not, however, preclude objections to testimony on the grounds of relevancy (Tr. 714).

2. Witnesses

31. Applicants presented a panel of witnesses to respond to the questions initially posed by CASE concerning the Applicants' QA/QC program.[5] The panel consisted of Messrs. David N. Chapman, Ronald G. Tolson, Antonio Vega, Raymond J. Vurpillat, and Roger F. Reedy, Ms. Susan L. Spencer, and Ms. Lisa M. Bielfeldt. Prefiled testimony was submitted by each member of this panel except for Mr. Tolson and Ms. Bielfeldt. Mr. Chapman presented prefiled testimony concerning the Applicants' QA/QC organization for Comanche Peak (Applicants' Exhibit 42). Mr. Chapman is the Manager, Quality Assurance for Texas Utilities Generating Company ("TUGCO") and is a Registered Professional Engineer (Applicants' Exhibit 9, Attachment). He has held that position since 1976. Mr. Vega presented testimony regarding the manner in which Applicants' QA program for Comanche Peak satisfies each of the criteria of 10 C.F.R. Part 50, Appendix B (Applicants' Exhibit 43). Mr. Vega is the Supervisor, Quality Assurance Services for TUGCO. Mr. Vega has been associated with the Quality Assurance program at Comanche Peak since 1973 and is also a Registered Professional Engineer (Applicants' Exhibit 12, Attachment). Mr.

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[5] Prior to the hearing, CASE had identified few specific issues which it intended to pursue. CASE had generally claimed that it sought to litigate matters raised in NRC Inspection & Enforcement Reports, as well as matters concerning the ASME Certificates of Authorization for Brown & Root. Such an approach to identification of issues to be litigated in administrative proceedings falls far short of what is required and reasonably expected, particularly where the party has had nearly two years to prepare for the hearing. The Board nonetheless permitted CASE to pursue at the hearing virtually any issue it wished, subject to the provision that it be able at least to state the general relevancy of its line of questioning to the contention.

Tolson is the TUGCO Site Quality Assurance Supervisor. He has held this position since 1977 and has worked on the Comanche Peak project since 1974. He also is a Registered Professional Engineer. (Applicants' Exhibit 20.) Ms. Spencer presented testimony concerning the status of resolution of each of the matters raised in NRC Inspection & Enforcement ("I&E"), Reports cited by CASE in support of its position on Contention 5 (Applicants' Exhibit 44). Ms. Spencer is a Quality Assurance Auditor for TUGCO, a position she has held since 1979 (Applicants' Exhibit 39). Mr. Vurpillat presented prefiled testimony concerning the response of Brown & Root, Inc. to the findings of the American Society of Mechanical Engineers ("ASME") regarding the N-Stamps held by Brown & Root (Applicants' Exhibit 45). Mr. Vurpillat has been the Power Group Quality Assurance Manager for Brown & Root, Inc. since 1980 and is a Registered Professional Engineer (Applicants' Exhibit 40). Mr. Reedy presented prefiled testimony concerning the adequacy of the Brown & Root response to the findings of the ASME survey team with respect to Brown & Root's N-Stamps for Comanche Peak (Applicants' Exhibit 46). Mr. Reedy is a consultant with the firm Reedy, Herbert, Gibbons & Associates, in the area of QA programs for nuclear power stations and in particular the requirements of the ASME Code. Mr. Reedy, also a Registered Professional Engineer, serves on several ASME Committees, has extensive experience in ASME Code matters, and is deemed by the Board to be an expert on such matters (Applicants' Exhibit 41). Ms. Bielfeldt presented

testimony on Applicants' reinspection program concerning the installation of Hilti Bolts. She is a degreed engineer. (Applicants' Exhibit 52.)

32. The NRC Staff presented testimony of Messrs. William A. Crossman, Robert C. Stewart and Robert G. Taylor concerning the construction of the Comanche Peak facility and the NRC Staff's role in the review of construction activities (NRC Exhibit 13). Mr. Crossman was responsible for supervision of reactor project inspectors for facilities in NRC Region IV, including Comanche Peak, until March 7, 1982. He previously held the same supervisory position with respect to other facilities (NRC Exhibit 13 at 1-2). Mr. Crossman has over thirty years' experience in the nuclear field, including fifteen years' experience with the AEC, now NRC, in the inspection of nuclear reactor construction, test and startup, and operation (NRC Exhibit 6). Mr. Stewart was the principal NRC inspector for Comanche Peak from June 1974 to January 1978 (NRC Exhibit 13 at 16). Mr. Stewart also has over thirty years' nuclear-related experience (NRC Exhibit 7). Mr. Taylor has been the Resident Reactor Inspector for Comanche Peak since 1978 (NRC Exhibit 13 at 17). Mr. Taylor is a Registered Professional Engineer, specializing in quality control engineering, with extensive experience in the nuclear field (NRC Exhibit 9). The testimony of these witnesses concerned the role of the NRC during construction, including the review of the Applicants' QA/QC

program, and the results of inspections regarding the particular subjects (e.g., concrete work, mortar blocks, etc.) listed in Contention 5.

3. Quality Assurance Organization

33. With respect to Applicants' QA organization for the Comanche Peak project, CASE primarily focussed on the organizational changes which were implemented in January 1978 by TUGCO (Tr. 1807-27, 1852-62). CASE asserted that the assumption of more direct involvement in the QA organization by TUGCO, replacing Brown & Root, was caused by failures in the performance of the Brown & Root QA organization for Comanche Peak (see Tr. 1861).

34. Applicants maintained ultimate responsibility for the QA/QC program from the commencement of the project (Applicants' Exhibit 42 at 2; NRC Exhibit 13 at 3). In the early stages of the project Brown & Root had direct management authority over construction QA/QC Program for Comanche Peak with TUGCO QA overview (Id. at 3; Tr. 1807). As the project progressed and became more complex, TUGCO determined that a more aggressive program specifically tailored to Comanche Peak with even more direct TUGCO involvement was essential to meet TUGCO's QA/QC goals for the project (Applicants' Exhibit 42 at 3). Accordingly, in January 1978, TUGCO assumed direct functional management of Brown & Root construction QA activities except for those under the ASME Boiler and Pressure Vessel Code (Tr. 1807; NRC Exhibit 13 at 13). TUGCO maintains audit and surveillance

functions as well as ultimate responsibility for those ASME activities. This organizational change resulted in the direct involvement of TUGCO in the day-to-day QA management decisions. This change did not result in significant changes of personnel but did result in TUGCO's becoming more directly involved in the management of QA activities (Tr. 1807-09, 1936-37).

35. In addition to TUGCO and Brown & Root, Gibbs & Hill, as Architect-Engineer, and Westinghouse Electric Corporation ("Westinghouse"), as nuclear steam supply system ("NSSS") supplier, have provided QA programs for principal activities within the scope of their responsibilities. (Applicants' Exhibit 42 at 4). Gibbs & Hill has provided Applicants with certain engineering, design, and procurement services as requested, and has provided the QA program for activities within its scope of work. Westinghouse provides the QA program governing work done on the NSSS structures, systems and components. As noted above, Brown & Root has managed the QA program for ASME Code work and has performed other QA functions as requested by the TUGCO Quality Assurance Manager. (Applicants' Exhibit 42 at 4-5.) TUGCO retains audit responsibility as well as ultimate responsibility for these activities (Applicants' Exhibit 43 at 2-3). An organization chart for the project QA organization is presented as Applicants' Exhibit 42A.

36. CASE submitted several exhibits concerning Brown & Root's performance prior to the QA organizational change in January 1978 (CASE Exhibit 173-187; Tr. 1860-62). These exhibits illustrate particular instances where the Applicants, in their exercise of ultimate responsibility for the quality of construction, had identified aspects of the Brown & Root QA organization that could be improved and effected such improvement. This evidence does not indicate any instances of failures or breakdowns in the QA Program prior to January 1978 that would give rise to any reasonable concern regarding the adequacy of construction of the project (NRC Exhibit 13 at 15). Applicants properly addressed each matter important to the assurance of safe construction of the facility (Id., at 12). For example, in July, 1977, TUGCO initiated action requiring TUGCO involvement in all Brown & Root vendor release inspections (Applicants' Exhibit 42 at 3; CASE Exhibit 178). Thus, when TUGCO determined that prompt action in the area of vendor release inspections was necessary, the matter was addressed and TUGCO took appropriate corrective measures. This responsiveness by the TUGCO QA Program to the need for change reflects a strong and dynamic program rather than a weak program, as CASE asserts.

37. Prior to January 1978, the construction QA Program and documents implementing that program had been established for the most part by Brown & Root in Houston and were controlled from Houston (Tr. 1814). Because of this situation, the logistics of administering the QA Program, e.g., making timely changes to

procedures, were difficult to implement. The reorganization solved that problem by integrating the organization and placing the control over such matters at the facility site. This change resulted in a program that was tailored specifically for, and responsive to, the needs of the project (Tr. 1813-14).

38. CASE questioned Applicants' witnesses regarding various personnel in the QA Program from the beginning of the project (Tr. 1815-1826). The purpose of CASE's line of questioning on this matter concerned the "importance of the people to the QA function" (Tr. 1819). CASE apparently intended through this process to identify QA personnel who had not performed satisfactorily. Applicants' witnesses testified that changes in personnel were not made because of the failure of anyone to fulfill his responsibilities in implementing the QA Program (Tr. 1815-26). CASE wholly failed to establish that any of the people identified, either the previous or present holders of the various positions, did not perform satisfactorily.

39. We find that there is substantial evidence demonstrating that Applicants, from the commencement of the project, have maintained a QA organization that satisfies the requirements of 10 C.F.R. Part 50, Appendix B. The restructuring of the QA organization by Applicants in 1978 is a positive sign, indictive of an organization which, on its own initiative, took action to assure that an effective QA organization was in place and functioning (See Tr. 1713). Further, there is no persuasive evidence demonstrating that Brown & Root's performance of its

managerial responsibilities for the QA organization prior to January 1978 failed to satisfy the requirements of 10 C.F.R. Part 50, Appendix B (Tr. 1934-36).

4. Satisfaction of 10 C.F.R. Part 50 Appendix B Criteria

40. Applicants submitted the testimony of Mr. Antonio Vega addressing the satisfaction of 10 C.F.R. Part 50, Appendix B criteria by the QA/QC Program (Applicants' Exhibit 43). That testimony set forth for each of the criteria in 10 C.F.R. Part 50, Appendix B, the measures which have been taken by the Applicants to establish an effective QA/QC Program for the Comanche Peak facility. Attached to Mr. Vega's testimony as Attachment 1 (Applicants' Exhibit 43A) was the Comanche Peak Steam Electric Station Quality Assurance Plan. This Plan establishes the quality assurance system to be used by TUGCO in performing design, engineering, procurement, fabrication, and construction activities in accordance with the requirements of the Code of Federal Regulations, and the ASME Boiler and Pressure Vessel Code and other applicable industry codes and standards. Also attached to Mr. Vega's testimony was a matrix which delineated the correlation between 10 C.F.R. Part 50, Appendix B criteria and the sections of the Quality Assurance Plan (Applicants' Exhibit 43B).

41. CASE submitted into evidence voluminous and cumulative records obtained during discovery, including various audits, surveillances and activity summaries of the Applicants. CASE's

stated purpose in submitting these documents was to show a history of identified deficiencies and a failure to remedy those deficiencies (Tr. 1571, 1578). We address each group of documents seriatim, below.

a. TIN Audits

42. CASE introduced six audits performed by Applicants from September 1973 through November 1976 (CASE Exhibits 40-45). These audits, designated by the abbreviation TIN(the first audit was referred to simply as TI-1) are audits of internal administrative activities (Tr. 1617). They do not represent the total audit activities at the plant during this time period (Tr. 1617). Audits TI-1 through TIN-3 (November 1974) were conducted prior to the issuance of construction permits on December 19, 1974. Applicants objected to the admission of these three audits on the grounds that they were irrelevant to issuance of the operating license. However, we overruled that objection because they were introduced solely for the purpose of establishing a pattern or course of conduct which intervenors contended began on or about the time the first audits were prepared.

43. In response to a Board request that CASE identify with more particularlity the nature of the patterns which it intended to establish, CASE stated that although it was unable to specify those "patterns" with which they were concerned, one area of possible concern involved the quality assurance records (Tr. 1578).

44. Each of the audits presented in this package contained responses to the findings, evaluations of those responses and a review of the status of the findings of previous audits in the sequence. From the beginning, Applicants sought to assure complete and responsive answers to the audit findings. With the very first audit, TI-1, conducted August 30 and September 5-6, 1973, the President of Texas Utilities Services, Inc. transmitted a letter to the audited group following their initial response to the audits in which it was stated that the response was not sufficiently specific in resolving deficiencies or in describing corrective measures. The letter stated that the responses must be proper in that the results of the audit should establish "an acceptable pattern for the many such audits that are ahead of us" (CASE Exhibit 45C). This aggressive attitude of Applicants' management was brought to bear repeatedly as project construction proceeded, as the evidence of record demonstrates.

45. With respect to findings in this group of audits concerning quality assurance records, the various findings in this general area were made in all but one of the subject audits. (Audit TIN-2 (CASE Exhibit 40) concerned personnel training.) Various findings were made in these audits concerning the QA filing system, document control system, procedure updating, and control of drawings. The findings of these audits, and responses thereto, indicate a thorough QA audit program which identified concerns and required a proper response to each audit finding in order to prevent recurrence of such matters (See NRC Staff

Exhibit 13 at 4-5). Contrary to the assertions of CASE (Tr. 1571), the weight of the evidence indicates that corrective measures were, in fact, being properly implemented in response to audit findings (See CASE Exhibit 43 at 2-3, Attachment 1 at 1). To the extent the same general inspection areas (e.g., document control) may have been the subject of findings in more than one audit, we find that those involved various aspects of the same general area and do not represent a pattern of problems which would or could jeopardize the safe construction and operation of the facility. We find no persuasive evidence that Applicants' QA program identified areas of repeated deficiencies that were not corrected in an appropriate manner.

b. NCR Summaries and Trending

46. CASE introduced documents (CASE Exhibits 46-50) prepared by the Applicants which set forth summaries of Non-Conformance Report ("NCR") issuances and Nonconformance Trend Reviews. Applicants submitted a summary of the trend categories (Applicants' Exhibit 51) which were utilized in those trend summaries.

47. Again, CASE sought to demonstrate with these documents a failure of the Applicants to identify and correct recurring difficulties or deficiencies in construction and in their QA Program. Specifically, CASE cited 10 C.F.R. Part 50, Appendix B, Criterion XVI wherein it states that "in the case of significant

conditions adverse to quality, the corrective measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition" (Tr. 1661).

48. CASE sought to demonstrate, by using responses provided by Applicants on discovery, that these NCR trending documents were used to preclude repetition of significant conditions adverse to quality as required by Criterion XVI of Appendix B. However, the responses to which CASE referred (Applicants' Response to Interrogatory 99 of CASE's 9th Set of Interrogatories and Applicants' Response to Interrogatory 21 of CASE's Eleventh Set of Interrogatories), dealt with other types of documents (deficiency reports) or did not relate to identification of significant conditions adverse to quality. (Tr. 1669-1680.)

49. Applicants' witnesses stated that it was not the purpose of the trend categories employed in the NCR summaries to identify significant conditions adverse to quality in order that corrective action could be taken to preclude repetition. Their purpose was simply to serve as a method to communicate to personnel responsible for cost and schedule where areas existed in which improvement could be made in complying with project specifications. The witnesses stated that the primary system designed to identify significant conditions adverse to quality in order that corrective action could be taken to preclude repetition is the NCR System itself, not these trending documents. (Tr. 1664-67.) CASE introduced no evidence to the

contrary. Accordingly, the Board concludes that the documents submitted as CASE Exhibits 46-50 were not intended for the purposes which CASE presumes and do not support CASE's position.

50. Neither are the trending documents able to be used for the purposes intended by CASE. The charts of NCR activity included in CASE Exhibits 46-50 do not take into account such matters as simultaneous increases in construction activity (Tr. 1637), inclusion of a wide range of different matters within the same general trend category (Tr. 1659), or even whether the material which was the subject of an NCR was installed or not (Tr. 1641). The Board finds that CASE Exhibits 46-50 do not indicate that there were significant conditions adverse to quality regarding which Applicants failed to identify and take appropriate corrective action.

c. Hilti Bolt Backfit Program

51. CASE interrogated Applicants' witnesses regarding a Hilti Bolt Backfit Program which is mentioned in CASE Exhibit 49. That program was initiated in response to a report by construction personnel of unauthorized fabrication of Hilti bolts. This unauthorized fabrication consisted of modification (alteration of the collar on the back of the bolt) of Hilti bolts prior to installation. (Tr. 1696, 1747.) Hilti bolts in some instances were installed in safety-related structures, and thus their function could be safety-related (Tr. 1693). CASE's

position was that since a potentially deficient condition was not discovered by QA personnel there was a breakdown in the QA program (Tr. 1698).

52. The primary issue presented by CASE is whether the initial identification of a particular deficiency by construction personnel, rather than QA personnel, constituted a failure of the QA program. The Board conducted a detailed examination of this matter on its own and found the testimony of the NRC Resident Reactor Inspector for Comanche Peak, Mr. Robert Taylor, and Applicants' witness Roger F. Reedy, to be dispositive. Mr. Taylor and Mr. Reedy are highly experienced in the area of QA/QC matters (NRC Exhibit 9; Applicants' Exhibit 41), and the Board considers them to be experts in that field.

53. Mr. Taylor explained that the QA program is divided into two primary aspects. These aspects are the two QA functions described in Criterion I of 10 C.F.R. Part 50, Appendix B. These functions involve (1) establishing an appropriate QA program and effectively executing that program, and (2) verification (such as through audits and inspections) that activities affecting safety-related functions have been correctly performed. The QA program itself (the first function) is an all-encompassing program which pervades the project. The second function is an independent function apart from the other aspects of the project. (Tr. 1717-19.) Mr. Taylor and Mr. Reedy testified that the quality assurance program would not be considered to have failed

simply if a particular deficiency in construction activities was identified initially by construction personnel rather than QA personnel (Tr. 1698-1701, 1720-24).

54. For purposes of determining whether the QA program was effective, the Board finds that it is not appropriate to segregate the audit and inspection function of the program from those other functions which are intended to assure the implementation of appropriate procedures and instructions in all phases of the project. To permit such segregation would inappropriately place total responsibility on the audit and inspection functions for assuring that quality work was performed at the facility. The Board finds that the identification of a particular deficiency by construction personnel demonstrates a properly functioning QA program.

55. Applicants' witnesses testified as to the measures taken in response to the unauthorized modification of Hilti bolts. These measures included the reinspection of a very substantial number of Hilti bolts that had already been installed (Tr. 1739). Applicants also submitted a report to the NRC with regard to the Hilti bolt reinspection program (Applicants' Exhibit 53). This report was prepared pursuant to 10 C.F.R. §50.55(e) following the identification by the Applicants of the unauthorized modification of Hilti bolts (Tr. 1747).

56. In view of the record presented on this matter, the Board finds that the Applicants' reinspection program provides a high level of assurance that no safety concerns are presented by these allegations regarding the installation of Hilti bolts at the facility.

d. Brown & Root Audits

57. CASE also introduced numerous audits which had been obtained in the discovery process. CASE Exhibits 53-70 are audits conducted by Brown & Root between December 16, 1974 and March 16-18, 1982. CASE did not specify the reasons for introducing these audits nor whether there were particular areas dealt with in the audits that it wished to pursue.

58. CASE Exhibits 53 through 70 are audit reports and other documents dealing with the audits that were performed by Brown & Root with respect to its functions at Comanche Peak. The purpose of the audits was to assess the status and effectiveness of the implementation of the programs and functions being audited as identified in each audit. In conducting these audits, the auditors reviewed the records, examined ongoing work and interviewed personnel in the areas being audited. Each audit report contained a review of corrective actions taken in response to previous audit findings to assure that all measures needed to close out those items had been taken. Also, with each audit in these Exhibits was a status report prepared in response to a

directive by Applicants' witness Mr. Raymond J. Vurpillat that the audit files be reviewed to assure that documentation of findings and resolutions was present. (Tr. 1779-81.)

59. The Board has reviewed these audits and responses and finds that where the audits identified areas in which action was required to improve the audited functions and activities, appropriate action was taken. We find no evidence in these audits of a failure of the Quality Assurance program either to identify deficiencies or to require appropriate corrective action. On the contrary, these audits demonstrate a QA program which has actively pursued and investigated all quality-related activities, identified deficiencies and concerns as they are discovered, and assured that appropriate corrective measures were taken. Accordingly, the Board finds that CASE Exhibits 53-70 demonstrate the existence of an effective QA organization.

e. Monthly QA/QC Reports

60. CASE Exhibits 71-105 are of numerous "monthly QA/QC reports" for the Comanche Peak project. These reports were monthly activity reports prepared by Brown & Root. The reports contain various summary documents including trending charts and logs for Deficiency and Disposition Reports ("DDRs") and Nonconformance Reports ("NCRs"). (Tr. 1787-89.) CASE did not indicate the purpose of introducing these Reports. The Board assumes that CASE again seeks to establish via this "trending" information some indication that certain deficiencies repeatedly were found and not properly corrected.

61. We find these reports to be of little or no probative value for demonstrating such conditions. There is no evidence that the general categories discussed in the reports (see Applicants' Exhibit 51 at 2-3) represent deficiencies in specific areas (other than broadly defined types of deficiencies) that indicate a repetition of significant conditions adverse to quality.

62. Applicants' witnesses testified as to several other factors which demonstrate that these documents do not present persuasive evidence that significant conditions adverse to quality went unidentified or uncorrected. First, it is possible for a single deficiency to be counted more than once in the trending categories (Tr. 1789). Seccnd, the trending is indicated with cumulative data over long periods of time which precludes comparison of categories on a meaningful basis, even assuming that such comparisons would demonstrate what CASE seeks to demonstrate (Tr. 1790). The Board finds that these documents do not present probative evidence that there existed trends in construction deficiencies that went uncorrected. In addition to the reasons given by Applicants' witnesses, there is no accounting in the reports for changes in the level of construction activity, whether particular DDRs or NCRs are merely repeating the same deficiency for different items, or whether a particular NCR or DDR identifies a deficiency which would in fact pose a safety concern. Further, there is no indication as to whether the categorization of deficiencies by the criteria of 10

C.F.R. Part 50, Appendix B (see CASE Exhibits 80 and 81, and Tr. 1792) indicates repetitive failures in particular activities or whether they merely involve deficiencies in different activities which fall under the same category. Accordingly, the Board finds that CASE Exhibits 71-105 do not demonstrate that Applicants' QA program failed to identify and remedy significant conditions adverse to quality so as to preclude repetition.

f. Site Surveillance Reports

63. CASE Exhibits 106 through 172 are "Site Surveillance Reports" prepared from September 1979 through February 1982. Again, CASE did not indicate the purpose of introducing these documents. The Board again assumes that CASE seeks to prove a failure of the QA program to identify and properly correct a significant condition adverse to quality so as to preclude repetition of such conditions (Tr. 1661). Applicants submitted additional material which includes close-out information not submitted by CASE concerning the Site Surveillance Reports (Applicants' Exhibits 66-116).

64. These reports concern "surveillances" performed by the Applicants on activities at Comanche Peak. Surveillances are on a broader scope than audits and are performed to identify possible areas where management attention should be directed, perhaps in the form of audits. The surveillance program is used to help guide the Appendix B QA program in detecting, identifying and resolving nonconforming matters. (Tr. 1845).

65. Surveillance activities are in addition to functions performed pursuant to 10 C.F.R Part 50, Appendix B. Applicants rely on Site Surveillance Reports only minimally in assuring compliance with Appendix B requirements. (Tr. 1848.) CASE did not point to any matters identified in the Site Surveillance Reports which it contends demonstrate noncompliance with the requirements of 10 C.F.R. Part 50, Appendix B or which indicate deficiencies in construction.

66. In contrast to the apparent purpose for which CASE has introduced the Surveillance Reports, the Board finds that these reports and the surveillance program as a whole indicate a concern for proper performance of construction activities in accordance with approved procedures and instructions. In addition, the reports cover a vast scope of activities and demonstrate the existence of an aggressive QA program designed to assure satisfaction of QA/QC requirements with measures that go beyond the strict confines of required activities. Accordingly, these reports evidence a QA/QC program which goes beyond the requirements of 10 C.F.R Part 50, Appendix B.

g. "Use As Is" Dispositions

67. CASE examined Applicants' witness panel with regard to the "use-as-is" disposition of non-conforming conditions. The Board has reviewed the exhibits submitted by CASE and the testimony of Applicants' witnesses on the subject, and finds that there is no matter that reflects adversely on the QA program or that adversely affected proper construction of the facility.

68. The phrase "use-as-is" is a term used in describing disposition of certain hardware-related conditions which, although identified by QA/QC personnel as not being in accordance with prescribed drawings, procedures, etc., nevertheless meet the requirements for proper functioning of the item. Following review by appropriate engineering personnel, the matter in question can properly be approved and the actual as-built configuration allowed to remain without repair or rework, hence "use-as-is." (Tr. 1854-56.) There was not a shred of evidence presented by CASE that questioned the engineering judgment which was applied when any such matters were dispositioned "use-as-is."

69. There are many ways to satisfy design and construction requirements. Construction of a structure or installation of equipment in a manner other than in strict conformance with a particular drawing or procedure does not indicate by itself that the structure or equipment does not satisfy appropriate design requirements. (Tr. 1854.)

70. From a safety standpoint, it is important that deviations identified by QA be evaluated by qualified engineering personnel to assure compliance with applicable design objectives, regulations and codes. Quality Assurance personnel are not to make engineering decisions. Applicants demonstrated their commitment to this principal early in construction. By letter dated July 30, 1975, Applicants advised Brown & Root that even though items identified as nonconforming may have no actual effect on quality, "problems of this nature must be identified by

quality assurance and . . . it is up to appropriate engineering personnel to determine the effect of deficiencies and non-conformances on the activity." The letter stated that Brown & Root QA had not actively followed this philosophy and that, consequently, TUSI had issued a stop work directive on the affected activities. Work was not resumed until Brown & Root provided evidence of measures to correct this situation (CASE Exhibit 173 at 1-2). The Board notes that while the activities subject to the stop work directive did not raise any safety issues, they were singled out by the Applicants for corrective action to assure proper implementation of the QA/QC program. This indicates to the Board that from the early stages of the project Applicants maintained and implemented a strict philosophy that deficiencies and nonconformances be identified in accordance with the QA program and that Engineering effect appropriate disposition of such matters. A determination by Engineering that a particular non-conforming condition can be used as constructed yet satisfy applicable requirements does not itself indicate any cause for concern regarding safe construction and operation of the facility.

71. The evidence also demonstrates that Applicants, from the commencement of the project, were concerned that QA/QC inspectors not be discouraged from identifying non-conforming conditions by the fact that some of the matters were subsequently dispositioned "use-as-is" (Tr. 1857). The memorandum cited by CASE in support of its concern with "use-as-is" dispositions

states that when a non-conformance identified by a QC inspector was subsequently dispositioned "use-as-is", "it should not be interpreted by the QC inspectors as a put-down of the particular non-conformance." (CASE Exhibit 174 at 1.) Applicants' witness expressed the concern that QC inspectors understand that they must still identify non-conforming conditions even though the inspectors were not qualified to judge whether the deviation was acceptable from an engineering standpoint (Tr. 1857-58). The Board finds that Applicants' attention to such concerns provides further evidence of a philosophy and practice of assuring that QA/QC inspections are thorough and independent of construction/engineering considerations.

72. CASE also seemed to believe that "use-as-is" dispositions should decrease over the life of the project. Applicants' witnesses testified that such is not the case and that the concern at the beginning of the project was that the inspectors not be disturbed by "use-as-is" dispositions, but continue to identify problems and let personnel qualified to judge the engineering significance of the deviation make that determination. (Tr. 1860.)

73. The Board finds that Applicants' approach to the disposition of deficiencies and non-conformances with "use-as-is" determinations was appropriate and demonstrates an awareness of the need to maintain thorough and independent QA/QC attention to all deviations and non-conforming conditions. CASE presented no evidence that any "use-as-is" determination was not proper, and

the Board found none in its review of the record. Accordingly, we find that the utilization of "use-as-is" dispositions does not reflect negatively on the QA program, and that such dispositions present no concerns as to the safe construction or operation of the facility.

5. Disposition of NRC I&E Reports

74. CASE sought to raise as an issue in this proceeding the fact that various instances of actual or apparent non-compliance have been identified in NRC I&E Reports over the life of the project. CASE apparently contends that the mere existence of such findings demonstrates that Applicants' QA/QC program was inadequate (See, e.g., Tr. 2063). Applicants' direct testimony regarding I&E Reports concerned those findings of the NRC which had not been formally resolved at the time of the hearing (Applicants' Exhibit 44). The NRC Staff presented testimony regarding the disposition of matters raised in I&E Reports which concern each of the general topics listed in Contention 5 as allegations of inadequate construction (e.g., concrete work, mortar blocks) (NRC Exhibit 13). The Board has reviewed the scope of all matters identified in I&E Reports and finds that those matters do not reflect negatively on the QA program and present no concern as to the safe construction or operation of the facility.

a. NRC Inspection Program

75. The NRC retains a Resident Reactor Inspector ("RRI") on site at the Comanche Peak facility. This individual and other Region IV staff personnel perform, on a routine basis, inspections at the plant. (Applicants' Exhibit 44 at 2; NRC Exhibit 13 at 6, 7.) This inspection program is one of selective auditing, and not 100% verification of the Applicants' program. It is designed to provide an accurate assessment of whether the Applicants' QA program is assuring compliance with regulatory requirements. (NRC Exhibit 13 at 6, 8.) Following each inspection, the inspector prepares an I&E Report detailing the results of the inspection (Applicants' Exhibit 44 at 2, NRC Exhibit 13 at 9).

76. In I&E Reports, the inspector may raise issues which concern matters requiring further examination or information to determine whether a nonconforming condition exists. These are identified in the Reports as "unresolved items". Where apparent deviations from NRC requirements are discovered, the Inspector will recommend that the NRC Office of Inspection and Enforcement transmit to the Applicants either a Notice of Violation (involving either a violation, infraction, or deficiency) or a Notice of Deviation, depending upon the severity of the matter. (Applicants' Exhibit 44 at 3; NRC Exhibit 13 at 10-12.) To resolve issues identified as "unresolved items", Applicants normally meet with the Inspector to present the results of

Applicants' investigations of the matter. The Inspector reviews the information presented and makes a recommendation concerning the disposition of the item. (Applicants' Exhibit 44 at 2-3.)

77. Where a Notice of Deviation or Violation is issued, the Applicants transmit a formal written reply within the specificed period of time responding to each issue raised. When the NRC is satisified that appropriate action has been taken by the Applicants, the Notice is closed out in a future inspection and notation is made to that effect in a subsequent I&E Report. (Applicants' Exhibit 44 at 4.)

78. Since 1973, the NRC has performed routine inspections, at least monthly, of preparations for and of actual construction activity at Comanche Peak. During this period, over 150 NRC I&E reports have been issued. On-site inspections and investigations by the NRC Inspectors have involved over 8000 man-hours, with additional NRC resources being spent off-site on inspection activity as well. (Applicants' Exhibit 44 at 4; Tr. 2124.)

79. Applicants examined all NRC I&E Reports which were cited by CASE in its answers to Applicants' Interrogatories over the more than one and a half years of discovery on this contention, and also examined I&E Reports cited by CASE in CASE's responses to NRC Staff interrogatories. Except for one matter cited by CASE which clearly has no relevance to Contention 5,[6] all but two issues raised in I&E reports cited by CASE as

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[6] The matter raised in I&E Report 80-09 regarding groundwater withdrawal rates does not involve matters of quality assurance.

pertinent to Contention 5 have been resolved, and that resolution has been verified by the NRC Staff. (Applicants' Exhibit 44 at 5.) The unresolved issues involved procedures for the inspection of coatings raised in I&E Report 81-15 (Applicants' Exhibit 44B) and a concrete pour on the Unit 1 dome raised in I&E Report 79-11 (Applicants' Exhibit 44D) (Applicants' Exhibit 44 at 6; NRC Exhibit 13 at 102). These matters are discussed below. The verification by the NRC Staff of resolution of issues raised in I&E Reports has been by a formal close-out in a subsequent I&E Report, except in one instance.[7]

80. The Board has independently reviewed the I&E Reports submitted by the Staff (NRC Exhibits 11-178, 196, 199), the Applicants (Applicants' Exhibits 37, 44A-44G, 61-63) and CASE (CASE Exhibits 15, 16 and 188). While these Reports indicate occasional infractions or deficiencies related to QA, neither their nature nor their frequency indicates that the Applicants' QA program was inadequate nor suggests the likelihood that good workmanship was not employed during the construction of the plant. NRC Exhibit 13 at 12; Duquesne Light Company (Beaver Valley Power Station, Unit 1), ALAB-408, 5 NRC 1383, 1387 (1977). In many cases the matters cited by the Staff in I&E Reports were

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[7] I&E Report 80-20 contained an unresolved item involving the spacing of, and circuit breakers for, safety and non-safety cables in the AC Instrument Distribution Panels. Applicants' Exhibit 44A. Applicants' commitment for resolution of that item is set forth in FSAR §8.3.2.1, Paragraph 7.c (Applicants' Exhibit 3). That commitment was accepted by the NRC Staff in SER Supplement No. 1, §8.4.4, p. 8-1 (NRC Exhibit 2). This matter is also discussed below.

reported to the Staff by Applicants in the first instance pursuant to 10 C.F.R. §50.55(e) or otherwise (See, e.g., NRC Exhibit 13 at 15; NRC Exhibits 44, 54, 74, 81, 92; CASE Exhibits 51-52). In these cases, the Applicants usually had taken corrective action before the Staff issued its Report. These instances reflect not that the QA program was deficient, but rather that it functioned to discover and correct non-conforming conditions. The Board addresses below the specific unresolved items and other matters pursued by CASE at the hearing.

b. AC Instrument Distribution Panel Cables

81. In I&E Report 80-20 (Applicants' Exhibit 44A), a concern regarding the spacing of safety and non-safety cables within the AC Instrument Distribution Panels and spacing of safety and non-safety circuit breakers was identified. CASE pursued this matter in cross-examination only to establish that it was identified by the NRC and not the Applicants (Tr. 1865).

82. As noted in note 7, supra, Applicants' resolution of this item was accepted by the NRC Staff in SER Supplement No. 1, p. 8-1 (NRC Exhibit 2). CASE presented no evidence that this resolution was inadequate. On the other hand, the resolution appears to the Board to be appropriate. Accordingly, the Board finds that no safety concern is posed by this matter.

83. With regard to the discovery of this matter by the NRC Inspector, the Board finds that the mere fact that a few items are discovered by NRC Inspections rather than by the Applicants does not indicate that their overall QA program is inadequate.

It would be surprising if during the life of such a major construction project the NRC Inspectors did not identify some areas of concern which had not previously been identified by the Applicants. In fact, the Board would question the effectiveness of an NRC inspection program that never discovered such matters independently and prior to their discovery by Applicants' QA program. Further, absent evidence that Applicants routinely failed to identify deficiencies and errors that raise a concern for the safe construction and operation of the facility, the Board is unable to find that the QA program was deficient.

c. Unsuitable Weld Surface Conditions

84. CASE Exhibit 199 is a Notice of Violation, issued with the I&E Report 80-20 (NRC Exhibit 125), regarding quality activities of a subcontractor involving acceptance criteria for welding. Applicants responded to this Notice of Violation in writing (NRC Exhibit 126), committing to a full reinspection of welds performed by the particular subcontractor. (NRC Exhibit 13 at 68.) The corrective action committed to by Applicants was verified and accepted by the NRC Staff in I&E Report 80-23 (NRC Exhibit 114; Tr. 2112-13). CASE presented no evidence that this resolution was unacceptable, and the Board, based upon its independent review, finds that the resolution was appropriate. In fact, the deficiency did not involve the soundness of the weld. Rather, the deficiency dealt with the surface condition of the welds in question which was not sufficiently smooth to permit

proper interpretation of nondestructive examination. Accordingly, the Board finds that no safety concern exists with respect to this matter.

d. Concrete Pour on Unit 1 Dome

85. I&E Report 79-11 (Applicants' Exhibit 44C) discusses a matter involving the placement of a small amount of concrete on the dome of the Unit 1 containment building without appropriate QA involvement (NRC Exhibit 13 at 39-40). CASE questioned Applicants' witness panel on this matter (Tr. 1867). CASE's concern was that a construction activity required to be performed with certain QA involvement had not been so performed.

86. The facts concerning this concrete pour, as described in I&E Report 79-11, are that on January 18, 1979, a concrete pour on the Unit 1 dome was begun under good weather conditions, but the weather subsequently deteriorated to the point that rain stopped work at approximately 7:30 p.m. The pour area was covered and the incoming shift was instructed to clean the area so the pour could resume the next day. (Applicants' Exhibit 44 at 7.) Since no further work was planned that evening, the QC personnel involved in the activity left the site. Later in the evening, the rain increased to the point that part of the protective covering over the pour was washed away and a small portion of the concrete also washed away. (Tr. 1870.) The General Foreman recognized that measures should be taken before the concrete had set, and he mixed one-half yard of concrete in accordance with design mix data for the dome concrete, although

no QA personnel were present (Applicants' Exhibit 44 at 8, Tr. 1870). The Foreman then supervised the placement of the concrete (Tr. 1870).

87. This incident was discovered by the combined efforts of the Applicants' personnel and NRC Inspectors in response to reports received in March, 1979. Applicants' personnel received a telephone call reporting that such a pour had occurred. Applicants' initial investigation did not substantiate the report. (Applicants' Exhibit 44C at 7.) The NRC also received a telephone call with the same report and commenced an investigation. While the NRC investigation was proceeding, Brown & Root personnel conducted an additional investigation and discovered the identity of the General Foreman (Applicants' Exhibit 44C at 9: Tr. 1872-73). The NRC Staff subsequently issued a Notice of Violation on the incident (Applicants' Exhibit 44C, Appendix A).

88. Quality Assurance involvement in this type of activity would only have involved a presence at the concrete batch plant during mixing and at the placement (Tr. 1869, 1871). Subsequent investigation by the Applicants indicated that the concrete nonetheless satisfied appropriate design requirements (NRC Exhibit 66).

89. The Notice of Violation concerning failure to implement the QA program with respect to this concrete pour was closed out in I&E Report 79-24/23 (Applicants' Exhibit 44D). Applicants advised the NRC that reviews by a consultant and Gibbs & Hill had

been performed and the in-place concrete was found to be satisfactory (See also NRC Exhibit 13 at 39). In addition, Applicants informed construction supervisory personnel that should a similar situation occur, no additional concrete should be batched or placed without prior notification of senior construction management (Applicants' Exhibit 44 at 8; NRC Exhibit 13 at 39). The only remaining outstanding item with respect to this matter concerned the structural integrity of the concrete pour which was cited in I&E Report 79-24/23. This item should be closed in view of the successful Structural Integrity Test performed pursuant to 10 C.F.R. Part 50 Appendix J, testing the leak-tight integrity of the entire primary reactor containments, as described in SER §2.8.1 at 2-18 (Staff Exhibit 1). (Applicants' Exhibit 44 at 9; Applicants' Exhibit 155.)

90. The Board finds that in the unusual circumstances presented in this situation, the absence of QC personnel from the concrete batching and placement constitutes a technical violation of 10 C.F.R. Part 50 Appendix B, as indicated by the Notice of Violation issued to Applicants. However, this instance does not bring into question the overall adequacy of the QA program. Further, Applicants' subsequent evaluation of the pour and measures to prevent recurrence of such a situation, and the successful structural integrity test, provide absolute assurance that there is no safety concern with respect to this matter.

e. Protective Coatings

91. In I&E Report 81-15 (Applicants' Exhibit 44B), the NRC Staff cited certain matters concerning records requirements for coating applications for miscellaneous steel, cable tray supports, and pipe supports. In addition, records reviewed by the NRC Inspector for the Unit 2 containment steel liner revealed incomplete check lists without recorded visual inspections and Dry Film Thickness readings. (Applicants' Exhibit 44 at 9; NRC Exhibit 13 at 74; Applicants' Exhibit 44B, Appendix.) This matter was the subject of CASE interrogation of Applicants' witnesses (Tr. 1874-1879).

92. The purpose of these coatings is to protect the coated structures from corrosion in the environment of the containment. Inspections are designed to assure proper adhesion of the coatings so as not to result in the peeling of coatings and possible blockage in the sumps. (Tr. 1879.)

93. To prevent recurrence of this matter, Application (Construction) Procedures were revised and reissued to clearly indicate pot life at all temperatures within the applicable range for application of the coating system. In addition, Inspection (Quality) Procedures/Instructions were revised to clarify applicable requirements and were reissued. Also, an identification system providing traceability of inspection documentation from blasting through installation and final coating for miscellaneous steel and supports was established. (Applicants' Exhibit 44 at 10; NRC Exhibit 13 at 77; Tr. 2143-4.) The NRC Staff subsequently reviewed and concurred in the adequacy

of the revised procedures (Tr. 2113-4). Formal close-out of this item will occur upon verification by the NRC Office of Inspection & Enforcement of satisfactory completion of the actions described above (Id.; NRC Exhibit 13 at 79).

94. The discrepancies cited in I&E Report 81-15 were identified as nonconforming conditions in accordance with established QA procedures. Reinspections of the coatings using both scratch and adhesion tests to evaluate the condition of the applied coatings are being conducted. A complete review of existing records and reinspection of affected areas also is being conducted. (Applicants' Exhibit 44 at 10; NRC Exhibit 13 at 79.) The initial phases of the reinspection effort confirmed that adequate application of protective coatings had occurred, and the concern was limited to the previously identified inconsistencies in the records. Any discrepancies are being identified and corrected in accordance with approved procedures. (Tr. 2114, 2143-4.)

95. The Board finds that the Applicants' reinspection efforts, corrective actions and measures to prevent recurrence present a satisfactory resolution to this matter. We find no programmatic breakdown of the QA program by virtue of this situation, and find that no safety concern is presented as to the safe construction or operation of the plant in view of such corrective action.

f. Reactor Vessel Misorientation

96. On February 20, 1979, Applicants reported to the NRC RRI that the reactor vessel support shoes, the ventilation duct work, and the surrounding reinforcing steel for the Unit 2 reactor vessel support structure had been rotated 45 degrees from correct positions (Applicants' Exhibit 44 at 12-13). The facts of this matter are set forth in IE Report 79-03 (Applicants' Exhibit 44G). CASE questioned Applicants' witnesses regarding this matter. CASE apparently contends that this matter represents a failure by Applicants to fulfill their responsibilities under 10 C.F.R. Part 50, Appendix B. (Tr. 1885-86.)

97. The source of the reactor vessel misorientation apparently was a miscommunication in the interface between the NSSS designer (Westinghouse) and the Architect/Engineer (Gibbs & Hill). The problem arose because Units 1 and 2 were to be mirror images, while the Units 1 and 2 reactor vessels were of identical construction. The evolving design of the Unit 2 reactor vessel supports to accommodate the same hand design of the Unit 2 reactor vessel was not coordinated adequately. As a result, the mounting pads for the Unit 2 vessel were misoriented by about 45 degrees. (Applicants' Exhibit 44 at 13; NRC Exhibit 13 at 47-49.)

98. When the misorientation was discovered, the Applicants discussed the matter with the NRC RRI. The Applicants concluded that because the vessel could not be installed and connected,

there was no safety significance that warranted reporting the deficiency pursuant to 10 C.F.R. §50.55(e), Applicants also concluded that the matter was of sufficient concern to notify the NRC because of the design and construction changes that would be required to accommodate the vessel and its connecting piping. (Tr. 1883; Applicants' Exhibit 44G at 3; NRC Exhibit 13 at 49.)

99. At the time the misorientation was discovered the support pads for the vessel were in place. Applicants determined that to accommodate the vessel, new support pads should be constructed by placing additional reinforcing steel at the location of the pads by drilling into the existing concrete. Additional concrete was then placed at the new location of the support pads. (Tr. 1883-84.) In March 1979, Applicants and NRC representatives held a meeting to discuss these proposed repair procedures for relocating the vessel support pads. At that meeting, the repair procedures were discussed and the NRC Staff concluded that "no unresolved safety concerns associated with the repair design for Unit 2 pedestal were identified at the meeting." (Applicants' Exhibit 44H at 2.)

100. Prior to commencement of construction activities, TUGCO QA reviewed scheduled repair activities to assure establishment of required hold points. During and upon completion of rework activities TUGCO QA conducted necessary inspections to assure completion in accordance with applicable of

requirements. (Applicants' Exhibit 44 at 14.) There is no evidence that the final placement of the Unit 2 vessel is unsatisfactory or unsafe (NRC Exhibit 13 at 49).

101. The NSSS design and fabrication was monitored under the Westinghouse QA program. However, Applicants retained the ultimate responsibility for all quality assurance for the facility. (Tr. 1885-86.)

102. The Board finds that this design misorientation does not indicate a programmatic failure on the part of the Applicants' QA program (NRC Exhibit 13 at 48-49). It involved a miscommunication between the design organizations. When it was discovered, it was handled properly by Applicants' QA program. Further, the corrective measures taken by the Applicants to accommodate the reactor vessel were conducted under appropriate QA oversight, inspection and review. The adequacy of those modifications were not questioned by CASE, and the Board upon independent evaluation finds them to be adequate. Accordingly, no safety concern exists with respect to this matter.

g. Honeycombing In Unit 2 Steam Generator Compartment Walls

103. In October 1979, Applicants' routine QC inspections identified and documented areas in the concrete placement for the Unit 2 steam generator compartment walls where exposed concrete contained honeycombed conditions. Engineering reviewed the condition and repair work was authorized. During repairs, Engineering and Senior QC personnel determined that the integrity

of the inaccessible portions of the placement be investigated further. Upon completion of that investigation and evaluation of all available data, it was concluded that the inaccessible portions of the placement met or exceeded design requirements and contained no hidden internal defects which would be detrimental to the safety or utility of the structure. (Applicants' Exhibit 44 at 11.)

104. Upon discovery of the honeycombing condition, Applicants immediately reported the situation to the NRC pursuant to 10 C.F.R. §50.55(e) (Tr. 1888-89). Applicants did not file a follow-up written report with the NRC within 30 days, and this resulted in the issuance of a Notice of Violation for noncompliance with 10 C.F.R. §50.55(e)(3) (Applicants' Exhibit 44E, Enclosure 2 at 7).

105. The NRC RRI conducted an examination of the repair work on the honeycombing in March, 1980. The RRI found that work was being accomplished in accordance with detailed instructions generated at the site and the "applicable portions of the U.S. Bureau of Reclamation 'Concrete Manual', a recognized authoritative publication on concrete work." (Applicants' Exhibit 44E at 6; Applicants' Exhibit 44 at 11-12.) Applicants' QA personnel verified that all repair work was conducted in accordance with appropriate specifications and procedures (Applicants' Exhibit 44 at 12). The NRC Staff conducted extensive reviews of this matter in April and May, 1980, and concluded that no items of noncompliance or deviation existed.

The NRC concluded that the entire repair work appeared to have been done in a sound manner in accordance with recognized concrete repair practices. (Applicants' Exhibit 44F, Enclosure at 4; NRC Exhibit 13 at 33.)

106. The Board finds that the honeycombing in the Unit 2 steam generator compartment walls presents no safety concern for the operation of the facility. The repair work conducted by the Applicants was appropriate, conformed to applicable construction practices, and was conducted subject to both Applicants' QA review and inspection by the NRC Staff. The Applicants' QA program functioned properly in detecting and reporting the honeycombing in a timely fashion. The failure to submit a follow-up written report pursuant to 10 C.F.R. §50.55(e)(3) is not indicative of a programmatic breakdown, and was appropriately dealt with by the Notice of Violation (See NRC Exhibit 13 at 28, 33).

6. Construction Practices

Contention 5 lists several general areas of construction in which poor construction practices allegedly occurred that CASE contends demonstrate inadequacies in the Applicants' QA/QC program. CASE has not identified specific practices in these areas with which it is concerned except to list I&E Reports in which these areas were the subject of inspections. Nor has CASE addressed the significance or insignificance of findings in those Reports with respect to the QA/QC program. Further, as noted previously, CASE presented no evidence to demonstrate that the

disposition of the findings in these I&E Reports was inadequate. Accordingly, the Board will address the findings made in those I&E Reports and the disposition of those matters involving the various construction categories listed in Contention 5. The Board finds that all matters raised in those Reports were properly addressed and dispositioned. Also, we find that the mere identification in I&E Reports of possible or actual deficiencies does not demonstrate that Applicants' QA program was inadequate or that any materials, components or equipment were installed improperly.

a. Concrete

107. NRC inspections of concrete construction activities cover both the direct work and the QA/QC tests and inspections, including the installation and splicing of reinforcing steel, testing of aggregates and cement, operation of the concrete batch plant and transportation of fresh concrete, testing of fresh concrete, form work used before and during concrete placement and the actual placement, consolidation and curing of concrete. From early 1975 there were over 45 inspections of these activities covering both Units 1 and 2. Approximately 75% of the routine inspections resulted in findings that the Applicants and their contractors had complied with commitments in their PSAR and 10 C.F.R. Part 50, Appendix B. The other 25% of the routine inspections revealed either items of noncompliance or deviations, for the most part early in the construction of the project when

concrete work was just beginning. NRC Staff testimony addressed only those reports in which negative findings were made. (NRC Exhibit 13 at 13-19.)

108. The Board finds that none of the inspection findings concerning "concrete work" raised substantial questions as to the adequacy of the construction of the facility. Each of the findings was the subject of responses by Applicants to assure that proper corrective measures were taken, and measures to prevent recurrence of such situations were implemented. The NRC Staff conducted follow-up inspections to determine whether Applicants had implemented the corrective actions to which they had committed, and the Board finds that the matters were resolved satisfactorily. (NRC Exhibit 13 at 19-42.)

b. Mortar Blocks

109. Presumably CASE refers to the use of pre-cast concrete blocks, sometimes referred to as "cinder block" construction, in its allegations regarding mortar blocks. The only identifiable instance of the use of concrete blocks at Comanche Peak which is of concern to CASE is the use of such blocks as divider walls in the control room area. Walls made of these blocks are present in a large room adjacent to the main control room and do not jeopardize any of the equipment or personnel within the control room should such walls fail. The Board finds that these walls are not safety-related and thus are not within the scope of the Quality Assurance requirements. (NRC Exhibit 13 at 43-44.)

c. Steel

110. The Board finds it virtually impossible to identify the meaning of the term "steel" when used in conjunction with alleged deficiencies at a nuclear plant. Such a broad category encompasses numerous areas of contruction. CASE evidently was concerned with the installation and testing of certain components made of steel. None of the matters identified by CASE in this regard adversely reflect on the construction of the facility or indicate a failure of Applicants to adhere to their commitments to the NRC or to implement an adequate QA program. (NRC Exhibit 13 at 45-46.)

d. Fracture Toughness Testing

111. The term "fracture toughness testing" in Contention 5 evidently was derived from concerns of a previous intervenor other than CASE which contended that an equipment supplier should not perform tests for fracture toughness of materials which it supplies. Such tests are performed at various stages during the fabrication and installation of equipment, including by the mill supplying steel to the component fabricator and by any party performing qualified welds on the material. Further, such testing is best performed by parties who are most knowledgeable of the conditions under which the steel is fabricated and utilized. NRC inspections disclosed no specific deficiencies in the Applicants' QA/QC program for fracture toughness testing. (NRC Exhibit 13 at 46-47.) The Board finds that CASE has raised

nothing regarding fracture toughness testing that calls into question the adequacy of the QA program or the adequacy of construction.

e. Welding

112. The NRC inspection program involves inspections of safety-related welding. These inspections include all aspects of welding, welder qualification, qualification of testing personnel and the application and results of testing activities. Approximately 65 NRC inspections dealing with various aspects of the Applicants' program for QA/QC of welding were performed. Only 17% of the routine inspections revealed either items of noncompliance or deviations with respect to welding activities. (NRC Exhibit 13 at 52-55.) Some of these non-conforming conditions had been identified by Applicants' QA program before the NRC conducted its inspections. In response to each of these findings Applicants committed to take corrective actions which were reviewed and verified by the NRC Staff. Follow-up inspections were conducted regarding these corrective actions. (NRC Exhibit 13 at 55-63.) The Board finds that no substantial questions as to the adequacy of Applicants' QA program or of construction were raised by the inspections of welding activities.

f. Expansion Joints

113. Inspections of expansion joints are performed as part of the normal inspections of concrete placement. NRC inspections resulted in no negative inspection findings with respect to

expansion joints. An investigation into allegations of alleged improper construction practices involving expansion joints did not substantiate the allegation. (NRC Exhibit 13 at 69-71.) The Board finds that CASE raised no issues of substance regarding expansion joints.

g. Inspection and Testing

114. An essential element of any QA/QC program is the performance of inspection and/or testing to determine whether a function or product sacisfies the established requirements. Accordingly, virtually all QA/QC activities will involve inspection and testing. To the extent that inspection results regarding inspection and testing are not dealt with in the discussions of other construction practices, such results were gathered by the NRC Staff under this heading. They relate primarily to the mechanical and electrical areas of the NRC inspection program. All inspection findings on this subject (NRC Exhibit 13 at 73-74) were the subject of corrective action by Applicants as well as commitments to prevent similar situations from recurring. NRC follow-up inspections confirmed the Applicants' corrective actions. An investigation into allegations regarding electrical inspections found that the allegations were unsubstantiated. (NRC Exhibit 13 at 71-81.) The Board finds that nothing in the record regarding inspection and testing raises a question as to the adequacy of Applicants' QA program or of construction of the facility.

h. Craft Labor Qualifications and Working Conditions

115. This matter focussed on the qualifications of welders and persons performing reinforcing steel splicing, i.e., cadwelding. The ASME Code and the American Institute for Steel Construction ("AISC") Code impose requirements concerning the qualification of welders and cadwelders, respectively. No convincing evidence regarding welder qualifications indicates that unqualified welders were being used at Comanche Peak. One instance where cadweld splicer helpers were not fully tested and certified was identified and resolved. Allegations regarding the qualifications of welders and cadwelders were investigated and were found to be unsubstantiated. (NRC Exhibit 13 at 82-83.) The Board finds that no issue of substance has been raised regarding craft labor qualifications.

i. Training and Organization of QA/QC Personnel

116. The training of QA/QC personnel is examined as part of most routine inspections, since training is one factor in the determination of the qualifications of an inspector to perform an inspection and in the determination of the acceptability of the inspected activity or material. The organization of QA/QC personnel is examined less frequently since the ability and integrity of persons in an organization is generally far more important than the exact structure of the organization. All adverse inspection findings related to the training and organization of QA/QC personnel were the subject of corrective action by Applicants and NRC follow-up inspections to confirm implementation of corrective actions. Investigation into

allegations regarding this subject revealed no substantiated allegations. (NRC Exhibit 13 at 84-99.) The Board finds that none of these matters raises a substantial question as to the adequacy of Applicants' QA program or of the construction of Comanche Peak.

7. Rock Overbreak

117. Shortly before the hearings in June 1982 commenced, CASE raised two matters (rock overbreak and a shrinkage crack) with the Board concerning construction at Comanche Peak. Even though the matters were not raised seasonably, the Board required Applicants to present evidence during those hearings. As found below, both matters were shown to be insignificant. The Applicants presented a panel of witnesses to respond to the matters raised by CASE concerning rock overbreak during excavation for the foundation for Comanche Peak. Because this matter was raised unseasonably, there was no prefiled written testimony. Despite this inconvenience, Applicants' witnesses addressed the issue quite ably. Applicants' witnesses were Raymond C. Mason, John T. Merritt, Jr., Kenneth L. Scheppele, Ralph E. McGrane and Ronald G. Tolson (Tr. 789). Mr. Mason is a Registered Professional Engineer in the field of civil engineering. He is the principal engineer of the firm which performed the geotechnical work and geological monitoring for the Comanche Peak facility. (Applicants' Exhibit 16.) Mr. Merritt, also a Registered Professional Engineer, was the Manager of Engineering and Construction for Comanche Peak (Applicants'

Exhibit 17). Mr. McGrane is a Registered Professional Engineer in structural engineering for the architect/engineer for Comanche Peak (Applicants' Exhibit 18). Mr. Scheppele is the Senior Vice President of the architect/engineer for Comanche Peak, and is also a Registered Professional Engineer (Applicants' Exhibit 19). Mr. Tolson is the Construction Quality Assurance Supervisor for Texas Utilities Generating Company, and is also a Registered Professional Engineer (Applicants' Exhibit 20).

118. The Comanche Peak facility is set on a geologic structure known as Glen Rose Limestone, a marine formation of cretaceous age (Tr. 803; Applicants' Exhibit 3 (FSAR Section 2.5.1.1.3, pp. 2.5-10, 26)). The static engineering properties of subsurface materials are discussed in FSAR Section 2.5.4.2.1. and the dynamic engineering properties of the subsurface materials are discussed in FSAR Section 2.5.4.2.2.

119. Excavation for the foundation for all structures at the Comanche Peak facility commenced with the clearing of approximately 60 feet of material by a variety of methods to reach a plateau described as plant grade. From this newly established plain all excavation for foundations began. Excavation from plant grade was designed to permit placement of foundations and below-grade walls against intact rock. The excavation for the containment buildings was performed using line drilling. This technique involved the placement of closely spaced holes outlining the perimeter of the structure to be excavated. Charges of dynamite were placed in these holes and

detonated with small delays between the holes to create a controlled crack around the perimeter of the excavated area. Following detonation of the perimeter holes, the central portion of the excavation was detonated to break the rock and permit removal of that rock. The depth of excavation by this technique was approximately 40 feet. (Tr. 806-13.)

120. Following removal of the rock within the excavated area it was discovered that approximately the upper 10 feet of material surrounding the excavation had experienced displacement and cracking. To determine the extent of such cracking, careful removal of the debris at ground level and excavation of trenches at intervals beyond the perimeter of the excavation wall was performed. The trenches were dug to a depth of approximately 3 feet to permit examination of displacement and cracking near the surface which was the most sensitive area to such conditions. Trenches were dug at intervals away from the excavation wall until no fracture was detected. The longest trench extended to approximately 30 feet from the excavation wall. In addition to the overbreak found in the walls of some excavations, some cracks were discovered in the base of the excavation. These instances also involved excavations for structures other than the containment building. (Tr. 815-24; CASE Exhibit 21.) Applicants provided timely verbal and written notification to the NRC of the rock overbreak in accordance with 10 C.F.R. §50.55(e) (Tr. 845-49).

121. Several methods of repair were considered for the rock overbreak. These alternatives included (1) a redesign of the containment so as to permit use of soil as a supporting material, taking no credit for the rock foundation; (2) placement of a series of rock bolts cemented in place so as to attempt to restore the previously displaced rock; and (3) the total removal of all displaced rock, radially from the excavation to a point where all apparent cracks had been removed. This last method of repair was selected upon consultation with the architect/engineer. This method of repair was the best and most conservative option from a structural standpoint. Using that technique, the rock was then broom-cleaned, air-hosed, and watered until all cracks and/or displacements created by blasting had been detected and removed. The desired geometry required to contain concrete for the containment structure was then restored by means of dental concrete. Where cracks were discovered which were relatively small, e.g., less than a quarter inch, and which were not associated with displacement of surrounding rock, a grouting procedure was employed. The grouting process was developed by the geological contractor and the architect/engineer in a manner that assured the grout would fill the cracks completely without causing crack propagation or building displacement. (Tr. 817-25, 832-33, and 953-54.)

122. Excavation procedures for the excavation of plant structures was performed in accordance with general construction procedures established for excavation (Applicants' Exhibits 31,

32 and 33), blasting (Applicants' Exhibits 28-29), and identification, evaluation and recordation of significant geologic features and/or defects encountered during exploration and excavation operations conducted at the site (Applicants' Exhibit 34). Neither the identification of rock deformation nor its repair would have been accomplished differently were separate inspection procedures utilized during excavation (Tr. 1173-76). Nevertheless, the NRC Staff cited Applicants for the lack of specific surveillance procedures governing excavation. The surveillance procedures developed by Applicants (Applicants' Exhibits 35-36), in response to the NRC's citation would have resulted in very little additional documentation being developed with respect to the excavation (Tr. 1247). The NRC Staff resolved the matter of construction surveillance procedures following Applicants' development of their procedures (Applicants' Exhibit 37; NRC Exhibit 13 at 29). The Board finds that this matter gives rise to no valid safety concerns. Structurally the excavation is stronger with the dental concrete structure than it would have been had the rock not been overbroken (Tr. 827). If anything, this would enhance the strength and stability of the foundation for the containment. Further, the Board finds that no programmatic QA problem is evinced by this matter.

8. Shrinkage Crack

123. The other issue raised by CASE unseasonably involved a shrinkage crack in a concrete structure. Within the containment building for Comanche Peak, Unit 1, and surrounding the reactor vessel, is a reactor cavity wall which serves the combined function of radiation shielding and structural support for the reactor (Tr. 865-66). This wall is approximately 35 feet in height and eight and one-half feet in thickness. It is constructed of reinforced concrete. Following removal of the forms for concrete placement for a portion of the reactor cavity wall, a shrinkage crack was discovered on opposite sides of the cylindrical placement (Applicants' Exhibits 21-23, Tr. 867-68, 959-61). The crack was assumed by Applicants to extend through the structure, although the NRC Staff believed the crack extended only to a depth of approximately two inches (Tr. 996-1001, 1365, 1375). CASE suggested that this shrinkage crack could be significant from a structural or radiation shielding standpoint, or otherwise connected to the rock overbreak which occurred during the excavation for the reactor foundations. However, CASE provided no evidence to support this conjecture.

124. The subject concrete placement ranges in depth from 6 to 13 feet. The minimum width of the pour was approximately 8 feet 6 inches, in the approximate configuration of a cylinder. (Tr. 866; Applicants' Exhibits 21-23.) The existence of shrinkage cracks in such massive concrete pours is not unusual (Tr. 870-71, 1197, 1295). Shrinkage cracks occur because of the

combination of forces created during the curing of the concrete from both the shrinking of the concrete as it dries and a thermal gradient within the placement (Tr. 1377-80).

125. A primary function of the concrete placement in which the shrinkage crack was discovered is to transfer the vertical load from the reactor through the reactor cavity wall and into the basemat of the containment structure. The existence of a hairline crack such as found here does not compromise the ability of the wall to transfer that load. (Tr. 869, 885, 1295, 1372-74.) Indeed, the placement of a construction joint at approximately the location of the crack was contemplated by the designers, although not utilized. Had those construction joints been employed, there would have been no impairment of capability. (Tr. 882-83, 1182, 1192-94.)

126. Another function of the reactor cavity wall is to provide radiation shielding. In fact, the thickness of the wall is determined by radiation shielding requirements, rather than load bearing requirements. (Tr. 865, 1331.) The existence of a shrinkage crack (even should the crack extend through the concrete pour as assumed by Applicants) would not affect the radiation shielding capability of the shield wall (Tr. 885-86).

127. Although there was no need to repair the crack to assure the integrity of the wall (Tr. 1313), the crack was sealed with grout to roughly an inch or an inch and a half depth to provide a smooth surface for painting and to inhibit spalling. All exposed areas of the crack were repaired in this manner. The

top of the crack had been covered by the concrete placement for the upper levels of the reactor shield at the time grouting was performed, and thus no repair was necessary for that portion of the crack. (Tr. 886, 890, 893.) The use of grout for repair was recommended by the contractor and approved by the responsible engineer as an acceptable repair method. Detailed procedures for performing the repair were developed and implemented. (Tr. 891, 908-15; CASE Exhibits 8-12.)

128. Even assuming the crack extended through the concrete pour, it is highly unlikely that the reinforcing steel used in the pour could rust or corrode to the extent that it would be structurally significant. The only source of water which conceivably could have led to such corrosion would have come from accidental spillage of water or from the curing of the concrete pours above this placement. Even should such water have seeped into the crack it would have been absorbed by the chemical reaction between the water and the cement. This presence of water would have no significant effect on the one and three eights inch diameter rebar used in this placement (Tr. 897-98, 1205). Following completion and curing of the pour immediately above the placement involved here, the crack would be isolated from exterior water sources (Tr. 1022). Exposure of the reinforcing rod to water even over a period of months would not affect its strength and ability to perform the function for which it was intended (Tr. 1198). Indeed, many structures using

reinforced concrete where shrinkage cracks may occur are submerged in water for many years without any adverse effect on the structure (Tr. 895, 899).

129. The existence of the cracks in the reactor cavity wall was noted by QA in an NCR (CASE Exhibits 8-12). Although shrinkage cracks are not routinely reported in NCRs, this crack was reported by a QC inspector acting conservatively (Tr. 901). The disposition of the NCR proceeded through the complete review channels, including the proposal and acceptance of the repair procedure (CASE Exhibits 8-12; Tr. 985-96).

130. The existence of the shrinkage crack in the reactor shield wall was not reportable to the NRC pursuant to 10 C.F.R. § 50.55(e), because the crack is of minor importance (Tr. 884, 900, 905, 1203). Subsequent review by the NRC Staff of this matter confirmed that the crack need not have been reported pursuant to 10 C.F.R. § 50.55(e) (Tr. 1311).

131. There is no evidence to suggest a connection between the rock overbreak experienced during excavation for the foundation and the shrinkage crack in the reactor cavity wall. The rock base on which the foundation is laid is hundreds of feet deep, topped by a twelve foot thick reinforced concrete foundation basemat for the reactor. The shrinkage crack occurred in a placement within the containment structure which is segregated from the rock foundation by the reinforced concrete basemat, a steel liner plate and additional concrete within that steel liner. (Tr. 860, 1215-16, Applicants' Exhibits 21-22.)

There is no plausible means for the propagation of cracks within the rock foundation through those structures and into the concrete structures in the interior of the containment building (Tr. 1215-16). Accordingly, the Board finds that this matter gives rise to no valid safety concerns. There is no impairment of the structural integrity or radiation shielding capabilities of the wall. Certainly there is no indication of a problem in the QA program evinced by this matter.

9. ASME Survey

132. On October, 12-14, 1981, an ASME Survey Team conducted a survey of the Brown & Root Quality Assurance Program for Comanche Peak. The survey was incident to the recertification of Brown & Root to perform work pursuant to the ASME Code. (Applicants' Exhibit 45 at 1.) Upon completion of this survey, ASME recommended that a resurvey be conducted in view of certain matters concerning the Brown & Root Quality Assurance program (Applicants' Exhibit 45B). That resurvey was conducted January 18-20, 1982 (Applicants' Exhibit 45 at 1). Before the resurvey was conducted, the certificates of authorization issued by ASME for the Brown & Root Quality Assurance Program at Comanche Peak expired (Applicants' Exhibit 46 at 8). CASE contends that because ASME required a resurvey of the Brown & Root QA Program for Comanche Peak before approving the reissuance of the certificates of authorizations and in view of the findings made

by the ASME Survey and Resurvey teams, Brown & Root's QA Program for Comanche Peak did not satisfy the requirements of 10 C.F.R. Part 50, Appendix B.

133. Applicants presented two witnesses to testify regarding the ASME survey and resurvey for the Brown & Root QA Program for Comanche Peak, Raymond J. Vurpillat and Roger F. Reedy. Mr. Vurpillat is the Power Group Quality Assurance Manager for Brown & Root, Inc. (Applicants' Exhibit 45 at 1.) Mr. Reedy is an engineering consultant with extensive experience in ASME Code application (Applicants' Exhibit 46). The Board considers both to be experts on the ASME Code by virtue of their educations and professional backgrounds. CASE witness Charles A. Atchison testified with respect to some matters regarding the ASME Survey (CASE Exhibit 650 at 35-36). The Board considers Mr. Atchison to be a layperson regarding the ASME Code. The record on this issue demonstrates that the ASME Code work performed by Brown & Root at Comanche Peak satisfied applicable ASME Code requirements. In addition, the concerns identified by the ASME Survey Team regarding the Brown & Root QA Program were insignificant or proper corrective action was taken by Brown & Root to assure safety issues were satisfactorily resolved.

134. The ASME establishes a set of engineering safety standards known as the ASME Boiler and Pressure Vessel Code. Section III of that Code, known as the ASME Nuclear Code, provides rules for the design and construction of pressure vessels, piping systems, pumps, valves, storage tanks, component

supports and core support structures used in nuclear power plants. (Applicants' Exhibit 46 at 2.) NRC regulations, 10 C.F.R. §50.55a, require that to the maximum extent practical the systems and components for nuclear plants be designed, fabricated, installed, tested and inspected in accordance with recognized codes and standards, such as the requirements of the ASME Nuclear Code.

135. All work performed pursuant to the ASME Nuclear Code must be certified by an ASME Certificate Holder as complying with the requirements of the Code. The Certificate Holder is authorized to stamp items subject to the ASME Code with an ASME Code Symbol Stamp following completion of the work being performed. These Certificates and Stamps are issued only upon satisfactory demonstration to the ASME that an acceptable QA Program exists and is being properly implemented. (Applicants' Exhibit 46 at 3-4.)

136. Before ASME will issue applicable Certificates and Stamps, an ASME Survey Team must review the facilities and programs of the organization performing Code work to assure that its QA Manual and related controlling procedures comply with the requirements of the ASME Nuclear Code. Upon satisfactory completion of the survey and upon the recommendation of the Survey Team, with the concurrence of the ASME Subcommittee on Nuclear Accreditation, the Certificates and Stamps will be

issued. The Certificates authorizing use of the Code Symbol Stamps are valid for a period of three years. (Applicants' Exhibit 46 at 4-5.)

137. Brown & Root is the holder of Certificates of Authorization for ASME Code work performed at the Comanche Peak facility. The Certificates then held by Brown & Root were valid until January 8, 1982. (Applicants' Exhibit 46 at 8.) It is the responsibility of the Certificate Holder to request a survey prior to the expiration of Certificates to assure satisfactory completion of the survey and a resurvey, if necessary (Tr. 2054). Brown & Root originally requested a survey for Comanche Peak, and other sites at which it held Certificates, in May, 1981. ASME scheduled surveys for the Comanche Peak site and for the other sites for one week in August 1981. Surveys at two sites were completed during that week, but the Comanche Peak survey was rescheduled for October. (Tr. 2056-57.) The survey conducted in October, 1981 resulted in several findings which required resolution prior to ASME's reauthorization of Brown & Root's Certificates for Comanche Peak. Resolution of these findings required a resurvey. ASME was unable to schedule the resurvey until January 18-20, 1982, which was after the Brown & Root Certificates had lapsed. (Applicants' Exhibit 45.) The Certificates were reissued by the ASME Accreditation Committee on March 15, 1982, after evaluation of the results of the January resurvey (Applicants' Exhibit 46 at 8; Tr. 2059).

138. The findings of the ASME survey team in the October, 1981, survey concerned both the Brown & Root QA Manual and its implementation. There were six findings with respect to the Manual and seven findings with respect to the implementation of that Manual. (Applicants' Exhibit 45A.) The specific findings were addressed by Applicants' witnesses, and their conclusions were not disputed.

139. The first finding with respect to the Manual was that it was vague and failed to establish required controls (Applicants' Exhibit 45A at 1). The ASME code requires that a QA manual describe the essential controls of the QA system. The Code permits the QA manual to be supplemented by procedures. (Applicants' Exhibit 46 at 10.) The QA Manual which was reviewed by the ASME survey team had been revised by Brown & Root before the survey. These revisions had been approved by the Authorized Nuclear Inspector ("ANI")[8] for Comanche Peak at the time they were made. (Applicants' Exhibit 45 at 3.) The result of these revisions was to remove from the Manual and place in implementing procedures some procedural detail (Tr. 1892). This finding was corrected by a revision to the QA Manual to reincorporate the details which had been placed in the procedures. Because the essential control features were still a part of the total Brown &

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8 The ANI is a representative of a third-party organization (Authorized Inspection Agency) which has an independent concern for the safe construction of the project (Tr. 2124-26). The ANI for Brown & Root ASME Code work at Comanche Peak is a representative of and is paid by Hartford Steam Boiler Inspection Company (Tr. 2127-28).

Root QA Program, the technical requirements of the ASME Code were met during this period. (Applicants' Exhibits 45 at 3; 46 at 13.) Quality of Code work was not affected by the revisions to the QA Manual.

140. The ASME Survey Team also found that certain ASME Code provisions used by Brown & Root were from later Code Addenda than the Addenda specified in the Manual for the work being performed. Brown & Root responded to this finding by demonstrating to the ASME that the required details concerning use of these later Addenda paragraphs were documented in appropriate design documents. (Applicants' Exhibit 45 at 4, 45A at 1.) This response demonstrates satisfaction of the technical requirements of the ASME Code (Applicants' Exhibit 46 at 14).

141. The ASME Survey Team found that the manual control system did not contain certain exhibits (Applicants' Exhibit 45A at 1). The appropriate control documents were, however, contained in implementing procedures. QA Manual approval and transmittal were, in fact, performed in accordance with the program as detailed in those procedures. (Applicants' Exhibit 45 at 4.) This approach did not adversely affect the QA Program, and thus the technical requirements of the Code were satisfied (Applicants' Exhibit 46 at 15). Brown & Root subsequentely added the exhibits to the Manual (Applicants' Exhibit 45 at 4).

142. The ASME Survey Team found that program elements of process control, non-conformity and document control required changes (Applicants' Exhibit 45A at 1). These elements of

control were, in fact, part of the Brown & Root QA Program as implementing procedures rather than in the QA Manual (Applicants' Exhibit 45 at 5). This situation does not adversely reflect on the implementation of any QA functions by Brown & Root (Applicants' Exhibit 46 at 15). The revision to the Manual to include these procedures satisfies the technical requirements of the Code (Applicants' Exhibit 46 at 16).

143. The ASME Survey Team found that design control elements were missing from the Manual (Applicants' Exhibit 45A at 1). This information had been contained in implementing procedures. These procedures were incorporated into the QA Manual and were accepted without change. (Applicants' Exhibit 45 at 5.) Accordingly, the technical requirements of the Code were satisfied (Applicants' Exhibit 46 at 16).

144. The ASME Survey Team found that elements of control had not been included in the QA Manual in sufficient detail (Applicants' Exhibits 45A at 2, 45 at 6, and 46 at 17). The QA Manual was revised to incorporate into the Manual the specific details of controlling work from the implementing procedures (Applicants' Exhibit 45 at 6). This finding did not signify improper implementation of any QA function by Brown & Root at Comanche Peak (Applicants' Exhibit 46 at 17).

145. The ASME Code requires that specific requirements of the QA Manual be verified by the Survey Team as having been adequately implemented (Applicants' Exhibit 46 at 17). The survey team made certain findings with respect to the

implementation of the QA Manual (Applicants' Exhibit 45A at 2-3).

146. The ASME Survey Team found that the QA Department file custodian had not properly maintained the design change log (Applicants' Exhibit 45A at 2). This finding involved the logging of completed document packages. The packages were not being used for field work but were strictly for records purposes. (Applicants' Exhibit 45 at 6.) CASE witness Atchison believed these documents were being used in the field (CASE Exhibit 650 at 36). The file custodian had not completed the review of these documents at the time of the ASME Survey, and the finding involved the timeliness of the review by the file custodian rather than the proper maintenance of these records. The document control center supervisor subsequently re-indoctrinated file custodians on the requirements of file maintenance, including the timeliness of review. (Applicants' Exhibit 45 at 7.) This finding does not involve any violation of the technical requirements of the ASME Code (Applicants' Exhibit 46 at 19).

147. The ASME Survey Team found that a construction procedure regarding the establishment of hold points for the ANI was in conflict with the QA Manual and Code (Applicants' Exhibit 45A at 2). The ASME Code requires that hold points on Code activities be established by the ANI (Applicants' Exhibit 46 at 20). This finding arose from a situation in which a particular paragraph in the procedures implied that the ANI was not establishing hold points as required by the Code (Tr. 1894).

However, the ANI had established hold points as he felt necessary, although the procedure did not accurately describe that hold point system. Therefore, the technical requirements of the Code were satisfied with regard to the ANI's establishment of hold points. (Applicants' Exhibit 46 at 20.)

148. The ASME Survey Team found that Brown & Root had procured material fabricated into a configuration for which the vendor had not been approved (Applicants' Exhibit 45A at 2). Brown & Root subsequently conducted a review of the procedures employed by the vendor for forming the materials. This review demonstrated that the vendor had in fact performed these processes in an acceptable manner. Brown & Root then identified the vendor on the approved suppliers list as being qualified to provide the formed material. Brown & Root took appropriate measures to assure that all requisitioned items or services were within the scope of the applicable supplier's approval prior to purchase order approval. (Applicants' Exhibit 45 at 9.) Because the procedures employed by the vendor were in fact properly qualified, and it was demonstrated that the procedure did not adversely affect the supplied material, there was no violation of ASME Code technical requirements (Applicants' Exhibit 46 at 21).

149. The ASME Survey Team also found that the material supplied by the same vendor had not been properly receipt inspected and marked with applicable heat numbers when the material was divided (Applicants' Exhibit 45A at 2). This

concern arose because of a misunderstanding by the Survey Team of the method used to place identifying heat numbers on material. Nonetheless, Brown & Root issued an NCR to cover all such items to verify the correctness of heat codes marked on the materials. In addition revised procedures were drawn up and implemented to require verification of the transfer of heat markings to divided material. (Applicants' Exhibit 45 at 10.) The reverification of the correctness of material identification assured proper material traceability and demonstrated that the requirements of the ASME Code had been met (Applicants' Exhibit 46 at 22).

150. The ASME Survey Team found that certain process sheets had not been reviewed by the ANI for establishment of hold points (Applicants' Exhibit 45A at 2). This finding arose because of a difference of opinion between succeeding ANI's regarding the review of process sheets to establish hold points. The first ANI on site did not wish to review all process sheets for pipe hangers, while a subsequent ANI wished to establish hold points on all process sheets. In response to this finding, Brown & Root now routes all process sheets through the ANI for establishment of hold points prior to issuance and the ANI has reviewed all documentation packages issued but not yet complete to establish hold points as desired. In addition, documentation packages which had been completed are reviewed by the ANI prior to certification of the items being certified. (Applicants' Exhibit

45 at 11-12.) In any event, because each ANI had inspected work as he felt necessary, the ASME Code requirements were satisfied (Applicants' Exhibit 46 at 24).

151. The ASME Survey Team was concerned that a welding procedure qualification record did not satisfactorily address the heat input of a welding procedure specification governing weld travel speed and, therefore, was not a qualification for the worst case conditions (Applicants' Exhibits 45A at 2, 45 at 12). This concern was resolved by subsequent additional procedure qualifications which tested all worst case heat input conditions for welding by the subject procedure (Applicants' Exhibit 46 at 24; Tr. 1901-03). In addition, all similar welding procedure qualification records were reviewed for adequacy (Applicants' Exhibit 45 at 13). The welding qualification measures performed by Brown & Root subsequent to the survey assures that Code requirements have been satisifed for welding performed under the subject procedure (Applicants' Exhibit 46 at 25).

152. The ASME Survey Team found that insufficient consideration had been given to heat input on a spool piece which was rewelded (Applicants' Exhibit 45A at 3). This finding arose because of confusion on the part of the Survey Team regarding the welding reviewed by the Welding Engineer. In this instance, the Welding Engineer had, in fact, reviewed the reworking of this material and considered the heat input effects of rewelding on that material. (Applicants' Exhibit 45 at 14.) In addition, the material referenced by the ASME Survey Team was of a type that

did not require evaluation of heat input. Accordingly, Applicants satisfied applicable ASME Code requirements regarding this matter. (Applicants' Exhibit 46 at 26.)

153. The ASME Survey Team found that Brown & Root had refabricated certain component supports by removing welds and fabricating other components with the material without having necessary certificates of compliance for the material (Applicants' Exhibit 45A at 3). Brown & Root resolved this finding by requiring that all documentation for material and component supports for which such refabrication occurred be transmitted to the site by the component support manufacturer. Brown & Root reviewed all material certifications to assure acceptablity of the documentation and the materials supplied. For new fabrication or modification, salvaged materials were inspected and released in accordance with applicable procedures and documented in appropriate inspection reports. (Applicants' Exhibit 45 at 15-16.) No component was stamped or data certified prior to the completion of this above review (Tr. 2060). The measures undertaken by Brown & Root in response to this finding demonstrate satisfaction of Code requirements regarding material documentation (Applicants' Exhibit 46 at 27).

154. The ASME Survey Team found that ANI hold points on process sheets had been bypassed on occasions (Applicants' Exhibit 45A at 3). The ASME Code provides that while ANI hold points should not be bypassed, the ANI may still make required inspections at a later point, place new hold points or require

work to be reperformed in order to witness whatever work he feels is required (Applicants' Exhibit 46 at 27). In response to this finding, Brown & Root documented all missed hold points on NCRs for resolution and resolved those NCRs, including ANI concurrence (Applicants' Exhibit 45 at 16). The concurrence of the ANI with the disposition of the NCRs signifies acknowledgement that the ANI is satisfied that Code requirements have been met (Applicants' Exhibit 46 at 27). To prevent recurrence of this situation, Brown & Root designated personnel in its own organization to be responsible for coordinating ANI activities and assuring that any concerns are timely resolved or brought to the attention of management for resolution (Applicants' Exhibit 45 at 17). There were no violations of the technical requirements of the Code (Applicants' Exhibit 46 at 28).

155. The ASME Survey Team conducted a resurvey of the Brown & Root QA Program for Comanche Peak on January 18-20, 1982. The Survey Team recommended renewal of the Certificates of Authorization upon completion of responses to three items and approval of those items by the ANI Supervisor. (Applicants' Exhibit 45 at 17.) The ANI Supervisor approved the responses on February 8, 1982 (Applicants' Exhibit 45B).

156. The first finding of the Survey Team at the resurvey involved a material supplier who had been surveyed and qualified by Brown & Root but had supplied materials which had been procured from other material suppliers which were not properly qualified. In response to this finding, Brown & Root restricted

the sources from which the subject material supplier could procure ASME materials for use by Brown & Root at Comanche Peak. This restriction remained in force until the material supplier was able to assure that all materials supplied to Brown & Root at Comanche Peak for ASME work were properly qualified. In addition, Brown & Root reviewed all documentation associated with that supplier and identified one material supplier who was not qualified. (Applicants' Exhibit 45 at 18.) The disposition of that material was approved by the ANI (Applicants' Exhibits 45 at 19; 45B at 1-2).

157. The Survey Team's second finding at the resurvey concerned a supplier of ASME Code items who was not listed on Brown & Root's approved suppliers list. Brown & Root subsequently reviewed its current suppliers of ASME Code items to assure that all suppliers were on the approved suppliers list. Brown & Root verified that all suppliers of Code items, including the supplier identified by the ASME Survey Team, held valid certificates of authorization. (Applicants' Exhibit 45 at 19.)

158. The third finding made by the ASME Survey Team at the resurvey involved welding material which had been receipt inspected and accepted by Brown & Root but not properly marked as so received. In response, Brown & Root reviewed all welding material on site to assure proper identification, segregated and scrapped the particular material identified by the Survey Team

and retrained all receiving inspectors in the proper use of receiving procedures and material identification requirements. (Applicants' Exhibit 45 at 20.)

159. The resolution of the matters raised by the ASME Survey Team at the resurvey, as evidenced by the ANI Supervisor's acceptance of that resolution, demonstrates satisfaction of the technical requirements of the ASME Code. The resolution demonstrates that there is no concern that work performed prior to or since that time in those areas does not meet Code standards. (Applicants' Exhibit 46 at 29.) In addition, the Survey Team leader returned to Comanche Peak on May 7, 1982, and verified that the three items have been satisfactorily resolved (Id.; Applicants' Exhibit 64).

160. Work performed during a lapse in the Certificates of Authorization, as occurred at Comanche Peak following expiration of the Brown & Root certificates on January 8, 1982 and prior to their reissuance on March 15, 1982, is treated by the ASME as work performed by a contractor prior to an initial ASME survey and certification (Applicants' Exhibit 46 at 8). ASME Code work performed in such circumstances is permitted by the ASME Code upon agreement with an Authorized Inspection Agency for providing inspection services and acceptance by that agency of the organization's QA manual. ASME Code work may proceed during this period, although no final approval of that work occurs until a valid Certificate of Authorization is in effect. The work

performed by Brown & Root during the period that its Certificates had lapsed satisifed these conditions. (Tr. 2051; Applicants' Exhibit 46 at 7-8.)

161. The Board finds that Brown & Root satisfactorily demonstrated, pursuant to the requirements of the ASME Code, that any Code work it performed at the Comanche Peak site, which was the subject of the ASME survey and resurvey, fully satisfied applicable ASME Code requirements. Specifically, Brown & Root demonstrated to the proper authorities implementation of an appropriate QA program for ASME Code work completed at Comanche Peak up to the present time. (Applicants' Exhibit 46 at 29.) The Board also finds that the results of the ASME survey and resurvey do not indicate that programmatic problems existed in the Brown & Root QA program or that the quality of the Code work performed by Brown & Root is deficient. Applicants' explanation of the events surrounding the survey and resurvey, and the actions taken by Brown & Root to rectify the concerns of the Survey Team, was forthright and complete. CASE presented no evidence that would support the conclusion that the ASME survey and resurvey surfaced significant problems that led to deficient construction practices.

10. Management Review of TUGCO QA Program

162. In 1981, Applicants' commissioned a management review of the TUGCO QA Program by an independent consultant, Mr. Frederick B. Lobbin (Tr. 2155-56). That consultant submitted a report in February 1982, which presented a number of findings

regarding the QA Program and recommendations regarding areas in which the consultant believed the program could be improved (Applicants' Exhibit 48).

163. Applicants presented a panel of witnesses to testify regarding the purpose of the review, its findings and TUGCO's response to those findings. Mr. B. R. Clements, Vice President, Nuclear, for TUGCO, presented prefiled testimony on the management review (Applicants' Exhibit 118). Applicants also called Mr. Lobbin who also presented prefiled testimony (Applicants' Exhibit 119). In addition, Applicants called Mr. David N. Chapman, the Manager, Quality Assurance for TUGCO and Mr. Antonio Vega, the Supervisor of Quality Assurance Services for TUGCO, as part of the witness panel.

164. Mr. Clements is the corporate officer responsible for assuring implementation of the QA Program for the design, construction and operation of Comanche Peak (Applicants' Exhibit 118 at 1-2). Mr. Clements initiated the review of the TUGCO QA program to provide to Applicants' management an independent assessment of the effectiveness and implementation of management controls and activities within the TUGCO QA organization, with primary emphasis on the TUGCO QA Audit Group, and to identify any areas that might require further management evaluation. The report was self-initiated, and was not commissioned in response to any regulatory requirement or commitment. (Applicants' Exhibit 118 at 2-3.)

165. The management controls which were the subject of Mr. Lobbin's review included utilization of resources, timeliness of the resolution of deficiencies, establishment of programmatic priorities, and staffing levels and qualifications. Specifically, because the project was approaching the phase where construction, turnover, start-up testing and preoperational testing activities were being performed simultaneously, the review was commissioned to provide an independent assessment of the need for further investigation into those areas beyond measures already taken to increase QA audit activity and auditor manpower authorizations. (Applicants' Exhibit 118 at 3-4.)

166. The scope of the review was limited to the effectiveness and implementation of management controls within the TUGCO QA organization. The review did not evaluate the effectiveness and implementation of the QA program for TUGCO's prime contractors, such as Gibbs & Hill, the architect/engineer, and Brown & Root, the constructor. The review was not an audit in the sense of verifying compliance with specified aspects of the QA program. (Applicants' Exhibit 118 at 3-4; Applicants' Exhibit 119 at 2.) The review was specifically a management evaluation to identify areas where the effectiveness of the TUGCO QA Department could be improved. The conclusions in the review were based primarily on personal judgment and experience of the reviewer, Mr. Lobbin. (Applicants' Exhibit 119 at 2-3.)

167. The methodology employed by the reviewer was described as "Directed Self-Evaluation." Specifically, the reviewer sought to identify key areas which had possible weaknesses during the limited time available for the review. The management of the evaluated organization was to further examine those areas. This process forces the organization to evaluate itself in areas which might otherwise not have been examined. (Applicants' Exhibit 119 at 3; Tr. 2182.)

168. The evaluation involved the review of QA Department records, including audit reports, procedures and personnel records, and interviews with a number of QA Department personnel. The time directly spent by Mr. Lobbin in these reviews and interviews was less than 60 hours. He was not involved in the subsequent evaluation by the QA Department in response to the findings in the report. (Applicants' Exhibit 119 at 4.)

169. In response to the findings in the report, Mr. Clements directed the TUGCO QA organization to review the report and prepare a response (Applicants' Exhibit 118 at 5). Each item in the report was evaluated in depth and the results were presented in a response document (Applicants' Exhibit 49). Where actions were deemed necessary in response to the findings of the report, a description of proposed actions and an implementation schedule were presented. In addition, where actions in response to particular findings were already in progress, the status of those actions was described. (Applicants' Exhibit 118 at 5.)

Mr. Clements also directed that a quarterly report be prepared providing updated information regarding the response to the report (Applicants' Exhibit 50).

170. Mr. Lobbin's report disclosed no significant breakdown in any portion of the QA program for design or construction of Comanche Peak. Mr. Lobbin did not find any failure to comply with any regulatory requirement or commitment. (Applicants' Exhibit 119 at 5; Applicants' Exhibit 48 at 2.) He did raise certain questions designed to stimulate TUGCO to closely evaluate certain aspects of its QA Program. He stated that some of his observations were overly-critical and conservative because of his desire to stimulate, and that he would have been more careful and precise had he known that the report was to be aired publicly (Tr. 2167-72).

171. Mr. Lobbin suggested that the level of experience within the TUGCO QA Organization, in particular with respect to commercial nuclear plant design and construction QA experience, was low (Applicants' Exhibit 48 at 2). This finding was based on the reviewer's personal opinion regarding the level of experience preferred at the later stages of the project so as to include personnel who had previous experience in such activities as start-up. The personnnel reviewed were, however, properly qualified in all respects, including requirements for experience. (Tr. 2165.) In addition, Mr. Lobbin did not consider TUGCO's use of consultant expertise in supplementing their staff, including the personnel of contractors such as Gibbs & Hill and Brown &

Root whose personnel also performed QA functions. Mr. Lobbin did not find that the QA staff at Comanche Peak was either too small or too inexperienced to monitor properly potential safety problems in design and construction. (Applicants' Exhibit 119 at 6.)

172. Mr. Lobbin recommended that the number of audits should be increased, especially audits of site engineering and construction activities (Applicants' Exhibit 48 at 2). This statement was based on a comparison of audits performed at another nuclear project with which the reviewer had some prior association. While the reviewer believed there may be a number of reasons for the difference in number of audits performed for one project versus another, this recommendation was intended to stimulate the TUGCO QA Department to evaluate its audit program to assure that a satisfactory level of audit activity was being maintained. (Applicants' Exhibit 119 at 7; Tr. 2167.) Mr. Lobbin considered the audits which had been performed to be excellent but believed additional efforts should be made to reach a point of "diminishing returns" where additional audits would not be effective (Tr. 2168-69, 2187). In addition, Applicants audit all activities relevant to a particular system and document that audit as a single process, including all reaudits of the same facility within the same audit number. Mr. Lobbin did not consider this aspect in his report. Other facilities may include those separate activities as separate audit numbers thereby suggesting a greater level of audit activity. (Tr. 2189-90.)

Applicants conducted an informal survey of the industry and found that the number of audits at Comanche Peak was consistent with that at other facilities (Tr. 2179). In addition, Mr. Lobbin did not consider the hundreds of QA audits performed by Applicants' architect/engineer (Tr. 2191).

173. Mr. Lobbin also included in his report observations and recommendations regarding surveillances (Applicants' Exhibit 48 at 2-3). Surveillances are not required by 10 C.F.R. Part 50, Appendix B (Applicants' Exhibit 119 at 7). Applicants employ the surveillance function to identify areas in the field which may warrant audits (Tr. 2177). The purpose of Mr. Lobbin's comments was to identify certain aspects of the surveillance program which could be improved to assure that the TUGCO QA organization would evaluate its surveillance program (Applicants' Exhibit 119 at 8).

174. Applicants did not find it necessary to implement any programatic changes as a result of the report. Nonetheless, there were measures taken, some of which had already been initiated by TUGCO itself at the time the report was made. Specifically, Applicants began to obtain greater input from project personnel in establishing audit schedules, reassigned personnel working in the surveillance area into areas more consistent with their backgrounds, identifying in audits the areas which were found to be satisfactory in addition to the practice of identifying those that were not, and increased audit staffing (a measure which had been undertaken prior to the review). (Tr. 599, 2178-2181; Applicants' Exhibits 49, 50.)

175. Although many findings were made by Mr. Lobbin in his report, at no time did he find or believe that the QA staff at Comanche Peak was too small or too inexperienced to monitor properly potential safety problems in design and construction or that it was necessary that Applicants go back and verify the adequacy of any product or any work done prior to his evaluation (Applicants' Exhibit 119 at 6, 8-9, Tr. 2184-85). In addition, Mr. Lobbin found that the attitude of the people in the Quality Assurance Program and the atmosphere in which they performed their work were probably at the top of any program he had seen (Tr. 2186)

176. The Board finds, on balance, that the Lobbin Report reflects favorably on the TUGCO QA program. Some of his criticisms were based upon mistaken or partial information. Others were designed to stimulate management to scrutinize the QA program, but were not necessarily reflective of Mr. Lobbin's actual views. In any event, the Applicants were responsive to the report. The Board commends the Applicants for their initiative in conducting such self-evaluations. This attitude of TUGCO management reflects a strong desire to improve the QA program, and a willingness to be subjected to self-generated criticism to the end that the overall quality of the project is enhanced.

11. Allegations

177. Applicants presented testimony from a panel of

witnesses to respond to two allegations raised by CASE witnesses and which had been the subject of NRC I&E Reports. This panel consisted of Mr. David N. Chapman, TUGCO Quality Assurance Manager (Applicants' Exhibit 123); Mr. Ronald G. Tolson, the TUGCO Site Quality Assurance Supervisor (Applicants' Exhibit 122); Mr. John T. Merrit, Jr., Engineering and Construction Manager for Comanche Peak (Applicants' Exhibit 127); Mr. Kenneth L. Scheppele, Senior Vice President of Gibbs & Hill (Applicants' Exhibit 128); Mr. Albert H. Boren, TUGCO Vendor Compliance Supervisor (Applicants' Exhibit 124); and Mr. Richard C. Barber, the former Project Welding Engineer for Comanche Peak and present Regional QC Supervisor at Comanche Peak for a subsidiary of Gibbs & Hill, the architect/engineer for Comanche Peak (Applicants' Exhibit 125). These two allegations concerned (1) welding on pipe whip restraints manufactured by Chicago Bridge & Iron ("CB&I") (CASE Exhibit 650 at 39-43), and (2), the modification of shims placed in the girder support brackets for the polar crane rail (CASE Exhibit 655 at 15-25).

a. Chicago Bridge & Iron Pipe Restraints

178. CASE witness Charles Atchison testified as to what he believed to be defects in welds of pipe whip and moment restraints manufactured by CB&I. The substance of Mr. Atchison's allegations was that welds on those restraints did not satisfy American Welding Society ("AWS") Standard AWS D1.1. Mr. Atchison stated his view that the dispostion of the alleged defects, as

reported on an NCR he prepared, was unsatisfactory and that other restraints from the same manufacturer were not reinspected. (CASE Exhibit 650 at 39-41.)

179. A moment restraint is a large steel structure intended to restrain a pipe subjected to bending moments arising from lateral forces on the pipe, from whatever source. A pipe whip restraint is intended to restrain the pipe in the event of a pipe rupture. (Tr. 2245-46.)

180. In July, 1980, a routine audit/source inspection by Brown & Root QA at the CB&I facility in Salt Lake City, Utah detected an apparent violation of non-destructive examination ("NDE") procedures. The findings by the auditor involved surface conditions of some welds on moment restraints being unacceptable for proper interpretation of NDE processes such as magnetic particle examination. (Applicants' Exhibit 122 at 2.) The NRC investigated the matter and documented the results of its investigation in NRC I&E Report 80-20 (Applicants' Exhibit 44A). The NRC found that the apparent violation of NDE procedures was an infraction, and issued a notice of violation to that effect. The NRC found that four of the moment limiting restraints inspected revealed surface conditions considered by the NRC to render the NDE results unacceptable. (Applicants' Exhibit 122B.)

181. Applicants identified all moment limiting restraints received at the site on the relevant purchase order through the date of I&E Report 80-20 as potentially non-conforming

(Applicants' Exhibits 122 at 3; 122C; Tr. 2257). All restraints were reinspected for conformance with specified requirements, and rework of relevant welding indications was effected to achieve full compliance with these requirements. In addition, personnel were assigned to Salt Lake City to perform in-process and release inspections of shipments from CB&I. (Applicants' Exhibits 122 at 3; 125 at 4.) Further, QA personnel examined the welding of restraints which had been returned to CB&I and had been reworked to determine whether the restraints were properly prepared for NDE and whether the potential non-conforming conditions were eliminated. The restraints were satisfactorily reworked and inspected to assure acceptability in compliance with ASME Section III, Subsection NF. (Applicants' Exhibit 125 at 4-5.) All reinspection and rework on this matter has been accomplished (Applicants' Exhibit 122 at 3; Tr. 2259), and the NRC closed the infraction raised by I&E Report 80-20 in I&E Report 80-23 (Applicants' Exhibit 61).

182. In March, 1982, a shipment of pipe whip restraints for Unit 2 was received at Comanche Peak and released to construction for installation. Following sandblasting and application of a light protective coating, construction personnel expressed concern to Mr. Atchison, then a Comanche Peak QC Inspector, that certain welds on the restraints might not conform fully to the accept/reject criteria in AWS D1.1. Mr. Atchison reinspected four of the restraint assemblies, marked areas on the assemblies that he considered to be rejectable indications, was directed to

document the inspection results in an NCR, and did so on NCR No. M-82-0296, Rev. 0. (Applicants' Exhibit 122 at 3-4; Applicants' Exhibits 122D, 122 F-L; CASE Exhibit 650 at 41.) Following identification of the indications, CB&I advised Applicants that the design drawing for those restraints permitted the fabrication either to the requirements of Subsection NF of the ASME Code, Section III, Division 1 or to the requirements of AWS D1.1, which was utilized by the QC Inspector. The fabricator advised that it had fabricated the structures to Subsection NF of the ASME Code. (Applicants' Exhibit 122 at 4.) Reinspection of the assemblies in accordance with Subsection NF was accomplished by the Lead QC Inspector of the responsible QC group, and the initial NCR was revised and reissued (Applicants' Exhibit 122E.)

183. Upon reinspection of the restraints, Applicants determined that most of the marked indications were clearly acceptable and should not have been designated as non-conforming. Overall, the reinspection found that the welding was acceptable and that the inspection by Mr. Atchison had been performed to some unknown, arbitrary criteria. (Applicants' Exhibit 124 at 3; Tr. 2217, 2234.) Applicants determined that only a small percentage of the items marked by Atchison as being rejectable indications could be properly defined as relevant indications. These indications were generally scattered and did not exceed 1/2 inch in length. The total cumulative length of these indications was less than one per cent of the total welding. At least 75 per cent of the indications were improperly marked by Atchison.

(Applicants' Exhibit 125 at 6.) Had the AWS D1.1 criteria been applied properly, most of the marked indications would have been acceptable (Tr. 2284). There are no other standards besides ASME and AWS that could have been used by the inspector (Tr. 2296, 2301).

184. With respect to the relevant weld indications that were noted, Applicants took several corrective measures. From March 29 through April 2, 1982, Applicants' inspectors were at CB&I to inspect restraints and meet with CB&I Management. During the inspection a number of restraints were discovered with relevant weld indications. Consequently, modified inspection practices were instituted whereby Applicants' inspectors would simply reject restraints on which unacceptable welding was identified, rather than provide detailed inspection reports to CB&I as to why restraints were rejected. The effect of this action was to force CB&I to perform more thorough inspections prior to requesting a release inspection from TUGCO. (Applicants' Exhibit 124 at 3.) Thus, Applicants' QA organization took escalated actions to assure adequate resolution of this matter (Tr. 2282).

185. In early May, 1982, Applicants' QA Manager called the president of CB&I and requested that he direct personal attention to improving the inspection effectiveness in the Salt Lake City facility. Subsequently a meeting was held with CB&I upper management at the Comanche Peak site, as is commonly done to resolve such concerns with vendors. (Applicants' Exhibit 123 at

3; Tr. 2237.) During this meeting it was decided that a Brown & Root welding specialist would be assigned full time to the CB&I shop in Salt Lake City for at least six weeks. In addition, Applicants conducted an inspection of a restraint at the Salt Lake City facility in the presence of a CB&I Inspector and directed its repair until all inspectors agreed that the restraint in the as-welded condition would pass the visual acceptance criteria of ASME Section III, Subsection NF. As further corrective action, it was agreed that CB&I would sandblast all welds prior to Applicants performing source release inspection, even though this is not required by ASME Section III, Subsection NF or the contract with CB&I. In addition, Applicants and CB&I informally agreed that the Applicants' inspector could select, at random, any weld area to be re-examined with the appropriate NDE procedures in the presence of the Applicants' inspector. These procedures remained in effect for ongoing inspections at CB&I. (Applicants' Exhibit 124 at 4-5.) These corrective measures resulted in a greatly improved quality of CB&I's product (Applicants' Exhibit 123 at 3).

186. Applicants also directed a complete re-inspection of the 52 restraint assemblies that had been received prior to or subsequent to the restraints previously documented on the NCR. These inspections revealed welding indications similar to the initial inspections but to a lesser degree. Following implementation of the corrective actions described above,

restraints received on-site were determined to be free of relevant indications and the re-inspection efforts at the site were therefore concluded. (Applicants' Exhibit 122 at 5.)

187. Applicants' architect/engineer concluded that there was sufficient design conservatism in the pipe restraints to offset weld indications that had been identified in the restraints, even assuming that the weld indications reflected actual deficiencies and even assuming (conservatively) that those deficiencies were not repaired. There are several bases for this conclusion. First, weld sizes are determined on the basis of the maximum load at any one point along the weld and welds are of uniform size throughout their length, even if not so required by calculated stresses. Second, fillet welds joining two right angle surfaces are generally oversized. Calculations indicate a minimum reserve capacity of five per cent in the fillet welds, and for most weldments the reserve capacity is larger. Third, since the minimum yield strengths for full penetration welds of all weld material exceeds the minimum yield strength of the base material (i.e., the materials being joined together), the joint strengths exceed the strength of the materials being joined. (Applicants' Exhibit 126 at 2.) The safety margin afforded for full penetration welds was fourteen per cent. Thus, even if the weld indications were actual deficiencies, there was sufficient margin to accommodate those deficiencies. (Tr. 2299-2300.) Accordingly, even had the above described indications gone

undetected, the safety function of the affected pipe whip restraints would not have been impaired (Applicants' Exhibit 126 at 3).

188. The Board finds that the performance of Applicants' QA Program in resolving the CB&I pipe whip restraint matter demonstrated the strong commitment to quality of Applicants' management. The QA organization took prompt and thorough action to identify and correct all non-conforming conditions and to remedy the unsatisfactory condition found to exist at the vendor's facility. On balance, this experience confirms the adequacy and responsiveness of the QA Program. Further, the record establishes that Applicants took appropriate action to assure that no technical problems remained uncorrected, and that no safety problem exists regarding these pipe restraints.

b. Polar Crane Girder Support Bracket Shims

189. CASE witness Stanley G. Miles presented testimony at the July 1982 hearings regarding the shims used in the polar crane girder support bracket assemblies. Shims are metal plates fabricated for insertion between two surfaces to maintain spacing or transfer load (Applicants' Exhibit 127 at 2). Mr. Miles stated that "finger" shims that did not conform to design drawings were inserted in the assemblies. He stated that central portions of some shims had been clipped to permit placement of the shim to the full depth of the assembly. Mr. Miles alleged that these modifications were unacceptable from an engineering and structural standpoint. (CASE Exhibit 655 at 17, 21.)

190. These activities entailed the insertion of shims between two vertical plates, one vertical plate attached to the polar crane girder and the other vertical plate attached to the support bracket assemblies. In assembling any complex structure such as the polar crane support girders, it is necessary to make allowance for variations in dimensions and locations within specified tolerances. The shims in question are utilized to provide a close fit between support girders and the connections to the containment wall following assembly of the polar crane support girders. Fitting a shim to this gap provides a means to account for slight variations in dimensions and locations. (Applicants' Exhibit 127 at 2.)

191. These shims are identified on the design drawing for the polar crane supports (Applicants' Exhibit 127A). As construction planning evolved, it became necessary to change the design for insertion of the shims. While the original design called for 1/4 inch shims, Applicants' site engineers determined that shims in addition to the 1/4 inch shim originally planned were necessary. (Applicants' Exhibit 127 at 3; Tr. 2276.) Accordingly, a design change was initiated in March of 1981 to add additional shims (Applicants' Exhibits 127H, 127I). Every assembly received a 1/4 inch shim initially, while additional shims, which were the subject of Mr. Miles testimony, were subsequently added to some of the assemblies (Applicants' Exhibit 127F; Tr. 2276, 2290)

192. The shims at issue here were employed in support brackets designed to transmit maximum horizontal loadings from the polar crane to the containment wall in the event of an earthquake. Other shims, such as those installed because of the tolerances in the brackets which support the polar crane during normal operation, are not at issue here. (Tr. 2306-06.)

193. Some of the shims were clipped such that the fingers did not extend to the full depth specified in applicable drawings. The fingers which were clipped included both outside and inside fingers. (Applicants' Exhibit 127 at 4-5; Tr. 2949; CASE Exhibit 655 at 17.) The shims on which only the central fingers had been clipped (with the outside fingers remaining full length) were not readily identifiable by visual inspection (Tr. 2279-80). There was no indication that construction personnel intended to hide the alterations or mislead inspectors as to those alterations, since many of the altered shims involved clipped outside fingers, and the shims had not yet been tack welded in place to prevent movement as required, both of those conditions being readily visible to the inspectors (Applicants' Exhibit 127 at 5; Tr. 2949).

194. At the time the altered shims were identified Applicants had not yet performed the inspections which were required prior to acceptance of these systems. The shims as installed would not have gone undetected or uninspected. (Applicants' Exhibit 127 at 5; Tr. 2268-69.) The Applicants' computerzied system for identifiying construction activities that

remain to be completed prior to QA/QC inspection showed that the installation of these shims was not to be completed until August 1, 1982. In addition, the Applicants' QA program requires an independent inspection of safety-related activities such as installation of the shims on the polar crane support assemblies. Construction personnel would have requested such inspection when installation activities were complete. Finally, a backup system is employed by Applicants to assure verification of compliance with specified design requirements. This procedure would have indicated that the installation of the shims had not been inspected, and appropriate measures would have to be taken for inspection by the QA/QC organization. (Applicants' Exhibits 122 at 6-7; 122M; 127 at 5.)

195. Had the QA Program had the time to function, the inspection that would have been performed after August 1 would have identified the modifications to the shims. Applicants' personnel would have prepared a detailed checklist to be completed during inspection of the shims which would have included, as a minimum, verification of compliance with the shim details. If the inspector could not have verified the adequacy of the installation (for example, because he could not visually inspect the bottom of the shim), it would have been classified as indeterminate and an NCR would be issued and dispositioned in accordance with established procedures. However, because the matter was raised in the July hearings, the QA Program had not yet inspected the work activities. Applicants' initial

inspection by visual examination identified six shim assemblies which did not contain complete shim plates. An NCR was issued for those assemblies and further inspections were required to be performed. (Applicants' Exhibit 122 at 8; Tr. 2280.)

196. In view of the initial inspection, Applicants developed a plan to remove all shims in the polar crane girder support bracket assemblies and inspect each for conformance to design specifications. The plan provided that all shims on which fingers were clipped were to be evaluated by Applicants' engineers and properly dispositioned. (Applicants' Exhibit 127 at 6.) These remedial actions will be performed following completion of certain construction activities. The inspections and remedial actions as necessary were to be performed for both units. (Tr. 2273-74.) When the remedial action is complete, a separate group will verify that all work has been done and all documentation requirements (including QA/QC records) have been satisfied before removing this item from the Applicants' computerized system (Applicants' Exhibit 127 at 6).

197. The function of the shims is to maintain contact or near contact between opposing vertical plates of the horizontal support brackets of the ring girders for the polar crane. That function may be accomplished through configurations other than the original design as long as contact or near contact is maintained between those vertical plates and sufficient bearing surface is available to transfer the maximum loads from the polar crane girder to the support brackets. These maximum loads occur

if the plant is in the operating mode and a safe shutdown earthquake occurs. The minimum area of the vertical plates which must be in contact to transfer adequately the calculated loads is less than 10 per cent of the vertical plate area. (Applicants' Exhibit 127 at 3.)

198. The Board finds that the fact that the modifications to the shims were not identified by the Applicants was a function merely of timing, not of any inadequacy of the QA/QC program. Applicants demonstrated that the QA/QC program has reliable, redundant measures that would have identified the inconsistencies, and would have led to correction of the matter by the construction and engineering organizations, had the QA/QC program been permitted to function in due course. (Applicants' Exhibit 122 at 6-9; Applicants' Exhibit 127 at 5-6.)

c. Sloppy Concrete Forms; Steel Liner Plate

199. CASE witness John Junior Gates presented testimony regarding several matters, but only two which were potentially significant, viz., sloppy form work for concrete pours and a misaligned steel liner plate. Mr. Gates' only area of expertise is carpentry work. He is not a professional engineer. His job at Comanche Peak involved setting forms for the pouring of concrete. Mr. Gates admitted that he was not qualified to judge and could not state that Comanche Peak was not safe. He also admitted he knew of no instance of work in which he participated where the end product was not of satisfactory quality. (CASE Exhibit 651 at 4-7, 33; Tr. 2777-78, 2885.)

200. Mr. Gates testified that a misalignment in the steel liner plate within the containment had not been corrected. Mr. Gates had never seen the liner plate personally, leading the Board to conclude that his testimony was based upon hearsay. Nevertheless, he believed that nothing was done to correct the problem. (CASE Exhibit 651 at 37; Tr. 2847-48.)

201. In oral rebuttal testimony, Applicants' witnesses testified that the liner plate, while originally out of alignment by approximately 4 inches in the first 20 feet of height, was within specification tolerances. Nevertheless, Applicants stopped work on installation of the liner plate for approximately three weeks. During this work stoppage the liner plate was corrected through realignment and the addition of stiffeners to the inside of the liner to bring it back in line. Installation of the liner plate continued following correction of the misalignment, and it was no longer out of alignment. The liner plate serves as the inside form for the 4 and 1/2 foot thick containment wall. The liner plate was straightened as described above before any concrete was placed, and it meets all applicable requirements, including the architect/engineer's specifications and American Concrete Institute placing tolerances for concrete. (Tr. 2992-99.) The Board finds that no valid concern was raised on this issue that would call into question the adequacy of the QA Program or the quality of construction. The Board notes that the Structural Integrity Test for the Unit 1 containment was

succcessfully completed in January 1983, demonstrating that the containment could withstand internal pressures exceeding its design bases (Applicants' Exhibit 155).

202. CASE witness Gates also testified that a photograph of the Comanche Peak containments (Board Exhibit 4) evidenced "sloppy" form work for the containment. Mr. Gates made no judgment as to the engineering significance of this matter. (CASE Exhibit 651 at 28; Tr. 2767.) Mr. Gates testified that he was able to determine that the form work was sloppy by examining the vertical wall line in a photograph of the containment structures (Board Exhibit 4). The Board finds that the witness was not credible, and his testimony in this regard was useless because no meaningful conclusion can be reached by examining the photograph. Mr. Gates stated that the maximum variation in the wall from vertical was about 3 inches for a wall which was approximately 5 feet thick (Tr. 2858).

203. Applicants' witness Ralph E. McGrane, the Assistant Chief Structural Engineer for Gibbs & Hill, testified in rebuttal to Mr. Gates' allegations. Mr. McGrane testified that he had observed no unusual problems or anomalies with regard to the containment walls. He considered the workmanship and quality of the structures to be similar to that of other containment buildings which he has observed. He also testified that even if the anomalies described by Mr. Gates were present, their size is of such small proportion to the thick walls of reinforced concrete that they would have no effect on the integrity of the

structure. (Tr. 2990-92.) The Board finds that no valid concern was raised on this issue that would call into question the adequacy of the QA Program or the quality of construction.

d. Records Availability; Downhill Welding; Use of PT Kits; Cable Lubricant; Restraint Bumpers; Cold Springing of Pipe; Inspector: Craft Ratio

204. CASE presented Mr. Charles A. Atchison as a witness regarding alleged defects in construction at Comanche Peak and failures in the QA/QC Program (CASE Exhibits 650, 656). Mr. Atchison claimed expertise only in areas relating to his job as a QC Inspector (Tr. 3209). Mr. Atchison had only approximately four months field experience as an inspector of welding (Tr. 3214-15), and was not familiar with provisions in the ASME Code regarding welding inspection (Tr. 3259-60). Mr. Atchison's veracity was challenged by Applicants. After initially claiming not to know why an education verification form from Tarrant County Junior College indicated "degree attained" (Tr. 3277), Mr. Atchison subsequently admitted to whiting out the word "no" in the phrase "no degree attained" so as to indicate he had obtained an Associates Degree when, in fact, he had not (Tr. 3340-41). This altered document had been submitted to Applicants with an application for employment (Tr. 3273; Compare Applicants' Exhibit 133 at page 7, and Applicants' Exhibit 137). Mr. Atchison also submitted an application for employment with Brown & Root in which he falsely stated that he had attained an Associates Degree (Applicants' Exhibit 132; Tr. 3270-71). When cross-examined on his specific education, Mr. Atchison admitted

that he had lied about that too. On his application to Brown & Root, Mr. Atchison represented that he had attained over 120 hours of credits at a junior college when in fact he had attained only 27 hours. When confronted with the discrepancy, Mr. Atchison simply stated that the 120 hour representation was merely "an approximation." (Tr. 3356-57.) Mr. Atchison advanced this same lie in prefiled sworn testimony in this proceeding (CASE Exhibit 650A at 2).

204A. The Board finds that Mr. Atchison is not a credible witness. His false testimony regarding his background and qualifications is found by the Board to be highly objectionable and totally inconsistent with the standards of candor that must obtain in NRC proceedings. Because a witness in NRC adjudicatory hearings testifies under oath, the Board normally attaches a presumption of truthfulness to such testimony, at least as to matters within the expertise of the witness. However, in the case of Mr. Atchison, his prevarications under oath destroyed that presumption of truthfulness. The fact that his prevarications involved his background and qualifications, and not technical issues, does not save the presumption in this case. If he testified falsely under oath regarding the former, how rationally can the Board, in its discretion and as the trier-of-fact, presume that he testified truthfully regarding the latter? Kennerly v. Aro, Inc., 447 F. Supp. 1083, 1089 (E. D. Tenn. 1977). If this were a civil trial in a court, Mr. Atchison's entire testimony would likely be afforded no weight, and possibly

stricken. However, in an NRC licensing case where implications of public health and safety are at stake, the tribunal must proceed with care, even when faced with a patently incredible witness. Thus, we address below each of Mr. Atchison's significant concerns, although we do not accept as true any of his statements absent independent verification in view of his demonstrated willingness to lie under oath and inability to discern truth from fiction.

The Board also finds that Mr. Atchison is not an expert in any field, including welding inspection. The Board comprises two technical members who are highly knowledgeable on matters of plant construction and nuclear safety and a lawyer who is highly experienced in trial practice, including the assessment and examination of witnesses. Thus, the Board has the technical and legal acumen to discern when a witness is knowledgeable and when he is not. It is primarily the technical acumen of the Board that we must draw upon to evaluate and make such judgments as to technical competency, a task that would be most difficult for other than an NRC tribunal to fulfill. The Board observed the demeanor of Mr. Atchison and of Applicants' witnesses who testified in response to Mr. Atchison. The Board found that Applicants' witness C. Thomas Brandt was highly qualified and an expert regarding welding and welding inspection. The Board found that Mr. Atchison was neither qualified nor an expert in these areas. As we discuss below, infra, Part II.A.12, Mr. Atchison's inability to comprehend and understand pertinent welding codes

led directly to Mr. Brandt's conclusion that Mr. Atchison was not competent as a welding inspector and to Mr. Atchison's transfer back to Brown & Root, from which he was then terminated.

205. In response to Mr. Atchison's allegations, Applicants presented a panel of witnesses with expertise and experience in each of the areas relevant to matters raised by Mr. Atchison. (Applicants' Exhibit 141.) The qualifications of these witnesses are set forth in Applicants' Exhibits 20 (Mr. Tolson), 40 (Mr. Vurpillat), 141A (Mr. Brandt), 141B (Mr. Purdy) and 141C (Mr. Smith). No evidence was presented nor information adduced on cross-examination which adversely reflected on the credibility or expertise of Applicants' witnesses, and the Board finds that they are experts in their respective fields.

Availability of Records to NRC Resident Inspector

206. Mr. Atchison testified that Applicants' personnel had violated site procedures and ANSI standards in obtaining certain plant permanent records from the record vault (CASE Exhibit 650 at 13; Tr. 3216). He submitted an NCR on this matter to Applicants' QA organization (CASE Exhibit 662). The alleged nonconformance involved certification files for electrical QC Inspectors which were made available by Applicants to the NRC Resident Inspector (Applicants' Exhibit 141 at 4-5).

207. Applicants are required to provide the NRC Resident Inspector with access to all records, including training records. In fact, no procedures were violated and no revisions to procedures were required to disposition this NCR. (Applicants'

Exhibit 141 at 5.) Mr. Atchison's allegation that the dispostion of the NCR required ANI approval is false (CASE Exhibits 650 at 14; 662; Tr. 3221; Applicants' Exhibit 141 at 5; Tr. 4516-19). Although ANI approval of NCR dispostions regarding ASME Code items is required, the subject matter of this NCR was the training files for electrical QC Inspectors, a non-ASME activity (Applicants' Exhibit 141 at 5).

Downhill Welding

208. Mr. Atchison alleged that a deficiency involving welding downhill in violation of AWS and ASME criteria was left uncorrected (CASE Exhibit 650 at 48). He subsequently contradicted his prefiled testimony and stated that such practice was not prohibited by AWS or ASME but by site Welding Procedure Specification 10046 (Tr. 3304-5). Mr. Atchison also did not know what welding technique had been utilized in the welding which was the subject of this allegation (Tr. 3376).

209. The fabrication code which is applicable to the welding of the pipe whip restraints which are the subject of this allegation is ASME Section III, Subsection NF. Specifically, ASME Section III, Subsection NF specifies that the qualification of welding procedures is specified in ASME Section IX. ASME Section IX permits downhill welding. (Applicants' Exhibit 141 at 22; Tr. 4602.)

210. The welding performed on the pipe whip restraints was performed pursuant to welding procedures of CB&I approved by Brown & Root for fabrication of pipe whip restraints. That

procedure (WPS-E7018-82105) states that vertical welds shall be made uphill except that the root and cover pass may be made either uphill or downhill. (Applicants' Exhibits 141, at 2; 141H.) Because the welding inspected by Mr. Atchison was only the cover pass, which is clearly permitted by procedures to be performed in either a downhill or uphill direction, the indication identified by Mr. Atchison is not a deficiency. The procedure referenced by Mr. Atchison (WPS-10046) is a Brown & Root welding procedure qualified in accordance with AWS D1.1. This procedure applies only to Brown & Root welding performed in accordance with that requirement and not to the welding by CB&I of the pipe whip restraints identified by Mr. Atchison. (Applicants' Exhibit 141 at 23; Tr. 4601.) Thus, Mr. Atchison obviously did not understand that the Brown & Root welding procedure did not govern work performed by CB&I.

Use of PT Kits

211. Mr. Atchison alleged that uncertified individuals were using a penetrant testing ("PT") kit to perform non-destructive examinations ("NDE") at Comanche Peak (CASE Exhibit 650 at 51; Tr. 3309). Mr. Atchison was referring to two individuals who borrowed his PT kit. These inspectors were not certified to perform PT at Comanche Peak. However, neither of these individuals had performed such testing and would have borrowed a PT kit only to obtain prerequisite training for certification. (Applicants' Exhibit 141 at 24-25; Tr. 4624-25.)

Cable Lubricant

212. Although he claimed no expertise in the field, Mr. Atchison expressed a concern regarding the flammability of a cable lubricant. He alleged that the laboratory tests conducted on the cable lubricant were inaccurate in that they did not properly simulate field conditions. (CASE Exhibit 650 at 55-56; Tr. 3327.) The cable lubricant in question tended to support combustion upon dehydration. An NCR was prepared regarding this concern (Applicants' Exhibit 141I) by Applicants' QA organization, and the matter was reported to the NRC as a potentially significant deficiency under 10 C.F.R. § 50.55(e). Subsequently, the lubricant was tested by a cable manufacturer in the dehydrated state with satisfactory results. The NRC Resident Inspector witnessed the test and the matter has been removed from the potential significant deficiency list. (Applicants' Exhibit 141 at 28.)

NPSI Pipe Whip Restraint Bumpers

213. Mr. Atchison alleged that NPSI pipe whip restraints became warped during welding (Tr. 3458). Mr. Atchison was apparantly referring to crushable bumpers provided by NPSI which attach to pipe whip restraint structures. These bumpers consist of a piece of plate, fillet welded to a piece of pipe, to provide a crushable structure to absorb impact loads in the event of a pipe whipping. The warpage to which Mr. Atchison referred is caused by and expected to occur in the welding process. However,

the warpage is within the acceptable limits established by the ASME Code and has absolutely no structural or safety significance. (Applicants' Exhibit 141 at 29.)

Cold Springing of Pipe

214. Mr. Atchison alleged that cold springing of pipe had occurred on the reactor coolant pump cooling coil (CASE Exhibit 650 at 63; Tr. 3330). The situation that Mr. Atchison described was documented in NCR M-3215SR1 (Applicants' Exhibit 141W). The piping was part of the component cooling water system, not the reactor coolant system as alleged by Mr. Atchison (Applicants' Exhibit 141 at 36).

215. The NCR written on this matter was dispositioned to require separation of the flanged connection, cutting out two welds, rewelding and then rejoining the flanges. The work has been completed and the NCR is closed. Mr. Atchison incorrectly indicated (CASE Exhibit 650 at 63) that the NCR was dispositioned "use-as-is" and that it was never submitted to QA/QC for "final buy-off." In addition, Mr. Atchison incorrectly stated (CASE Exhibit 650 at 63) that the NCR was submitted to Mr. Tolson, Applicants' Site QA Supervisor, and that he had no problem with it. Mr. Tolson is not routinely involved with disposition and subsequent "close-out" of Brown & Root NCRs, such as the NCR written on this matter. (Applicants' Exhibit 141, at 36-37.)

Inspector: Craft Ratio

216. Mr. Atchison alleged that as a QC inspector he was

responsible for covering the work of 200 craftsmen. CASE Exhibit 650 at 57. He approximated the ratio of the number of craft to inspectors at various times as 4,000 to 200 and 200 to one. Mr. Atchison's concern was that there were insufficient numbers of inspectors to review adequately work performed. (CASE Exhibit 650 at 43, 57; Tr. 3328.) Mr. Atchison obviously was not knowledgeable on this subject. In fact, the total number of QC Inspectors and craft workers in both safety and non-safety areas during the years 1979, 1980, 1981 and 1982 were approximately, as follows:

	Craft	QC Inspectors
1979	3,000	160
1980	2,900	140
1981	2,600	130
1982	2,750	240

All of the inspectors and no more than 75% of the craft personnel were involved in safety-related activities. The ratios of safety-related craft to inspectors were 14:1 in 1979, 16:1 in 1980, 15:1 in 1981 and 9:1 in 1982, which are appropriate ratios for nuclear power plant site construction activities. However, the amount of inspection is not a function of the number of inspectors. Inspection points and hold points are set regardless of the size of the inspection force. The number merely

influences how efficiently the job can be done and how little time is wasted waiting for inspections to be performed. (Applicants' Exhibit 141 at 38-39.)

The Board finds that nothing alleged by Mr. Atchison raises significant questions regarding the adequacy of the QA Program or of construction.

e. Inspection Documentation; Scaffolding; Protective Coatings

217. CASE presented two witnesses who were formerly employed at Comanche Peak to testify regarding matters concerning protective coatings (paint) and related documentation. Mr. Robert L. Hamilton, a former QC Supervisor, testified regarding the use of protective coatings (CASE Exhibit 653). Mrs. Cordella Marie Hamilton, a former documentation clerk at Comanche Peak, testified regarding alleged problems with documentation (CASE Exhibit 652). Both witnesses were presented as lay witnesses, and did not profess any expertise in making judgments regarding the safety significance of alleged deficiencies (Tr. 3490, 3512).

218. Mrs. Hamilton made allegations regarding the accuracy of some inspectors' documentation and inspection reports prepared by QC inspectors. However, the alleged documentation deficiencies were corrected by the Hamiltons. Specifically, Mrs. Hamilton alleged that approximately 15 inspection reports were misplaced by an inspector. (CASE Exhibit 652 at 5, 8-10.) These inspection reports related to the first coating on steel applied

at the Comanche Peak paint shop (CASE Exhibit 652 at 17-18.) There were no non-conforming conditions reported in these inspection reports (CASE Exhibit 652 at 11).

219. Mrs. Hamilton also made a general allegation regarding the lack of sufficient documentation regarding protective coatings (CASE Exhibit 652 at 14). Mrs. Hamilton was concerned that improper application of coatings could permit radiation to leak in the event of an accident (Tr. 3490-91). The documentation and reinspection of protective coatings was the subject of the protective coating backfit, addressed above in Section II.A.5.e. (CASE Exhibit 652 at 15).

220. Mr. Hamilton focused a significant part of his testimony on the circumstances surrounding his termination. The circumstances involved the inspection of painted surfaces at the polar crane rail without scaffolding, which Mr. Hamilton deemed to be necessary for safe inspection (CASE Exhibit 653 at 7-10). Such matters of occupational safety (not related to radiological health and safety) are not within the jurisdiction of the NRC and thus are irrelevant to this decision. Mr. Hamilton stated that the only concerns he had with safety regarding the plant concerned occupational safety, and that his concerns regarding quality were limited to matters concerning protective coatings (CASE Exhibit 653 at 12; Tr. 3497).

221. Mr. Hamilton's general allegations concerning protective coating related to surface preparation, repair, and documentation (CASE Exhibit 653 at 15, 17) and traceability of

coated items (CASE Exhibit 653 at 55). Again, these matters concern the protective coating program which is the subject of a backfit program discussed in the findings above. Mr. Hamilton did not claim to be an expert on paint and coatings (Tr. 3510).

222. A specific allegation made by Mr. Hamilton concerned paint which had been supplied by a supplier that he believed could be unqualified because audits of that supplier disclosed discrepancies in its QA Program. The audits of this supplier had resulted in a stop work order issued by Applicants' QA organization with respect to paints received from that company. A new supplier was identified and coatings were obtained from the new supplier. Subsequent audits of the original supplier found that corrections had been made, and no discrepancies remained. Thereafter, paint was again purchased from that company. (CASE Exhibit 653 at 47.) No problems were discovered with respect to the new supplier. Mr. Hamilton believed that the disposition of the audits, including the stop work order, demonstrated an effective QA Program (CASE Exhibit 653 at 46-54.) Mr. Hamilton was aware of no problems that he considered to be important and significant to safety that still existed at the plant and which had not been corrected (Tr. 3521).

223. Mr. Hamilton also expressed a concern regarding a specific batch of paint which showed evidence of contamination by grease or oil (CASE Exhibit 653 at 21, 29-33). The deficiency alleged by Mr. Hamilton was identified by him on an NCR (Tr. 3499). Mr. Hamilton disagreed with what he believed was the

final disposition of that NCR, which was to strain the paint through a cheesecloth (CASE Exhibit 653 at 29; Applicants' Exhibit 138). Mr. Hamilton was not aware that following attempts to strain the foreign material from the paint through a cheesecloth a revision to the NCR was prepared which directed that the paint be returned to the vendor (Applicants' Exhibit 139; Tr. 3502). Mr. Hamilton then contended that some of the paint, although he had no idea how much (Tr. 3505), had been used before segregation and returned to the vendor. He admitted that the returned containers which were not full may have resulted from the attempts to strain the paint. (Tr. 3504.)

224. Mr. Hamilton's final allegation was that he had never been instructed that he should perform his work more carefully because the project was a nuclear plant (CASE Exhibit 653 at 65). However, he admitted that he was instructed that the construction of a nuclear power plant was a matter related to the public health and safety and acknowledged that he had participated in general training courses upon arriving at the site in which he had been told that work at a nuclear plant must be performed with care (Tr. 3514-16; Applicants' Exhibit 140).

225. The Board finds that nothing raised by either Hamilton raises significant questions regarding the adequacy of the QA Program or of construction.

f. Weave Welding; Torque Seal; Weld Rod Ovens; Plug Welds; Weld Grinding; Scrap Material; Polar Crane Bus Box

226. Mr. Henry A. Stiner, a former welder at Comanche Peak

presented testimony regarding several concerns (CASE Exhibit 666). Mrs. Darlene K. Stiner, who was employed at Comanche Peak as a QC Inspector, presented testimony regarding the allegations made by her husband and other areas of concern (CASE Exhibit 667).

227. Mr. Stiner testified as a lay witness (Tr. 4271). Mr. Stiner is not an engineer and did not purport to render an engineering judgment on the adequacy of welds which were the subject of his testimony (Tr. 4274). Mr. Stiner admitted to a criminal record involving crimes of moral turpitude (CASE Exhibit 666 at 48), and that job applications filled out by him for employment at Comanche Peak were not complete with respect to the extent of his criminal record (Tr. 4483-84, 4488-89; Applicants' Exhibits 145 and 146). In addition, Mr. Stiner admitted that his claim of a "GED" high school equivalency degree in his application for employment was fabricated (Applicants' Exhibit 145). Mrs. Stiner presented testimony as one experienced in welding and QC inspection but not as an expert in structural engineering or other disciplines qualifying her to testify as to the structural significance of the concerns addressed in her testimony (Tr. 4028).

228. Mr. and Mrs. Stiner both raised the issue of the use of weave welding on component supports and the subsequent repair of those welds (CASE Exhibit 666 at 8; CASE Exhibit 667 at 23). These witnesses were probably directed by their instructors not

to perform weave welding (Tr. 4643). Weave welding, as defined by the ASME Code, is a weld made with "significant transverse oscillation" in the welding process (Applicants' Exhibit 141 at 30; Tr. 4428). Limitations on the degree of oscillation is significant only with respect to materials which require Charpy impact testing (Tr. 4430). Instances of weave welding have been identified in NCR's at Comanche Peak and properly dispositioned based on engineering evaluations (Applicants' Exhibits 141, 141J-M).

229. The weave welding which is the subject of the Stiners' concerns is governed by Brown & Root welding procedures (Applicants' Exhibit 141 at 30; Applicants' Exhibits 141N-V). These procedures permit a maximum bead width of 4 core wire diameters. A weld which is made with a width of 4 core wire diameters will require some transverse oscillation of the weld electrode and is, therefore, a weave weld which is permitted by the Brown & Root procedures. (Tr. 4420-22, 44323-33.) Thus, the determining factor is whether the degree of transverse oscillation employed in welding is significant by the terms of applicable codes (Tr. 4429, 4643).

230. Bead width and weave welding is limited by procedure because welding procedures are written to be qualified for as wide a range of material thicknesses as possible. In doing so, the procedures are intended to cover materials of thicknesses which are great enough to require impact testing as well as material thicknesses that do not require impact testing.

Accordingly, procedures may limit the bead width for welding of materials of thicknesses which do not require impact testing and thus such bead width limitations would not be necessary for those materials. (Applicants' Exhibit 141 at 30-31; Applicants' Exhibits 141J-M; Tr. 4636-37.)

231. Mr. and Mrs. Stiner testified that a material known as Torque Seal has been improperly used by craft workers. They allege this improper use could result in improperly installed bolts not being caught by QC. (CASE Exhibits 666 at 20-21; 667 at 31.) Torque Seal is a fluid which dries to a wax-like consistency and which is applied to the face between a nut and the bolt following installation to serve as a preliminary indicator that a satisfactory torque value has been attained. The Torque Seal is specifically used in the installation of Hilti bolts, which are a form of concrete expansion anchors. Hilti bolts are installed by drilling a hole into a concrete wall, driving the bolt into the wall and then torquing the bolt in order to set the wedges on the imbedded end of the bolt in concrete. Inspection procedures require that a minimum of one bolt per base plate of structural steel members which are attached to concrete structures shall be inspected by a QC Inspector to verify that a correct torque has been applied. Applicants attempt nevertheless to verify the proper torquing of 100 per cent of all bolts in safety-related structures. (Applicants' Exhibit 141 at 31-32.)

232. A QC Inspector verifies that a bolt has been torqued by first verifying that a torque wrench to be used by the craft has been set at a proper torque value. The Inspector then assures that the required torque value has been reached on a given bolt as evidenced by a clicking noise made by the torque wrench when the proper torque is achieved. Finally, the Inspector must verify that the setting on the torque wrench after torquing remains as it was prior to torquing. Normally, the QC Inspector perfoming the verification of the torque operation applies the torque seal. In those case where physical access to the Hilti bolt is limited to one person, the inspector may hand the torque seal to the craftsman for application provided that the inspector verifies that the sealant is applied. (Applicants' Exhibit 141 at 32-33.) If a bolt was removed following application of the torque seal it would be obvious that the bolt had been tampered with (Tr. 4649-50).

233. Mrs. Stiner had identified in an NCR (CASE Exhibit 667R) that torque seal had been applied to Hilti bolts without documentation to verify that application of the sealant was done by QC personnel or that the proper torque had been achieved. The NCR generated by Mrs. Stiner was dispositioned by requiring verification of the torquing on the subject Hilti bolts. In addition, Hilti bolt installation will be subject to a record review to verify proper torquing of those bolts prior to turnover of those systems to the operations group. This process will verify that sufficient inspection records exist to substantiate

that QC performed all required torque verifications. (Applicants' Exhibit 141 at 33.) This program is set forth in the quality procedure manual and will address the torquing of bolts for each individual support (Tr. 4600-01).

234. The Stiners alleged that portable weld rod ovens had been misused, and weld rod control procedures not followed, resulting in weld rods being employed which did not conform to applicable requirements (CASE Exhibit 667 at 39; CASE Exhibit 666 at 28). Instances where weld rod control procedures have not been followed were identified in NCRs (CASE Exhibit 667S; Applicants' Exhibit 141 at 35.)

235. Low hydrogen electrodes (rods) are issued in heated containers to minimize the possibility of moisture accumulating in the electrode coating. Procedures are employed for controlling the use of weld rods for both ASME and non-ASME welding. These controls are established to assure that the proper type of weld rods are used in the correct applications. (Applicants' Exhibit 141 at 33-35.)

236. The use of a weld rod that was not maintained in a heated condition could result in a weld containing excessive amounts of porosity. This would be due to moisture contained in the electrode coating being introduced into the weld as steam and leaving a gas pocket (porosity) upon escape from the weld material. Such porosity would be detected upon visual

inspection, and appropriate acceptance criteria would be applied in accordance with applicable inspection instructions. (Applicants' Exhibit 141 at 35.)

237. Mr. and Mrs. Stiner also both raised allegations regarding the improper use of plug welds (CASE Exhibit 666 at 17; CASE Exhibit 667 at 30). Plug welds are fillet welds of holes which are drilled in incorrect locations in structural steel members. This type of welding is permissible to repair holes which were drilled in the wrong location, and a final visual inspection of such welds is to be performed by the QC Inspector. (Applicants' Exhibit 141 at 36; Tr. 4629.)

238. Mr. Stiner alleged that bad welds which were required to be repaired were improperly repaired by grinding the face of the weld off and capping with a proper weld to disguise the underlying improper weld (CASE Exhibit 666 at 12-13). Although Mr. Stiner claimed that such practice would cause the weld to be weaker, he admitted to not having the expertise to make an engineering judgment on that point (Tr. 4272-74). Applicants testified that although such repair would not be detectable, it would be permitted so long as the weld had been ground to the point where the oscillation limit was within the four core wire diameter limitations (Tr. 4598-99). No evidence was presented that any such repairs were performed outside of those limits.

239. Mr. Stiner alleged that scrap material was employed for pipe hangars in violation of the ASME Code (CASE Exhibits 666 at 42; 666C-37; Tr. 4366). Mr. Stiner first alleged that the

practice was prohibited by the ASME Code, but could not identify a section, even when provided a copy of the Code (Tr. 4276). Mr. Stiner incorrectly identified two standards which he contended supported his allegation. These were ANSI N45.2, Article 9 and ASME Code, NCA-3867.3 (Tr. 4480-81) Applicants' experts testified that neither ASME Section III nor the appropriate ANSI standard (ANSI B31.1) required the use of new materials for this application (Tr. 4628).

240. Mrs. Stiner also stated that she had observed a cable to contact the polar crane bus box and burn an area in that box upon contact (CASE Exhibit 667 at 53). An NCR written on this matter was dispositioned by voiding because the polar crane bus box is a non-Q item (CASE Exhibits 667 at 54; 667U). Mrs. Stiner did not claim any expertise to evaluate the significance of this matter (Tr. 4052) and was unsure of its significance (Tr. 4095).

12. Termination of Atchison

241. On April 12, 1982, Mr. Atchison was terminated from employment at Comanche Peak. Mr. Atchison maintained that he was dismissed for identifying deficiencies in construction and threatening to go to the NRC with his allegations (CASE Exhibit 650 at 53-54). Mr. Atchison has pursued legal remedies through the Department of Labor seeking to obtain reinstatement in his former position at Comanche Peak (CASE Exhibits 650B, 781). On the record before the Board, we do not believe that Mr. Atchison was dismissed from Comanche Peak for the reasons he stated. The

evidence presented by Applicants demonstrates that Mr. Atchison was dismissed for his inability to perform satisfactorily his job as a welding inspector and the absence of other positions for which Mr. Atchison was qualified.

242. The individual who determined that Mr. Atchison's performance as a welding inspector was unsatisfactory was Mr. C. Thomas Brandt. Mr. Brandt is the Mechanical/Civil QA/QC Supervisor at Comanche Peak (Applicants' Exhibit 141 at 2). Mr. Brandt has extensive experience in several aspects of nuclear power reactor construction, and he has been a welder and a welding inspector at several nuclear facilities (Applicants' Exhibits 141 at 8-9; 141A). He also has conducted numerous seminars on welding and mechanical inspection and non-destructive examination at nuclear facilities. He has been a QC Supervisor and served in various QA/QC positions at other nuclear facilities prior to coming to Comanche Peak. He is a certified Level III Mechanical, Level III Protective Coatings and Level III Instrumentation Inspector. Mr. Brandt is a certified Level III mechanical inspector for Texas Utilities Generating Company and Ebasco Services. (Applicants' Exhibits 141 at 8-9; 141A.) The Board finds that Mr. Brandt is an expert in welding and welding inspection at nuclear power reactors.

243. Mr. Atchison was employed at Comanche Peak for approximately three years. He was initially hired by Brown & Root, Inc., as a documentation clerk in February, 1979. He worked at that position for approximately 7 months, at which

point he became a "training coordinator," a position he held until December, 1981. While still a Brown & Root employee, Mr. Atchison was transferred to the non-ASME side of construction where he served as a welding inspector for approximately four months before he was terminated on April 12, 1982. (CASE Exhibits 650 at 9, 650A; Tr. 3214.) This position was Mr. Atchison's only field experience in the inspection of welding at nuclear power reactors (Tr. 3214-13). During a portion (approximately two months) of his assignment as a welding inspector, his immediate supervisor was Mr. Randall Smith (Tr. 3215-16).

244. When Mr. Atchison was first transferred to Mr. Brandt's group by Mr. Gordon Purdy, the Site QA Manager for Brown & Root at Comanche Peak, Mr. Brandt indicated that he doubted Mr. Atchison's capabilities in view of a previous experience with Mr. Atchison (Applicants' Exhibit 141 at 11; Tr. 4607-10). Subsequently, Brandt had two occasions, prior to the events culminating in Mr. Atchison's termination, on which he personally observed work of Mr. Atchison which he concluded demonstrated a lack of ability and judgment necessary for performing visual welding inspections (Applicants' Exhibit 141 at 6). Mr. Brandt discussed these personal observations of Mr. Atchison's capabilities as a welding inspector with Mr. Purdy in March, 1982, and again on April 8, 1982. Mr. Brandt advised Mr. Purdy on April 8, that Mr. Atchison's services would not be required much longer by Mr. Brandt. Mr. Brandt, while not possessing the

authority to terminate Mr. Atchison, transferred him back to Mr. Purdy because he believed Mr. Atchison's level of competence as a QC welding inspector was unsatisfactory. (Applicants' Exhibit 141 at 6, 11.)

245. Mr. Brandt's first opportunity to evaluate Mr. Atchison's capabilities to judge acceptable/rejectable welding was in late 1981 when Mr. Atchison was still serving as a training coordinator. Mr. Brandt had gone to Mr. Atchison to discuss Mr. Atchison's grading of a welding examination he had administered (using an answer key prepared by someone else) of an individual Mr. Brandt knew to be a qualified welder. (Tr. 4607-09.) At that time Mr. Atchison attempted to explain to Mr. Brandt the bases for his determination as to why certain welds were acceptable or rejectable. Mr. Brandt concluded from this conversation that Mr. Atchison did not understand welding inspection criteria. (Tr. 4608-10.)

246. The first instance in the field in which Mr. Brandt personally observed Mr. Atchison's inability to perform properly welding inspections involved an inspection performed by Mr. Atchison of vendor welds (CASE Exhibit 660A at 3). Mr. Brandt had inspected the areas in which Mr. Atchison had identified weld indications and concluded that Mr. Atchison was unable to evaluate correctly indications of porosity. In addition, Mr. Brandt felt that linear indications identified by Mr. Atchison were only cracks in paint. Nonetheless, Mr. Brandt directed that the indications identified by Mr. Atchison be cleaned of paint if

Mr. Atchison continued to feel the indications were a problem. Mr. Brandt also observed at the same time a nearby area of welding which had been cleaned by Mr. Atchison for liquid penetrant testing which Mr. Atchison had subjected to excessive surface preparation prior to testing. (Applicants' Exhibit 141 at 6-7; Tr. 4614-15, 4631-32, 4648-49.)

247. Mr. Atchison never properly entered into the NCR system the welds which were the subject of CASE Exhibit 660A (Applicants' Exhibit 141 at 4). When Applicants learned at the July, 1982 hearings that this NCR draft had not been properly entered into the system by Mr. Atchison, the matter was addressed by issuance of NCR M-82-01236 (Applicants' Exhibits 141 at 9; 141D). The reinspection conducted pursuant to this NCR found that the linear indications identified by Mr. Atchison were indeed cracks in the paint and the porosity which he had identified was not rejectable. Mr. Atchison properly had identified only one half of the undercut indications and had not reported other defects which were obvious (Applicants' Exhibit 141 at 10).

248. The procedures for obtaining NCR numbers are set forth in procedure CP-QAP-16.1 (applicable to ASME activities) and procedure CP-QP-16.0 (applicable to non-ASME activities) (Applicants' Exhibits 59 and 60). These procedures provide that upon identifying a non-conforming condition, an inspector shall immediately apply a hold tag, obtain an NCR number, return and put the number on the hold tag, and prepare an NCR draft for

approval by the QC Inspector Supervisor. These procedures are addressed in the indoctrination and training session which all inspectors must attend. The purpose of the non-conformance control system is to assure that all non-conforming conditions identified by inspection personnel are properly addressed. (Applicants' Exhibit 141 at 3; Tr. 4546-47.) However, Mr. Atchison did not properly enter the NCR discussed in the previous finding into the system and failed to apply a hold tag on either that item or the items discussed below (Applicants' Exhibit 141 at 4, 10-11; Tr. 4578). Mr. Atchison admitted he failed to follow proper procedures in some instances (Tr. 3243).

249. The second instance in which Mr. Brandt personally observed Mr. Atchison's inspection competence occured in March, 1982, with respect to four pipe whip restraint assemblies identified in NCR M-82-00296 (Applicants' Exhibits 141 at 7; 112D and 122E). The sketches of these assemblies prepared by Mr. Atchison to accompany the NCR indicated what seemed to Mr. Brandt to be an incredible amount of porosity. Following reinspection of the subject pieces Mr. Atchison was advised that he was not able to judge the acceptability of porosity and should be more consciencious in applying pertinent acceptance criteria governing his inspections. (Applicants' Exhibit 141 at 8; Tr. 4513-15.) The disposition of these items is discussed above in Section II.A.11.a.

250. On the morning of April 12, 1982, Mr. Brandt received a request from Mr. Atchison through Mr. Randall Smith, Mr. Atchison's immediate supervisor, requesting permission to seek employment elsewhere at Comanche Peak. Mr. Brandt verbally approved that request. He subsequently received a request from Mr. Atchison through Mr. Smith seeking permission to transfer back to the Brown & Root ASME Mechanical Equipment Group in which Mr. Atchison had previously worked. Mr. Brandt approved that request on the condition that Mr. Purdy concurred with the transfer, and signed the request. Mr. Brandt later that morning received an NCR with a note from Mr. Atchison attached (Applicants' Exhibits 135; 141 at 12.)

251. The note attached to the NCR received by Mr. Brandt on the morning of April 12, indicated that an NCR number had been assigned, yet the NCR had not been issued (Applicants' Exhibit 141 at 12). The note stated "open to pow wow on subject . . . black or white no grey area's [sic]" (Applicants' Exhibit 135). Mr. Brandt interpreted that note as an attempt to arbitrate issuance of the NCR. The note implied to Mr. Brandt that Mr. Atchison was offering not to process the NCR in return for approval of a promotion request which had been previously submitted to and rejected by Mr. Brandt. The magnitude of the deficiency described by Mr. Atchison in the draft NCR, and thus the leverage for negotiation, would have been tremendous, if valid. The impression these documents gave to Mr. Brandt was

that Mr. Atchison had selected a major matter on which to write the NCR so that his bargaining position regarding the promotion would be enhanced. (Applicants' Exhibit 141 at 12-13.)

252. Mr. Brandt contacted his supervisor, Mr. Tolson, who directed that Mr. Brandt bring Mr. Purdy for a meeting. Mr. Tolson reviewed the "pow wow" note and concluded independently that the note was an attempt by Mr. Atchison to use the NCR as a lever. Mr. Purdy also reviewed the "pow wow" note and the attached NCR for the first time during that meeting and concluded independently that Mr. Atchison was after something and that this was an attempt to obtain it through abnormal means. Mr. Brandt advised Mr. Purdy at that time that his organization no longer required the services of Mr. Atchison and that he was being returned to Mr. Purdy in his capacity as Brown & Root Site QA Manager. (Applicants' Exhibit 141 at 13-14.) Mr. Brandt sent a memorandum to Mr. Purdy confirming that discussion (CASE Exhibit 650C).

253. Mr. Purdy subsequently contacted four of his supervisory personnel to determine whether any of them had a position for which Mr. Atchison was qualified. None did. Mr. Purdy then contacted Mr. Vurpillat, the Power Group QA Manager for Brown & Root. Mr. Purdy sought to determine whether Mr. Vurpillat had a position for which Mr. Atchison was qualified and Mr. Vurpillat stated that he did not. Mr. Purdy then determined that Mr. Atchison's services were no longer required by Brown & Root and effected his termination. Mr. Purdy was not directed by

anyone to terminate Mr. Atchison and made the decision to terminate him on his own. As Brown & Root Site QA Manager, Mr. Purdy has the sole responsibility and authority to terminate his employees. (Applicants' Exhibit 141 at 14.)

254. Mr. Atchison was terminated by Mr. Purdy after taking into account several considerations. First, respecting Mr. Brandt's judgment, Mr. Purdy considered Brandt's lack of desire to further utilize Mr. Atchison due to his incompetence in performing visual welding inspections. In addition, Mr. Purdy considered the use by Mr. Atchison of an NCR as a negotiating tool in obtaining a promotion. Finally, Mr. Purdy was unable to locate an open position for which Mr. Atchison was qualified. (Applicants' Exhibit 141 at 19-20.)

255. Mr. Randall D. Smith, the Non-ASME Mechanical QC Lead for Comanche Peak, was Mr. Atchison's immediate supervisor. At the time of Mr. Atchison's termination, Mr. Smith believed that Mr. Atchison was qualified as an inspector and should not have been terminated. (Applicants' Exhibit 141 at 15; CASE Exhibit 650E.) Mr. Smith subsequently had the opportunity to observe in more detail the work previously inspected by Mr. Atchison and formed the opinion that Mr. Atchison had been properly terminated and that Mr. Brandt's decision to transfer Mr. Atchison because of his lack of competence as an inspector was correct. Mr. Smith attributed his reaction at the time of Mr. Atchison's termination as a reflection of his limited experience in the supervision of

technical personnel and his reluctance to discipline and instruct his inspectors on adherence to proper acceptance criteria. (Applicants' Exhibit 141 at 15-16.)

256. Mr. Atchison was not terminated for finding and reporting safety problems at Comanche Peak. At the time of Mr. Atchison's termination, Mr. Purdy was unaware that Mr. Atchison had been the author of NCR M-82-00296 (Applicants' Exhibits 122D and 122E). On April 12, the only NCR that Mr. Atchison had written to Mr. Purdy's knowledge was NCR M-82-00361 (to which the "pow wow" note was attached) (Applicants' Exhibit 135). (Applicants' Exhibit 141 at 20.)

257. Mr. Brandt did not return Mr. Atchison to Brown & Root for finding and reporting safety problems. Mr. Brandt returned Mr. Atchison to Brown & Root because he determined that he was not competent to perform his duties as a QC Welding Inspector and because he felt that he was using an NCR as a lever to obtain a pay increase. (Applicants' Exhibit 141 at 21.) In fact, as already noted, Mr. Atchison never even submitted an NCR on the indications he thought he had observed on the vendor welds which later were documented on NCR M-82-01236 (Applicants' Exhibits 141 at 9; 141D). As for the welds on the four pipe whip restraint assemblies, Mr. Atchison admitted he had not submitted an NCR on the subject until Mr. Brandt instructed that an NCR be written (CASE Exhibit 650 at 41; Tr. 3350-52). Although Mr. Atchison claimed to have placed hold tags on these assemblies prior to receiving instructions to write an NCR (Tr. 3351), Mr. Brandt saw

no hold tags when he observed the assemblies (Applicants' Exhibit 141 at 10-11). Thus, Mr. Atchison not only failed to follow procedures for issuing an NCR (by failing to apply hold tags immediately) upon identification of an apparent non-conforming condition, but apparently lied when he claimed he did. Further, Mr. Atchison had written only approximately a dozen NCRs during his four months as a QC Inspector, not forty NCRs as Mr. Atchison claims in his testimony. A dozen NCRs is not a large number of NCRs for a QC Inspector to issue in a four-month period. (CASE Exhibit 650 at 21; Applicants' Exhibit 141 at 3-4, 10-11; Tr. 4546-47.)

258. Mr. Brandt was unaware at the time of his decision to return Mr. Atchison to Brown & Root that Mr. Atchison had made allegations to the NRC, and was unaware of any threat by Mr. Atchison to contact the NRC (Applicants' Exhibit 141 at 20-21). In fact, none of Applicants' personnel directly involved in the dismissal of Mr. Atchison was aware when Mr. Atchison was dismissed that Mr. Atchison had made allegations to or threats to contact the NRC with what he perceived as construction deficiencies at Comanche Peak (Applicants' Exhibit 141 at 11-12).

259. Subsequent to Mr. Atchison's termination, Mr Brandt identified other instances in which Mr. Atchison's capability as an inspector were questionable, thereby confirming his judgment that Atchison was incompetent. Mr. Atchison was a Level II liquid penetrant inspector, and in that position had to possess the capabilities to evaluate the degree of surface preparation

(if any is required) in order to distinguish between relevant and non-relevant indications. Mr. Brandt had already identified an instance in which Mr. Atchison was insistent upon employing excessive surface preparation prior to performing PT. In addition, NCR M-82-00289 (Applicants' Exhibit 141E) was an example of Mr. Atchison's inability to distinguish between relevant and nonrelevant indications. In this NCR, Mr. Atchison reported what he perceived to be linear indications which were actually fit-up gaps established between the members of a tee joint, which should have been recognized by Mr. Atchison as obviously non-relevant indications. (Applicants' Exhibit 141 at 18.)

260. Also subsequent to the termination of Mr. Atchison, Mr. Brandt learned of the falsifications of Mr. Atchison's applications and the alteration of the verification of education by Mr. Atchison. Mr. Brandt is the responsible individual designated to evaluate the education and experience of an inspector prior to certification for non-ASME Mechanical Inspectors, including welding inspectors. While Mr. Atchison's lack of education did not necessarily relate to his incompetence as a QC Welding Inspector, Mr. Atchison would not have qualified under the requirements of ANSI N45.2.6 as a Level II Visual Inspector without the Associates Degree which he claimed to have earned. (Applicants' Exhibit 141 at 16.)

261. Mr. Brandt and Mr. Tolson jointly concluded that in light of Mr. Atchison's questionable certification and poor credibility, reinspection of his work was in order. Consequently, Mr. Brandt directed that all items inspected by Mr. Atchison be reinspected. This reinspection was accomplished by two means. First, as records involving Mr. Atchison's previous work inspection were presented for the field, a reinspection of that work was initiated at that point. Second, for inspections performed for which the inspection documentation has already been submitted to the permanent record vault, a tabulation of those records was made and those items which were originally inspected by Mr. Atchison were reinspected. (Applicants' Exhibit 141 at 17.)

262. The Board finds that Applicants' witnesses were credible and experts in their respective fields. The Board finds that Mr. Atchison was not credible and not an expert in any field, including welding inspection. We are convinced on the record before us that Atchison was terminated for lack of competence in performing his job and not for reporting non-conforming conditions (which, after all, is expected of a QC Inspector). We find the testimony of Applicants' witnesses to be forthright and convincing on the reasons for Atchison's termination. We further find that nothing raised by Mr. Atchison in his allegations reflects adversely on the adequacy of the QA Program or of construction at Comanche Peak.

263. With regard to Contention 5 overall, the Board finds that none of the matters raised by CASE that are the subject of this Initial Decision reflects adversely on the QA Program for Comanche Peak or on the quality of construction. The record reflects that the Applicants have consistently had in place and conscientiously implemented a QA Program that identified non-conforming conditions accurately and followed each through to appropriate resolution. CASE has attempted to discredit the QA Program by showing that non-conforming conditions were discovered at Comanche Peak. This ignores the fact that such conditions are bound to exist on a construction job of the magnitude of this one. In any event, the important consideration is not that non-conforming conditions existed, but rather that such conditions were detected and corrected. It is the fundamental role of Quality Assurance to find and report any such conditions and to assure that they are corrected. This the Comanche Peak QA Program has done in a most efficient and comprehensive manner.

B. Contention 22 - Emergency Planning

264. CASE Contention 22 provides as follows:

> Applicants have failed to comply with 10 C.F.R. Part 50, Appendix E, regarding Emergency Planning, for the following reasons:
>
> a. The FSAR does not identify state or regional authorities responsible for emergency planning or who have special qualifications for dealing with emergencies.
>
> b. No agreements have been reached with local and state officials and agencies for the early warning and evacuation of the public, including the identification of the principal officials by titles and agencies.

c. There is no description of the arrangements for services of physicians and other medical personnel qualified to handle radiation emergencies and arrangements for the transportation of injured or contaminated individuals beyond the site boundary.

d. There are no adequate plans for testing by periodic drills of emergency plans and provisions for participation in the drills by persons whose assistance may be needed, other than employees of the Applicant.

e. There is no provision for medical facilities in the immediate vicinity of the site, which includes Glen Rose.

f. There is no provision for emergency planning for Glen Rose or the Dallas/Ft. Worth metroplex.

265. CASE presented no witnesses regarding Contention 22. Applicants presented two panels of witnesses regarding Contention 22. The first panel concerned measures for on-site emergency plans (Tr. 5492). This panel consisted of Mr. Richard A. Jones, whose responsibilities include overall management of operation in the event of an emergency at Comanche Peak (Applicants' Exhibit 143 at 1). In addition, Mr. Bobby T. Lancaster, the Radiation Protection Engineer for TUGCO responsible for coordination of radiological protection at Comanche Peak, presented testimony (Applicants' Exhibit 143 at 2). Also on the panel was Dr. Roger E. Linnemann, M.D., Vice-Chairman of Radiation Management Corporation ("RMC"), which provides TUGCO with emergency medical assistance in the event of an accident involving radiological injuries at Comanche Peak (Applicants' Exhibit 143 at 2-3). The Board finds that each witness is an expert in his respetive field.

266. Applicants also presented a panel of four witnesses to testify regarding off-site emergency response planning. Three of these individuals are employed by the State of Texas in the various divisions and bureaus responsible for Emergency Planning and Radiation Control, as follows: (1) Mr. Alton B. Armstrong, Jr., the Resource Planning Officer with the Division of Emergency Management of the Texas Department of Public Safety; (2) Mr. Clarence L. Born, the Manager of the Emergency Response Planning Program at the Bureau of Radiation Control of the Texas Department of Health; (3) Mr. Larry J. Skiles, a consultant for Emergency Planning to Texas Utilities and the State of Texas in the area of emergency planning; and (4) Mr. Arthur C. Tate, an Environmental Quality Specialist (Emergency Planning) with the Bureau of Radiation Control of the Texas Department of Health. Each of these witnesses possesses extensive experience in the areas of emergency planning. The witnesses demonstrated a high level of familiarity with the off-site emergency planning provisions for Comanche Peak and a compentence both in the areas of emergency planning and radiation health. (Applicants' Exhibit 144 at 1-2.) The Board finds that each witness is an expert in his respective field.

267. The NRC Staff presented testimony of Mr. David M. Rohrer, an Emergency Preparedness Specialist with the NRC. Mr. Rohrer is responsible for the review and evaluation of radiological emergency response plans. (NRC Exhibit 202 at 1.) Mr. Rohrer was responsible for the review and evaluation of the

Comanche Peak Emergency Plan. Mr. Rohrer is highly experienced in health physics and emergency preparedness requirements for nuclear power reactors, and an expert in these fields.

268. The Federal Emergency Management Agency ("FEMA") presented two witnesses with respect to the state of off-site emergency preparedness for Comanche Peak. Messrs. Albert L. Lookabaugh and John W. Benton are responsible for the review and evaluation of off-site Radiological Emergency Response Plans for Fixed Nuclear Generating Facilities within FEMA's Region VI, which includes Comanche Peak. Each of these witnesses has over 15 years of experience in emergency planning (Staff Exhibits 203A, 203B), and demonstrated a high degree of familiarity with the emergency response plans appicable to Comanche Peak and the review of those plans by FEMA. (NRC Exhibit 203 at 1.) The Board finds that each is an expert in his given field.

> Contention 22a - The FSAR does not identify state or regional authorities responsible for emergency planning or who have special qualifications for dealing with emergencies.

269. The responsibilities for Emergency Response Planning for a nuclear facility must be assigned between the licensee and the state and local organizations within designated Emergency Planning Zones ("EPZs"). 10 C.F.R. §50.47(b)(1). Applicants' Emergency Plan must describe the organizations with responsibilities for coping with radiological emergencies, including the identification of the state and/or local officials responsible for the planning for, ordering, and controlling of

appropriate protective actions, including evacuations when necessary. 10 C.F.R. Part 50, Appendix E, Paragraph IV.A.8. See NUREG-0654/FEMA-REP-1, Criteria A.1 and P.2.

270. The Comanche Peak Emergency Plan identifies the various state and regional (county) authorities responsible for emergency planning (Applicants' Exhibit 143 at 3; Tr. 5489; Applicants' Exhibit 143D). Section 1.3.1 of Applicants' Emergency Plan (Applicants' Exhibit 143D) identifies the Hood and Somervell County Emergency Organizations as the key emergency planning organizations involved at the local level. These include the Sheriff departments, fire departments, hospitals, and ambulance services for those counties. The County Judges for Hood and Somervell counties are the individuals responsible for the respective county emergency organizations and for directing emergency response operations (Applicants' Exhibit 144 at 3; NRC Exhibit 202 at 7; Tr. 5475-76).

271. Written agreements between TUGCO and the local emergency organizations to provide support in the event of an emergency at Comanche Peak are set forth at Appendix H to Section 15 of the Comanche Peak Emergency Plan (Applicants' Exhibit 143D). The agreements with the Somervell County and Hood County Sheriff departments provide for emergency response support by providing officers and vehicles to assist in evacuation efforts, traffic control, security, and in communications. Local firefighting support is also provided for by written agreements. (Applicants' Exhibit 143 at 4.)

272. Applicants' Emergency Plan (Applicants' Exhibit 143D) identifies the Bureau of Radiation Control of the Texas Department of Health as the responsible lead agency in the State of Texas for response to radiological emergencies. The planning, direction and control for overall emergency response by state agencies and departments is the responsibility of the Director, Division of Emergency Management (Director of the Department of Public Safety ("DPS")) of the State of Texas. (Applicants' Exhibit 143D, Section 1.3.2.) TUGCO has a written agreement with the Department of Public Safety for support in the event of an emergency at Comanche Peak. That agreement provides for coordination between DPS and TUGCO to coordinate with local law enforcement agencies in assisting in maintaining traffic control, protection of life and property, establishing road blocks, and alerting and warning persons in the affected area. (Applicants' Exhibits 143 at 6; 143D, Section 15.0, Appendix H.) The responsibility for directing the State of Texas Radiological Emergency Response is the responsibility of the Chief of the Bureau of Radiation Control. The Governor of the State of Texas has the ultimate responsibility to direct and control state emergency activities. The Governor has delegated this authority to the Director, Division of Emergency Management, Texas Department of Public Safety. (Applicants' Exhibit 144 at 3.)

273. The NRC, FEMA, and Department of Energy ("DOE") are the primary Federal response organizations in the event of a radiological emergency at Comanche Peak. Additional Federal

agencies, such as the Environmental Protection Agency, Federal Aviation Administration, Department of Commerce, and National Weather Service may provide ancillary services in support of the primary emergency response agencies. The NRC is primarily responsible for activities occuring on-site and to review FEMA findings and determinations on the adequacy and capability of implementation of state and local plans. FEMA provides assistance to the state and local governments in the preparation, review, and testing of radiological emergency response plans. (Applicants' Exhibit 143 at 6-7; NRC Exhibit 202 at 4.) FEMA is responsible for reviewing off-site plans for emergency preparedness for nuclear power plants (NRC Exhibit 203 at 3; Tr. 5704-05).

274. The Department of Energy is responsible for coordinating Federal off-site radiological monitoring and assessment and for relaying this informaion to the NRC assessment personnel at the site. DOE will provide radiological assistance teams, communication equipment, aircraft for airborne monitoring and transportation, mobile labs for surface monitoring, radiation specialists, a DOE emergency coordinator and other support personnel as may be needed. (Applicants' Exhibit 143 at 7-8.)

275. Other organizations which provide support in the event of an emergency at Comanche Peak include RMC, Squaw Creek Park, Inc. ("SCPI"), and Westinghouse Electric Corporation. RMC provides medical support services and backup hospital facilities for on-site radiological injuries. SCPI operates and maintains

Squaw Creek Park, a 570 acre recreation area adjacent to Squaw Creek reservoir and north of Comanche Peak. SCPI is responsible for controlling access to the park and reservoir and is responsible for accountability and evacuation of the park and reservoir in the event such action is necessary because of an emergency at CPSES. Westinghouse, in its capacity as supplier of the nuclear steam supply system for Comanche Peak, can supply emergency assistance on a 24-hour basis. This is described in the Emergency Response Plan of the Westinghous Water Reactors Division, which is included in the Comanche Peak emergency plan as Appendix R to Section 15.0. (Applicants' Exhibits 143 at 8-9; 143D, Section 15.0, Appendix R.)

276. Tab 1 of Appendix 7 to Annex L of the Texas Emergency Management Plan amplifies the assignment of essential emergency functions and identifies the framework of relationship among the State of Texas, the governments of Hood and Somervell County (which are located within the EPZs), the Applicants, and the agencies of the United States having the responsibility for regulatory assignments under Federal plans or regulations (Applicants' Exhibit 144G).

277. The NRC Staff concluded, and the Board so finds, that the Comanche Peak Emergency Plan adequately identifies the State and local country government organizations and individuals with responsibility and authority for emergency response planning (NRC Exhibit 202 at 7). FEMA concluded, and the Board so finds, that

the state and local plans indicate appropriate State and county officials responsible for emergency planning (NRC Exhibit 203 at 4).

> Contention 22b - No agreements have been reached with local and state officials and agencies for the early warning and evacuation of the public, including the identification of the principal officials by titles and agencies.

278. Applicable criteria for the notification and evacuation of the public are set forth in Section II, Part E of NUREG-0654/REMA-REP-1, Criteria E5 and 6. These criteria require state and local government organizations to establish a system to disseminate information received from the licensee to the public. Administrative and physical means to notify and provide prompt instructions to the public within the plume exposure pathway EPZ are to be established by each organization. In the event of an emergency at Comanche Peak, the Texas Department of Health and the Bureau of Radiation Control will be notified by the Division of Emergency Management. The Division of Emergency Management will have been notified by the Department of Public Safety regional office in Waco. The licensee notifies that regional office directly. (Applicants' Exhibit 144 at 5; NRC Exhibit 203 at 6.) The Control Room Shift supervisor at Comanche Peak is responsible for initial communications with offsite organizations. When the Technical Support Center is activated, the TSC manager will relieve the shift supervisor from offsite communications responsibility. Once activated, the Emergency Operations Facility becomes the primary communications center

onsite for offsite communications. Initial notification is made by Applicants to the Texas Department of Public Safety regional office and the NRC Incident Response Center in Bethesda, Maryland. (Applicants' Exhibit 143 at 12-13.)

279. Sections 3.0 and 8.2 of the Comanche Peak Emergency Plan describe the methods for emergency notification of the public and off-site protective actions, respectively (Applicants' Exhibit 143D). Procedures have been developed which delineate the notificaton criteria for each emergency action level, the time constraints on initial and close-out information messages, the methodology for notifying emergency response personnel, and the details on call-back verification of telephone and radio communications (Applicants' Exhibit 143 at 10).

280. The public will be notified using an outdoor alerting system consisting of 40 pole-mounted acoustical sirens and a warning system that utilizes the Emergency Broadcast System (Applicants' Exhibit 143 at 10; Tr. 5586). Although Applicants own and maintain the outdoor siren system, it will also be used for notification purposes other than a radiological emergency, e.g., weather warnings. However, each county is responsible for activating that portion of the system in their jurisdiction and for ensuring that the Emergency Broadcast System has the proper message to broadcast. (Tr. 5655-58.) The siren system is designed such that each county can activate two sectors or two quadrants in their own county or they can activate all the sirens

for the county (Tr. 5478). In addition, all 40 sirens can be activated simultaneously from either county's operations center (Applicants' Exhibit 143 at 11).

281. The county judge is the individual who recommends that the sirens be initiated (Tr. 5482). The outdoor siren notification system will be installed prior to full-power operation at Comanche Peak. The system is designed to provide coverage of the entire 10 mile EPZ, including urban, rural, and recreational areas (NRC Exhibit 203 at 6-7; Tr. 5663.)

282. The primary method for providing information to the public, once the sirens have alerted them, is the Emergency Broadcast System ("EBS") (NRC Exhibit 203 at 7). The state and county emergency preparedness officials are responsible for broadcasting messages via the EBS network. Notification to local and state officials will include initial and follow-up messages. Notification messages broadcast over the EBS will convey information concerning the type and nature of the emergency condition, the affected area, the protective action which should be taken by the affected public, for instance, take-shelter, close all doors and windows, and/or listen to the radio and/or TV for instructions. Additonal messages may include, when necessary, evacuation instructions specifying the location of shelter areas, what to take to the shelter areas and what equipment and facilities will be available at the shelter. The EBS will also be used to advise the public of changes in recommended protective actions and to issue an all-clear

announcement. (Applicants' Exhibit 143 at 11.) In the event the EBS cannot be utilized, and as a complement to that system, the County's mobile PA units will be dispatched to provide information to the public (NRC Exhibit 203 at 7; Applicants' Exhibit 144E, Attachment F).

283. Applicants have obtained written agreements with the various state and local agencies responsible for warning and evacuation of the public in the event of an emergency at Comanche Peak (Applicants' Exhibits 143 at 12; 143D, Section 15.0, Appendix H). Under these agreements, the Sheriff of Hood County has agreed to make available his Department's equipment and personnel to authenticate notification of an emergency by callback to the notifying agency; notify key officials as described on appropriate "call lists"; activate the warning of Hood County citizens within the 10-mile EPZ; provide traffic control; and coordinate with the Granbury Police Department and the Texas Department of Public Safety and establish detour routes if required. The Texas Department of Public Safety has agreed and assured TUGCO that in the event of an emergency at Comanche Peak the Department will serve as the primary communications contact and coordinate emergency communications between Comanche Peak and the State of Texas, Hood and Somervell counties; and that the DPS will coordinate with local law enforcement officials and assist in maintaining traffic control; protecting life and property; establishing road-blocks and alerting and warning persons in the affected area. (Applicants' Exhibit 143 at 13.)

284. Warning and evacuation are law enforcement functions. The responsible officials at the State, county and city levels are the Director of DPS, county sheriff and chief of police, respectively. The decision to recommend evacuation of an area is made by the senior elected official of the affected jurisdiction (i.e., the Governor, County Judge or Mayor). (Applicants' Exhibit 144 at 6; NRC Exhibit 203 at 7; Tr. 5750.)

285. DPS has primary responsibility for law enforcement and public safety, communications, warning and evacuation in the event of an emergency, including an accident at a fixed nuclear facility. DPS also has supporting responsibility for radiological emergency response. (Applicants' Exhibit 144 at 6; Applicants' Exhibit 144F, Annex R, Appendix V.) The DPS communications service provides a primary means for rapid and efficient communication in support of disaster operations. These communications are performed in accordance with detailed operating procedures providing for multiple means of communication. Applicants' Exhibit 144 at 7-8.

286. FEMA concluded, and the Board so finds, that the state and county plans contain adequate provisions for the notification and evacuation of the public within the 10-mile EPZ (NRC Exhibit 203 at 8).

Contention 22c - There is no description of the arrangements for services of physicians and other medical personnel qualified to handle radiation emergencies and arrangements for the transportation of injured or contaminated individuals beyond the site boundary.

Contention 22e - There is no provission for medical facilities in the immediate vicinity of the site, which includes Glen Rose.

287. Applicants are required to arrange for medical services for contaminated injured individuals. 10 CFR §50.47(b)(12). Applicants' Emergency Plan is required to describe the arrangements for the services of physicians and other medical personnel qualified to handle radiation emergencies on site. In addition, Applicants' Emergency Plan must describe arrangements for the transportation of contaminated injured individuals from the site to specifically identified treatment facilities outside the site boundary. Evaluation criteria regarding physicians, medical facilities and transportation of injured and radiological contaminated individuals are set forth in NUREG-0654/FEMA-REP-1, Criteria L1, 2, 3 and 4.

288. Hood General Hospital in Granbury, Texas, located approximately 16 road miles from Comanche Peak, is the primary facility for treatment of persons with radiological injuries received at Comanche Peak (Applicants' Exhibits 143 at 18; 143D, Section 1.3.1.4). TUCGO has obtained a letter of agreement from Hood General Hospital to receive and treat injured persons who are contaminated with radioactive material or who have an overexposure requiring medical evaluation (Applicants' Exhibits 143 at 18; 143D at Section 15, Appendix H). To insure that appropriate members of the Staff at Hood General Hospital are adequately trained to handle such individuals, and that the facilities of the hospital are adequate to perform such

treatment, the Applicants have contracted with RMC to provide expertise, facilities and equipment to assure a comprehensive emergency medical assistance program (NRC Exhibit 202 at 9; Applicants' Exhibit 143D, Section 10.1).

289. Backup medical services, support and definitive care will be provided by RMC and an affiliated medical center for definitive care at Northwestern Memorial Hospital in Chicago. Letters of agreement have been written to this effect. (Applicants' Exhibits 143 at 18; 143C; 143D at Section 15.0, Appendix H.)

290. Hood General Hospital serves as the local support hospital for treatment of radiological contamination victims, providing gross decontamination, life saving activities, and patient stabilization. Radiological monitoring equipment and personnel monitoring devices will be provided by TUGCO. The hospital staff will include at least one physician trained in handling radiation accident victims. In the event a victim requires more definitive evaluation and treatment RMC will arrange for a transportation of the radiologically injured patient to Northwestern Memorial Hospital where more extensive facilities are available. (Applicants' Exhibit 143 at 19.)

291. Additional support services provided by RMC include a round-the-clock, seven-day-per-week availability of expert consultation and services of a radiation emergency medical team consisting of a licensed physician experienced in radiation medicine, a certified health physicist, and technicians with

portable instruments to evaluate and treat accident victims at Comanche Peak or Hood General Hospital as requested by TUGCO. Additional laboratory review and training services will be provided, as necessary, by RMC. (Applicants' Exhibit 143 at 20; Staff Exhibit 202 at 9.)

292. Additional arrangements for treatment of contaminated injured persons have been made with hospitals in Erath and Johnson Counties. No such arrangements by the state are required for the county-owned hospital, Hood General Hospital in Granbury. (Applicants' Exhibit 144 at 8.)

293. The NRC Staff witness concluded that the Applicants' emergency plan adequately identifies medical personnel and facilities for the treatment of radiologically contaminated persons (NRC Exhibit 202 at 10).

294. The FEMA witnesses testified that upon receipt of a letter of agreement with the hospital in Stephenville, and a statement in the state plan that the Hood General Hospital is a County-owned hospital and therefore requires no letter of agreement, the state and county plans would sufficiently describe plans for receiving, evaluating and treating radiologically contaminated or injured individuals (Tr. 5708-13).

295. Injured persons whose medical treatment is not complicated by radiological considerations may be sent to Hood General Hospital or Marks English Hospital which is approximately

eight road miles distance in Glen Rose, Texas (Applicants' Exhibit 143 at 21). Letters of agreement are not required for treatment of non-radiologically contaminated injured persons.

296. TUGCO has obtained written agreements with the Glen Rose/Somervell County Volunteer Fire Department Ambulance Service and the Hood General Hospital Ambulance Service to provide back-up assistance to the TUGCO onsite ambulance for transporting injured and contaminated victims for medical assistance. Arrangements have been made to train ambulance personnel in the transportation and handling of radiologically injured patients. (Applicants' Exhibit 143 at 21-22; 143D at Section 15.0, Appendix H.)

297. Provisions for the transportation of contaminated injured individuals in the vicinity of Comanche Peak are also made by the Division of Emergency Medical Services of the Texas Department of Health. These arrangements include the responsibility for providing names, telephone numbers and capabilities of trained manpower and vehicle ambulance firms which could provide medical transportation support.)Applicants' Exhibit 144 at 8-9.)

298. The NRC Staff concluded, and the Board so finds, that the Applicants' Emergency Plan adequately described the provisions for transportation of injured persons, including persons who are radiologically contaminated. The Staff also concluded, and the Board also finds, that the Plan contains

adequate provisions for medical personnel, services and back-up medical facilities for the treatment of radiologically contaminated persons. (NRC Exhibit 202 at 12.)

299. FEMA testified that upon receipt of the letters of agreement discussed above regarding medical facility services, the criteria governing transportation of radiologically contaminated or injured individuals would be satisfied if the amubulances are owned by the hospital itself, whether county or privately owned (Tr. 5718).

Contention 22d - There are no adequate plans for testing by periodic drills of emergency plans and provisions for participation in the drills by persons whose assistance may be needed, other than employees of the Applicant.

300. Evaluation of radiological emergency plans for periodic drills and exercises is the responsibility of FEMA (NRC Exhibit 202 at 8). The planning standard for evaluating plans for periodic drills and exercises of emergency plans are set forth in Section II, Part NN of NUREG-0654/FEMA-REP-1, Revision 1.

301. Exercises and drills to test the Comanche Peak Emergency Plan and to familiarize plant personnel with their duties and responsibilities will be conducted on an annual basis as a radiological emergency preparedness exercise at Comanche Peak. The annual exercise will include mobilization of TUGCO, state, local, and private personnel and resources to the extent necessary to verify adequacy of the integrated emergency response capability. (Applicants' Exhibit 143 at 14.)

302. At specified intervals, drills for testing, developing, and maintaining skills in particular areas will be conducted and will follow pre-planned scenarios designed to thoroughly test the response of the personnel involved. Drills will be conducted to test communication links, fire response, emergency medical support, radiological monitoring, health physics and repair and damage control. To insure that local law enforcement agencies will participate in emergency drills and exercises, the sheriffs of Hood and Somervell Counties have entered into written agreements with TUCGO whereby it is understood and agreed that appropriate sheriff's department personnel will participate in periodic drills, annual exercises and site specific emergency response training sessions provided by TUGCO personnel at mutually agreed times and locations. (Applicants' Exhibits 143 at 14-16; 143D at Section 15.0 Appendix H.)

303. Letters of agreement have been reached with the Glen Rose-Somervell County Volunteer Fire Department and Ambulance Service and the Hood General Hospital for participation in periodic drills, the annual exercise, and site specific training sessions. The training sessions will be conducted by TUGCO personnel and RMC and will include procedures for notification, basic radiation protection, site access, and emergency response functions. A similar letter of agreement with the Granbury

Volunteer Fire Department is being renegotiated and will also be included in the plan. (Applicants' Exhibits 143 at 16-17; 143D at Section 15.0, Appendix H.)

304. The Bureau of Radiation Control of the Texas Department of Health will participate, along with appropriate utility, local, state and Federal agencies in annual exercises of Fixed Nuclear Facility Response Plans. Either in conjunction with or in addition to, the major annual exercise, the Bureau will conduct monthly communications drills, and semi-annual health physics drills. (Applicants' Exhibits 144 at 9-10; 144F, Annex L, Appendix 7, Tab 1 at 19-20.)

305. The State of Texas emergency response organizations have received extensive experience in responding to emergencies. In the year immediately prior to the hearings on Comanche Peak, the State Emergency Management Plan was tested in over 1,000 actual emergency situations involving radiation hazards, flooding, tornado damage, hazardous materials spills and numerous other emergencies. These emergencies included four Presidential declarations of disaster. Many also included warning of the affected population, evacuation, provision of temporary shelter, provision of food and medical support, and provision of recovery services. (Applicants' Exhibit 144 at 9; Tr. 5659-60.)

306. Squaw Creek Park, Inc., which operates the recreational area adjacent to Squaw Creek Resevoir, has agreed to participate in exercises, drills, and site specific training

sessions with regard to evacuation of the park and resevoir in the event of an emergency at Comanche Peak (Applicants' Exhibits 143 at 17; 143D at Section 15, Appendix H).

307. FEMA concluded, and the Board so finds, that adequate provisions are included in the state and county plans for periodic drills and exercises (NRC Exhibit 203 at 15).

Contention 22F - There is no provision for emergency planning for Glen Rose or the Dallas/Ft. Worth metroplex.

308. The City of Glen Rose is located in Somervell County, and is within the 10-mile EPZ for Comanche Peak (NRC Exhibit 203 at 16). The Somervell County emergency operations plan contains the emergency planning provisions, including emergency notification and evacuation, for Glen Rose (Applicants' Exhibit 144E). The plan assigns specific responsibilities and tasks to members of the city government and city departments and agencies (Applicants' Exhibit 144E, Annex F, Tab 1, and Section 5). There are specific provisions in the plan for notifying persons living, working or traveling within the 10-mile EPZ of Comanche Peak (including Glen Rose) (NRC Exhibit 203 at 17).

309. FEMA concluded, and the Board so finds, that the Somervell County Emergency Operations Plan is adequate with regard to emergency notification and evacuation for the city of Glen Rose (NRC Exhibit 203 at 17).

310. Portions of Ft. Worth are within the 50-mile Ingestion Exposure Pathway EPZ. The emergency plan for residents located within the 50-mile EPZ is the Texas Emergency Management Plan

(Applicants' Exhibit 144F). (NRC Exhibit 203 at 17.) The principal objective in this area is preventing public ingestion of radioactive contamination from agricultural products produced within the 50-mile EPZ (Applicants' Exhibit 144F, at Annex L, Tab 1, Appendix 7; NRC Exhibit 203 at 17). Milk and other by-products of animals and plants intended for human consumption must be protected from radiation contamination, or must be monitored to insure that they do not contain radioactive materials in quantities which could pose a threat to the consumer (Applicants' Exhibit 144 at 14). Emergency actions in this regard will be ordered by the State, after consultation with the U.S. Department of Agriculture (NRC Exhibit 203 at 17).

311. With respect to products in the food chain, protective actions will primarily be conducted by the Bureau of Consumer Health Protection and the Bureau of Veterinary Public Health of the Department of Health, and by the Texas Department of Agriculture. Protective measures will include food-stuff sampling and analysis, and monitoring and/or collection, as necessary, of dairy product samples, water for dairy animals and vegetation, and unprocessed meat from animals which were inside the ingestion exposure pathway EPZ when contamination was present. The Department of Health's efforts to curtail distribution of contaminated products and to develop protective actions are facilitated by land-use maps of the ingestion exposure pathway EPZ showing crop and food production areas and activity; listings of County Agricultural Agents; monitoring of

food stuff and other agricultural products; and identification of food processors who receive livestock or produce from the affected portion of the ingestion exposure pathway EPZ (Applicants' Exhibit 144 at 12-14).

312. FEMA concluded, and the Board so finds, that emergency planning provisions contained in the State Plan for the Ingestion Exposure Pathway are adequate (NRC Exhibit 203 at 17).

313. The Board finds that all witnesses who testified regarding emergency planning were credible, knowledgeable and forthright. Each witness was well versed in both the programmatic scope and the five details of emergency planning, leading the Board to conclude that the overall state of emergency preparedness at and around Comanche Peak is excellent. The Board finds that none of the issues advanced by CASE in Contention 22 raised any valid question regarding emergency planning for Comanche Peak.

C. Board Question Two - Operations Quality Assurance

314. Board Question Two reads as follows:

> Applicant and Staff should describe in detail the operating quality assurance program for CPSES. A description of the provisions of conduct of QA audits should be provided, including a description of how reactor operations and reactor operator training will be audited.

315. Applicants presented a panel of five witnesses to address Board Question 2. These witnesses were the principal management and supervisory personnel responsible for the operations quality assurance program. Mr. B. R. Clements, TUGCO

Vice President, Nuclear, presented testimony regarding management's commitment to the operations QA program (Applicants' Exhibit 8). Mr. David N. Chapman, Manager of Quality Assurance for TUGCO, presented testimony regarding the operations QA program for Comanche Peak. Specifically, Mr. Chapman addressed the role of the Quality Assurance Division, in the overall corporate QA Program. (Applicants' Exhibit 9). Mr. Richard A. Jones, the Manager of Plant Operations, submitted testimony regarding the commitment of operations personnel to the Operations QA Plan and the implementation of that Plan (Applicants' Exhibit 10). Mr. Antonio Vega, the Supervisor of Quality Assurance Services for TUGCO, presented testimony regarding the conduct of QA audits of reactor operations activities, including reactor operator training (Applicants' Exhibit 12). Mr. David E. Deviney, the Operations Quality Assurance Supervisor, was a member of the panel but did not submit prefiled testimony. Each of these witnesses was credible, demonstrated a thorough understanding of the Operations Quality Assurance Program for Comanche Peak, and exhibited expertise in their respective roles in that program.

316. The NRC Staff presented testimony of Mr. John G. Spraul, a Senior Quality Assurance Engineer (Nuclear) in the Quality Assurance Branch, Office of Nuclear Reactor Regulation. Mr. Spraul's testimony concerned the NRC Staff's evaluation of the Applicants' operations QA Plan for Comanche Peak. Mr. Spraul has extensive experience in nuclear power reactor design and QA.

He has worked with the NRC in reviewing QA programs for nuclear power reactors since 1974. (NRC Exhibit 5.) Mr. Spraul also was credible, demonstrated a thorough familiarity with the Applicants' operations QA program and expertise in the development and implementation of such programs.

1. Operations QA Organization

317. Applicants' corporate QA Program provides for a multitier system of checks, inspections, surveillances and audits. The operational portion of this system is carried out by two independent organizations under the Vice President, Nuclear. The Manager, Plant Operations conducts all safety-related activities associated with plant operations in accordance with the Operations Administrative Control and Quality Assurance Plan ("OACQAP") (Applicants' Exhibit 11). The Manager of Quality Assurance performs independent assessment audits on operations safety-related activities to assure they are performed in accordance with the OACQAP. (Applicants' Exhibit 8 at 2.) The management structure for the TUGCO QA organization is designed to assure direct lines of communications between supervisory and managerial positions to the Vice President, Nuclear, and to assure independence from those responsible for costs and scheduling (Applicants' Exhibits 8, Attachment B; 9 at 4; Tr. 556-559, 565, 567).

318. The Manager of Plant Operations is responsible for and has the authority to assure the development and implementation of an Operations QA Plan in accordance with 10 CFR Part 50, Appendix

B and Regulatory Guide 1.33. To provide for implementation of these requirements, the OACQAP was developed. That plan contains the QA requirements governing activities at Comanche Peak which affect safe operation of the plant. (Applicants' Exhibits 10, at 2; 11.)

319. The Operations Quality Assurance section is supervised by the Operations Quality Assurance Supervisor who reports directly to the Manager of Plant Operations (Applicants' Exhibit 10 at 3; Tr. 573). The Operations Quality Assurance Supervisor is responsible for Quality Surveillance of station activities, implementation of the station Quality Control Program, review of purchase documents for inclusion of quality requirements, advising the Manager of Plant Operations on matters of quality and review of all safety-related station procedures (Applicants' Exhibit 10 at 3). He is authorized to communicate directly with the Manager for Quality Assurance and the Vice President, Nuclear, of resolve issues which may arise with the Manager of Plant Operations (Tr. 573-574).

320. The Manager of Quality Assurance directs the Quality Assurance Division. The QA Division is responsible for conducting safety-related audits of quality-related activities, both on-site and off-site, and auditing and evaluating the QA programs and procedures of consultants, contractors, and suppliers. The Quality Assurance Division is also responsible for surveilling and inspecting equipment and material at suppliers' facilities, reviewing procurement documents of non-

routinely procured items and services and apprising corporate management of the status of QA. The Manager of Quality Assurance is responsible for regularly assessing the status and adequacy of the OACQAP and reporting the results of his evaluation to the Vice President, Nuclear. This assessment is performed continuously, through the audit and surveillance functions as well as through independent outside assessments of the overall QA program. (Applicants' Exhibit 9, at 1-3; Tr. 626-27).

321. The Vice President, Nuclear, is responsible for establishing corporate QA policy, and maintains a continuing involvement in QA activities. He is responsible for assuring that the Manager of Quality Assurance has sufficient independence and authority to fulfill his QA responsibilities. (Applicants' Exhibit 9 at 3.) The Vice President, Nuclear, is responsible for the development and implementation of the corporate QA Program for Comanche Peak. Further, he is responsible for assuring that the Operations QA Plan is established and implemented with sufficient independence to fulfill each of its QA responsibilities. (Applicants' Exhibit 8 at 2.)

322. A separate program for review and audit of activities affecting station safety during the operational phase has been established, which augments the audit and surveillance program described below. This additional program involves the Station Operations Review Committee ("SORC"), the Operations Review Committee ("ORC"), and the Independent Safety Engineering Group ("ISEG"). This program assures that operational activities are

performed in accordance with company policy and rules, approved procedures, and license provisions. The program will provide an additional layer of review of safety-related plant changes, tests, and procedures. It will verify the proper reporting of reportable events to the NRC and will detect trends which may not be apparent in daily observation. (NRC Exhibit 5 at 8.)

323. The SORC is composed of station supervisory and technical personnel and is charged with reviewing various areas of plant operation and advising the Manager, Plant Operations on the status and disposition of those items. The primary purpose of that committee is to review all safety-related activities associated with operation. (NRC Exhibit 5 at 9; Tr. 567-68.) This committee meets on a monthly basis and reports to the ORC with its findings (Tr. 568.)

324. The ORC, chaired by the Vice President, Nuclear, is an independent body assigned primary responsibility for the review of safety-related station matters. The ORC will periodically conduct independent reviews of the audit programs to assure satisfaction of applicable criteria and procedures. (Staff Exhibit 5 at 10.) The Manager of Nuclear Operations is the Vice Chairman of the ORC. The majority of the members of the ORC is people who are not responsible for operations at Comanche Peak. The ORC is responsible for matters concerning only Comanche Peak and it will have the authority to delve into any questions concerning the operation of Comanche Peak. (Tr. 569-71.) 325. The ISEG performs independent reviews of operations and related

activities at Comanche Peak (NRC Exhibit 5 at 11). The ISEG was formed in response to Regulatory Guide 1.33, Revision 3, and will be directed by the Manager of Nuclear Operations, completely independent of the Manager, Plant Operations (Tr. 571-72). The ISEG will be composed of engineers with a minimum of three to five years experience in varying disciplines with the sole responsibility of evaluating the operations of the facility (Tr. 576-77). The ISEG will make recommendations to management regarding means to improve the overall quality and safety of operations and will review matters referred to it by the SORC or the ORC (NRC Exhibit 5 at 11).

2. Management Commitment to Quality Assurance

326. The TUGCO Vice President, Nuclear (Mr. Clements) and the Manager for Plant Operations (Mr. Jones) testified as to the corporate management philosophy regarding the implementation of an effective QA Program. Both individuals demonstrated a firm commitment and genuine concern for the implementation of an operations QA Program that assures the safe operation of the facility. Mr. Clements testified that it is the philosophy of the TUGCO corporate management that safe operation of a nuclear plant depends not only on the operational technical groups at the plant, but also on continual attention by corporate management to the programs, policies and implementing procedures which are essential to the operation of the nuclear plant, including QA (Applicants' Exhibit 9 at 3-4). Mr. Jones testified that TUGCO

management recognizes that QA is the responsibility not only of a single department, but also of all personnel at Comanche Peak (Applicants' Exhibit 10 at 2).

327. One aspect of the management commitment to an effective QA Program is the assurance that the QA organization is independent of direct responsibility for the conduct of specific operations activities. An additional aspect of the corporate commitment to QA is the commitment to have qualified personnel in the operations QA Program. Mr. Clements stated that corporate management is firmly committed to utilizing recruiting and training programs to assure that persons experienced in applicable QA activities are included on the QA staff for the operations phase of Comanche Peak. These include persons knowledgeable in nuclear power plant systems. In addition, consultants are utilized for QA training to assure a comprehensive knowledge of QA procedures and practices on the part of all QA personnel. (Applicants' Exhibit 8 at 4.) The QA Program for operations will utilize staffs of qualified individuals for performing audit, inspection, and surveillance activities. In addition, all members of the on-site operations group, including operator, maintenance and other associated personnel, receive QA training. (Tr. 598-608.)

3. Audits, Surveillances and Inspections

328. The QA Program establishes a comprehensive audit system to ensure that the Program requirements and related implementing procedures are followed during operations (NRC Exhibit 5 at 6). Audits of reactor operations and reactor operator training will be conducted in accordance with procedures by qualified personnel. Those procedures comply with industry standard ANSI N45.2.12 entitled, "Requirements For Auditing of Quality Assurance Programs For Nuclear Power Plants." The personnel performing audits are certified in accordance with a program which requires the evaluation of their education, experience, training and capabilities. This certification program satisfies the provisions of NRC Regulatory Guide 1.146 and ANSI N45.2.23, entitled, "Qualification of Quality Assurance Program Audit Personnel For Nuclear Power Plants." (Applicants' Exhibit 12 at 2-3; Tr. 633-34.)

329. Applicants are committed to audit all aspects of the QA Program on a scheduled basis. The audits are performed by qualified personnel, independent of the activity being audited, using checklists in accordance with approved procedures. (NRC Exhibit 5 at 8.) The NRC Office of Inspection and Enforcement will itself audit the implementation of the QA Program and review procedures to verify fulfillment of commitments in the FSAR. This review occurs in advance of the date (90 days before fuel loading) on which the operational QA program must be functioning. (Tr. 656-57.)

330. In addition to the audit program, a quality surveillance program is administered by the Operations Quality Assurance Supervisor (Applicants' Exhibit 10 at 3). This surveillance program is not required by regulation since Applicants' audit program would satisfy applicable regulatory requirements in its absence (Tr. 610, 635-36) A list of activities for which surveillances are performed at least annually was submitted as Applicants' Exhibit 10, Attachment B.

331. In addition to the audit and surveillance activities, the operations QA section conducts inspections of on-going quality-related activities. Prior to the performance of an activity involving any safety-related work, instructions are developed and reviewed by a Quality Control Inspector and inspection hold points are established. These inspectors are qualified in accordance with Regulatory Guide 1.58 and ANSI N45.2.6. (Applicants' Exhibit 10 at 4; Tr. 613-617.)

4. Audits of Reactor Operator Training

332. Audits of reactor operator training are performed in accordance with the procedures and requirements applicable to the audit of other quality-related activities (Tr. 628-30; Applicants' Exhibit 12). Operator training and maintenance of qualifications for Comanche Peak operators will include utilization of a similator to be located on-site. A total of 64 on-shift operators for two-unit operation will be employed at Comanche Peak. Since training of on-shift operators began in

January of 1977, the Westinghouse training facility in Zion, Illinois, employing the Westinghouse similator, is being used until the on-site similator is operational (Tr. 632-633.)

333. The Board is satisfied that its question regarding QA for plant operations has been answered fully. The Board finds that Applicants have organized a comprehensive, well-staffed QA Program for operations in accordance with applicable regulations. The Board further finds that TUGCO management is duly committed to the effective implementation of the QA principles in that Program and recognizes the importance of that Program in assuring the safe operation of Comanche Peak.

D. Boron Injection Tank

334. The original design for Comanche Peak contemplated installation of a Boron Injection Tank ("BIT") system. However, upon consideration of several factors, discussed below, the Applicants decided to delete the BIT from the design. (Tr. 740.)

335. The BIT was designed as a component subsystem of the Emergency Core Cooling System ("ECCS") at Comanche Peak. It was a 900-gallon stainless steel tank filled with a 12 weight/percent ("w/o") concentration of boric acid to be connected to the high-head charging pump system to provide make-up water for core cooling when either the reactor vessel pressure or primary cooling system pressure remains high.

Under those conditions, the high-head pumping system draws water through suction from the Refueling Water Storage Tank ("RWST") which contains 450,000 gallons of 2,000 p.p.m. boron concentrated water. The RWST water is then injected into lines that lead to the four reactor vessel cold legs by two centrifugal charging pumps. The BIT system was connected to the high-head pumping system lines between the discharge point of the centrifugal charging pumps and the injection point into the reactor vessel cold legs. Isolation between the BIT system and the high-head pumping system is provided by four BIT isolation valves. (Board Exhibit 2 at 3-4, and Attachment 2.)

336. The purpose of the BIT was to limit the reactor's power increase following a postulated steamline break event. In the event of ECCS initiation, the emergency core cooling water discharged into the reactor vessel cold legs would sweep the BIT water with it and into the reactor vessel itself. The boron solution in the BIT water would add negative reactivity to the reactor coolant system with a net effect of limiting the power increase following the steamline break. (Board Exhibit 2 at 4-5.)

337. Maintenance of a BIT system has resulted in problems at other facilities, such as creating difficulty in maintaining the high concentration of boric acid in solution, complicating clean-up in the event of an inadvertant

actuation of the safety injection system, crystalization and solidification of the boric acid solution, and overcoating and possible gumming of valves. (Tr. 741, 746, 782-83.) The decision to delete the BIT was not made on the basis of cost (Tr. 767).

338. The additional shutdown safety margin afforded by use of the BIT through the negative reactivity contributed by the 12 w/o boric acid solution was taken credit for only in the steamline break analyses for Comanche Peak (Tr. 761; Board Exhibit 2 at 6). A number of reanalyses were performed to assure that deletion of the BIT was fully in accord with safe reactor operation. These reanalyses demonstrated that even upon removal of the BIT, all licensing and safety criteria were satisfied. (Tr. 741.) Specifically, the principal criterion used to evaluate the effect of deletion of the BIT, the Departure from Nucleate Boiling Ratio ("DNBR"), remains above the safety limit of 1.3 regardless of whether a BIT is employed (Board Exhibit 2 at 6; Applicants' Exhibit 154). In addition, although the calculated value for the DNBR demonstrated that no fuel failure would result without utilization of a BIT even in the limiting accident scenario of a zero power steamline break, the Applicants nonetheless conservatively assumed up to 5% fuel failure for purposes of analyzing off-site dose calculations. Those

doses remained at small fractions of the limits established in 10 C.F.R. Part 100 (Tr. 751; Board Exhibit 2 at 6; Applicants' Exhibit 154).

339. The Staff has reviewed the information presented by the Applicants regarding removal of the BIT. Similar findings had been made previously by the Staff regarding removal of the BIT at Turkey Point, Units 3 and 4. Upon evaluation of the ECCS for Comanche Peak without the BIT, the Staff concluded that the designs of the reactivity control system conformed to all applicable regulations and are acceptable. (Board Exhibit 2 at 7, SER at 4-21.)

340. The Board finds that no safety concerns are presented by the deletion of the BIT from Comanche Peak. Appropriate calculations of the consquences of postulated accident scenarios with and without the BIT demonstrate satisfaction of applicable safety criteria, including dose limitations established in 10 C.F.R. Part 20 and Part 100.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Applicants' Proposed Findings of Fact on Intervenor's Contentions 5 and 22, Board Question 2 and Deletion of the Boron Injection Tank In The Form of a Partial Initial Decision," in the above-captioned matter, were served upon the following persons by hand delivery (*), express delivery (**) or by deposit in the United States mail first class postage prepaid, this 25th day of February 1983:

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