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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before Administrative Judges:

Peter B. Bloch, Chairman
Dr. Kenneth A. McCollom
Dr. Walter H. Jordan

In the Matter of

TEXAS UTILITIES ELECTRIC COMPANY, et al.

(Comanche Peak Steam Electric Station,
Units 1 and 2)

Docket Nos. 50-445-OL
50-446-OL

ASLBP No. 79-430-06 OL

MEMORANDUM
(Concerning Welding Issues)

December 18, 1984

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MEMORANDUM
(Concerning Welding Issues)

In this Memorandum, we decide issues raised by Darlene and Henry Stiner. Mr. Stiner was a welder at Comanche Peak. Mrs. Stiner, his wife, was both a welder and quality control inspector at the plant.

Because these witnesses have direct knowledge of the plant, we have taken their testimony with great seriousness, involving many hours of hearing time. In deliberating on what we have heard, we have reluctantly come to the conclusion that neither of the Stiners is a credible witness.

Our conclusion about the Stiners' credibility is more fully explained in the body of our opinion. Part of the basis for our conclusion came from our realization that both of the Stiners misunderstood the technical foundation for the weave welding procedure which was the crux of a substantial portion of their complaint about the plant. Furthermore, we find that Henry Stiner had a long-standing absentee problem at work and that he was discharged from the plant because of his absenteeism, not because he gave information to a QC inspector about a gouge in a pipe preceding the three day absence that precipitated his termination. As a result of reaching this conclusion about the Stiners' credibility, we have found it appropriate to use Applicants' proposed partial initial decision as the framework within which to write our decision.

Despite the Stiners' general lack of credibility, they have raised questions about some welding practices that are of concern to us and that the Commission's Staff continues to investigate. To the extent that these concerns are corroborated by others, issues raised

by the Stiners may later be found to be meritorious. For the time, however, these issues are the Staff's concern. We expect a Staff report following which we will make a determination concerning whether these should be issues in this case.

I. BACKGROUND

This is the third decision concerning allegations regarding welding at the Comanche Peak Steam Electric Station ("CPSES"), Units 1 and 2, raised by two witnesses of intervenor Citizens Associations for Safe Energy ("CASE"), Darlene and Henry Stiner. The first, LBP-83-43, Proposed Initial Decision, 18 NRC 122 (1983) (pp. 26-41), resolved all but four issues related to their allegations, viz., weave welding, downhill welding, weld rod control and welding of misdrilled holes.¹ The second decision, LBP-83-60, Memorandum and Order (Emergency Planning, Specific Quality Assurance Issues and Board Issues), 18 NRC 672 (1983), discussed weave welding, repair of plug welds, downhill welding and weld rod control.

In response to objections to the July 29, 1983 Proposed Initial Decision filed on August 27, 1983, by Texas Utilities Electric

¹ This first decision was based on testimony presented at hearings held on September 13, 1982, e.g., Testimony of Henry Stiner (CASE Exhibit 666) and Darlene Stiner (Case Exhibit 667) received into evidence at Tr. 4202 and 4124, respectively; Rebuttal Testimony of C. Thomas Brandt, et al. (Applicants' Exhibit 141), received into evidence at Tr. 4655; and NRC Staff Exhibits 13 (at 98-99) and 178, both received into evidence at Tr. 2336.

Company, et al. ("Applicants"), by Memorandum and Order of September 29, 1983 at p. 24, the Board closed the issue of weave welding raised by the Stiners in favor of Applicants. Subsequently, in a February 10, 1984 Licensing Board Order, the Board reopened the weave welding issue.

To resolve these remaining open issues, hearings were held on February 23, March 19-23, and April 24, 1984. During these hearings, the Board expanded the issues to be addressed to include allegations made by Mr. Stiner regarding preheat of weld joints (CASE Exhibit 919 at 9; Tr. 10799, 10802, 10825). In sum, the welding issues raised by the Stiners which are the subject of this Partial Initial Decision relate to weave welding, downhill welding, weld rod control, welding of misdrilled holes and preheat.

II. FINDINGS OF FACT - CONTESTED ISSUES

A. Witnesses and Testimony

1. CASE

Mr. and Mrs. Stiner each testified on welding issues addressed in the July 29, 1983 Partial Initial Decision, i.e., CASE Exhibits 666 and 667, respectively. In addition, they jointly sponsored testimony introduced at the second round of hearings on this issue (CASE Exhibit 919, received into evidence at Tr. 9979). However, major sections of this testimony were stricken, including Attachment B of their testimony referencing a welding handbook (see e.g., Tr. 9937, 9960, 10262, 10282, 10325, 10494, 11069).

The Stiners were offered as expert witnesses with regard to welding activities at Comanche Peak. Mr. Stiner was first hired on December 5, 1979, and shortly thereafter was trained as a welder. He was qualified as a structural welder on February 11, 1980. During his first period of employment at Comanche Peak, he worked 41 weeks during which he was absent a total of six weeks and worked 30 hours or less during an additional eight weeks. Mr. Stiner's last day of work (for his first term of employment) was November 26, 1980. However, he was rehired and was again qualified as a structural welder on June 22, 1981. He welded for approximately three weeks before he was again terminated, following a three day absence from work.

Mrs. Stiner was in a qualified welding position (though not welding the entire time) from February 27, 1979 to August 3, 1980. (Applicants Exhibit 177 at 5.) During the summer of 1980, Mrs. Stiner began work as a welding QC inspector. Tr. 4130.

The Stiners stated that they were "certified to weld to both ASME and AWS D1.1" (CASE Exhibit 919 at 1-2). More specifically, they were qualified to two production welding procedures (Procedures 11032 and 10046), one relating to a portion of the ASME Code and one to a portion of the AWS D1.1 Code. These procedures qualified them to weld with the shielded metal arc process only on low carbon steel material such as pipe supports, and not on pressure piping joints, stainless steels or with other processes such as gas tungsten arc. (Tr. 9981-82.) Mr. and Mrs. Stiner's testimony was found to be qualified as expert welders within the limited areas of their qualifications.

In addition, based on Mrs. Stiner's experience in quality control inspection of welding at CPSES (CASE Exhibit 667 at 7-14), she was accepted as an expert witness concerning quality control.

Neither Mr. nor Mrs. Stiner was offered as an expert in metallurgy or any phase of engineering (Tr. 10255, 10774, 11047), and the Board gives no weight to their testimony with regard to issues relating to those disciplines (Tr. 10283, 10776).

2. Applicants

Applicants presented 10 witnesses (as described below) to respond to the allegations of Mr. and Mrs. Stiner. These witnesses jointly sponsored testimony during the second round of hearings on these allegations. (Applicants Exhibit 177, received into evidence at Tr. 9976.)

Messrs. S. Fernandez, I. Pickett, and A.M. Braumuller are three welders still employed at CPSES who were on Mr. Stiner's crews. Each welder has at least four years of welding experience at CPSES, and Mr. Braumuller has a total of 28 years experience as a welder. (Applicants Exhibit 177 at 3-4.)

Messrs. F.E. Coleman and C.R. Brown are two welding foreman assigned to Mr. Stiner's crews during his employment at CPSES. The welding foreman was a non-supervisory technician who would constantly monitor and assist the work of the five to 15 welders on his crew. Mr. Coleman also worked as a welder in the same areas as Mrs. Stiner, and Mr. Brown welded in the same areas as Mr. Stiner during Stiner's first term of employment. Messrs. Coleman and Brown have each been

employed at CPSES for over four years in welding-related positions. Both are currently QC Level II inspectors. (Applicants Exhibit 177 at 2.)

Messrs. J. Green and E. Hallford were the foreman and general foreman, respectively, over Mr. Stiner's crew during Stiner's second term of employment. Both have been employed at CPSES for approximately five years. (Applicants Exhibit 177 at 3.)

Mr. C.T. Brandt is the QA Staff Engineer at CPSES. He was formerly Mechanical/Civil QA/QC Supervisor responsible for all non-ASME Mechanical and Civil Quality Control Activities and had overall responsibility for training, staffing and personnel development of Civil and Mechanical inspectors and QA personnel, including Mrs. Stiner. He has been employed at CPSES in QA/QC related work for four years. Mr. Brandt is also a member of the American Welding Society. (Applicants Exhibit 141 at Attachment A.)

Mr. W. Baker, Senior Project Welding Engineer at CPSES for six years, has over 28 years of diversified experience in the welding industry. His experience encompasses 15 years of pressure vessel and power plant construction. He is a member of the American Welding Society and currently a Senior Project Welding Engineer at Brown & Root. (Applicants Exhibit 177 at Attachment A.)

Mr. M. Muscente has 25 years experience associated with the design, engineering, fabrication, material selection, and examination and erection of engineered equipment and systems, including pressure vessels, pumps and piping. Mr. Muscente is a member of the American Welding Society, The American Society of Mechanical Engineers and is a

registered Professional Engineer in Quality Engineering in California. He is currently the Manager of Materials Engineering at Brown & Root. (Applicants Exhibit 177 at Attachment B.)

Applicants' witnesses Brown, Braumuller, Fernandez, Pickett, Coleman, Brandt and Baker are recognized by the Board as expert welding witnesses. Applicants' witnesses Baker and Muscente are recognized by the Board as expert witnesses in the area of metallurgy. Applicants' witnesses Brandt, Coleman and Brown are recognized by the Board as experts in quality control.

3. NRC Staff

The NRC Staff presented the testimony of Messrs. W. Collins, L. Gilbert, D. Smith and R. Taylor. These witnesses jointly sponsored testimony provided during this second round of hearings on welding allegations. (NRC Staff Testimony on Welding Fabrication Concerns Raised by Mr. and Mrs. Stiner ("NRC Staff Testimony") and Addendum to Page 27 of NRC Staff Testimony on Welding Fabrication Concerns Raised by Mr. and Mrs. Stiner ("Staff Addendum"), both received into evidence at Tr. 12146.)

Mr. Collins is a Senior Metallurgical Engineer with the Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission. He has approximately 25 years experience in metallurgy, 16 of which have been as a technical adviser in the area of metallurgy and metallurgical problems relating to construction, testing and operation of nuclear power plants. (NRC Staff Testimony at 1 and Attachment 1.)

Mr. Gilbert is expert in welding and non destructive examination and is a Reactor Inspector responsible for inspecting nuclear power plants located in Region IV. He has 14 years experience in welding and seven years experience as a Reactor Inspector. Mr. Gilbert is a registered Professional Engineer in Quality Engineering in the State of California. (NRC Staff Testimony at 2 and Attachment 1.)

Mr. Smith is a materials engineer responsible for the review of materials and fabrication processes used in the construction of nuclear power plants, as well as the evaluation of material and weldment failure in nuclear power plants. He has 17 years experience as a materials engineer, including four years with the Materials Engineering Branch of the NRC. (NRC Staff Testimony at 2-3 and Attachment 1.)

Mr. Taylor is employed by the NRC as a Reactor Inspector in the Division of Reactor Safety and Projects, Region IV. In this position, he coordinates all safety-related inspection efforts relative to the NRC Region and the site. He was assigned to Comanche Peak as Senior NRC Resident Inspector for Construction. Mr. Taylor is a registered Professional Engineer in the State of California. Prior to this, from 1976 to 1978, Mr. Taylor was the construction project reactor inspector at the South Texas Project. (Staff Exhibit 9.)

B. Credibility

Prior to the hearings, the Board determined that there were direct conflicts in the testimony of witnesses for CASE and the

Applicants regarding important factual allegations. Accordingly, in an attempt to elicit accurate factual information with regard to compliance with welding procedures and the quality assurance program involving welding, the Board directed limited sequestration of all witnesses who would provide testimony on craft activities at CPSES regarding these issues. The purpose of this sequestration was to prohibit communication between the witnesses so that they would not know what one another had said at the time each testified. (Tr. 9916-17.)

Due to the extensive direct conflicts of factual evidence, the credibility of each witness was weighed carefully in evaluating the evidence in the record. Applicants' witnesses provided credible and consistent testimony on direct and in response to the cross-examination questions of all parties. In addition, in response to cross-examination questions Applicants' witnesses stated that they were instructed to tell the absolute truth when testifying and that if their testimony reflected problems with the plant, it would not adversely impact their employment at the plant (Tr. 11518-9, 11652, 11703, and 11744-5). In short, the Board finds no inconsistencies from Applicants' witnesses which would call into question their credibility. The Board makes a similar finding with respect to the Staff's witnesses.

However, the Board finds that Mr. and Mrs. Stiner's allegations must be considered in light of inconsistencies in their testimony and demonstrated lack of credibility.

1. Henry Stiner

Henry Stiner has been convicted of three felonies: Theft (State of Texas) in 1980 (Applicants Exhibit 183 previously received into evidence in this proceeding at Tr. 10,579); Robbery with a firearm (State of Oklahoma) in 1979 (Applicants Exhibit 182, previously received into evidence at Tr. 10,579); and Possessing Marijuana with the Intent to Deliver (State of Arkansas) in 1976 (Applicants Exhibit 181, previously received into evidence at Tr. 10,579). The Board finds that this is relevant evidence. See Rule 609 of the Federal Rules of Evidence, and the accompanying notes thereto.

Mr. Stiner's testimony also indicates that he has had a tendency to elaborate on testimony adverse to Applicants as the proceeding progresses. For example, in earlier testimony filed in this proceeding, Mr. Stiner stated that he performed welds on misdrilled holes several times (CASE Exhibit 666 at 18). In subsequent testimony Mr. Stiner changed from several repair welds on misdrilled holes to at least 20 or 30 such welds (CASE Exhibit 919 at 22) and during redirect examination Mr. Stiner testified that he performed hundreds of "plug welds" throughout the plant (Tr. 10672). Mr. Stiner subsequently testified that he had performed 20 or 30 plug welds in a single day (Tr. 10699-70).

Mr. Stiner sometimes gave conflicting testimony. For example, during previous hearings, Mr. Stiner testified that he never left his weld rods out of the can (Tr. 4301-02). When asked this question again during the March 1984 hearings he directly contradicted his previous testimony by stating that he did leave weld rods out of the

can as much as any other welder did (Tr. 10856). In attempting to explain the obvious inconsistency in his testimony, the following discussion occurred:

BY MR. REYNOLDS:

Q. Do you have an explanation [for the inconsistency]?

A. Yes, I do. I believe at the time the line of questioning and the manner that it was being -- the line of, I call it interrogation, was being handled, I think maybe I just misunderstood what you were trying to get to and in what reference you were trying to actually set me up or whatever. And that's probably the reasons for the inconsistencies in the testimony there and now.

JUDGE BLOCH: Mr. Stiner, your job is never to figure out what the lawyer is trying to get to. If he asked you "do you put things into a rod can," you just answer what the truth is. You have no business trying to figure out what he's trying to get to.

I don't understand that explanation.

Did you or did you not put these things into the -- leave your rods out of the rod can?

THE WITNESS: I did leave them out.

JUDGE BLOCH: Why do you think you said you didn't in the last testimony?

THE WITNESS: Like I say, I was in such a fog when I was up here testifying the first time, that I'm liable to have actually said anything. That's why I try to go back and find all these inconsistencies. But I'm sure that I did skip over some of them that I didn't catch, like that one instance. I would have clarified it if I saw it when I read through the transcript.

It's not that I intentionally lied. It's just a case where at the time of the questioning it was not in my mind to grasp.

The Board Chairman noted at the time "that this seriously affects his credibility" (Tr. 10861).

As another example of an inconsistency, Stiner stated in his pre-filed testimony that his work always looked good to QC and they almost always ended up "buying it off" (CASE Exhibit 666 at 34; Tr. 10674). However, during Mr. Stiner's cross-examination he stated that many of his welds were rejected (Tr. 11009).

As another example, Mr. Stiner initially testified that workers violated weld rod control procedures regarding retention of rods because "they are under so much pressure to get the work done and get the hangers up that they try to do anything they can do to speed up work" (CASE Exhibit 919 at 19). However, in response to an inquiry that appeared to bring into question the logic of such a position, Mr. Stiner reversed himself and testified that he did not hold out rods because he was under time pressure (Tr. 11126-8).

As another example, Mr. Stiner testified that under the direction of Cliff Brown and Jimmy Green, he performed a downhill weld on a particular hanger in a limited access area (Tr. 10622). Significantly, when Mr. Stiner was confronted with conflicting testimony regarding whether Mr. Brown could direct him to perform a weld, he testified that Mr. Brown did not direct him to make this downhill weld; rather Mr. Brown made the weld himself (Tr. 10967-75, especially 10967 (which references Tr. 10622) and 10975).

As another example, Mr. Stiner testified that while he was "illegally" repair welding misdrilled holes that Messrs. Brown, Coleman and Green stood watch for OC (Tr. 10685-6). Later however, he

testified under cross-examination that only Fred Coleman had stood watch for him while he was repairing misdrilled holes (Tr. 11031). Mr. Stiner testified that Mr. Brown never stood watch for him for QC inspectors in any respect (Tr. 11031). Mr. Stiner after being informed by Applicants' counsel of an inconsistency with previous testimony then stated that Mr. Brown did stand watch for him once (Tr. 11032).

Mr. Stiner also testified that it would take him approximately two minutes to perform a repair weld on a 1 1/4 inch hole in a two inch thick plate, excluding blending of the weld and base metal surface (Tr. 10698). Further, Mr. Stiner stated that it would only take two weld rods to perform such a repair (Tr. 11158). Staff's witnesses testified that based on simple volumetric calculations it was not possible to do what Mr. Stiner stated. They testified that disregarding all other factors, such as cleaning the weld surface, changing weld rods, or turning the member, it would take no less than 20 minutes and 20 to 25 weld rods to complete the weld on the misdrilled hole cited by Mr. Stiner. (Staff Testimony at 26; Tr. 12250-51.) Based on independent testing Applicants verified the Staff's testimony (Tr. 11767-68).

Mr. Stiner testified that it was faster to weave weld than to perform a stringer (line) weld, and accordingly, supervisors directed welders to weave weld to accelerate production (Tr. 10863, 10896). However, in response to cross-examination of earlier testimony, Mr. Stiner stated first that it took approximately the same length of time to perform a stringer and weave weld; next, that the stringer weld

took longer; and finally, that the weave weld took much longer (Tr. 4361-63).

In explaining how he knew that he was allegedly performing an illegal "plug weld" on ASME hangers, Mr. Stiner changed his position in mid-sentence as illustrated by the following discussion:

JUDGE BLOCH: Do you ever know of having done one [illegal "plug weld"] that was an ASME support?

THE WITNESS: Yes, sir.

JUDGE BLOCH: How do you know it was an ASME support?

THE WITNESS: Because it was a Class 3.

JUDGE BLOCH: How did you know it was Class 3?

THE WITNESS: The package numbers will indicate on the end of the package number, A35R or A33R, an A32R.

JUDGE BLOCH: They brought this material to you, which was an illegal weld, together with the package that legally went with it, just to show you that it was an ASME weld?

THE WITNESS: No, not to show me that the package -I mean most of the time you know when you're working in a particular area, according to what class of hanger you're working on.

[Tr. 10,673-74]

Mr. Stiner's testimony concerning the relationship of "arc blow" to downhill welding is illustrative of bias, consisting of his willingness to provide adverse testimony to Applicants without sensitivity to whether the matter is beyond his expertise. Mr. Stiner testified that downhill welding is useful to compensate for the "arc blow" caused by the magnetization of the welded metal. Tr. 4246-47, CASE Ex. 666 at 45. Metal, according to Mr. Stiner, becomes "magnetized" when cut with a welding torch. Tr. 4246. This

assertion, however, indicates total lack of metallurgical expertise. "Arc blow" is the phenomenon resulting in the deflection of the arc due to a deformation in the magnetic field. Applicants' Ex. 177 at 15 (Baker, Muscente). This deformation in the magnetic field is caused not by "cutting with a welding torch," but by welding close to ground into obstructed areas such as corners. Id. Small amounts of arc blow are beneficial to the welder because it helps him form the bead shape, control molten slag, and achieve proper penetration. Id. Arc blow is a potential problem only when using amperage rates in excess of 250 amps, for rate more than double that specified (90-120 amps) for welders at CPSES. Id.

2. Darlene Stiner

With regard to her testimony, Mrs. Stiner apparently relied heavily on what her husband told her. For example, Mrs. Stiner relied on Attachment B to her testimony in responding to several questions concerning why she believed and testified that weave welding caused excessive heat input that would result in damage to the parent metal (e.g., Tr. 10305-10). However, in subsequent cross-examination she revealed that she had not even read Attachment B, but rather her husband had discussed it with her and she agreed with his views on the subject. She stated that the Attachment related to her husband's testimony, not her testimony (Tr. 10542-45).

Mrs. Stiner responds to questions by significantly overstating the facts. For example, she testified that her supervisor told her that she "would be fired" if she didn't accept a certain hanger (Tr.

10276). However, in responding to another question, she related the substance of the conversation, which did not include a threat to fire her (Tr. 10276-77). The Board cautioned Mrs. Stiner to not overstate the facts (Tr. 10277). As another example she stated that a QC inspector had the authority to order that a hanger be cut down. However, based on other questions she admitted that she didn't know if an inspector had that authority (Tr. 10278-79). As another example, she testified that her supervisor had not given certain weld rods that she had found; subsequently, to Tom Brandt she admitted that she did not know (Tr. 10474-75). As another example, Mrs. Stiner testified that "she is sure" that Mr. Brown does not monitor his welders and watch them make their welds so that he would know if they were weave welding contrary to procedures (Tr. 10200). However, on cross-examination she testified that Mr. Brown was never her foreman, she did not know he was a foreman and she was simply speculating (Tr. 10291).

Mrs. Stiner testified that welders did not generally have and could not easily obtain pencil grinders (Tr. 10285-86). Other welders and foremen (Messrs. Pickett, Braumuller, Fernandez, Coleman, Brown and even Mr. Stiner) testified that they had pencil grinders and, when asked, they testified that pencil grinders were readily accessible in the areas in which they were working (Tr. 10614, 11469, 11547, 11621-22, 11643, 11666). On this direct conflict of testimony, we find that Mrs. Stiner lacks credibility.

In her testimony, Mrs. Stiner made one specific allegation regarding excessive weave welding by one of Applicants' witnesses, Mr.

Braumuller. However, this testimony was inconsistent and lacking in credibility. Significantly, when testifying Mrs. Stiner had notes allegedly made at around the same time as the events in question. (The notes were not admitted into evidence.) The Board notes below only a few of the inconsistencies in this testimony:

- Mrs. Stiner testified that on March 24, 1981, while inspecting a companion hanger, she first noticed Mr. Braumuller making excessive weave welds on hanger TWX-0397-14A35R (Tr. 10161, 10183-85). She testified that, she inspected the hanger for a final inspection on March 26 and again saw Mr. Braumuller weave welding on the hanger (Tr. 10156, 10164). However, in earlier testimony she had stated that her initial inspection was on March 26 and the final inspection occurred later (CASE Exhibit 667 at 25; Tr. 10185). Mrs. Stiner provided a long explanation attempting to reconcile the difference (Tr. 10185-89). At bottom, however, her earlier testimony was, at best, incomplete. Mrs. Stiner testified that after her inspection on March 26, she returned on March 27 and wrote an NCR on the hanger (Tr. 10173). Again, conflicting earlier testimony was presented that the NCR was not written until several days after the "initial" inspection of March 26. CASE Exhibit 667 at 25. This time Mrs. Stiner just admitted that the earlier testimony was wrong (Tr. 10196). To summarize, at the conclusion of the hearing on February 23, 1984, Mrs. Stiner's story was that she had seen Braumuller weave welding on the hanger on March 24 and 26, 1981, and had written an NCR on March 27. (Tr. 10196.) When the hearing reconvened over three weeks later, Mrs. Stiner, responding to a Board question precipitated by an inconsistency, testified that she had not seen Mr. Braumuller welding on the hanger on March 24; indeed, the first time she noted weave welding on the hanger was on March 26, 1981 (Tr. 10454-56).
- Mrs. Stiner testified on many occasions that she had never approved the hanger due to her concern over the alleged weave welding (Tr. 10273). Yet, Applicants presented an Inspection Report dated April 8, 1981 that was signed by her (Tr. 10266) indicating that the hanger was satisfactory (Tr. 10263-64). Mrs. Stiner testified that while she doesn't remember signing it, she may have (Tr. 10273). She testified that she must have signed it under threat of being fired (Tr. 10265,

10261). Later however, she admitted that there was no direct threat of firing (Tr. 10276-77).

- Mrs. Stiner testified that the NCR she had written had been voided and Applicants had no record of it. The Board reminded Mrs. Stiner that even voided NCRs are given numbers. Mrs. Stiner did not know and could not find the number even though she kept a log of her significant work activities and stated that she had written it down. (Tr. 10144-45.) On the Inspection Report for this hanger, that we conclude was signed by Mrs. Stiner on April 8, however, she had written "not applicable" under the section for listing outstanding NCRs. (Tr. 10267.) She reconciled the testimony by stating that the NCR had been voided and she had no number to put in the box. However, she earlier testified that she had not known what had happened to the NCR. (Tr. 10267.) Mrs. Stiner could not provide a satisfactory explanation as to why she wrote "not applicable" in this section of the Inspection Report if she had reported an NCR which, to the best of her knowledge, had not been dispositioned (Tr. 10267-68).
- Mrs. Stiner's notes purported to be contemporary records of events taking place at the plant. However, key entries about the disputed hanger were in blue pen. These were the only entries in blue pen. Mrs. Stiner was unable to explain this aberration in a convincing way. We conclude that these blue-penned entries were not contemporaneous but were made at a later date to support Mrs. Stiner's testimony. (Tr. 10,172-74, see also 10,520.)

On this record, Mr. Stiner is shown to be a convicted felon; further, the record demonstrates that Mr. and Mrs. Stiner are individuals who possess memories that produce different versions of the same facts when questioned at different times and possess selective recall of facts and details favorable to their claims,

accompanied by a failure of memory as to other facts regarding those claims.²

C. Contested Issues

The welding issues raised by CASE and addressed in this Partial Initial Decision relate to weave welding, downhill welding, weld rod control, weld repair of misdrilled holes and preheating of welds. In addressing each of these issues in the context of the quality assurance contention raised by the intervenor, the Board examined and weighed the testimony presented to determine if it reflected systematic or significant violations of the OA/OC program indicative of a breakdown in the program. In addition, in that resolution of many of the issues involved balancing conflicting testimony raising credibility issues, the Board attempted to address the probable impact on plant safety assuming the allegations were well founded.

1. Weave Welding

Weave welding as defined by Section IX of the ASME Code is a weld with significant transverse oscillation (NRC Staff Testimony at 4; Applicants Exhibit 177 at 7). The AWS D1.1-1975 Code also defines a weave weld as a type of weld bead made with transverse oscillation.

² While many additional inconsistencies are contained in their testimony (See e.g., Tr. 10744-58, 11153), the Board will not take the time to detail them. However, some additional inconsistencies in their testimony are noted below in discussions of specific allegations.

Weave welding may be distinguished from a stringer bead, which is defined as a type of weld made without appreciable transverse oscillation. (NRC Staff Testimony at 5; Tr. 12153.) Neither the ASME Code nor the AWS Code prohibits weave welding (Applicants Exhibit 177 at 7; NRC Staff Testimony at 5; Tr. 11222). Further, weave welding is not in itself contrary to applicable welding procedures used at Comanche Peak unless the final weave width is in excess of four times the diameter of the weld rod being used. For example, if the welding material specified to be used is 1/8 inch diameter electrode, it would be acceptable to use an oscillating weld technique up to 1/2 inch wide (four times the diameter of the weld rod). (Applicants Exhibit 177 at 7-8.)

CASE's concerns regarding weave welding were based on Mr. and Mrs. Stiner's allegations that although excessive weave welding³ was

³ The record reflects that Mr. and Mrs. Stiner's initial allegations were based on a belief that all weave welding, no matter how slight, was unauthorized (Applicants Exhibit 177 at 7-9; Tr. 9991, 10589-90). Henry Stiner subsequently acknowledged that weave welding was not impermissible at Comanche Peak if the bead width did not exceed four core diameters. See Tr. 10,590 (H. Stiner); CASE Ex. 919 at 6 (H. Stiner). He then stated that his concern had always been for
(Footnote Continued)

contrary to procedures at CPSES, it was common practice and foremen even directed welders to use improper weave welds (Tr. 4147-48, 4210-11, 11098-11103; CASE Exhibit 919 at 9-10). Mr. and Mrs. Stiner were concerned that weave widths in violation of procedures could result in excessive heat input into the weld joint (CASE Exhibit 919 at 5; Tr. 10305, 10591, 10785).⁴

As discussed more fully below, the record reflects that the allegations raised by Mr. and Mrs. Stiner regarding weave welding are not reflective of systematic or significant violations of the QA/QC program. In this regard, no specific instances where violations were alleged to have occurred were substantiated. Furthermore, the record reflects that even if Mr. and Mrs. Stiner had violated procedures by welding in excess of weave width procedural requirements as they alleged, excessive heat input in the welds they made would not have had a significant adverse impact on plant safety.

a) Allegations of Weave Welding do not Reflect a Breakdown in the QA/QC Program

Henry and Darlene Stiner testified that excessive weave welding in violation of procedures was a widespread problem at CPSES (CASE

(Footnote Continued)

excessive weave welding (Tr. 10,590 (H. Stiner)). However, we find that the earlier testimony is lacking in credibility, thereby seriously questioning the basis for CASE's allegations regarding weave welding.

⁴ During the hearing, the Board determined that the issue of weave welding included the impact of heat input during weave welding (Tr. 9947).

Exhibit 919 at 6, 9, 14).

Mr. and Mrs. Stiner testified that under the direction of their supervisors they had welded and had observed others welding with weave widths in excess of procedural requirements. While they stated that such violations routinely occurred, they were only able to identify a few specific hangers where they believed unauthorized weave welding occurred. The two specific incidents identified⁵ involved A. Braumuller, one of Applicants' witnesses who had previously testified that he had never performed weave welding in violation of procedures. (Applicants Exhibit 177 at 9; Tr. 11675.) (The two specific incidents identified are addressed below.)

In response to these allegations of widespread weave welding in violation of procedural requirements (i.e., where the weave width was over four times the diameter of the weld rod used), Messrs. Fernandez,⁶ Pickett and Braumuller (welders still remaining at CPSES

⁵ Mr. Stiner also alleged that Fred Coleman directed him to beat the flux off a rod, insert it into a weld gap and weave weld over it (CASE Exhibit 919 at 9). However, he was not able to identify a specific hanger or weld which could be investigated. In any event, Mr. Coleman presented contradictory testimony (Tr. 11538). Further, other welders who were under Mr. Coleman on the same crew as Mr. Stiner, stated that Mr. Coleman had not given them similar instructions and they had never heard of this being done at CPSES (Applicants' Exhibit 177 at 9).

⁶ Mr. Stiner testified that Mr. Fernandez was not on his crew and had never welded in the same area as Mr. Stiner (Tr. 10589). Subsequently, when asked if Mr. Fernandez ever performed an illegal weld, Mr. Stiner stated that Fernandez had; Stiner knew because he was welding in the same area (Tr. 10675-76). In any event, Messrs. Fernandez and Brown (Mr. Stiner's welding
(Footnote Continued)

who were on Mr. Stiner's crews) testified that they had never welded or seen another person weld using a weaving pattern in excess of the bead width specified in welding procedures. Further, they testified that they had never heard a foreman or supervisor direct a welder to perform such illegal welds. (Applicants Exhibit 177 at 9.) All welders (including the Stiners) apparently knew that intentional violation of procedures could result in termination (Tr. 11729).⁷

In addition, Messrs. Brown, Coleman, Green and Hallford (supervisors on crews over Mr. Stiner and/or welders in areas where Mrs. Stiner welded) stated that they had never heard any supervisor direct a welder to perform illegal weave welding (Applicants Exhibit 177 at 9-11). Significantly, Messrs. Brown and Coleman (welding foremen on H. Stiner's crews) testified that they monitored each welder on their crews (including Mr. Stiner) several times a day (Tr. 11464, 11534, 11541) and if any welders were using excessive weave welding as a practice (as alleged by Mr. and Mrs. Stiner), they would have known about it (Applicants Exhibit 177 at 10; Tr. 11587).

(Footnote Continued)

foremen) testified that Mr. Fernandez was on the same crew under Mr. Brown (Tr. 11857; 11673).

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Mr. and Mrs. Stiner alleged that welders routinely violated procedures under the direction of their foreman even though they knew that they could be terminated if they were caught (Tr. 10284, 10287-88, 10312-14). Mr. Stiner stated that the guidance he was given by his foreman was not to get caught (Tr. 10680, 10897). In addition, they stated that foremen and other welders kept a look out for QC to warn welders if QC was coming (Tr. 11030-32, 11103). This is in direct conflict with testimony of welders presented as witnesses by Applicants who, when asked by
(Footnote Continued)

Mr. Baker testified that he was unaware of any instances of excessive weave welding which had not been identified and appropriately dispositioned, and that if a welder was using excessive weave welding as a practice, Mr. Baker would have found out about it. Mr. Baker based his testimony on his personal observations of and discussions with welders coupled with the monitoring programs he administered in welding construction, e.g., welding technicians who all reported to him and the welder inspection program. Mr. Baker testified that welding technicians (assigned to each area of the plant where welding was taking place) continuously monitor the welders they are assigned. Mr. Baker stated that if any welder used excessive weave welding as a practice, it would have been detected by these technicians and reported to him. (Applicants Exhibit 177 at 12-13.)

Further, Mr. Baker testified that welding engineering (apart from OA/OC) also conducted unannounced inspections of each active welder approximately every 14 days. (For example, Mr. Baker testified that during the short time Mr. Stiner was actively welding, he was inspected 15 times, and Mrs. Stiner was inspected at least 28 times during the period she welded.) During the inspection, numerous areas are checked, including the filler material, the acceptability of the welding, progression of travel (uphill or downhill), bead width, and weld rod control. Mr. Baker testified that to his knowledge, none of

(Footnote Continued)

the Board, stated that, in essence, it did not make sense to intentionally violate procedures if you knew you could lose your job (Applicants Exhibit 177 at 11; Tr. 11729).

the inspections identified any concerns regarding excessive weave welding.

Further, Mr. Brandt testified that he was unaware of any instances of excessive weave welding which were not identified and dispositioned appropriately, and if a welder did excessive weave welding as a practice (as alleged by Darlene and Henry Stiner), OC would have found out about it and taken appropriate actions. Mr. Brandt's testimony was based on his observations of welders in the plant, and his discussions with numerous OC inspectors (who are monitoring the welders) regarding this issue. (Applicants Exhibit 177 at 12-13.)

The NRC Staff investigated the allegations made by Mr. and Mrs. Stiner regarding weave welding (NRC Staff Exhibit 178 at 11-13). Based on the investigation, the Staff concluded that there was no evidence to support Mr. and Mrs. Stiner's allegations (NRC Staff Testimony at 11-12).

While testimony reflected that all welders were trained on the appropriate weave width that could be used (see e.g., Applicants Exhibit 177 at 9, 13; Tr. 9991, 11297), Mr. Stiner testified that he was never told that weave welding in any fashion (even less than four times the diameter of the weld material) was authorized (Tr. 4211 and 10590). However, Mr. Stiner contradicted himself by stating that one of his training instructors (Kenneth Golden) told him that weave welding was acceptable and even at times preferable (CASE Exhibit 666 at 9). In addition, in March 1980 Mr. Stiner attended a training class on CPM-6.9 (CASE Exhibit 666 at 8) which requires a maximum bead

width of four times the weld rod diameter (NRC Staff Testimony at 6). In short, despite the contradictory testimony of Mr. Stiner, the Board finds that welders were properly trained on acceptable bead width.⁸

Mr. Stiner's Specific Allegation. On cross-examination, Mr. Stiner could recall only one instance where he had witnessed excessive weave welding. Tr. 10,592. According to Mr. Stiner, he noticed that the hanger on which a welder named Armand Braumuller was welding had turned blue approximately 4-5" from the weld joint. CASE Ex. 919 at 8. In Mr. Stiner's view, the blue discoloration was due to overheating of the base metal caused by excessive weave welding. Tr. 10,592.

The steel used at CPSES to construct hangers, A36 steel, has a carbon content of less than 0.3 percent and is considered "low-carbon" steel. Staff Testimony at 6-8 (Taylor, Gilbert). Low carbon steel, which changes color during oxidation, *id.* at 8; Tr. 10,020 (Baker) "turns blue on the surface at 600 °F." Tr. 10,020 (Baker). This surface discoloration is not an indication of embrittlement, or a loss of ductility or tensile strength. Tr. 10,020-24 (Baker, Muscente). Thus, the fact that Mr. Stiner may have observed a blue discoloration on the hanger at issue does not mean that the bead width of the weld made by Mr. Braumuller exceeded four core diameters.

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Applicants testified that the bead width weld specified as acceptable in some welding procedures may have been confusing (Tr. 9991). Accordingly, these procedures are being changed to remove confusion (Tr. 9992). However, it appears that the
(Footnote Continued)

It is noteworthy that Mr. Braumuller, a welder with 28 years experience (Applicants' Ex. 177 at 4), denied that Mr. Stiner ever assisted him on a welding job and had no recollection of the incident described by Mr. Stiner. Tr. 11,694-95. Mr. Coleman, who was Mr. Stiner's foreman at the time, stated that Mr. Stiner was a welder "like all the rest", Tr. 11,539, and denied that Mr. Stiner was assigned the task of walking around correcting other welders' work. Id. Clifford Brown, who was a member of Mr. Stiner's welding crew, also controverted Mr. Stiner's statement that he and Mr. Stiner were roving repairmen, responsible for getting "bad welds" bought off by OC. Compare Tr. 11,467 (Brown) with Tr. 10,606; Tr. 10,622-23 (H. Stiner). Indeed, Mr. Stiner admitted on cross-examination that Mr. Coleman's and Mr. Brown's testimony on this point is correct. Tr. 10,974-75.

Mr. Stiner visited Comanche Peak with the Board chairman to indicate the hanger that contained the improper weave weld made by Armand Braumuller. Tr. 11,118. Mr. Stiner identified hanger CT-1-017-005-Y35R as the offending hanger. Tr. 11,023. The weld package for hanger CT-1-017-005-Y35R, however, indicates that neither Mr. Stiner nor Mr. Braumuller ever welded on hanger CT-017-005-Y35R. Tr. 11,023.

(Footnote Continued)

confusion, if any, was not widespread. Further, any confusion would have resulted in welders conservatively using less of a weave pattern than they could have used.

The Staff inspected hanger CT-1-017-005-Y35P and the two adjacent hangers to determine whether any had excessive weave welds. Staff Testimony at 13 (Taylor). The welds did not appear to have been ground down and thus the longitudinal ridges and valleys of welds could be observed. Id.; Tr. 12,224 (Taylor). The ridges and valleys of these welds were "indicative of properly-made stringer beads well within the four rod diameter limitation." Staff Testimony at 14 (Taylor).

The Staff also reviewed the construction package for hanger CT-1-017-005-Y35R to determine whether it had been removed or replaced subsequent to the July-August 1980 time period that Mr. Stiner claims he and Mr. Braumuller welded on it. The construction package indicates that welding took place only in June 1979, January 1981, and October 1983, and nothing in the construction package or in the Staff's inspection of the hanger indicates that it has ever been removed or replaced. Id.

One of the adjacent hangers did have the weld symbols of both Mr. Braumuller and Mr. Stiner, suggesting the possibility that this was the hanger Mr. Stiner had described. However, the documentation for this additional hanger showed that Mr. Braumuller and Mr. Stiner had welded on that particular support several months apart. (Tr. 11024; CASE Exhibit 96R, received into evidence at Tr. 11180.) So the documentation contradicts Mr. Stiner's testimony. Further, since the hangers pointed out by Mr. Stiner did not require Charpy impact testing (NRC Staff Testimony at 13), the existence of excessive weave

welding on these supports would merely have indicated an isolated violation of a procedure without an adverse safety consequence.

See Staff Testimony at 5, 7 (Collins, Smith); Tr. 9998 (Muscente).

We conclude that Mr. Stiner did not establish the existence of even one illegal weave weld. However, this incident does cast doubt on Mr. Stiner's credibility. When he was forced into pinpointing the location of a mysterious problem he stated positively that he knew existed, he failed to do so.

Mrs. Stiner's Specific Allegation. Mrs. Stiner testified that she saw Mr. Braumuller and Mr. Stiner weave welding on an Auxiliary Building hanger, TWX-034-714-A35R (elevation 790) on March 24, 1981 and March 26, 1981 (Tr. 10161, Tr. 4149; Case Exhibit 667 at 24). This issue is discussed in Section II.B., above, as it relates to the credibility of Mrs. Stiner. While this discussion casts substantial doubt on her credibility as a witness as well as the accuracy of this specific allegation, documentation reflects that, in any event, Mr. Braumuller used a total of two rods on the hanger on March 24 and five rods on the hanger on March 25, 1981 (Tr. 11790-91). (We find, based on the documentation, that Mr. Stiner did not weld on the hanger on March 26, 1981 as alleged (Tr. 11791).)⁹ Significantly, Mrs. Stiner

⁹ During cross-examination, CASE questioned Mr. Baker as to the adequacy of weld filler material documentation for this and other Class 5 hangers. Specifically, CASE was concerned that because weld filler material log sheets were not numbered for Class 5 hangers (as they are for Class 1, 2 and 3 hangers), there would be no way of telling if any sheets were missing (Tr. (Footnote Continued)

testified that 17 to 18 weld rods would not have completed even one weld on the hanger (Tr. 10149). Accordingly, if Mr. Braumuller had weave welded on the hanger as Mrs. Stiner had alleged, he could not have weave welded for very long. In any event, the welds on the hanger did not require Charpy impact testing and would, therefore, have been constructed safely even if there had been weave welding.

We conclude that whether or not Mr. Braumuller may have weave-welded on this particular hanger, there is at most proof of one isolated instance of a violation of procedures. The violation, if it occurred would not have safety consequences. Consequently, Mrs. Stiner's testimony does not establish any serious shortcomings in welding practices with respect to weave welding.

Based on the evidence, the Board finds that CASE's allegations regarding weave welding do not reflect significant violations of procedural requirements, and thus, do not reflect even a minimum breakdown in the QA/QC program at CPSES. There also is no reason for concern about safety consequences of the alleged practices.

(Footnote Continued)

11942-43). Mr. Baker testified that this hanger package was taken from official company records and he had no reason to believe that it (as well as any other Class 5 hanger package) was not complete (Tr. 11978-79). Further, he testified that there are no Code requirements regarding retention of such documentation for Class 5 hangers (Tr. 11983). Further, Mr. Baker stated that after the filler material is used, the weld filler material log sheets for Class 5 hangers serve no safety function (Tr. 11981-83). CASE presented no conflicting testimony.

In making these findings, the Board notes that the testimony regarding this issue is in direct conflict. On the one hand Applicants' witnesses testified that they were not aware of any unreported weave welding in violation of procedures. These witnesses included welders who worked in the same areas as Mr. and Mrs. Stiner and who would have experienced the same working conditions that they did. Indeed, each of these welders has been at CPSES longer than either Mr. or Mrs. Stiner. In addition, Applicants' witnesses included two of Mr. Stiner's welding foremen and two of his other supervisors, all of whom would have monitored him and others on his crew. Finally, Applicants' witnesses included Messrs. Baker and Brandt who testified as to direct and substantial oversight of welding by the welding engineering department and QC personnel. Significantly, while each of Applicants' witnesses was sequestered and thus did not hear the testimony of the others before testifying, there were no inconsistencies of any moment in any of Applicants' witnesses' testimony.

b) Safety Implications of Allegations of Excessive Weave Welding

In the course of the foregoing discussion, we reached certain conclusions about the safety significance of Mr. and Mrs. Stiner's allegations, had we found them to have been true. In this portion of our opinion we discuss that conclusion in greater depth.

Mr. and Mrs. Stiner stated that their primary concern regarding weave welding was that it would result in excessive heat input into

the parent metal resulting in damage (CASE Exhibit 919 at 5; Tr. 10784).

With regard to CASE's concern, Messrs. Muscente and Baker testified that the type of steel Mr. and Mrs. Stiner were qualified to weld on was low carbon steel with a carbon content below 0.3 percent (Tr. 9997-98). Applicants testified that the vast majority of all carbon steel used at CPSES is low carbon steel. Further, Applicants testified that this material is extremely ductile, not susceptible to cracking or embrittlement, and not susceptible to reduction in strength from excessive heat input. (Tr. 9998-99.)¹⁰ Applicants testified that heat input during welding on these materials is only a factor when welding on materials that require Charpy impact testing (Tr. 10012). Applicants testified that excessive heat on such materials may alter the fine grain structure (Tr. 10012). The NPC Staff testimony was consistent with Applicants in this regard (NRC Staff testimony at 7; Tr. 12156, 12178-82).

Applicants testified that the main steam and feedwater systems were the only two systems installed by Brown & Root in which there were any portions that required Charpy impact testing, (Tr. 9996, 10100). Mr. and Mrs. Stiner's qualifications would have restricted

¹⁰ Applicants testified that these characteristics were present in low carbon steels, including A-36. Further, Applicants testified that due to the fabrication process for SA-500 tube steel (also a low carbon, unalloyed steel), excessive heat input may cause some change in the mechanical properties and perhaps tensile strength. However, these characteristics would be essentially the same. (Tr. 11926-27.)

them to welding structural attachment welds on these systems (Tr. 9996). To determine whether Mr. or Mrs. Stiner welded on these systems, Applicants conducted a computer search of the welding documentation of the sections of the main steam and feedwater systems requiring Charpy impact considerations (Tr. 9996, 10013). To verify that this documentation contained all pertinent attachments to the systems, Applicants also conducted a cross-check of all the drawings for the main steam and feedwater systems and identified all of the hangers attached to portions of those systems that required Charpy impact testing (Tr. 11765). From these reviews, Applicants determined that neither Mr. nor Mrs. Stiner welded on materials requiring Charpy impact testing (Tr. 9996, 10012). Another computer check by Applicants of all systems welded on by Mr. and Mrs. Stiner supported this conclusion (Tr. 9996). While Mr. Stiner stated that he was sure that he welded on systems requiring impact testing, he could not remember the hanger numbers or exact locations (CASE Exhibit 919 at 7-8). On the basis of this record the Board finds that neither Mr. nor Mrs. Stiner welded on material requiring Charpy impact testing.

To illustrate worst case heat input conditions, Mr. Stiner testified that he observed hangers on which the weld was in excess of four times the diameter of the weld rod and the parent metal was heated so hot that four or five inches out from the weld it was "blue tempered" (CASE Exhibit 919 at 8). Applicants testified that this coloration was a surface condition which occurred at 600°F (Tr. 10020). Applicants attempted to simulate this condition using the material Mr. Stiner alleged to have seen, six inch by eight inch tube

steel, 1/4 inch thick (Tr. 10021). (In that this material was tube steel, it was SA-500 low carbon steel (Tr. 11927).) Applicants welded on this material continuously for 37 minutes using excessive weave beads. During the test, there were interpass temperatures of over 650°F, which exceeds the 500°F specified by the procedure. The result was a blue ring on the surface 1 3/4 inches from the top of the weld. (Tr. 10022.) Applicants testified that the excessive heat would not have had an impact on the characteristics of the base material (Tr. 10021-25). Judge Bloch summarized Applicants' testimony in this regard as follows "...first, it is impossible to get that wide a blueness and second, if it did, it wouldn't matter anyway" (Tr. 10,025, citing Applicants Exhibit 178, 179). NRC Staff testimony supported Applicants' position in this regard (NRC Staff Testimony at 8).

Applicants also performed a test on low carbon SA-36 material where interpass temperatures of 750°F (250°F in excess of the maximum interpass temperature) were achieved (Tr. 10015). Specimens were cut from the test plate and tested. These tests confirmed the acceptability of the material's important properties (Applicants Exhibits 178, 179; Tr. 10018).

From the testimony, the Board finds that even if Mr. and Mrs. Stiner had made some weave welds in violation of procedures, as alleged, that it would not have had an adverse impact on safe operation of the plant.

2. Downhill Welding

Downhill welding is an industry term with its expected common meaning. It refers to vertical welds made by progressing from the top of the weld toward the bottom of the weld.

Downhill welds are accepted for many applications. Neither the ASME nor AWS Codes exclude any particular direction of progression. Rather, both Codes would allow the contractor to specify direction of travel. While the Codes do not exclude uphill or downhill welding, the Codes do state that regardless of which direction of progression is selected the welder must be qualified to weld in that direction.

Brown & Root welding procedures do not authorize downhill welding. However, welding procedures of other contractors on site do authorize downhill welding. (Applicants Exhibit 177 at 15-16.)

CASE's concerns regarding downhill welding were based on Mr. Stiner's allegations that (1) "once metal has been welded on and cut on with a torch, it builds up a magnetic field which causes arc blow" and to correct arc blow "lots of times, people will run a downhill weld instead of doing it correctly, because then you're going in the direction of the magnetic field" (Tr. 4246-47) and (2) because of limited access conditions welders were at times directed to make downhill welds instead of uphill welds (CASE Exhibit 191 at 15). Mr. Stiner contended that such downhill welds were contrary to procedures and could potentially result in trapped slag and lack of fusion (Tr. 4247).

As discussed more fully below, the record reveals that the allegations raised by CASE regarding downhill welding have not been

substantiated. In any event, even if isolated instances of downhill welding occurred, as alleged, the likelihood that it would have an adverse impact on plant safety is remote.

a) CASE's Allegations Regarding Downhill Welding do not Substantiate a Breakdown in the QA Program

Mr. Stiner alleges that downhill welds were routinely made to correct for arc blow¹¹ and, as directed by supervisors, in limited access conditions (CASE Exhibit 919 at 15). While Mr. Stiner stated that unauthorized downhill welding was common practice at CPSES, he was only able to identify two specific instances where he alleged downhill welding occurred (Tr. 10607, 10622).¹²

With regard to arc blow, Applicants testified that contrary to Mr. Stiner's assertions, welding on metal or cutting it with a torch will not result in a magnetic field on the base material. In any event, arc blow is not caused by the base material being magnetized.

¹¹ Applicants testified that arc blow is a phenomenon sometimes encountered in D.C. arc welding where the arc is deflected due to the deformation of the magnetic field which is present in some form in all arc welding (Applicants Exhibit 177 at 15).

¹² In addition to the two specific instances, Mr. Stiner states generally that Messrs. Coleman, Brown and Green (and other unnamed foremen) directed him to perform, or themselves made, downhill welds in limited access conditions (CASE Exhibit 919 at 5; Tr. 10607-20, 10622, 10624-26, 11489). Messrs. Coleman, Brown and Green denied these allegations. (Tr. 11488, 11716; Applicants Exhibit 177 at 19.) Mr. Brown, however, testified that in restricted positions he had made welds that Mr. Stiner could not make, but such welds were not downhill (Tr. 11488).

Applicants testified that if proper grounding is present arc blow is a problem only at elevated amperage rates, usually above 250 amps. (Applicants Exhibit 177 at 14-15.) Applicants further stated that because of the method of grounding used at CPSES, and the small diameter electrodes and low amperage ranges used in the field for vertical welding (90-120 amps), arc blow for vertical welding is not a problem at CPSES (Id.; Tr. 10085-86). However, Applicants testified that due to a separate grounding system in the welding training facility, at one time arc blow was a problem in the training facility, but not in the plant (Tr. 10085-88). Mr. Stiner did not take issue with this testimony.

With regard to Mr. Stiner's allegations that downhill welding was routinely performed in limited access situations under the direction of a supervisor, Messrs. Fernandez, Pickett and Braumuller (welders remaining at CPSES from Mr. Stiner's crews) testified that they had not welded or seen others weld downhill in violation of procedures. Further, they testified that welders knew downhill welding was unauthorized and there was no incentive to do it; if caught it could mean the loss of the welder's certification or perhaps termination. (Applicants Exhibit 177 at 18.) In this regard, Applicants testified that the welders at CPSES are trained that downhill welding is not authorized. In addition, the weld technique sheets used by all welders specify an upward progression. (Tr. 10130.)

Messrs. Brown and Coleman (welding foremen on Mr. Stiner's crews) testified that they had never welded or seen others weld downhill in violation of procedures. They testified that due to their close

monitoring of welders on their crews (including Mr. Stiner), if a welder welded downhill as a practice, they would have known about it. (Applicants Exhibit 177 at 19.)

Mr. Baker testified that based on his personal observations in combination with numerous interviews with welders, welding technicians (including the results of the periodic unannounced welder inspections), fitters, welding foremen, and construction supervision, he is unaware of any information which would indicate that unauthorized downhill welding on safety-related or Class 5 supports occurred at CPSES. Based on his personal observations of welders and his review of pertinent records as well as discussions with numerous welders, foremen, fitters and QC inspectors, Mr. Brandt also testified that he was unaware of information that would indicate that such unauthorized downhill welding occurred at CPSES. (Id. at 16-18.)

Significantly, Applicants testified that there was no situation where it was easier to do a downhill weld than an uphill weld (Tr. 11488-89, 11854-57). NRC Staff testimony of Messrs. Gilbert and Taylor supports Applicants' testimony (NRC Staff Testimony at 22).

The Board now turns to the two specific incidents of alleged downhill welding raised by Mr. Stiner. The first involved another welder, Mr. Roy Combs, who allegedly welded stainless steel lugs to a pipe using a downhill weld (CASE Exhibit 919 at 15). Applicants testified that they performed a computer search of all stainless steel welds made by Mr. Combs (who is no longer working at CPSES) and performed a record search to assure that in all instances where he welded stainless steel lugs to a pipe, proper QC inspections had been

conducted. In addition, all welds that had not been ground down for nondestructive examination were again visually inspected to assure that there were no indications of downhill welds. (Tr. 10036.) Based on this sample, which is the best available under the circumstances, we conclude that this alleged incident provides no support for Mr. Stiner's allegations.

In the second incident, Mr. Stiner testified that under the direction of Cliff Brown and Jimmy Green, he performed a downhill weld on a particular hanger in a limited access area (Tr. 10613, 10622).¹³ However, when Mr. Stiner was confronted with conflicting testimony regarding whether Mr. Brown could direct him to perform a weld, he reversed himself and testified that Mr. Brown did not direct him to make this downhill weld, but rather Mr. Brown made the weld himself (Tr. 10967-75). An example of Mr. Stiner's inconsistency in this regard:

BY MR. REYNOLDS:

- Q. Mr. Stiner, on page 10,622 you state that you were instructed to downhill weld by Jimmy Green and Cliff Brown?
- A. What paragraph?
- Q. This is lines 10 through 13.

¹³ The Board notes that while Mr. Stiner relates this incident in vivid detail in his oral testimony (Tr. 10612), in his earlier testimony (CASE Exhibit 666) Mr. Stiner did not mention this downhill weld. Since Mr. Stiner's earlier testimony discussed this hanger in detail (although not this downhill weld), the Board questions why Mr. Stiner failed to relate this incident earlier (CASE Exhibit 666 at 35-36).

- A. That's correct.
- Q. Yet, you say on lines 19 and 20 that you didn't even know Brown was a foreman? Is that correct?
- A. I think when I said "instructed" I should have said "they told me to."

That'd probably have been the--

JUDGE BLOCH: As I understand the testimony, am I correct, Mr. Brown had a kind of a responsibility to get things fixed up so they could be bought-off. Is that correct? That's your testimony?

THE WITNESS: That is correct.

JUDGE BLOCH: And that you sometimes had that responsibility, too?

THE WITNESS: Yes, sir.

JUDGE BLOCH: Now, when you had that responsibility, you sometimes told other welders how to help you do that?

THE WITNESS: Yes, sir.

* * * *

THE WITNESS: No, I never had the authorization to actually instruct a welder to go to another support and do something.

JUDGE BLOCH: Okay.

Did Mr. Brown ever have that authorization, to your knowledge?

THE WITNESS: Not at the time I worked there.

JUDGE BLOCH: So what was he doing telling you what to do?

THE WITNESS: Like I say, the reason why he came down there was because I couldn't crawl into the area; I couldn't crawl into the space due to the--my chest cavity being too big; and he was much thinner than I am; and they went to get him to come down there and do it.

And he tell me, he said, "Well you can do it, just run a downhill path."

And I said, "Well, I can't even get to it." So, you know, he went out and did it.

That's what I mean by he "instructed" me is when he told me, "Well, you can do it, you know"--
[Tr. 10967, 10975.]

In any event, Messrs. Brown and Green testified that they did not instruct Mr. Stiner to perform a downhill weld nor had they ever heard any foreman direct any welder to perform a downhill weld in violation of procedures (Tr. 10037, 11715-16, 11753). In addition, pursuant to plant procedures, all such welds were required to receive a OC inspection. Furthermore, the NRC Staff inspected the hanger in question and testified that without cutting the hanger down and removing the paint it would be impossible to determine if a downhill weld was made. However, the Staff has testified that it will require the Applicants to evaluate the hanger and provide assurance that it is satisfactory for service. (NRC Staff Testimony at 22-23.) In short, due to the inconsistencies in Mr. Stiner's testimony this incident provides no support for CASE's position. The Board finds that the Staff action noted above is acceptable to provide reasonable assurance that even if this isolated incident did occur, there will be no compromise of public health and safety.

Based on the record, the Board finds that CASE's allegations regarding downhill welding are not substantiated. In addition, the Board finds either that the specific incidents of downhill welding alleged by Mr. Stiner did not occur or, in any event, that there is reasonable assurance that isolated violations that may have occurred would have no adverse impact on safe plant operation.

In making these findings, the Board is cognizant of the direct conflicts in testimony between Applicants witnesses and Mr. Stiner. Based on the substantial inconsistencies in Mr. Stiner's testimony regarding this and other issues, as well as other factors set forth in Section II.B., above, the Board finds Applicants witnesses to be more credible.

b) Safety Implications of Downhill Welding

Mr. Stiner testified that his concern regarding downhill welding was that slag may be trapped and there may be a lack of fusion in the weld (Tr. 4247).

While Applicants testified that the likelihood of downhill welding in violation of procedures is extremely remote, they further testified that even if it occurred the probability that it would have an adverse impact on the plant is virtually zero. Applicants testified that if a welder experienced in downhill welding made the weld, it would in all likelihood be acceptable from a structural standpoint. (As previously noted, downhill welding itself is not contrary to any welding code.) However, if a welder was inexperienced, Applicants testified that his mistakes would in all likelihood result in obvious unacceptable visual indications which would be detected by either the welding technician/foreman (before QC inspection) or by the QC inspector during his inspection.

(Applicants Exhibit 177 at 18-20.) The NRC Staff supported this conclusion (NRC Staff Testimony at 20-21).¹⁴

Mr. Stiner attempted to refute this testimony by raising one instance where downhill welding may have adversely impacted the structural integrity of a weld, i.e., the weld which he alleged first that he performed and later that Mr. Brown performed, as discussed above. While Mr. Stiner's testimony on this weld is of questionable reliability in the first instance, in any event, as previously noted, the Staff will satisfy itself that there is reasonable assurance that the hanger is acceptable.

Accordingly, from the record the Board finds that even if there were some downhill welds as alleged by Mr. Stiner, there is reasonable assurance that they would not adversely impact plant safety.

3. Weld Rod Control

CASE's concerns regarding weld rod control are based on allegations by Mr. and Mrs. Stiner. Mrs. Stiner alleged three specific instances of alleged weld rod control violations:

¹⁴ In cross examination of Applicants and Staff witnesses, CASE attempted to show that downhill welds could be made faster than uphill welds, and because of such speed there was a greater chance for lack of fusion and slag entrapment (e.g., Tr. 11841-6). However, the Board notes that Mr. Stiner's allegations regarding downhill welding only related to instances where uphill welding could not be performed due to limited access or because of arc blow. In these instances, there would not be any accelerated welding speeds on downhill welds. Accordingly, such cross-examination is irrelevant to the issues before the Board.

- (1) she wrote an NCR on a welder who she alleged had used two weld rods that had been checked out and not returned the day before (Tr. 4166);
- (2) she alleged that on one weld 75 rods were reported to have been used when it should have only taken three to four rods (Tr. 4164); and
- (3) she found two bundles of rods laying in the plant which she alleges were turned over to a QC supervisor who did not investigate the incident but simply threw the rods in the trash (Tr. 4164).

In addition, Mr. Stiner raised one specific instance of alleged inappropriate weld rod control, i.e., that he welded hangers with rods that were checked out to others in the crew (Tr. 4220-21). From these specific instances and other general observations, Mr. and Mrs. Stiner alleged that weld rod control violations were common practice at CPSES.¹⁵

At the start of each shift, the foreman signs and issues to each welder one or more weld filler material log ("WFML") sheets(s). (Prior to 1979, the form used was called a filler material requisition form; it contained essentially the same information as the WFML.) Each WFML specifies, among other things, (1) the specific item or joint to be welded on, (2) the weld rod material type and quantity requested to perform the work, (3) the welding procedure to be used, and (4) the identification symbol of the welder doing the work. The

¹⁵ The issue of unplugged weld rod containers was also raised. However, in the July 29, 1983 Partial Initial Decision at p. 36, the Board ruled that this issue would have "no effect on the safe operation of the plant."

welder then takes the WFML to the appropriate issue station to draw the weld rod material for each specific work item. The distribution station attendant enters on the WFML the amount of material issued and the heat number of the material. The attendant also checks the welder's symbol against the welder qualification matrix to assure that the welder is qualified for the welding procedure listed and verifies that the material requested is the correct type for use with the procedure. In a separate accountability log, the station attendant lists the welder's symbol and the container numbers that have been issued.

After obtaining the filler material, the welder goes to a work station to weld. It should be noted that before a welder uses a weld rod, he checks it to assure that it is not damaged. Damaged and used rod stubs are retained by the welder.

At the conclusion of each shift, each welder is required to return to the issue station to turn in any unused or damaged filler material and to turn in all remaining rod stubs. The amount of unused and undamaged filler material is entered on the WFML. Unused rods, rod stubs and damaged electrodes are counted and where this count does not equal the number of rods issued, this information is entered on a welder's log which is periodically tracked by the distribution station attendant and reviewed by welding engineering to assure that there is no trend of excessive rod stubs unaccounted for. If a welder does not turn in his filler material at the end of the shift, this can be a basis for firing the welder.

In short, regardless of what area the welder is welding in, at the beginning and end of each shift each welder must go to the issue station to disposition the material he is using. In this way, filler material used is accounted for at the beginning and end of each shift. If a welder fails to turn in his filler material at the end of his shift, an investigation is conducted to determine where it is. It should be noted that this weld rod control program exceeds all ASME or AWS Code requirements for control programs.

Finally, the Welding Engineering Department inspects the rod distribution stations for compliance with these procedures every two weeks.

As discussed more fully below, the record reveals that CASE's allegations regarding weld rod control violations are not reflective of a systematic or significant breakdown in the QA/QC program. In this regard, specific instances where violations were alleged to occur were either unsubstantiated or were previously detected by QC and corrected. In any event, the record reflects that even if violations had occurred as alleged, the likelihood of an adverse impact on safe plant operation is remote.

- a) Allegations of Weld Rod Control Violations Do Not Substantiate a Breakdown in the QA/QC Program

Applicants presented testimony describing the weld rod control program which the Board adopts in these findings of fact, as follows (Applicants Exhibit 177 at 21-23):

The Brown & Root weld rod control program at CPSES is governed by a construction procedure. The program is based on a daily system of accountability where each welder is accountable for all weld material he uses on each shift.

In response to Mr. and Mrs. Stiner's allegations that violations of the weld rod control program at CPSES are widespread, Applicants presented Messrs. Fernandez, Pickett and Braumuller (welders on Mr. Stiner's crews who also worked in areas inspected by Mrs. Stiner), who testified that they had not themselves violated or seen others violate the weld rod control procedures at CPSES. Further, they testified that welders who intentionally violated these procedures would be fired; thus, there was an incentive to adhere to these procedures (Applicants Exhibit 177 at 31-33; Tr. 11534).

Mr. Brown (a QC inspector who was also welding foreman over one of Mr. Stiner's crews) presented similar testimony. Mr. Coleman (a QC inspector and a welding foreman over one of Mr. Stiner's crews and who also welded in the same areas as Mrs. Stiner) stated that except for one incident, he also had never observed violations of the weld rod control program. (Mr. Coleman's exception related to an instance where he had unintentionally failed to turn in a rod container; the rod shack attendant alerted his supervisor and the next morning Coleman was "chewed out" by his foreman.) (Applicants Exhibit 177 at 31-33.) Messrs. Brown's and Coleman's testimony in this regard is significant in that they closely monitored the work of all welders on their respective crews and would have been in a position to notice violations if they occurred (Id. at 10).

Messrs. Green and Hallford (foreman and general foreman over one of Mr. Stiner's crews) testified that they had not observed any violations of the weld rod control program, but they were aware of one where QC noted a violation and the welder was fired immediately. (This incident is one raised by Mrs. Stiner and discussed below.)

Messrs. Baker and Brandt testified that based on personal observations of welders in the plant, as well as discussions with numerous welders, fitters, foremen, QC inspectors, welding foremen and welding technicians, the weld rod control procedures at CPSES are, with very few exceptions, strictly adhered to. In this regard Applicants testified that in addition to the inherent checks built into the rod control program (e.g., the counting of returned rods and rod stubs to determine if any are missing), other mechanisms that provide assurance that violations are detected include the periodic inspections of each active welder every 14 days (previously addressed), routine monitoring of welders by welding technicians/foremen and other supervisors, and QC inspections (during which weld rod traceability is checked) and surveillance. (Applicants Exhibit 177 at 33-4.)

The NRC Staff presented supporting testimony regarding Applicants' weld rod control program. Further, the Staff testified that over the period of construction at CPSES, NRC inspectors have routinely examined the Applicants' welding activities, including weld rod control. With respect to weld rod control, the inspectors emphasized "whether the documented weld rod was being used in a given weld under observation, and whether the weld rod was appropriate and

properly traceable." (NRC Staff Testimony at 36.) The Staff testified that there were no identified findings indicating problems in these areas. In this regard, the Staff noted that what may appear to be a situation where a weld rod has been abandoned, in reality may be where a welder has temporarily left his immediate work station for personal or other needs. As part of the NRC's routine inspections, the inspector has observed apparently unattended weld rods in cans, buckets, or pouches and after remaining near these "unattended" rods found that welders did return to the work station in a matter of minutes. (NRC Staff Testimony at 36-37.)

The NRC Staff also testified that Brown & Root Project Welding Engineering is required by the ASME-approved Brown & Root QA manual to maintain periodic surveillance of the rod issue stations and of welders to whom rods have been issued. This requires surveillance of the rod issue stations every 14 days, and of the welder at least once every 10 working days. A sample of the records of these surveillances has been reviewed by the Staff. The Staff found that the records were complete, the required surveillances were done, and no pattern of discrepancies or potential problems with either weld rod control or welder activities was identified. In addition, the Staff testified that the Brown & Root QA Corporate Office conducted periodic audits of the welder and weld rod issue station surveillances. The Staff reviewed one of these audit reports, and it did not disclose any significant problems. (NRC Staff Testimony at 34-35.)

Mr. Stiner testified that he received no training or indoctrination regarding weld rod control (Tr. 11140). However, he

later contradicted himself by stating that his first foreman, Mr. Coleman, gave him indoctrination regarding weld rod control (Tr. 11146). In addition, Applicants testified that after successful completion of qualification testing and prior to being released for production welding, each new welder at CPSES (including Mr. Stiner) was given an orientation by welding engineering as to the requirements of the weld rod control procedure. Applicants testified that at this orientation the importance of filler material control at the facility was explained to the welder and the welder was informed that any willful violation of the procedure would result in immediate firing. This orientation was documented and the welder signed a form indicating his understanding. (Applicants Exhibit 177 at 27-28.)

With regard to the threat of termination for weld rod control violations, Mr. Stiner testified as follows (Tr. 10853-4):

BY MR. REYNOLDS:

- Q. What would happen if you were caught doing that [committing weld rod control violations] Mr. Stiner?
- A. Immediate termination.
- Q. What is the incentive for doing it?
- A. The incentive for doing it is, as I said before, the convenience to the welder.
- Q. You would risk your job to avoid having to walk back to the rod shack for rods?
- A. Well, as I have stated before, the quality control program at Comanche Peak is, you know, less than adequate in the fact that they can't catch these types of problems. So they can literally do it all over the place and the quality control inspector has no way of knowing that it is being done.

JUDGE BLOCH: But before, Mr. Stiner, you said that the quality control people would wander around the plant and you would have to worry about them and cover for your welds. Why wasn't the same thing true for additional weld materials as it was for your repair welds?

THE WITNESS: That is why I say they always had somebody watching when they do this.

JUDGE BLOCH: But why do you always have to have someone watching when you are doing a repair weld but you don't worry at all about QC finding extra weld rod materials

THE WITNESS: Well, you do worry about it. Like I said, it is reason for termination, you see.

Mr. Stiner also testified that workers violated weld rod control procedures regarding retention of rods, even under threat of termination, because "they are under so much pressure to get the work done and get the hangers up that they try to do anything they can do to speed up work" (CASE Exhibit 919 at 19). However, in response to an inquiry that appeared to bring into question the logic of such a position, Mr. Stiner reversed himself and testified that he did not hold out rods because he was under time pressure (Tr. 11126-8). The Board finds Mr. Stiner's testimony on this issue to be inconsistent and unreliable.

Mr. and Mrs. Stiner also testified that the accountability process specified in the weld rod control program was ineffective. Specifically, they alleged that rod stubs were not counted or recorded

by rod shack attendants (Tr. 10638, 10978-83).¹⁶ However, Mr. Stiner testified later that early in his employment he was told by his first welding foreman, Mr. Coleman, that he had to "keep account of everything ... don't lose none of your stubs ... because they may count them on you when you go back and if you don't have any they will write you up, you know." (Tr. 11146).

Applicants testified that rod stubs are counted (Applicants Exhibit 177 at 21-23; Tr. 11419-20, 11422, 11592, 11670) and introduced an example of the checksheets maintained by the rod shacks reflecting shortages resulting from such counts (Applicants Exhibit 185, introduced into evidence at Tr. 11975).

Mr. Baker testified that the rod counts are monitored on a daily basis by the rod shack attendant and reports are sent monthly to the piping general superintendent who reviews them for trending purposes (Tr. 11892-93). Mr. Coleman testified that normally the attendants in the rod shack would take the rod stubs and pour them out of the stub can, count them and then throw them into a barrel (Tr. 11594). However, Messrs. Coleman, Pickett and Braumuller testified that at busy times the attendants would take the stub cans and write the welders' symbols on them and place them off to the side; when the rush was over they would count the stubs (Tr. 11594-95, 11637-41,

¹⁶ Mr. Brandt testified that the practice of issuing a precise number of weld rods and counting returned stubs was not widely used at other nuclear construction sites. Other nuclear construction projects which are in compliance with Code requirements merely issue rods by weight. (Tr. 11422.)

11684-85). Further, Mr. Brown testified that if a welder did not return his unused weld rods and stubs, the weld technicians would conduct an investigation (Tr. 11501-02).

Mr. and Mrs. Stiner raised four specific incidents of weld rod control violations. In the first incident, Mrs. Stiner testified that she wrote an NCR on a welder who had used two weld rods that had been checked out and not returned the day before (Tr. 4166). Applicants' witness Baker testified that Applicants' investigation of Mrs. Stiner's NCR (#M82-0034) revealed that while the facts were substantially as Mrs. Stiner had stated, she did not discuss the resolution. In this case, Applicants testified that the welder had completed the weld the day before and intended to alert OC that an inspection was needed the next day. The next morning the welder was assigned another task, drew his weld rods for the other task, and went back to the weld he had worked on the preceding day to get a OC inspection. For some reason he did some more welding on the weld (perhaps he saw something he had missed) using two additional rods (either from his rods checked out for other tasks that day, or as Mrs. Stiner alleges, from two rods he kept from the previous day). In any event, the incident was uncovered in the OC inspection and an NCR was written. The resolution of the NCR was that the welder was terminated immediately and the weld was ground out and replaced. (Applicants Exhibit 177 at 28-29.) The Board finds that this incident provides no support for CASE's position. If anything, it reflects that the QA program functioned properly and that violations of the weld rod control procedure at CPSES are taken seriously.

In the second incident, Mrs. Stiner alleged that 75 weld rods were used on hanger SI-0135032.S35R (Tr. 4164). She alleged that that particular hanger should not have required more than three to four rods (Case Exhibit 919 at 20; Tr. 4165). Applicants testified that the Applicants' investigation revealed that only 50 weld rods (not the approximately 75 that Mrs. Stiner reported) were issued. Further, the weld rod accountability log did not reflect that any rods were missing (i.e., the total number of unused rods, rod stubs and damaged rods turned in was 50). As to the specifics of the incident, records reflect that at 7:10 a.m. on April 9, 1980, the date in question, the welder checked out 50 rods for the hanger. At 1:48 p.m. that same day he returned the rod can, plus unused and damaged rods and rod stubs. (Records indicate that there were no missing rods.) The welder then checked out additional rods for another job using a separate WFML. At the end of the day he turned in the remaining unused rods, stubs or damaged rods. The welder could not remember the incident. (Applicants Exhibit 177 at 29-30.) The Board finds that this incident does not raise a safety concern or provide support for Mrs. Stiner's allegations.

In the third incident, Mrs. Stiner testified that she found bundles of unburned rods wrapped in a rubber band (Case Exhibit 919 at 20). Mrs. Stiner alleged that after she gave the rods to her supervisor, he threw them into the trash (Tr. 4165, 10206-07, 10293-97, 10470-74). Mrs. Stiner stated, however, that she did not know if he later removed them from the trash (Tr. 10296). Applicants testified that the two bundles of weld rod material were not

immediately discarded without an investigation, as Mrs. Stiner had indicated. Rather, the weld rod material was given to Mr. Brandt who subsequently turned it over to construction to assure that an investigation was conducted. (Applicants Exhibit 177 at 30; Tr. 11459-60.) Based on the investigation, Applicants were able to trace the rods to the organization which used them (not Brown & Root) and training was conducted to correct the situation (Tr. 11454-55).¹⁷

The Board finds that this incident also reflects that the QA program was effective and appropriate corrective action taken. However, there is a gap in the record for the Staff to fill through investigation. If Applicants found bundles of unburned rods left uncontrolled by Grinnell Fire Protection Company, an organization doing construction on site, it is not at all clear that instruction alone would cure the problem with respect to work that had been already done. We trust that the Staff will inquire into whether this nonconforming condition was properly resolved with respect to prior work of Grinnell Fire Protection Company.

In the final incident, Mr. Stiner testified that his supervisor was under a great deal of pressure to complete a particular assignment which Mr. Stiner described in detail. He stated that to accomplish this the welders on the crew used rods checked out to other welders to

¹⁷ Mr. Brandt testified that other QC inspectors have at times also discovered loose rods and reported them to their supervisors (Tr. 11426-7) who assured that the incidents were investigated (Tr. 11440).

complete work. (Tr. 4220-21.) Mr. Baker testified that the Applicants investigated the allegation and determined that welders from Henry Stiner's first crew remaining at Comanche Peak (Messrs. Picket and Braumuller) stated that no such incident occurred. Further, the welding foreman (Mr. Coleman) on Stiner's crew at that time also stated that no such incident occurred. In any event, even if the incident did occur, Applicants testified that all the welders on Stiner's crew would have been welding on the same material with the same type weld rod. Thus, while such action would have been a violation of procedure, Applicants concluded it would not have had an adverse impact on plant safety. (Tr. 4220 and 10648-50.) The Board finds that substantial and credible testimony from Applicants' witnesses reflect that the incident never occurred.

From the testimony, the Board finds that CASE's allegations regarding weld rod control do not reflect systematic or significant violations of procedures indicative of a breakdown in the QA/QC program. In addition, the Board finds that there is reasonable assurance that the specific incidents of weld rod control violations raised by Mr. and Mrs. Stiner do not raise a significant safety concern.¹⁸

¹⁸ During direct examination of Mrs. Stiner, CASE attempted to raise in connection with weld rod control, the new issue of placement of welders' symbols adjacent to welds (Tr. 10477-10494). Upon a representation by Applicants counsel that such symbols would not be relied on to support the adequacy of the weld rod control program, the Board ruled that such testimony was not admissible (Tr. 10494).

b) Safety Implications of Weld Rod Control Violations

Mr. and Mrs. Stiner raised as their concerns regarding weld rod control violations, the possibility that weld rods left out may absorb moisture and result in defective welds due to excessive porosity (CASE Exhibit 919 at 18; Tr. 10648). Also, they were concerned over the impact of welders exchanging weld rods (Tr. 10640-41, 10650); however, in later testimony, Mr. Stiner stated that this was not a safety concern (Tr. 11150).

With regard to the first concern, Mr. and Mrs. Stiner testified that when weld rods are kept out and not controlled they can absorb moisture (Case Exhibit 919 at 19, 21; Tr. 10283, 10648, 10858, 11124). They stated that E-7018 type electrodes should not be exposed to an unheated atmosphere for more than four hours (Case Exhibit 919 at 20; Tr. 10646).

The NRC Staff testified that if weld rods had been exposed to ambient air at CPSES for two to three days (such as alleged here) the "worst-case effect" would be porosity in the weld (which is due to arc instability and off-gassing of water vapor) which should be detected during the normal visual inspection by the welder and QC (NRC Staff testimony at 33, 35).

Applicants conducted tests of E-7018 electrodes (the electrodes used by Mr. and Mrs. Stiner) which had been stored for seven months in an open container in an uncontrolled atmosphere. Using this electrode, test specimens were welded utilizing a full penetration butt weld. Nondestructive and destructive examinations conducted on

the resulting specimen showed no rejectable defects; failure of the base material (not the weld material) occurred at a reading in excess of 70 ksi, the maximum requirements for any affected steels (most steels have a much lower requirement). In short, even if weld material was left out for 2-3 days (as alleged by Mr. and Mrs. Stiner), the Board finds that there is little likelihood that this could have an adverse impact on the safety of the plant. (Applicants Exhibit 177 at 27.)

With regard to the second concern, Mr. and Mrs. Stiner alleged that welders deliberately saved weld rods to lend to other welders so that these welders would not have to get rods issued from the distribution stations (Case Exhibit 919 at 19; Tr. 10209-10, 10223, 10648-50). However, Mr. Stiner stated that this was not a safety concern (Tr. 11150). Applicants presented testimony that all welding on safety-related low carbon and mild steels at CPSES which is of concern here (the welding to which Mr. and Mrs. Stiner referred in their testimony) uses the same electrode (weld rod), E-7018. Thus, Applicants testified that the possibility of a welder borrowing an electrode from another on his crew and getting the wrong electrode for the job was virtually nonexistent. Applicants further testified that, in any event, welders are trained to know that they can only use the specific electrodes designated for that job. (Applicants Exhibit 177 at 26.) The Board finds that even if some weld rod control violations such as alleged by Mr. and Mrs. Stiner occurred, there is reasonable assurance that they would not have a significant adverse impact on plant safety.

4. Welding of Misdrilled Holes

Mr. and Mrs. Stiner alleged that under the direction of supervisors, welding of misdrilled holes without appropriate welding engineering authorization or proper QC inspection was common practice at CPSES (CASE Exhibit 919 at 22-23).

The numerous inconsistencies in Mr. and Mrs. Stiner's testimony called into question their credibility on all issues (see Section II.B., supra). On this issue we do not believe that Mr. Stiner's testimony can be relied upon and accordingly, the Board gives it no weight. The one overriding factor regarding the Board's decision involves Mr. Stiner's incredible statement that a 1 1/4 inch hole in two inch thick material (on which he allegedly welded many times (Tr. 10683-84)) could be easily welded in about two minutes (excluding the blending of the weld with surface material (Tr. 10698-9)), and it would only require two weld rods to complete (Tr. 11158).

NRC Staff witnesses stated that it was impossible for such a hole to be welded in two minutes or with the two weld rods as noted by Mr. Stiner. The Staff testified that a simple volumetric calculation reflected that it would require 25 weld rods to fill the hole. (Staff Testimony at 26; Tr. 12250-51.) Further, the Staff testified that it takes approximately one minute to burn one weld rod (Tr. 12250). Accordingly, even assuming that only 20 rods were required to fill the volume of the hole, it would take 20 minutes to simply burn the rods, not including the time required to change rods or turn the specimen over (Tr. 12251-52). Based on independent testing, Applicants

testified that such a hole would require approximately 20 weld rods to complete (Tr. 11768).

Mr. Stiner's sworn testimony on this point is not accurate and reliable. The Board believes that any welder who had ever weld-repaired a misdrilled hole of this large size or smaller would have been able to at least provide a response that was in the ballpark. In that Mr. Stiner was not able to do so, the Board questions whether Mr. Stiner has ever performed a weld repair on a misdrilled hole. This, in combination with other inconsistencies noted in Section II.B., above, leads the Board to conclude that on this issue Mr. Stiner's testimony will be given no weight.

In any event, Mr. Stiner's principal concerns are that misdrilled holes were performed without proper authorization or OC inspections, and may contain slag so as to call their structural integrity into question.¹⁹ These concerns are addressed below in conjunction with the Board's discussion of Mrs. Stiner's allegations.

With regard to allegations concerning widespread repair of misdrilled holes without proper engineering authorization or OC inspection, Messrs. Fernandez, Braumuller and Brown, who each were welders or foremen in the same areas as Mr. and Mrs. Stiner for an extended period of time, testified that they had never welded a

¹⁹ It should be noted that individuals that Mr. Stiner implicated as having performed such welds or having directed him to perform these welds have denied the allegation, viz., Messrs. Coleman (Tr. 11540), Brown (Tr. 11479), Pickett (Tr. 11622), Fernandez (Tr. 11690) and Braumuller (Tr. 11690).

misdrilled hole (Applicants Exhibit 177 at 38; Tr. 11479, 11690). Mr. Coleman testified that he had welded some misdrilled holes on cable tray supports in the cable spreading room, but that these had all been properly inspected (Tr. 11542-53). Mr. Pickett also stated that he had welded a few misdrilled holes on cable tray supports in the cable spreading room which had also been properly inspected by QC (Tr. 11625). Indeed, both Messrs. Coleman and Pickett testified that QC personnel were in the cable spreading rooms when the repairs were being made (Tr. 11543, 11625).

The testimony of both Messrs. Coleman and Brown that they had not observed any unauthorized welding of misdrilled holes is significant in that they routinely monitored the work of the welders under them, including Mr. Stiner, and would have been aware of any problem which existed in this regard (Applicants Exhibit 177 at 10; Tr. 11480, 11534). Messrs. Green and Hallford, who have also had welders under their supervision for an extended period of time at CPSES, provided similar testimony (Applicants Exhibit 177 at 41).

Applicants further testified that there was little motivation to violate procedures by performing unauthorized welding on misdrilled holes, to do this could result in termination (Applicants Exhibit 177 at 41).

Both Mr. Pickett and Mr. Coleman stated that they were not sure what design documentation authorized their repair of the misdrilled

holes in cable tray supports (Tr. 11544-45, 11647).²⁰ Applicants testified that these repairs were made in accordance with a Design Change Authorization ("DCA") issued by the design engineer for the welding of these and other holes on cable tray supports (Tr. 10039).²¹ Since these repairs were non-ASME repairs, only the DCA was needed, not an RPS (NRC Staff Testimony at 24; Tr. 10137). The Staff further testified that an Inspection Report 81-12 (Staff Exhibit 178) determined that "plug welds" were being utilized by welders in accordance with Brown & Root welding procedures (NRC Staff Testimony at 26, 30).

With regard to the welding procedure used to make the repairs, Applicants testified that if the welds were authorized by engineering, welding procedures 10046 and 11032 could be used to repair AWS and ASME welds, respectively (Tr. 11393). As previously noted, a DCA had been authorized to repair misdrilled holes on cable tray supports. Repair of pipe supports was not authorized by this DCA. (Tr. 10040.)

²⁰ Mr. Coleman stated that he had no paperwork when repairing the holes (Tr. 11545). He stated that his foreman may have had the paperwork (Tr. 11545, 11787). In any event, the Board requested that Applicants provide it a report on this issue (Tr. 11786-87). By letter of April 27, 1984, Applicants provided to the Board and all parties a report which explained why separate authorization at that time was not needed to weld repair misdrilled holes on cable tray supports in the cable spreading room. The Board is satisfied with the report.

²¹ DCA 5347 provided direction on which misdrilled holes needed to be repaired and authorized their repair (Tr. 11407). It should be noted that based on this DCA, Mrs. Stiner's testimony that all misdrilled holes needed to be welded (Tr. 10506) is in error.

In response to cross-examination on this issue, Mr. Pickett verified this by testifying that baseplates for pipe supports which had misdrilled holes were discarded (Tr. 11632-3).

To determine if the QC inspections were being routinely performed on weld repair of misdrilled holes, Applicants conducted a preliminary search of documentation for cable tray hangers in the cable spreading room and reported that QC inspection reports of over 450 misdrilled holes were located (Tr. 10038). Applicants concluded that this reflected that misdrilled holes were being properly inspected by QC (Tr. 10039, 11401-07).

Mrs. Stiner testified that she weld repaired misdrilled holes under orders many times (Case Exhibit 919 at 23). However, she stated that she could only remember doing them on the "fab tables" in the turbine building (Tr. 10555). She stated that while a couple of other welders who worked on the fab tables also made such welds (she doesn't remember the names), she did not know what other welders in the field did (Tr. 10553-4). She stated that she made such welds under the orders of James Stembridge (her foreman), and though she was less sure, Clay Andrews (another foreman). (Tr. 10286-88, 10541.) She stated that she thought it was improper because she was told to watch for QC (Tr. 10529). The record reflects that Mr. Andrews was Mrs. Stiner's first foreman while she was a welder; Mr. Stembridge replaced Mr. Andrews and was her foreman for a fairly short period of time. (Tr. 4130 and 11782.)

Applicants investigated Mrs. Stiner's allegation by interviewing Mr. Stembridge (Mr. Andrews no longer works at CPSES) and others

associated with the incident (Tr. 11781-86). Mr. Stembridge stated that he had directed Mrs. Stiner to make unauthorized repairs on three hangers that had misdrilled holes in them (Tr. 11781). Applicants testified that Mr. Stembridge had been a foreman in the small bore hanger fabrications area for about four months when the incident occurred. Applicants testified that one day, seven hangers were sent from the fab shop to Mr. Stembridge to install, but three of them were wrong. Applicants testified that Mr. Stembridge stated that as a new foreman he tried to shortcut the system. (Tr. 11782.) However, another foreman saw the activity and informed a OC inspector, Mr. Wilkerson. Mr. Wilkerson stated that he investigated and caught Mrs. Stiner making unauthorized repairs. (NRC Staff Testimony at 28; Tr. 11782.) The hangers were subsequently scrapped and Mr. Stembridge was demoted to and remains in a non-supervisory position (NRC Staff Testimony at 28-30; Tr. 11786). Staff testimony supported the results of Applicants' investigation (NRC Staff Testimony at 27-30).

Mrs. Stiner stated that her concern with repairing misdrilled holes is slag entrapment²² (Case Exhibit 919 at 22). She further stated that if slag were left in the weld it would be an

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Mrs. Stiner also stated that repair welds could not be traced because welders did not put their symbols on them (Tr. 10504, 10528-29, 10670-71). Applicants' witness Coleman stated that he repaired misdrilled holes in accordance with procedures and that included placing his welding symbol by the welds (Tr. 11545-46). Applicants' witness Pickett also placed his symbol on the "plug welds" he did in the cable spreading room (Tr. 11629). In any event, the allegation does not raise a safety concern.

improper weld (Tr. 10497). While she attempted to clean out as much slag as possible with a chipping hammer, she testified that there was still some left inside the weld²³ (Tr. 10229, 10235, 10236, 10284).

Applicants testified that welding of a misdrilled hole is a relatively simple procedure (Applicants Exhibit 177 at 42; Tr. 11623). Further, Applicants stated that it was very difficult to leave significant slag deposits using low hydrogen electrodes, like those used at CPSES, because the normal welding technique provides assurance that slag remains fluid, floats to the top of the weld and is removed (Applicants Exhibit 177 at 36). The Staff testified that if there were large amounts of slag entrapped, when the arc was struck much of this slag would become granulated from the force of the arc and would float to the top with succeeding passes (Tr. 12240). Applicants testified that it was very difficult to weld over unacceptable slag deposits using normal welding techniques (Applicants Exhibit 177 at 36, 37). Further, if the weld was not relatively free of slag, there would in all likelihood be unacceptable surface indications remaining on the face of the weld. Test techniques corroborated this. (Applicants Exhibit 177 at 37, 39.)

23 Mrs. Stiner testified that a pencil grinder was needed to clean slag completely out of a misdrilled hole, but there were none available (Tr. 10285-10286, 10499). Other welders and foremen (Pickett, Braumuller, Fernandez, Coleman, Brown and even Mr. Stiner) testified that they had pencil grinders in the areas in which they worked (Tr. 11469, 11547, 11621-22, 11643, 11666).

To determine the possible impact of slag deposits on repairs of misdrilled holes, Applicants conducted a test of the effects of slag inclusions in a misdrilled hole on the strength of the material. Two test specimens of SA36 plate material with a minimum tensile strength requirement of 58 KSI were prepared. The specimens were approximately eight inches in length and 3/8 inch thick,²⁴ and, in the area of concern, approximately 1.5 inches in width. A 3/4 inch diameter hole (which was to be welded) was drilled in the area of concern of each specimen. This hole, therefore, comprised 1/2 of the cross-sectional area of the test specimen. (Applicants testified that in view of gauge tolerance requirements under which a hole cannot be placed nearer than 1-hole diameter to the edge of the material (here being 3/4 inch), this configuration was extremely conservative.) (Applicants Exhibit 177 at 43-44. However, it is difficult to generalize about the probable location of welds made in violation of procedures because there was no authorizing weld repair paper.)

The hole in one of the specimens was properly welded and radiographed to assure that it was perfect. Applicants testified that after numerous attempts and using abnormal welding techniques, the hole in the second specimen was welded with significant slag deposits remaining. (As previously noted, it is very difficult to weld over

24 Mr. Stiner stated that this test was flawed because the specimens should have been two inches thick (Tr. 10683). Applicants testified that the thickness was immaterial in that the relevant parameter of concern (psi) was dependent and correlated with the cross-sectional area (Tr. 11905-6).

slag in a hole.) The second specimen was radiographed showing major slag inclusions throughout the weld, including one which was about 1/4 inch at its widest point, 1/2 inch in length and about 1/8 inch thick. Tensile tests were performed on each specimen. The first specimen (with the good weld) failed at a tensile strength of 71,639 psi. Significantly, the failure occurred in the specimen material and not the weld material (i.e., the weld material was stronger than the base material). The second specimen (with major slag inclusions) failed at a tensile strength of 69,918 psi, still significantly above the 58,000 psi required of the material. (Applicants Exhibit 177 at 43-44.)

In sum, Applicants testified that even when skilled craftsmen attempted to weld a worst case weld such that major slag inclusions were present in the material, the strength of the resultant weld was not significantly lower than the strength of the base material, and still well above the required strength. Applicants thus stated that even if some degree of slag was present in a weld of a misdrilled hole, as alleged by Mrs. Stiner, it would not have had a significant adverse impact on the strength of the material.

Ordinarily, we would not accept any test of a single sample to be dispositive of any safety issue, particularly where the relevant variable--the amount of slag inclusion--is not fully detailed and where it is not possible to tell whether the test caused stress concentration within the welded area. In addition, the only thing

that was tested was a newly made weld, which may or may not be representative of the extent to which inclusions may progressively weaken the weld material over time.

However, the NRC Staff supported Applicants' conclusions and testified that the Brown & Root Welding Procedures 11032 and 10046 specified the use of E-7018 weld rod, a low-hydrogen rod which produces a weld with a tensile strength of approximately 70K psi, or about 10K psi better than the tensile strength of the base material. If the "plug weld" was made well enough not to be readily discernible after surface grinding, which was the case for both Mr. and Mrs. Stiner, the Staff testified that the weld and the surrounding base material would be at least as strong as the original base material before it was drilled. (Staff Testimony at 26.) Although the Staff did not testify about the continued strength of the weld, over time, the technical point is fairly obvious and we expect that the Staff considered it. If the Staff did not, we would expect it to correct the record on this point.

From the foregoing, the Board finds that Mrs. Stiner was directed to perform unauthorized weld repairs of misdrilled holes on at least three hangers on the turbine building fab tables.

In any event, in view of the testimony of Applicants and Staff, the Board finds that most, if not all, hangers repaired by Mrs. Stiner on the fab tables were subsequently cut down and replaced. In addition, based on (1) Applicants testing which suggests that even large amounts of slag in the repair weld would not effect the weld integrity of a newly made weld and (2) Staff testimony that as long as

the surface of the weld repair of a misdrilled hole was acceptable (as both Mr. and Mrs. Stiner stated) the weld would provide acceptable structural strength, the Board finds that even if some weld repairs of misdrilled holes were not properly inspected and contained defects as alleged by Mr. and Mrs. Stiner, it is unlikely to have an adverse impact on the safety of the plant.

Conclusion About Improperly Documented Repairs. We are far less sanguine about Applicants' failure to comply with their procedures than we are with the possible safety implications of their having failed to do so. Violations of procedures are important in their own right because they contribute to the workers' understanding of the extent to which procedures are to be taken seriously and followed scrupulously. The record in this instance convinces us that there was a practice of indeterminate extent at Comanche Peak with respect to welding unauthorized repair welds. Since Applicants did not make the required contemporaneous investigation of this practice, we find that the practice was of substantial extent and that this violation of procedures was a significant violation of Appendix B to 10 CFR Part 50.

First, we note that until January 1983, welding procedure WES-29 required that the welding engineering department issue a Repair Process Sheet (RPS) specifying the methods and techniques to be used for any base metal repairs, the qualified welding procedure to be used in making the repair (for Class 4 & 5 hangers the repair procedure is CDM 6.9 (Tr. 11,969)(Baker), and the type of nondestructive

examination to be made of the repair. The RPS also provided for a final inspection by quality control. Tr. 11,766 (Baker).

Second, we note that when Applicants detected Mrs. Stiner making an improper repair at the direction of her supervisor, they failed to create any deficiency paper and made no contemporaneous investigation of the extent of this improper practice. Tr. 11,783-84. This was a clear violation of Appendix B requirements for the prompt identification of deficiencies and for trending of deficiencies that may be significant. (At that time, Applicants had not done studies of the effects of improper repairs and they cannot take credit for their subsequent studies as an excuse for not trending this earlier deficiency.)

Third, we note that Applicants repeatedly testified that individuals are "terminated" when they violate procedures. However, Mr. Stembridge was merely reduced in rank. We infer from other testimony and from the failure to investigate the extent of the practice at that time that Mr. Stembridge's directions to his welders about repair welds may not have been an isolated incident. Fred Coleman, who was a welder at the plant, testified that there were many misdrilled holes repaired in the Unit 1 cable spread room. Tr. 11542. Additionally, Mr. Coleman was not even aware that any form of paper, such as a Repair Process Sheet, was needed for him to repair such a hole. Tr. 11544-45. Nor have Applicants even attempted to explain this testimony of Mr. Coleman.

The welding of misdrilled holes without authorization is further substantiated by a Staff inspection of 56 supports in the north cable

spreading room. Staff found two plug welds in each of three supports, but none of these welds was properly documented. Addendum to Page 27 of Staff Testimony at 1 (Gilbert).

We note that the Staff has requested and is evaluating an explanation of these undocumented repairs from the Applicants. NRC Staff Proposed Findings of Fact on Weld Fabrication at 57. We will consider the Staff's analysis of the Applicants' response in this proceeding. We are particularly concerned about the extent to which welding procedures and, possibly, QC procedures may have been ignored. The possibility of QC procedures being ignored is supported by the testimony of Mr. Fred Coleman, who stated that QC inspectors were present in the cable spreading room during the time he was welding misdrilled holes. Tr. 11542.

We find that there was a significant violation of Appendix B in that there was a practice in which misdrilled holes were not properly documented.

5. Preheat Requirements

Preheat requirements are specified temperatures above which the parent metal surrounding a weld joint must be heated prior to beginning to weld (Tr. 10026). Brown & Root welding procedures, however, require all weld joints to be preheated to at least 70°F (Tr. 118367).

Mr. Stiner alleged that most of the hangers he worked on at Comanche Peak "were not preheated." Case Exhibit 919 at 9. He later testified that "all" hangers he worked on were not preheated (Tr.

10824). Subsequently, he testified that he did preheat one hanger and that there were many he did not have to preheat (Tr. 10826-8). Mr. Stiner testified that he was directed by his supervisor not to preheat in order to speed up production (CASE Exhibit 919 at 9). He testified that failure to preheat was a common practice at Comanche Peak (Tr. 10800, 10826). He further stated that on many occasions he had welded without preheat when the temperature was below freezing (CASE Exhibit 919 at 9; Tr. 11084-5).

As discussed more fully below, the record reveals that Mr. Stiner's allegations regarding preheat are not reflective of systematic or significant violations of procedural requirements. Further, even if isolated events of violation of preheat requirements have occurred, the likelihood of an adverse impact on plant safety is remote.

a) Preheat

Mr. Stiner alleged that he welded on Class 3 hangers that were not preheated on days when the temperature was below 32°F. He stated that he was ordered to do this in order to speed up production. CASE Ex. 919 at 9 (H. Stiner). Although the Board discussed striking this portion of Mr. Stiner's testimony, it decided not to do so after Applicants withdrew their motion rather than have this matter referred to the Staff. Tr. 9947-49.

During Mr. Stiner's first term of employment at Comanche Peak, the environmental temperature dropped below 32°F only on March 3, 1980, when the recorded temperature rose from 28°F at 6 am to a high of 60°F. (Tr. 10,035 (Baker)). The Board took official notice that

during Mr. Stiner's second term of employment, from June 1981 to July 1981, the temperature at Comanche Peak (in central Texas) did not drop below 32°F. Tr. 10,035.

Welding when the temperature is below 32°F is not necessarily a violation of the applicable procedure. Paragraph 4.2 of Section IV of the ASME Code prohibits welding only "where the ambient temperature is below 0° Fahrenheit." Tr. 10031 (Baker). "Ambient temperature" does not refer to the atmospheric or environmental temperature, but rather the temperature in the immediate vicinity of the weld joint. Id. Thus, even if it were 0°F outside, welding operations could continue so long as the area adjacent to the weld joint were maintained at 0°F or higher. Id.

"Preheat temperature" is the temperature of the material immediately prior to welding. Tr. 10,026 (Baker). Weld procedure 11032 specifies a minimum preheat temperature of 60°F for material up to 1½" thick and 200°F for materials of greater thickness. Id. Joint Affidavit, p. 9 (Gilbert, Taylor). Procedure 10046 (non-ASME) specifies a pre-heat temperature of 70°F for steel up to 1½" thick. For steel from 1½" to 2" thick, preheat is specified as 150°F, and for steel over 2 inches thick, the specified preheat is 225°F. Joint Affidavit at 9-10 (Gilbert, Taylor).

During the colder months, the temperature in the areas where welding takes place is likely to be somewhat higher than the environmental temperature because welding usually takes place inside heated enclosed structures. Tr. 10,034 (Baker). Moreover, the ambient temperature is even higher than room temperature due to

supplemental heat sources such as space heaters, and lighting. Id.; Tr. 11,618 (Pickett). It is not necessary to preheat material when the room temperature has been greater than the required preheat temperature for a period of time. When it is necessary to preheat, however, a propane torch is used. See Tr. 11,537 (Coleman).

Mr. Stiner also testified that the welders at Comanche Peak, himself included, did not preheat metal before welding. CASE Ex. 919 at 11. The weight of the evidence is to the contrary. Mr. Pickett, for example, testified that Mr. Stiner did preheat. Tr. 11,643 (Pickett). Mr. Pickett was certain of this because he remembered lending his propane torch ("rosebud" or "preheat bottle") to Mr. Stiner. Id. The other welders who worked on Mr. Stiner's crew or in the same general area as Mr. Stiner each testified that they complied with preheating requirements. E.g., Tr. 11,665 (Fernandez); Tr. 11,665 (Braumuler); Tr. 11,615 (Pickett).

Although Applicants' witnesses testified that welders preheated material prior to welding, this testimony does not address precisely the allegation made by Mr. and Mrs. Stiner: that welders do not check to make certain that the temperature prior to welding is at least 60°F for materials less than 1½" in thickness. Applicants' witnesses testified only that they used preheating bottles. There is no evidence, however, that suggests that welders utilized any kind of temperature measuring device to verify that the temperature of the metal after being preheated was at least 60°F or 200°F, whichever the case may be. In fact, Mr. Muscente implied that it is sufficient for a welder "to take his torch and play it over this material until he

gets it up to what we refer to as hand warm." Tr. 10,028 (Muscente). Accordingly, the Staff has required Applicants to assess the significance of permitting welders to make subjective determinations as to whether the preheat requirement of Procedure 11032 is met. Staff's assessment of Applicants' response will be considered in this proceeding.

b) Safety Implications of Violation of Preheat Requirements

Mr. Stiner's apparent concern regarding failure to preheat is that porosity (Tr. 10799) or "under bead" cracking could occur (Tr. 10802-03). In this regard, Mr. Stiner relates an incident where he failed to adequately preheat and the result was a visible crack down the middle of the weld. Mr. Stiner testifies that he ground out the weld and repaired it. (Tr. 10801-4.)

With regard to Mr. Stiner's concerns, Applicants testified that in view of Applicants' use of low-hydrogen electrodes, failure to preheat would not have had a significant adverse impact on the low carbon steels welded on by Mr. Stiner or resulted in a hydrogen embrittlement related defect in the weld joint itself. However, given extreme conditions, restraint of the weld joint, and thick materials, failure to preheat may result in shrinkage stresses that could impact the weldment and possibly the heat affected zone of the weld. While the likelihood of a problem even under these conditions is remote, Applicants testified that if such a weld was not adequately preheated to retard the cooling rate, excessive stresses could develop in the

joint resulting in a wide-open, centerline crack of the weld. (Tr. 11820-38.) This was apparently the type of crack that allegedly occurred when Mr. Stiner failed to preheat the one weld joint he described in his testimony (Tr. 10802-3). Significantly, this type of failure is clearly visible and would result in detection by the welder (with appropriate action such as that allegedly taken by Mr. Stiner) or the QC inspector during his final visual inspection of the weld. In either case, the resulting defect would be detected and corrected.

With regard to Mr. Stiner's concerns regarding possible porosity in a weld resulting from lack of preheat, if such a condition should occur Applicants have previously testified that it would also be detected by the welder and corrected or by QC during their final visual inspection (Tr. 11897). In this regard, Applicants have testified that the AWS and ASME Codes state that some porosity in a weld is acceptable. For example, for Class 3 welds, such as alleged to have been welded without preheat by Mr. Stiner, the ASME Code does not even address porosity as a visual accept/reject criterion, and it is rejectable under ASME subsection NF construction only if a pore of porosity exceeds 1/16 of an inch (Tr. 11215). In addition, pursuant to the AWS Code porosity is rejectable only to the extent that the sum of the diameters of the porosity exceeds 3/8 of an inch in any linear inch of weld, or 3/4 of an inch in any linear 12 inches of weld. (Tr. 11215). There has been no testimony that even implies porosity of this magnitude.

In sum, the Board finds that even if Mr. Stiner had failed to preheat some weld joints as alleged, there is reasonable assurance

that this would not have resulted in an adverse impact on plant safety. The principle impact in this proceeding would be on the Board's opinion of whether Applicants have conscientiously applied their procedures.

III. OTHER MATTERS CONSIDERED

We have addressed in this decision each of the remaining allegations by Mr. and Mrs. Stiner regarding the welding issues at Comanche Peak which we perceive could have affected our determination as the adequacy of the QA program or the safe operation of the plant. To the extent CASE may have raised other questions, we have considered those also, and found they were without merit, were improperly raised or were insignificant and could not affect our determination here.

IV. CONCLUSION

The Board concludes that the allegations raised by Mr. and Mrs. Stiner and addressed here (i.e., weave welding, welding of misdrilled holes, downhill welding, weld rod control and preheat) are without merit except to the extent that the Board has specifically indicated in this opinion, primarily with respect to implementation of repair weld procedures and the use of temperature measuring instruments to verify preheat. We await further Staff filings before determining the extent of the breakdown indicated by these situations. The Board further concludes, however, that there is reasonable assurance that these allegations are not reflective of any condition that could adversely impact the safe operation of the plant. (We expect

Applicants or Staff to correct the record, however, if they know that slag inclusions may cause a long-term safety problem because of the effect of the inclusions on weld integrity over time.)

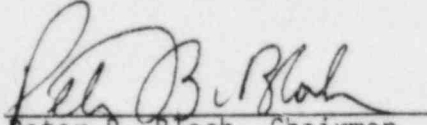
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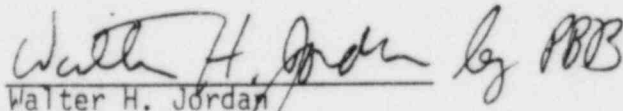
For all the foregoing reasons and based on consideration of the entire record in this matter, it is this 18th day of December 1984

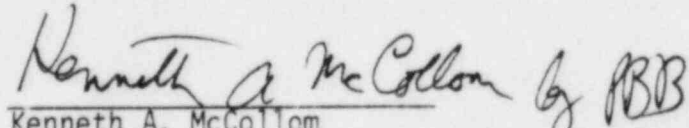
ORDERED:

1. Staff analyses of Texas Utilities Electric Company, et al., (Applicants) responses concerning preheat and repair welding will be considered in this proceeding.
2. Applicants appear to have had the practice of verifying preheat by subjective determination of whether materials were "hand warm."
3. Applicants had a practice, of indeterminate extent, of making repair welds without proper documentation.
4. Applicants demoted a welding supervisor for directing improper welding in violation of procedures, but they violated Appendix B by: (a) failing to document this personnel problem in deficiency paper and (b) by failing to conduct an adequate contemporaneous investigation of the extent of the practice or the effect of the practice on plant safety.
5. In all other respects, the welding allegations discussed in this opinion are found to be without merit.

FOR THE
ATOMIC SAFETY AND LICENSING BOARD


Peter B. Bloch, Chairman
ADMINISTRATIVE JUDGE


Walter H. Jordan
ADMINISTRATIVE JUDGE


Kenneth A. McCollom
ADMINISTRATIVE JUDGE

Bethesda, Maryland