

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

82 APR -7 10:52

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
UNION ELECTRIC COMPANY) Docket No. STN 50-483 OL
)
(Callaway Plant, Unit 1))

APPLICANT'S REPLY TO THE
PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW
FILED BY OTHER PARTIES

SHAW, PITTMAN, POTTS & TROWBRIDGE

Thomas A. Baxter, P.C.
Richard E. Galen

April 5, 1982

Counsel for Applicant

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
UNION ELECTRIC COMPANY)	Docket No. STN 50-483 OL
)	
(Callaway Plant, Unit 1))	

APPLICANT'S REPLY TO THE
PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW
FILED BY OTHER PARTIES

SHAW, PITTMAN, POTTS & TROWBRIDGE

Thomas A. Baxter, P.C.
Richard E. Galen

April 5, 1982

Counsel for Applicant

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION.....	1
II. STANDARDS APPLIED IN THE BOARD'S CONSIDERATION OF THE PARTIES' PROPOSED FINDINGS.....	2
III. PROPOSED FINDINGS OF FACT.....	7
A. Embedded Plates.....	7
B. Honeycombing, Reactor Building Base Mat.....	43
C. SA-358 Piping.....	50
D. Centerline Lack of Penetration in SA-312 Piping..	58
E. Preassembled Piping.....	74
IV. PROPOSED CONCLUSIONS OF LAW.....	76

April 5, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
UNION ELECTRIC COMPANY) Docket No. STN 50-483 OL
)
(Callaway Plant, Unit 1))

APPLICANT'S REPLY TO THE
PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW
FILED BY OTHER PARTIES

I. INTRODUCTION

Pursuant to the schedule established by the Board in its Memorandum and Order of March 19, 1982, Applicant herein submits its reply to "Joint Intervenors' Proposed Findings of Fact and Conclusions of Law," dated March 1, 1982.^{1/} Applicant has not attempted to respond to each proposed finding and conclusion by Joint Intervenors with which Applicant disagrees.

^{1/} The NRC Staff has filed "Proposed Findings of Fact and Conclusions of Law," dated March 29, 1982. Applicant has no response to present to the Staff's proposed findings, which accurately reflect the evidentiary record.

Nor is the Board required to address expressly each and every individual finding proposed by every party. See Public Service Company of New Hampshire, et al. (Seabrook Station, Units 1 and 2), ALAB-422, 6 N.R.C. 33, 41 (1977), and cases cited therein. Where the disagreements are plain, and the positions are accompanied by accurate citations to the record, for example, we have not repeated our position, but rely upon "Applicant's Proposed Findings of Fact and Conclusions of Law in the Form of a Partial Initial Decision," dated February 1, 1982.

Applicant's reply is set forth in the form of a section of a partial initial decision in which the Board addresses the proposed findings of fact and conclusions of law filed by the parties. Proposed findings and conclusions are cited as "[proposing party] PF [paragraph number]" -- for example, "Joint Intervenor PF 23." Abbreviated titles for the direct testimony are those used in Applicant's original proposed findings of fact and conclusions of law.

II. STANDARDS APPLIED IN THE BOARD'S CONSIDERATION OF THE PARTIES' PROPOSED FINDINGS

1. Before the Board begins its detailed discussion of the proposed findings, it is imperative to address certain material shortcomings of a generic nature in Joint Intervenors' proposed findings which have been uncovered in our review. The Commission's Rules of Practice, at 10 C.F.R. §2.754(c), require that proposed findings of fact shall be confined to the

material issues of fact presented on the record, with exact citations to the transcript of record and exhibits in support of each proposed finding.^{2/} While the Board was extremely liberal in allowing Joint Intervenors to introduce and use documents in the cross-examination of Applicant and Staff witnesses, there were limitations placed on the admission and use of certain exhibits. Thus, some exhibits, the reliability and/or materiality of which were not established, were admitted solely for use in Joint Intervenors' cross-examination and attempted impeachment of Applicant and Staff witnesses' testimony, and were specifically not admitted as substantive evidence of the truth of the matters asserted in the documents themselves. See, e.g., Tr. 592-594.^{3/} Joint Intervenors, however, have relied heavily on such documents as affirmative proof of their positions, even going so far as to extract, reformulate or interpret the data in such documents and present it as "fact" or "expert opinion." Such materials, however, are

^{2/} Joint Intervenors' proposed findings, on each part of Contention No. 1 which they address, include sections which generally are devoid of citations to the record -- a "Summary and Outline" and "Conclusions." These conclusory findings, of course, may only be considered to the extent that they are supported elsewhere by proposed findings with citations to the record. Consequently, we generally have not separately addressed the conclusory findings.

^{3/} The concept of "limited admissibility" is one that is well established in the law. See, e.g., Federal Rule of Evidence 105 which provides in pertinent part "[w]hen evidence which is admissible . . . for one purpose but not admissible . . . for another purpose is admitted, the court, upon request, shall restrict the evidence to its proper scope . . .".

not part of the affirmative evidentiary record and cannot form the basis for a decision of this Board. See Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-463, 7 N.R.C. 341, 351, 352(1978) ("...neither [an appeal board] nor a licensing board may base a decision on factual material which has not been introduced into evidence."); Public Service Co. of Indiana (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-459, 7 N.R.C. 179, 191(1978) ("Nothing can be treated as evidence which is not introduced as such."); see also, Administrative Procedure Act §7(d), 5 U.S.C. §556(e).^{4/}

2. It is inappropriate for a party to present what amounts to "testimony" in its proposed findings. Joint Intervenors chose not to present any witnesses on their behalf at the hearing on Contention No. 1. They did, of course, have ample opportunity to make their case by cross-examination of Applicant and Staff witnesses. Joint Intervenors cannot, however, now attempt to present affirmative testimony under the guise of proposed findings of fact. While a party may properly summarize or draw logical inferences from the evidence or other findings which are supported by citations to the record, Joint Intervenors have in some cases gone further and drawn what amounts to technical or "expert" conclusions from the evidence. Such proposed findings are not sponsored by a duly-qualified

^{4/} On occasion, Joint Intervenors cite to discovery materials and exhibits which were not received into evidence at all.

expert, have not been subjected to cross-examination, and will not be adopted by the Board.

3. In addition, the Board takes note of a frequent complaint of Joint Intervenors that the testimony and documentary record in this proceeding raise certain unanswered questions or alleged inconsistencies. See, e.g., Joint Intervenor PF 16, 40, 41. While we will consider the specifics of these concerns below, it should be noted that Joint Intervenors have had the opportunity to resolve such "unanswered" questions during the cross-examination of Applicant and Staff witnesses. Where the Applicant has presented substantial evidence that clearly satisfies its burden of proof, Joint Intervenors' response must be more than that there are additional questions that are unanswered.^{5/} Furthermore, many of the alleged inconsistencies in documentation raised by Joint Intervenors are the result of the substantial number of often voluminous documents which Joint Intervenors placed in the record in this case. The Board accorded Joint Intervenors wide latitude as to the documents admitted and as to the use Joint

^{5/} Hypotheticals should remain within the evidence and include only such facts as are supported by the evidence or which the evidence tends to prove. Otherwise, a misleading and unsatisfactory record could result. Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units Nos. 1 and 2), ALAB-334, 3 N.R.C. 809, 828-829 (1976). Joint Intervenors have proven nothing by posing hypotheticals which they have failed to link to reliable evidence. A hypothetical question is not evidence, and can neither add to nor detract from the evidence. Id. at 825.

Intervenors could make of such materials in cross-examining Applicant and Staff witnesses. Nonetheless, in the case of many documents, few, if any, questions were asked of the witnesses. It is wholly inappropriate for Joint Intervenors to argue now that some particular item within such a document raises inconsistencies or unanswered questions when they had the opportunity to confront the witnesses with such concerns but chose not to. This is particularly egregious since Joint Intervenors, contrary to this Board's Order of September 24, 1981, did not identify prior to the commencement of the hearing those documents to be introduced into evidence. Certainly the witness panels could not be expected to address every conceivable question or concern raised by documents identified and introduced for the first time at the hearing, particularly in light of the fact that Joint Intervenors asked no questions about many of the documents, thereby giving no indication of the purpose for their introduction.^{6/}

4. Finally, the Board notes that Joint Intervenors suggest a weakness in Applicant's case whenever Applicant's witnesses testify to a fact which Joint Intervenors cannot confirm by documentation in Joint Intervenors' possession. See, e.g., Joint Intervenor PF 18. The Commission's Rules of

^{6/} This situation was further exacerbated by Joint Intervenors' introduction into evidence of exhibits allegedly related to the embed issue after Applicant's witness panel on the embed contention had been excused. See paragraph 20, infra, discussing Joint Intervenors' use of such a document.

Practice contemplate, however, that testimony by a sworn witness is admissible. See 10 C.F.R. § 2.743. There is no basis for a suggestion that documentary evidence is required to prove each and every fact.

III. PROPOSED FINDINGS OF FACT

A. Embedded Plates

5. Proposed findings of fact on Joint Intervenors' Contention No. 1, Part I.A. have been filed by Applicant, Joint Intervenors and the Staff. Both Applicant and Staff have presented comprehensive proposed findings supporting the conclusion that the embedded plates installed at Callaway prior to June 9, 1977, are structurally sound and fully capable of supporting the required loads imposed on them. Joint Intervenors, as was the case during the hearing on Contention No. 1, have principally focused their attention on this embed contention in their proposed findings of fact. They have presented an extended discussion which they claim supports their allegations that certain embedded plates installed at the Callaway Plant may contain faulty welds thereby endangering the safe operation of the plant and that Applicant's quality assurance program was deficient in failing to prevent this occurrence. The findings of fact which follow will address those proposed findings presented by Joint Intervenors which require further discussion beyond the matters determined in our early findings of fact on the embed issue.

6. Joint Intervenors' proposed findings of fact regarding embedded plates cover a broad spectrum of concerns. The Board's discussion of these proposed findings will be organized as follows: We will first consider Joint Intervenors' allegations that Applicant's quality assurance program did not follow prescribed procedures. We will next discuss Joint Intervenors' attack on Applicant's conclusions regarding the manually welded embeds including concerns raised about inspection data, the Bechtel engineering analysis, the Lehigh University testing program, Dr. Fisher's expert opinions and the exceptions to the AWS Code which were adopted. The Board will then address Joint Intervenors' arguments regarding the machine welded plates, including the validity of the reinspection results, the Bechtel engineering analysis and the results of the Lehigh University tests on the machine welded embeds. Finally, the Board will consider the additional arguments raised in Joint Intervenors' "Conclusions Regarding Embeds."

7. Joint Intervenors contend that prior to the issuance of the embed-related stop work orders in June, 1977, Bechtel and Daniel failed to comply with their own documented quality assurance procedures for inspection of the embeds manufactured and shipped by Cives. See Joint Intervenor PF 6, 7 and 8; see also Joint Intervenor PF 50. This contention is unsupported by the record. The written and oral testimony of record in this proceeding establishes that under the SNUPPS

quality assurance concept, Cives had responsibility for quality control inspection of the embeds and Bechtel had responsibility for "quality surveillance" during the manufacturing process. Applicant Embed Testimony at 14; see also, Schnell Testimony at 30-33. Contrary to Joint Intervenors' assertion, Bechtel was not required to "inspect" each item prior to shipping. Rather the document cited by Joint Intervenors (Joint Intervenor Ex. 28 at 6-7) makes clear that Bechtel was required to "verify" that the required inspections had been performed. There is, however, nothing in the quality assurance procedures which requires Bechtel to repeat each of the inspections performed by Cives. Rather, Bechtel was responsible for a quality surveillance and a verification of documentation prior to shipment. See Tr. 854, 855 (Meyers).

8. Similarly, the record is clear that prior to June 6, 1977, under the SNUPPS quality assurance concept, Daniel was responsible during receipt inspection of Bechtel-procured materials only for verifying the quantity of materials and checking for shipping damage. Tr. 663-666 (Schnell), 1348-1351 (Starr). For items that Daniel procured, however, Daniel conducted a receipt inspection including a quality control inspection. See Schnell Testimony at 33. The reference in Joint Intervenors' proposed finding 6 to a receipt inspection checklist (based upon a quotation from a Daniel Administrative Procedure contained in an NRC I&E Report, Joint Intervenor Ex. 28, p. 7) does not indicate whether all the items on the

checklist applied to Bechtel-procured materials (subject only to the "over/short or damaged" inspection) or if some only applied to the Daniel-procured materials (requiring a full quality control receipt inspection).^{7/} Accordingly, the Board finds that there is no basis in the record for concluding that Bechtel and Daniel were not complying with their respective quality assurance procedures and we find that Applicant's quality assurance program was in compliance with the general mandate of NRC Criteria II, VII and X, 10 C.F.R. Part 50, Appendix B, contrary to the assertions in Joint Intervenors' proposed finding 7.

9. The unresolved item raised in NRC I&E Report No. 50-483/77-05, p. 7 (Joint Intervenor Ex. 28) concerning full documentation regarding the manufacture of the embeds (see Joint Intervenor PF 7) was subsequently closed out when the NRC inspector returned to the Callaway Plant site and the documentation was presented to him for review. This is documented in Staff Ex. 4 (NRC I&E Report No. 50-483/77-07) at p. 6.

10. Joint Intervenors argue that Applicant and its contractors were aware of deficiencies in Cives products prior

^{7/} This is an example of the "unanswered" question or documentary inconsistency created by Joint Intervenors' indiscriminate introduction of documents and the use in their proposed findings of portions of those documents not addressed in the hearing. See paragraph 3, supra. Although not a part of the record Daniel officials have indicated that the checklist is a generic document and that for a receipt inspection of a particular purchase order, the Daniel inspector consults the relevant Material Control Report (MCR) to determine which items on the checklist apply. Prior to June, 1977, the MCR for embeds only required an over/short or damaged inspection.

to June, 1977 and "failed to improve their quality assurance procedures." Joint Intervenor PF 10. The support cited for this proposition, however, reveals that the quality assurance program was performing as designed in identifying and resolving problems in Cives' performance and insuring that quality products were delivered to the site. See, e.g., Joint Intervenor Exs. 18, 19 and 21. The concerns raised in Joint Intervenors' proposed finding 12 regarding the four discrepancies found during an inspection of 374 Cives embeds have been previously addressed. See Applicant PF 51 at n.13. The additional concern raised by Joint Intervenors in their proposed finding 14 regarding the installation of one of these four embeds was resolved and closed out by the NRC in NRC I&E Report 50-483/77-10 at p. 10 (Joint Intervenor Ex. 34) where it was reported that the embedded frame had been reinspected, found to be acceptable and released for installation. This is further evidence that the four discrepancies identified in Joint Intervenor Exhibit 18 were of a very minor nature or were acceptable imperfections and would not affect the intended functions of the embeds. See Tr. 1234, 1235 (Thomas).

Manually Welded Embeds

11. As established in prior findings of fact, the Board has found that Applicant has demonstrated that the manually welded embedded plates installed prior to June 9, 1977 are capable of safely supporting the required design loads

imposed on them. See Applicant PF 86. Joint Intervenors have interposed a multifaceted objection to each of the grounds for this conclusion. While the approach taken by Joint Intervenors contains much superfluous and unnecessary material which we have determined does not require further extended discussion,^{8/} we will review the major points of contention raised by Joint Intervenors and demonstrate the basis for rejecting their position.^{9/}

12. A major point of contention concerns Applicant's review of the Daniel inspection data for the manually welded embeds and the conclusion reached that such data could not be used for an engineering analysis of the structural integrity of

^{8/} Thus, for example, the factual renditions contained in Joint Intervenors' proposed findings 15, 22, 26, 27, 28 and 31 are of little, if any, importance in the discussion of the manually welded embed issue. As has been stated before, the concern with the manually welded embeds was not the number of deficiencies, but rather the maximum deficiency which existed. See Applicant PF 67, 78 and 80; see also paragraph 13, infra. Therefore, Joint Intervenors' discussion of these numbers is of no apparent significance. Indeed some of Joint Intervenors' compilations of numbers and facts are related in no way to the conclusions they propose and are apparently presented solely for purpose of confusing the record. See, e.g., Joint Intervenor PF 15 and 28.

^{9/} We note at the outset that Joint Intervenors' contention that it took Applicant more than three years to establish the integrity of the embeds installed prior to June 9, 1977 and that Applicant's efforts included "elaborate experiments" (Joint Intervenor PF 29), is without substance in the record. To the contrary, the embed concerns were resolved in a matter of months -- the Bechtel report was issued in August, 1977 and the Daniel data package issue was concluded in March, 1978. Furthermore, while testing on some embeds and anchor rods was performed no "experiments" were conducted. See Applicant Exs. 4 and 6.

the welds on such plates. See Applicant PF 77-82; Joint Intervenor PF 23, 38-40. A related argument is Joint Intervenors' assertion that the results of the Cives reinspection program do not support the "worst case" assumption in the Bechtel engineering analysis that weld undersize does not exceed 1/8 inch for the full 360° circumference of the weld. See Applicant PF 69, 71 and 76; Joint Intervenor PF 24, 30A, 31, 33, 35, 37-40.

13. There is ample evidence in the record to support the conclusion that the Cives inspectors^{10/} who reinspected the manually welded plates found no anchor rod welds with a weld undersize greater than 1/8 inch for the entire weld circumference.^{11/} Joint Intervenors complain that there is no

^{10/} Joint Intervenors' contention (see Joint Intervenor PF 24 at n.8) that the Commission's Quality Assurance Criterion X, 10 C.F.R. Part 50, Appendix B, prohibits Cives quality assurance inspectors from inspecting Cives manufactured materials and requires that such inspections be performed by "unbiased" third-parties is without substance. What Criterion X mandates is that such inspections be performed by "individuals other than those who performed the activity being inspected." This does not require that the inspector be employed by another company. Rather it requires, for example, that welds on embeds be inspected by an individual other than the welder. See also, Criterion I, 10 C.F.R. Part 50, Appendix B, which implicitly recognizes that quality assurance functions will be performed by individuals within the same corporation as those persons performing the activities being reviewed. Moreover, the testimony indicates that it is standard procedure for a manufacturer to perform such a reinspection. It is the manufacturer's responsibility, part of its warranty. Tr. 1230 (Meyers).

^{11/} Contrary to Joint Intervenors' misinterpretation of Applicant's position (see Joint Intervenor PF 37 at n.18 and 38 at n.19) the critical weld parameter is maximum average weld undersize on the individual welds, not the average undersize of

[Continued Next Page]

"documentation" of this finding and that the Cives inspection reports do not have sufficient data. See Joint Intervenor PF 30A and 37. As stated in our previous findings, the purpose of the Cives reinspection effort for the manually welded embeds was to determine the maximum extent of the identified welding deficiencies. See Applicant PF 67.^{12/} All parties concerned knew very early in the inspection process that there were welding deficiencies on the manually welded plates. It was also determined that minor deviations from the AWS Code-required weld detail would not affect the load carrying capacity of the plates. It was necessary, therefore, to inspect all available manually welded plates and determine what the "worst case" deviations were so that an engineering analysis could be performed. It was not necessary to record every weld deficiency found nor to count accurately the number of deviations identified, as Joint Intervenors imply in their proposed findings. See Joint Intervenor PF 37. In essence,

[Continued]

all welds on a plate. See Applicant PF 69, 78(n.25), 79(n.28).

^{12/} Contrary to Joint Intervenors' claim that the Cives inspectors were given the same instructions as the Daniel inspectors -- to determine whether the embeds contained deviations from the procurement specifications and applicable AWS Code requirements (see Joint Intervenor PF 24) -- this was not the case. Cives was directed to identify the maximum deviation and Daniel was inspecting solely to accept or reject the plates. See Applicant PF 67 and 80, and citations therein.

the only piece of information needed from the Cives inspectors was the amount of undersize found on the one or more anchor rods with the worst undersize condition. Dr. Meyers of Bechtel testified at the hearing that Cives was instructed to obtain this information and that they subsequently provided such data to Bechtel in oral communications. Tr. 724, 796, 1241 (Meyers). This uncontradicted sworn testimony is credible and fully supports Applicant's position.

14. Contrary to Joint Intervenors' assertions in their proposed finding 37, this conclusion is also supported by a subsequent letter from Cives which states in relevant part as follows in regard to the manually welded plates:

The re-inspection of the plate assemblies indicated the following:

- A. Most of the deficiencies were 1/16 [inch] undersize welds. A few welds were 1/8 [inch] undersize. Our inspection records do not indicate that any welds were more than 1/8 [inch] undersize.

Board Ex. 1, Enclosure 2. This Cives letter, written by one of the individuals who actually inspected the plates, unequivocally confirms that the undersize deficiencies were mostly 1/16 inch and a few were 1/8 inch. The fact that the next sentence in paragraph A refers to the inspection records does not dilute the significance of the previous sentences confirming the maximum undersize found. Certainly, this Cives employee who performed the inspections is better able to interpret those records than Joint Intervenors. The Board finds, therefore,

that there is no credible evidence in the record to refute the finding that the maximum undersize found in the Cives inspection was 1/8 inch.

15. Joint Intervenors assert, however, that "there is competent and substantial evidence that many of the manually welded plates inspected after June 9, 1977 had average weld undersize greater than 1/8 inch." Joint Intervenor PF 38; see also Joint Intervenor PF 40. The principal factual basis for this assertion is Joint Intervenors' reliance on the 610-page Daniel inspection data package (Joint Intervenor Ex. 12). We have previously discussed the extensive in-depth review and analysis given to this document by Applicant, Bechtel and Daniel, and the basis for their joint conclusion that the data in this document is inaccurate, unreliable, inconsistent and misleading. There is substantial documentary evidence as well as oral and written testimony in the record to support this conclusion and it has been adopted by the Board. See Applicant PF 78-82 and citations therein.

16. Joint Intervenors, nonetheless, have set themselves up as interpreters of this document and claim that it is credible evidence which supports their position. We reject that contention for several reasons. First, no witness has been presented who will vouch for the reliability, accuracy or credibility of the data in Joint Intervenor Ex. 12. The Bechtel witnesses clearly established the basis for their rejection of the data. The detailed Bechtel report on this

review is part of the record and the examples of the types of inaccurate and unreliable data are clearly demonstrated. Joint Intervenors cross-examined the Bechtel employee, Mr. Parikh, who was in charge of this Bechtel review, and they had the opportunity to question him concerning the bases for rejection of specific items in the data package.^{13/} They have pointed to no portions of the testimony which challenge the conclusions drawn in the Bechtel report. Furthermore, it is most significant that Daniel itself explained the limited purpose of its inspection, acknowledged the deficiencies in its data package, and concurred in the conclusion that such data could not be used for an engineering analysis of the load carrying capacity of the manually welded plates.^{14/} See Applicant PF 80. Witnesses from Daniel, including the project manager, testified at the hearing and confirmed that Daniel fully accepted these findings. Tr. 1357, 1358 (Starr); 1380-1384 (Holland).

^{13/} Accordingly, Joint Intervenors' claim that "no explanation is provided" as to why certain data entries were rejected in the Bechtel report (see Joint Intervenor PF 40, at p. 30) is accorded little weight. Furthermore, many of these items are explained either in the Bechtel report itself (see Applicant Ex.7) or its accompanying attachments (see Board Ex. 1, Enclosure 6).

^{14/} It is true that "Daniel's project manager characterized the data collected as 'professional'." Joint Intervenor PF 21. He does, however state in the same passage from the hearing transcript that "it was not sufficient to do an engineering evaluation...it was adequate to accept or reject these products...It was professional, from my point of view, and provided the data as we understood it was required." Tr. 1358 (Starr) (emphasis added).

17. Furthermore, the results of the various reinspections of manually welded embeds previously rejected by Daniel inspectors, confirms that the original Daniel inspection reports did not accurately reflect the condition of the plates and supports the decision to reject the Daniel data package. As early as November 4, 1977, 10 of these plates were reinspected by Bechtel and on November 19, 1977, Daniel reinspected 39 plates. Both reinspections indicated significantly different results than those contained in the original Daniel inspection reports. Board Ex. 1, Enclosure 4 to ULNRC-238, at p. 1. Most significantly, the final reinspection of Daniel rejected, but unrepaired manually welded embeds, conducted jointly by Daniel, Bechtel and Union Electric inspectors, confirms that the weld deviations were less than originally reported.^{15/} A review of

^{15/} Joint Intervenors suggest that this joint reinspection is suspect because the plates had been "received soon after commencement of individual on-site inspection." Joint Intervenor PF 32; see also Joint Intervenor PF 44 n.30. Joint Intervenors claim that this "individual on-site inspection" did not commence until approximately July 6, 1977 (citing to Tr. 666) about one month after the stop work order thus giving Cives an opportunity to improve its performance. The reference to July 6, 1977 at Tr. 666 concerns instructions to Daniel from Applicant to begin 100% quality control receipt inspections for all Bechtel-procured items, not just Cives products. See Tr. 666. The Daniel on-site inspections of individual embeds had commenced shortly after the issuance of the June 9, 1977 stop work orders. See Applicant PF 67, 77 and citations therein. Furthermore the fact that the plates may have been inspected by Daniel after the issuance of the stop work order does not necessarily mean that they were manufactured and shipped after that date. There is, therefore, no basis for concluding that these plates are not representative of all plates rejected by Daniel. Furthermore, even if Joint Intervenors were correct, the joint reinspection nonetheless confirms that Daniel inspections were generally inaccurate and tended to overstate

[Continued Next Page]

the inspection results from this joint reinspection is particularly revealing. See Board Ex. 1, Encl. 9 to ULNRC-238, pp. 1-47. It confirms that the average weld undersize on any anchor rod never exceeded 1/8 inch. Furthermore, most undersize detected extended over only a small percentage of the weld circumference, and in the three cases where an undersize greater than 1/8 inch is observed, its extent is 2% or less of the total weld circumference.^{16/} The reinspection, therefore found not one weld deficiency even approaching the magnitude suggested by Joint Intervenors in their interpretation of the Daniel data package.

18. The inherent and pervasive unreliability of the Daniel data package (Joint Intervenor Ex. 12) leads to the final basis for rejecting Joint Intervenors' allegations founded on such evidence -- the document itself has not been admitted into the record as substantive evidence. The record is clear in this case that this document was admitted solely for use by Joint Intervenors in cross-examination of Applicant witnesses concerning their review and analysis of the document and was not admitted as substantive evidence of the truth of the matters asserted in the document. The following colloquy between counsel and the Board at the hearing confirms this:

[Continued]

the welding deficiencies. See Applicant Ex. 6, attached report at 5.

^{16/} See Board Ex. 1, Enclosure 9 to ULNRC-238 at p. 16 of 47, item 6, and at p. 20 of 47, items 6 and 8.

MR. GALEN [Counsel for Applicant]: Mr. Chairman, I think we have reached an agreement with the Joint Intervenors on the use of this particular document. We have determined that it would be inappropriate to allow only portions of the document into evidence because, as is indicated in Applicant's testimony and the exhibits which have been submitted, it is the entire document itself which was extensively reviewed and determined to be inaccurate and unreliable for purposes of an engineering evaluation.

We have agreed with the Joint Intervenors that this document can be used for the limited purpose of impeachment of that portion of the Applicant's testimony dealing with that evaluation and review, but that the document would not be admitted as substantive evidence itself for the truth of the matters allegedly asserted in the document.

JUDGE GLEASON: Is that acceptable to the Joint Intervenors?

MS. DREY [Representative of Joint Intervenors]: Yes, sir.

MR. LESSY [Counsel for the Staff]: The Staff participated in those discussions and agrees with that...

JUDGE GLEASON: ...All right, then the Joint Intervenor exhibit which on the record will be admitted...as Exhibit Number 12 for the purposes that have been enunciated.

Tr. 592, 593 (emphasis added). The record as subsequently developed in this case presents no basis for changing this ruling. No evidence has been presented establishing the trustworthiness or reliability of the data contained in the document. To the contrary, as indicated above, the record clearly establishes that such data is not reliable evidence.

Accordingly, the Board rejects as unsupported by the record, those portions of Joint Intervenors' proposed findings of fact supported solely by reference to the data in Joint Intervenor Ex. 12. See Joint Intervenor PF 16, 21, 22, 23, 28 (n.10), 32 (n.13), 38 and 40 (n.27).

19. We similarly reject the attempts by Joint Intervenors to present as fact their compilations of or extractions from the data in Joint Intervenor Ex. 12. See Joint Intervenor PF 23, 38 (Table I), 39 (Table I) and 40 (n.27). Not only is the underlying data suspect, but it is also wholly inappropriate for a party to attempt to introduce what amounts to testimony in their proposed findings of fact. While summaries of voluminous documents may be appropriate (see Federal Rule of Evidence 1006), it is axiomatic that such a summary be presented as evidence at the hearing, that the individual preparing it be available for cross-examination and that opposing parties have an opportunity to contest the summary upon the record.^{17/} See 5 D. Louisell & C. Mueller,

^{17/} Joint Intervenors attempted at the hearing to introduce into evidence an apparent summary or index of Joint Intervenor Ex. 12 in the form of a box of cards. See Tr. 1190, 1191. Applicant interjected an objection on the grounds that the proffered material was the work product of Joint Intervenors' counsel or her client, was not produced by any sworn witness and that Applicant therefore would have no opportunity to confront the exhibit's preparer or to test the accuracy of the document by cross-examination. The Board sustained the objection. Tr. 1191. Similarly, Joint Intervenors attempted to introduce a "chart" they had prepared apparently to compare Cives and Daniel data as they have attempted in their Table I attached to their proposed findings. See Joint Intervenor Ex. 32 (Rejected). Joint Intervenors acknowledged that such a

[Continued Next Page]

Federal Evidence § 599 (1981) (discussion of the use of summaries pursuant to Federal Rule of Evidence 1006). These procedural safeguards would not be accorded if we were to consider Joint Intervenors' summaries in making our findings of fact.^{18/}

20. We also reject the arguments presented in Joint Intervenors' proposed finding 16 that "[t]here is a reasonable likelihood that an additional 16 defective plates... were installed in the plant after the stop work orders" and that "a serious problem may exist with at least three of the missing plates." There are several bases for this decision. First, the document supporting this allegation (Joint Intervenor Ex. 36) was introduced into evidence by Joint Intervenors after the cross-examination and redirect examination of Applicant's witness panel on the embed contention had been completed and after that panel had been excused. Moreover, Joint Intervenors

[Continued]

chart was probably not "authentic" and should not be used "in any official capacity." Tr. 1250. The Board also rejected this proffered exhibit. Tr. 1251, 1252. We see no reason for ruling differently in regard to the summaries presented in Joint Intervenors' proposed findings.

^{18/} We note further that the Board sees little, if any, significance in the data summaries themselves. As has been previously stated, in regard to the manually welded embeds, the number of deficient welds was not significant (as allegedly reported in Joint Intervenor PF 23 and 38, Table I). Rather it was the maximum extent of such deficiencies which had to be identified. See Applicant PF 67, 68 and 78 and citations therein

asked no questions concerning this document, thus not indicating in any way that this particular item was of any concern.^{19/} Accordingly, not only did Applicant have no indication that this matter was at issue, but even if it did, it had no opportunity to explain or respond to the allegation. Secondly, we reject Joint Intervenors' arguments because the calculations contained therein are based on data from Joint Intervenor Ex. 12, the reliability of which has not been established and which data has specifically been rejected by the Board. See paragraphs 15-19, supra. Finally, we reject Joint Intervenors' calculations because they are based on an assumption that the indicated weld undersize extended the full 360° circumference of the anchor rod. As demonstrated below, this assumption is not supported by the evidence. See paragraph 21, infra.^{20/}

21. Joint Intervenors argue that "Bechtel admits to the existence of at least eight manually welded plates with average undersize in excess of 1/8 inch, but contends that it is too few to affect the validity of its engineering analysis

^{19/} Indeed, during the discussion by counsel as to the admissibility of this document, the only relevant portion that was identified was a reference to the pendency of the embed investigation on page 3 of the document. See Tr. at 1428-1431. Joint Intervenors made no effort to inform the other parties or the Board that their use of this document related to an entry on page 18.

^{20/} The Board similarly rejects the arguments in Joint Intervenors' proposed findings 17 and 50 which are based on their proposed finding 16.

(Applicant's Ex. 7, p.3)." Joint Intervenor PF 38 (footnote omitted).^{21/} They also assert that Union Electric found "10 plates [with] an average undersize greater than 1/8 inch (Board Ex. 1, Enclosure 8 to ULNRC-238, p. 2)." Id. These findings by both Bechtel and Applicant, however, resulted from their reviews of the Daniel data package utilizing the extremely conservative assumption that if an undersize weld was reported but no indication was given of the extent of the undersize around the circumference of the rod, it was assumed that the undersize extended 100% around the weld. See Applicant Embed Testimony at 43; Applicant Ex. 7 at 3; Board Ex. 1, Enclosure 8. As all information available indicates, undersize rarely extends completely around the weld and the greater amounts of undersize usually extend only for very limited portions of the weld. See Applicant Embed Testimony at 43; Applicant Ex. 7 at 3; Board Ex. 1, Enclosure 8; Applicant PF 71(1) and citations therein; see also paragraph 17, supra. Accordingly, Applicant and Bechtel were justified in not accepting these results as being representative of the true condition of the manually welded plates. The Board, accordingly, finds that there is no credible basis in the record for Joint Intervenors' contention

^{21/} Also in Joint Intervenors' proposed finding 38, Joint Intervenors contend that "Bechtel's review of the Daniel data indicated 26 plates have an average weld undersize exceeding 1/8 inch." There is no citation to the record to support this statement nor is the Board aware of any factual basis for this assertion. Therefore, the Board will reject this portion of the proposed finding. See 10 C.F.R. §2.754(c).

that average weld undersize greater than 1/8 inch existed on the manually welded anchor rods.

22. Joint Intervenors' other principal attack on Applicant's conclusion that the manually welded plates are structurally sound is their assertion that the Bechtel engineering analysis of the load carrying capacity of manually welded embeds with assumed worst case welding deficiencies reveals that there is "little or no margin for error." Joint Intervenor PF 36; see also Joint Intervenor PF 2, 30, 37, 52 and 53. Joint Intervenors claim that "[i]f Bechtel's calculations are wrong and the reduced load capacity is slightly lower, plate failure can be expected." Joint Intervenor PF 36. Joint Intervenors furthermore accuse Applicant of material misrepresentations in presenting the results of the Bechtel analysis to the Board. See Joint Intervenor PF 36; see also Joint Intervenors' Motion For Admission of Additional Evidence (filed February 19, 198?) at 1, 2. This is a very serious allegation which the Board has fully investigated.^{22/} We have concluded that Joint Intervenors' attack on the Bechtel engineering analysis is without factual basis, that Joint Intervenors' assertions of material misrepresentations are

^{22/} In this regard we have granted Joint Intervenors' motion and have admitted and reviewed their proffered Exhibit No. 78. We have also received and considered responses to Joint Intervenors' motion from Applicant and Staff together with the proffered Affidavit of Eugene J. Gallagher and Affidavit of Kirit G. Parikh (Applicant Ex. 20).

groundless, and that such conclusions are readily apparent from a review of the record in this case.

23. As Applicant's testimony and proposed findings of fact make abundantly clear, a manually welded embed is never loaded to its full structural capacity. Rather the design load calculated for and assigned to a particular type of embed provides a minimum safety factor of at least 2.0 against the yield limit state of the plate and the tensile capacity of the anchor rods.^{23/} See Applicant Embed Testimony at 34; Applicant PF 66.

24. When it became apparent that some manually welded embeds had undersized welds, Bechtel engineers calculated the reduced load carrying capacity of each type of manually welded embed assuming that each weld on the embed was undersized 1/8 inch for the full 360° circumference of the weld. Additional conservative assumptions were also used in these calculations. Applicant Embed Testimony at 37; Applicant PF 71(1). The reduced load carrying capacities were then compared to the actual loads on the plates.^{24/} As Applicant's testimony

^{23/} For example, in the design process, a plate with a full structural capacity of at least 50,000 lbs. would be assigned a design load of no more than 25,000 lbs. Accordingly, even if loaded to its full design load of 25,000 lbs., the plate would have a margin of safety of 2.0. In most cases, however, the actual load on a plate is considerably less than its design load capacity, thereby providing an additional margin of safety. It is, however, accepted engineering practice to load a plate to its full design load capacity. Applicant Ex. 20 at para. 5.

^{24/} The actual load on a plate is the maximum load which it has been calculated could be imposed on the plate during the

[Continued Next Page]

clearly reflects, even with the recalculated load carrying capacity there still existed a smallest minimum safety factor of 1.92.^{25/} See Applicant PF 71(1) and citations therein. Accordingly, there is no basis for Joint Intervenors' allegation that there is little or no margin for error or that plate failure can be expected. To the contrary, a review of the document Joint Intervenors claim supports their position (Joint Intervenor Ex. 78) reveals that in no case does the actual load on a plate exceed its reduced plate capacity. While it is true that in a few instances the actual load equals or is just less than the reduced plate capacity (see Joint Intervenor PF 36 at n.17), this does not portend potential plate failure. Rather, since each manually welded plate, even with a recalculated load carrying capacity, retains its inherent margin of safety, it may be safely loaded to its full "reduced" capacity.^{26/} See Applicant Embed Testimony at 38; Applicant PF 71(1); see also Applicant Ex. 20 at paras. 7 and 8.

[Continued]

life of the plant and includes dead loads, live loads and seismic loads. Applicant Ex. 20 at para. 6.

^{25/} Additional conservatisms assumed in the recalculations caused the smallest minimum safety factor to be reduced slightly from 2.0. Applicant Ex. 20 at para. 7.

^{26/} Applicant acknowledges that there was an overstatement in the sentence in its proposed finding 71(1) and in Applicant's Embed Testimony at 37-38 which states that "[i]n all cases the recalculated load carrying capacity still exceeded the maximum intended design load." Applicant concedes that in the case of four of the 259 plates listed in Joint Intervenor Ex. 78, the reduced load carrying capacity equals the actual load.

25. Furthermore, the Board sees little, if any, significance in Joint Intervenors' extended discussion in their proposed findings 33, 34 and 35, concerning the timing of Bechtel's analysis of reduced load carrying capacities in relation to the timing of the Cives reinspection program. It was apparent from the very beginning of the embed investigation that certain weld deficiencies existed on the manually welded plates. Applicant Embed Testimony at 32, 33; see also Applicant PF 67 and citations therein. The Board sees nothing inappropriate in the Bechtel engineers beginning their calculations using as yet unconfirmed assumptions subject to subsequent confirmation when the final results of the Cives reinspection program were communicated to them.

26. Similarly, the factual rendition in Joint Intervenors' proposed finding 39 is of little relevance.^{27/} Joint Intervenors attempt to establish that Applicant and/or Bechtel knew of the existence of the Daniel data package prior to November, 1977. The reasons why this information did not come to the attention of the appropriate Union Electric and Bechtel personnel has been discussed previously. See Applicant PF 77 (n.24). The document referred to by Joint Intervenors

^{27/} Applicant and Bechtel did not go to "great lengths to discredit the Daniel data." Joint Intervenor PF 39; see also Joint Intervenor PF 40. Rather their efforts were directed at analyzing the data and determining whether it was valid and capable of forming the basis for an engineering analysis of the manually welded embeds. See Applicant PF 79 and citations therein.

which indicated a 90 percent rejection rate in August, 1979 (Joint Intervenor Ex. 39) does not indicate the nature or extent of the welding deficiencies. As previously discussed, there was no question that the manually welded plates did not strictly comply with the AWS Code; the critical concern was the nature and extent of the welding deficiencies. No new information in that regard is provided in this document. Similarly, the two statements concerning a Mr. Don Wells and a Mr. Nick Husting in a document prepared by an unknown author which Joint Intervenors quote in their proposed finding 39, provides little credible basis for refuting the sworn testimony of the principal Bechtel personnel involved in the embed investigation that they did not know of the Daniel data package until November, 1977.^{28/}

27. Joint Intervenors also contend that the Bechtel engineering analysis of the manually welded plates is deficient in that it did not consider the reduced load carrying capacity, due to undercut, on the manually welded embeds with unthreaded anchor rods. Joint Intervenor PF 41. There is no support in the record for this contention. Rather, the evidence clearly

^{28/} We note simply in passing that the quotation concerning Don Wells could be referring to machine welded embeds and even if concerning manually welded plates no indication is given that the "conditions described on the Daniels NCR's" were any worse than those being found by Cives. The Nick Husting reference, similarly, gives no indication of the type of plate being inspected, the nature or extent of the deficiencies involved, or even if welds were at issue. See Joint Intervenor Ex. 20.

establishes that the capacity of an anchor rod was determined by the net area of the rod at the root of its threads, assuming it was a threaded rod. If the rod was unthreaded, there would be an additional margin of safety because the same net area would be used as on the threaded version. For example, in calculating the load carrying capacity of a 1-1/2 inch diameter anchor rod (both threaded and unthreaded) the net area used for both types of rods was the same -- 1.41 inches, the net area at the root of the threads on the threaded version of the 1-1/2 inch anchor rod. See Applicant Ex. 4 at Appendix B, Table 36.^{29/}

28. Joint Intervenors in their proposed finding 43 claim that the justification presented by Applicant for adopting four minor exceptions to the AWS Code requirements for welding between manually welded anchor rods and plates "was refuted by Mr. Gallagher of the NRC Staff after he discussed it with a representative of the AWS and others within the NRC." This statement is incorrect. To the contrary, Mr. Gallagher testified orally that his inquiry to the AWS representative and to other NRC personnel was to determine the general

^{29/} Joint Intervenors' reference to Applicant's response to an NRC inquiry is not relevant to this issue. The NRC's inquiry (Staff Ex. 6, Attachment A, ULNRC-349 at para. 12) and Applicant's response (Staff Ex. 6, Attachment B, ULNRC-354 at para. 12) both concern the manual welding of unthreaded Nelson studs which are normally attached to plates by the automatic welding process. The inquiry and response do not concern welding of unthreaded anchor rods.

applicability of the AWS Code to anchor rod welding. Tr. 1293, 1294 (Gallagher). Applicant has not challenged the applicability of the AWS Code; rather, it has only adopted minor exceptions to the Code. As the record reflects, the AWS Code is just a guideline for the engineer and exceptions can be taken if appropriate. Tr. 773, 1135 (Fisher). The exceptions adopted in this case have been justified by the Bechtel engineering analysis and have been approved by the NRC. As Mr. Gallagher stated in his sworn testimony: "[t]hese exceptions are minor in nature and do not affect the basic weld design or the capacity of the connection." Gallagher Testimony at 5.

29. Joint Intervenors assert that the physical tests performed on manually welded anchor rods were requested by the NRC Staff "[a]pparently because they were not satisfied that the inspection data and the Bechtel engineering analysis were sufficient to establish the adequacy of the manually welded plates installed before June 9, 1977." Joint Intervenor PF 44. There is no support for this inference in the portion of the record cited by Joint Intervenors. Accordingly the Board rejects this aspect of Joint Intervenors' proposed finding 44.

30. It is clear from the Bechtel report on this testing that the worst welds available for testing were chosen. Applicant Ex. 5 at p. 1, para. 1; see also Staff Ex. 6 at Attachment D ("Detailed Procedure for Test Programs to Evaluate Welds of Anchor Rods and Studs to Embedded Plates" at p.1, para. 2.1). Joint Intervenors complain, nonetheless, that the

rods chosen for testing were not as bad as the worst cases reported by Daniel or the worst cases assumed in the Bechtel engineering analysis. Joint Intervenor PF 44; see also Joint Intervenor PF 52 and 53. This is just further evidence of the extreme conservatisms in the Bechtel analysis and of the fact that the Daniel data was not representative of actual conditions. The plates were representative of the Cives produced manually welded plates^{30/} and the welds chosen were clearly the worst available.

31. Joint Intervenors argue further that the tests performed did not deal with the kinds of loads that the plates have to support. Joint Intervenor PF 44. There is no basis in the record for this conclusion. This is an example of Joint Intervenor trying to introduce expert testimony into the record in their proposed findings. It is not for Joint Intervenors to speculate as to the forces on the welds, particularly when they had the opportunity to question both Applicant and Staff witnesses on this issue. Nonetheless, their contentions can be easily disposed of. Dr. Fisher testified at the hearing that in the tensile tests of these anchor rods, the tensile force on the rods subjected the welds to a shear stress. He also testified that all load factors that act upon such welds also produce shear stresses. Tr. 1150, 1151 (Fisher). It is

^{30/} Joint Intervenors' contention to the contrary has been discussed above. See paragraph 17 at n.14, supra.

evident therefore that the capacity of the welds was adequately tested. We note further, that the test procedures were reviewed and approved by representatives of the NRC Staff who also witnessed the actual testing of the embeds.

32. Joint Intervenors have asked the Board to reject the expert opinion testimony of Dr. John W. Fisher, Professor of Civil Engineering and Associate Director of the Fritz Engineering Laboratory at Lehigh University. The Board recognizes Dr. Fisher, based on his oral and written testimony and his submitted curriculum vitae, as a highly qualified and widely recognized expert in the design, manufacture and static and fatigue strength analyses of welded concrete anchors and shear connectors.^{31/} Dr. Fisher testified that even if the Daniel data package were taken at face value (with the exception of readily obvious errors such as where the data is not technically feasible) neither the load carrying capacity of the manually welded embeds nor their required margins of safety

^{31/} Despite Joint Intervenors' stated intention of attempting to impeach the credibility of Dr. Fisher by demonstrating his "bias" (see Joint Intervenor PF 44 at n.32), the Board finds no basis for questioning the integrity or impartiality of Dr. Fisher. It is certainly clear that any relationship he may have with the Nelson Stud Welding Company, which manufactures machine welded studs, would not be a basis for questioning Dr. Fisher's conclusions regarding the manually welded anchor rods. Furthermore, Dr. Fisher's vitae reveals that he has consulted for dozens of different companies, firms and state and local government and agencies since 1965. Joint Intervenors' mere suggestion that one such "relationship" would improperly influence Dr. Fisher's testimony under oath, is without merit and is rejected.

would be adversely affected. Joint Intervenors claim that Dr. Fisher's opinion is based "upon no knowledge of the actual loads imposed on the embeds in the Callaway Plant, and upon no formal analysis or study." Joint Intervenor PF 45. No citation to the record is given for this allegation and it therefore is rejected. Furthermore, it is quite clear that Dr. Fisher's opinion is based on formal Code-related investigations and includes an analysis of all the types of forces imposed on the anchor rod welds. See Tr. 742-746 (Fisher).^{32/} Nor does Dr. Fisher's opinion contradict the Bechtel conclusion "that with 1/8 inch undersize many of the plates would be loaded to or nearly to their full capacity" (Joint Intervenor PF 45), since that interpretation of Bechtel's analysis by Joint Intervenors has been shown to be incorrect. See paragraphs 22-24, supra. Rather, Dr. Fisher's opinion confirms that the Bechtel design of the manually welded embeds incorporates substantial conservatisms and that significant additional margins of safety exist for these embeds.

33. For the foregoing reasons we find that the Joint Intervenors' objections to Applicant's proposed findings and conclusions concerning the safety and structural integrity of

^{32/} Dr. Fisher testified that he was secretary of the committee which developed the data base upon which the current code was written and that he is a member of the AISC Specification Committee which recently determined to change the code requirements which would permit further reductions in the weld size for anchor rods. Tr. 742-745 (Fisher).

the manually welded embedded plates are unfounded and without substance in the record. Therefore, the Board reiterates its finding that such embeds are capable of safely supporting the loads to be imposed on them.

Machine Welded Embeds

34. In comparison, Joint Intervenors' dispute with Applicant's conclusions concerning the machine welded embeds is limited. Joint Intervenors have commented on the Cives inspection of machine welded embeds, presenting some calculations purporting to demonstrate the average time taken to inspect each machine welded stud. Joint Intervenor PF 25. Joint Intervenors do not proffer any argument as to the significance of these calculations. We note only that they are based on assumptions not in the record^{33/} and will not be considered by the Board. The Cives data, moreover, has been confirmed by the results of the separate reinspection program conducted by Daniel. Joint Intervenors suggest that it is

^{33/} Joint Intervenors assume that only one Cives inspector inspected all the studs. The record reflects, however, that there was more than one inspector on the Cives team. Tr. 796 (Meyers). Joint Intervenors also assume that the inspectors worked only eight hours a day. There is no basis in the record for this assumption either. Finally, Joint Intervenors assume that the inspection forms were not prepared in advance and that all inspections were performed on the date printed on the reports. Again, there is no citation to the record for support of this assumption. We note in passing, moreover, that the exhibit cited by Joint Intervenors reflects that the inspections on the reports dated July 6-8, 1977, were actually conducted over a longer period of time, July 6-12, 1977. See Applicant Ex. 4 at Appendix A, Data Summary 2.

"interesting" that Applicant accepts the Daniel reinspection data for the machine welded plates but has rejected such data for the manually welded embeds. While this may be interesting to Joint Intervenors, it has been fully explained and justified on the record. See Applicant PF 58 and n.20, and citations therein.

35. Joint Intervenors challenge Bechtel's engineering analysis of the probability of the failure of a machine welded plate resulting from a defective stud weld. Joint Intervenors suggest that the probability analysis should be rejected because the NRC Staff has not accepted it. Joint Intervenor PF 48. While it is true that the analysis has not been reviewed by an NRC Staff member with expertise in probability studies, the Staff has accepted the analysis to the extent it indicates an extremely small probability of failure. Tr. 1327 (Gallagher). As Mr. Gallagher, the Staff witness, pointed out, it was not necessary to have such a review, because the results of the reinspection program alone demonstrated "excellent quality control in the factory and an extremely low failure rate." Tr. 1328 (Gallagher).^{34/}

^{34/} We reject Joint Intervenors' contention in their proposed finding 48 that Applicant demonstrates a lack of confidence in the Bechtel engineering analysis by adopting the more conservative result presented₉ in Bechtel's sworn testimony (probability of failure is 1×10^{-9}) than that₁₁ presented in the Bechtel report (probability is 8.6×10^{-11}). Rather, this is further evidence of the extremely conservative approach Applicant has taken to this embed issue.

36. Joint Intervenors also attack the Bechtel engineering analysis contending that no consideration was given to the fact that the majority of plates with deficient welds were manufactured during a particular period at the beginning of Cives fabrication of the plates. They suggest that these plates may have been more likely to have been installed prior to June 9, 1977. Joint Intervenor PF 48. The testimony indicates, however, that the first embedded plates manufactured were not necessarily the first ones installed; the plates were generally interchangeable and on receipt were accumulated in a laydown area with other unused plates already on site. Tr. 1218, 1219 (Thomas, Meyers).

37. Finally, we reject Joint Intervenors' assertion that the fallacy of the probability analysis is demonstrated by their hypothetical assumption that all studs on all of the plates are rejectable. Joint Intervenor PF 48. There is no support cited for the factual basis of this hypothetical situation nor for the conclusions drawn. Again we reiterate that it is inappropriate for counsel to present expert testimony in the form of proposed findings of fact. If Joint Intervenors wanted to address a hypothetical question to Applicant's witnesses or to their own witnesses, they had that opportunity and chose not to. We note furthermore that Joint Intervenors' conclusion falls of its own weight. Joint Intervenors' hypothetical assumes that "all other probabilities

remain the same." There is no basis for this assumption in the citations provided and it is otherwise unsupported.^{35/} Accordingly, we reject the contentions raised in this portion of Joint Intervenors' proposed finding 48.

38. We find Joint Intervenors' objections to the Lehigh University testing of the machine welded embeds also without merit. See Joint Intervenor PF 49. It is clear that the selection of plates to be tested was entirely random. Those plates that were accessible were tested. There has been no showing that Applicant had any control over which particular plates would fall in this category. The test procedures and plates chosen were also reviewed and deemed acceptable by the NRC Staff. Applicant Embed Testimony at 27; Gallagher Testimony at 4, 5; Applicant Ex. 5 at 2; Tr. 1418 (Gallagher). In addition, there is no evidence in the record that the results achieved on two of the generic types of plates are not applicable to the other categories of plates which have the same type of machine welded studs and were designed on the same engineering basis. We also reject, for the reasons stated above, the suggestion that the tests are suspect because of the alleged bias of Dr. Fisher and his colleague, Dr. Slutter. See

^{35/} Furthermore, it is apparent that this assumption is wrong. If all studs were rejectable, then not only would factor P_1 in the Bechtel formula change, but factors P_2 (the probability that a defective stud would be on a safety-related plate) and P_3 (the probability of a failure load being located relative to an assumed defective stud) would also change. See Applicant Embed Testimony at 21-26 (Meyers, Parikh).

paragraph 32 (n.30), supra. Finally we find no support in the record for Joint Intervenors' theory that unrelated testing performed in 1978 was a "dry run" for the 1980 testing of the machine welded embeds. To the contrary, the 1978 tests had nothing to do with the adequacy of stud welds as was the issue in 1980. Rather the 1978 tests were concerned with the effect on the ultimate capacity of the plates of bending studs in order to accommodate placement of reinforcing bars. See Tr. 1083, 1084, 1085 (Fisher, Meyers, Thomas). In conclusion, we find that the Lehigh University testing of the machine welded plates, when taken in conjunction with the results of the Cives and Daniel reinspections and the Bechtel engineering analysis, provides substantial evidence of the structural integrity and safety of these embeds.

Joint Intervenors' Conclusions Regarding Embeds

39. In several concluding paragraphs Joint Intervenors present some additional arguments concerning the alleged failure of Applicant's quality assurance program and the alleged inadequacy of the embeds, as well as reiterating some of their previous contentions. See Joint Intervenor PF 50-56. We will discuss here only those items not previously addressed. First, Joint Intervenors contend that because there have been problems with embeds at Callaway and at other nuclear plants, there was a failure in the design of the Callaway Plant to select appropriate materials. Joint Intervenor PF 50. The

record does not support this sweeping indictment of the use of embedded plates. To the contrary, the evidence presented demonstrates that in designing the embeds for Callaway, Bechtel conformed to accepted industry standards and incorporated extreme conservatisms which have been shown to eliminate any concerns raised by the minor deviations from the original welding design requirements. See Applicant Embed Testimony at 13; see generally Tr. 947-950, 954, 955 (Fisher). It is important to reiterate that as to the machine welded embeds it was determined that no structural concerns existed. See Applicant Embed Testimony at 15. As for the manually welded embeds, the minor exceptions to the AWS Code welding requirements have been fully justified and indeed are permitted by the Code. See Applicant PF 74, 75. Finally, the Board does not consider the existence of certain unspecified "problems" with embeds at other nuclear facilities a legitimate basis for condemning the use of such materials at the Callaway Plant.

40. Joint Intervenors also claim that Applicant violated Criterion XVI of 10 C.F.R. Part 50, Appendix B, because it was initially unaware of the results of the Daniel inspection of embeds. Joint Intervenor PF 50. This particular provision in Appendix B requires that procedures be set up to identify and correct conditions adverse to quality.^{36/}

^{36/} In their proposed findings, Joint Intervenors quote only a portion of Criterion XVI. In its entirety this provision reads as follows:

[Continued Next Page]

It is evident that notwithstanding the fact that Applicant and Bechtel personnel were unaware of the Daniel inspection, Applicant together with Bechtel did identify the potential embed problems, determined the nature, extent and causes of the welding deviations, analyzed the possible effect of such deviations, implemented appropriate corrective actions and properly reported these activities to appropriate levels of management. Similarly, we find no violation of Criterion XVII (Quality Assurance Records) in the Cives reinspection data, because this inspection clearly was not a quality assurance inspection. Rather, it was designed for the limited purpose of identifying the nature and extent of the maximum welding deficiencies on the manually welded plates in order that Bechtel could perform an analysis of the effect of such deficiencies.

41. Furthermore, there is no evidence in the record that Applicant was obligated to file a report with the NRC

[Continued]

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

pursuant to 10 C.F.R. §50.55(e) regarding the welding deficiencies discovered on the manually welded embeds. See Joint Intervenor PF 51. The deviations from the AWS Code were quickly determined to be minor in degree and insignificant in their effect on the capacity of the plates. Although the entire reinspection took several months, nothing was discovered which contradicted the initial conclusions or which the Board can see would have required the filing of a §50.55(e) report.

42. In their proposed findings 54 and 55, Joint Intervenor present a hypothetical situation which has no basis in fact. Applicant addressed the contention that failure of one plate could cause an entire floor to collapse or could cause breakage of "critical pipes" only because that argument was raised in the language of Joint Intervenor's embed contention. Joint Intervenor now raise the specter of two or more plate failures, as well as a "domino theory" of plate failure, and claim that Applicant has not addressed such additional hypothetical possibilities. The evidence in this proceeding, however, clearly establishes that none of the manually welded embeds will fail and that the probability of even one machine welded plate failing is extremely remote. Accordingly, there is no factual basis for Joint Intervenor's hypothetical concerns and there is no reason for Applicant to have addressed them in its testimony or proposed findings.

43. Finally, we address Joint Intervenor's allegation that Applicant has been guilty of material

misrepresentations and misleading statements. See Joint Intervenor PF 52. As we have discussed above in addressing these concerns specifically, we have found no basis for these serious allegations. See paragraphs 13, 14, 22-24 and 30, supra. Indeed it appears to the Board that in making these allegations and attempting to support them, Joint Intervenors have selectively omitted or overlooked those very portions of the record which refute their contentions. Whether such actions in themselves rise to the level of material misrepresentations by Joint Intervenors, we need not determine. Suffice it to say that the Board finds no substance in Joint Intervenors' allegations and to the contrary, finds that Applicant's presentation, together with the evidence presented by the Staff, clearly establishes the safety of the embedded plates at issue.

B. Honeycombing, Reactor Building Base Mat

44. Joint Intervenors allege that the evidence in connection with honeycombing in the reactor building base mat fails to establish the structural integrity of the mat and therefore the safety of the reactor building. Joint Intervenor PF 165. It is argued that the record does not include the loadings on the trumplates under normal or accident load conditions, and that

Without evidence of the amount of pressure that would be on the plates under various conditions and the capacity of the concrete to resist that pressure, the Board is not

able to determine that there would not be, in accident situations, enough pressure to lift the entire structure off the base.

Joint Intervenor PF 154.

45. In reaching this provocative conclusion, Joint Intervenor have overlooked Applicant's testimony on the post-tensioning operation at the Callaway Plant. That testimony stated as follows:

Further evidence of the adequacy of the repairs is provided from the post-tensioning operations, which imposed the highest loads which will occur on the concrete in the area of the repairs. The trumplates serve as an anchorage for the vertical tendons in the reactor building. During the post-tensioning operation, a force as high as 1,600,000 pounds is imposed on the area surrounding each trumplate. At transfer of the load from the jack to the tendon anchorage, the load on each embedded plate (and therefore the force between the plate and the concrete directly behind it) is at least 1,400,000 pounds. These are the most severe loads that will ever be imposed on the trumplates.

The post-tensioning operation at the Callaway Plant is essentially completed. All of the tendons anchored in the base mat have been tensioned, with no evidence of distress in the concrete. This indicates that the concrete behind the trumplates, both in the repaired and unrepaired areas, is acceptable.

Applicant Base Mat Testimony at 31. Since the highest loads occur during the tensioning, there obviously is no need for a list of load forces associated with a spectrum of accident scenarios. This testimony, which Joint Intervenor ignore, conclusively makes the case against Contention I.C.1.

46. While the Board could well stop its consideration of Joint Intervenors' proposed findings on this subject, we will record our reasons for rejecting other aspects of Joint Intervenors' case as well.

47. Joint Intervenors are in error when they state that "[t]here was a total of 44 areas of honeycombing identified above the tendon gallery." See Joint Intervenor PF 152. It is well documented that localized honeycombing was identified at 19 areas, resulting in 24 separate excavations that may have affected the performance of 14 out of 172 trumplates in the base mat.^{37/} Applicant Base Mat Testimony at 15; Applicant Ex. 1.

48. Joint Intervenors also misinterpret one of Daniel's sketches of a honeycombed area arguing that "it appears" the void extends behind three plates, while concrete was not chipped behind one plate. See Joint Intervenor PF 152. What appears in fact is that Daniel chipped to sound concrete and there was no honeycombing behind plate V35B. See Applicant Ex. 1, Continuation Sheet Page 17.

49. In their attack on the soniscope investigation conducted for Applicant by Wiss, Janney, Elstner & Associates, Joint Intervenors have displayed a serious misunderstanding of

^{37/} Mr. Varela obviously misspoke in the testimony cited by Joint Intervenors. (Tr. 484). The number 44 represents the number of trumplate testing locations selected for the soniscope investigation. Applicant Base Mat Testimony at 25.

the record on that study. First, Joint Intervenors seem to believe that if the generated sound pulse bends around what are termed cavities, the cavities will not be detected. See Joint Intervenor PF 156. Of course, this is exactly how the soniscope technique works to detect the location of voids, honeycombing or cracks. A disturbance of the signal passing through the concrete (i.e., bending around cavities) is detected as a delay in the signal travel-time between transducers and results in a lower sonic pulse velocity. See Applicant Ex. 2 at 15; Tr. 267-268, 305-309 (Pfeifer). There is absolutely no evidentiary basis for the incorrect conclusion by Joint Intervenors that "[s]uch a pulse could easily travel around an area of considerable size without appreciable interference." See Joint Intervenor PF 156.

50. Second, Joint Intervenors hypothesize that the high velocities measured in the soniscope investigation -- indicative of very high-strength concrete -- may be due to the sonic pulse transversing steel. Joint Intervenor PF 156. This interesting idea was never presented to the witnesses for confirmation, comment or rejection. Consequently, Joint Intervenors can cite to absolutely no evidence to support this speculation. We do know, however, that angled shots were made, and that there is no angled reinforcing steel. See Applicant Base Mat Testimony at Figures 3 and 6. Further, even the vertical shots were perpendicular to the bulk of the reinforcing steel. See id. at Figures 3 and 5; Applicant PF 107.

51. Third, Joint Intervenors question the accuracy of the placement of the crosshair on the oscilloscope. See Joint Intervenor PF 156. Again, this is mere speculation. The test was conducted in accordance with ASTM C597-71, "Standard Method of Test for Pulse Velocity Through Concrete." Applicant Ex. 2 at 15. All of the evidence is that the soniscope is a long-used, well accepted and established tool for determining whether honeycombing exists in concrete. Applicant Base Mat Testimony at 24; Varela Testimony at 5; Tr. 385 (Pfeifer). In addition, the WJE firm has considerable experience with the soniscope, having utilized it for approximately 15 years on numerous projects, including many tests on nuclear power plants. See Applicant Base Mat Testimony at 24.

52. Joint Intervenors made a weak attempt to infer honeycombing elsewhere in the base mat by attributing some degree of universality to the factors which contributed to honeycombing above the tendon access gallery. See Joint Intervenor PF 157. With respect to the most important factor, however -- the effect of congestion on accessibility -- Applicant's witnesses were emphatic about the uniqueness of the area where honeycombing occurred. ". . . [A]bsolutely the worst congestion in the mat is in this area over the tendon gallery." Tr. 363 (McFarland). See also, Tr. 364 (Meyers). They knew of no other area in the base mat which would have the "hard-to-reach" areas such as exist in the tendon access gallery area. Tr. 364 (Meyers, McFarland). Joint Intervenors'

hypothesis that there might be honeycombing near the reactor cavity area was also explicitly refuted. See Tr. 371-372 (Meyers). Finally, while closer supervision and additional training were identified in the Daniel NCR as actions to prevent recurrence (Applicant Ex. 1 at 2), one of Applicant's construction supervisor's testified that the training for the concrete placement was satisfactory, and that there had been adequate supervision for the placement crews. Tr. 331, 383 (McFarland). Cf. Joint Intervenor PF 151, 157.

53. In their proposed finding 158, Joint Intervenors ignore testimony that the base mat surfaces inspected by Applicant included not only the roof of the tendon access gallery, but also the exterior vertical surfaces of the base mat once the forms were removed, and the entire top surface. No honeycombing was identified on these additional surfaces. Tr. 381-382 (McFarland). Honeycombing is basically a surface phenomenon. Tr. 240-241 (Meyers).

54. Joint Intervenors find significance in the fact that for the base mat placement one Concrete Placing Report was prepared by the QC inspector present at the termination of the pour, rather than by each of the 13 QC inspectors who had monitored earlier shifts. Joint Intervenor PF 161, 162. This and other matters raised by the NRC Staff involve interpretation and judgment as to what procedures should contain and require. See Tr. 330, 331 (McFarland). Cf. Joint Intervenor PF 160. They do not necessarily represent serious deficiencies in Applicant's QA/QC program. See Applicant PF 97, n.34.

55. Joint Intervenors also criticize Applicant's actions in reporting the honeycombing condition. Mysteriously, Joint Intervenors imply that Daniel did not report the honeycombing to Bechtel (Joint Intervenor PF 164), while Joint Intervenors earlier discuss the preparation of a nonconformance report. See Joint Intervenor PF 163. The record clearly shows that NCRs were prepared by Daniel for Bechtel review, and that Bechtel commented on and approved the Daniel repair procedure. Applicant Base Mat Testimony at 15, 19-20; Applicant Ex. 1; Varela Testimony at 3, 4. To the extent that Joint Intervenors criticize the timing of the issuance of the first NCR (Joint Intervenor PF 163), it was explained that this was not critical because from the standpoint of the engineering evaluation there was no concern or suspicion of a significant deficiency. Tr. 381 (McFarland).

56. It is also alleged that Bechtel determined the honeycombing not to be reportable to the NRC under 10 C.F.R. § 50.55(e).^{38/} Joint Intervenor PF 163. This is contrasted with the situation of the reactor building dome where smaller areas of honeycombing were reported to the NRC. Id. Joint

^{38/} Joint Intervenors, at the hearing, often confused, or failed to distinguish between, Daniel's obligation to report to the architect-engineer (Bechtel), and Applicant's obligation to report to the NRC under 10 C.F.R. § 50.55(e). See, e.g., Tr. 244 (Meyers, addressing the Code of Federal Regulations), 245 (McFarland, addressing reports to the designer). They are obviously quite different, Tr. 262 (McFarland), and there is no specification which dictates parameters for reporting a nonconformance to the NRC. Tr. 252 (McFarland), 253 (Meyers).

Intervenors apparently overlook the fact that Applicant did report the base mat honeycombing to the NRC under section 50.55(e). Varela Testimony at 4; Tr. 253-256 (McFarland). At the time Mr. Miller of Bechtel made the initial assessment referred to by Joint Intervenors (Joint Intervenor Ex. 1), not all of the areas eventually uncovered had been identified. Tr. 256 (McFarland). Finally, as the record clearly shows, the condition on the dome was reported to the NRC not because of the size of the honeycombed area, but because further evaluation was needed and Applicant could not exclude the possibility that a significant deficiency existed. See Applicant PF 120. See also, Tr. 257 (Meyers).

C. SA-358 Piping

57. In its proposed findings, Joint Intervenors cite to Applicant's direct testimony and to a Staff exhibit for the dual proposition that one of the defective conditions in the SA-358 pipe in question is excessive reinforcement, which may have resulted from "melt-thru" or "drop-thru." Joint Intervenor PF 63. The record cited documents the nonconformance as to the reinforcement height. It does not, however, postulate "melt-thru" or "drop-thru" as a possible cause of the excess reinforcement. This is solely a hypothesis of Joint Intervenors for which there is, in fact, no support in the record. The Board is well aware of the testimony of Licensee and Staff witnesses explaining the implausibility of Joint

Intervenors' theory. See Applicant PF 145-148; Key SA-358 Testimony at 2; Tr. 1751 (Key), 1751-1752 (Beeman).^{39/} The Board cannot and should not give any weight to an anonymous affidavit, quoted by Joint Intervenors, as probative evidence in this case. See Metropolitan Edison Company, et al. (Three Mile Island Nuclear Station, Unit No. 2), ALAB-525, 9 N.R.C. 111, 114 (1979).

58. In postulating "melt-thru" or "drop-thru" as potential causes of the excess reinforcement, Joint Intervenors ignore the uncontroverted testimony that "drop-thru" would be an extremely unlikely occurrence for the submerged arc welding process used for this SA-358 pipe. A highly automatic feed-wire system and the high heat input associated with this welding process would result in gross passage of metal and slag, and not just a short bead that might be defined as "drop-thru." Tr. 1564-1565, 1642-1643 (Stuchfield). In their

^{39/} Joint Intervenors attack the direct testimony of Staff witness Key, which appears to express an opinion at variance with his earlier affidavit in support of a summary disposition motion, to the effect that "drop thru" did not occur in this pipe. Joint Intervenors assert that Mr. Key's testimony was based upon his misimpression that the weld is prosecuted from both sides at the same time. Joint Intervenor PF 63. Whatever his understanding was at the time the direct testimony was prepared, Mr. Key clearly understood, at the time of his oral testimony, that the welding is not done simultaneously on the inside and the outside. Mr. Key confirmed, however, the opinion in his direct testimony that "drop thru" had not occurred. Tr. 1734, 1750 (Key). Further, the Board does not attach any sinister motive to the fact that Mr. Key was careful enough to examine the radiograph again in November prior to presenting testimony here on which the Board could be expected to rely heavily. Cf. Joint Intervenor PF 63, n.37.

proposed findings, Joint Intervenors totally fail to refute the testimony that a "melt thru" would have been readily detectable by radiography and visual inspection as a result of resultant surface porosity and the slag and weld metal which would have adhered to a large area of the inside pipe surface of the pipe. Applicant PF 145, 146. There have been absolutely no indications that such a "melt thru" occurred.^{40/}

59. Staff Exhibit 7 (IE Report 81-04), at pp. 9-10, simply does not address the point Joint Intervenors seek to make in their proposed finding 65. See also, Joint Intervenor PF 80. The report states that ". . .the weld reinforcement defect, if uncorrected, would have been an unacceptable condition." Staff Ex. 7 at 9; Tr. 1654 (Stuchfield). It does not address the capability of grinding to restore the mechanical properties of a weld weakened by "melt-thru."

60. Addressing ovality, Joint Intervenors point out that two sets of measurements were taken by the Staff -- the first resulting in a maximum variation of more than one percent; the second resulting in a maximum variation of less than one percent. Joint Intervenor PF 66. In the first set,

^{40/} Joint Intervenors erroneously cite to the testimony of Applicant witness Stuchfield in an effort to hypothesize that backgouging could have resulted in "melt-thru" or "drop-thru." See Joint Intervenor PF 64. Mr. Stuchfield did not testify, however, that there were "no acceptance criteria" that apply to the backgouging operation. He testified, in fact, that there are such criteria, they specify grinding until the resulting area is visibly sound, and they do not necessarily state a weld metal thickness. Tr. 1551-1553 (Stuchfield).

however, and as Joint Intervenors acknowledge, one measurement was made on the seam weld itself. The Staff determined, from the ASME Code, that the outside diameter measurement on the pipe seam weld was inappropriate due to the inclusion of allowable weld reinforcement. Staff Ex. 7 at 15; Tr. 1725 (Key), 1728 (Foster), 1751 (Beeman).

61. Contrary to Joint Intervenors' assertion, there is no great amount of confusion regarding how ovality is to be determined and how it was determined in this instance. See Joint Intervenor PF 66, n.38. Applicant's witness testified that ovality normally is measured at the ends of a pipe, although it can be measured along the length. Tr. 1660 (Stuchfield). The Staff explained, however, that in this case there was no pipe end available because both ends of the entire spool piece had been welded in place.^{41/} Tr. 1721 (Foster). In any case, there is reasonable uniformity to this type of pipe, so that a measurement at any given point is fairly representative of the entire length. Tr. 1677 (Stuchfield).

62. Joint Intervenors appear to argue, with respect to the irregularity termed "overlap" by Applicant, that the terminology was chosen solely to avoid the ASME Code, since

^{41/} Joint Intervenors contend that the plane that was measured was selected because it appeared to be round. Joint Intervenor PF 66. In fact, it is clear from the testimony that what the witness meant when he said the pipe appeared round was that it was a representative location, unaffected by counterboring or by the welding when the pipe end was fit up and welded to the valve. See Tr. 1721-1722 (Foster).

"incomplete fusion" is identified in the Code as a rejectable condition, whereas "overlap" is not. See Joint Intervenor PF 67. From the available data and the photographs, however, the only condition which can be determined with a fair degree of certainty is an overlap condition which exists wherein the excess metal on the surface is lying toward and possibly partly on top of the adjacent base metal. There is no evidence at all of the quite different condition called "incomplete fusion," which means inadequate fusion between the weld metal and the side wall of the groove of the weld. Tr. 1671 (Stuchfield).^{42/}

63. Part II.A.1 of Joint Intervenors' Contention No. 1 alleges, inter alia, that the pipe in question was machined below the minimum wall thickness. This allegation is not substantively addressed in Joint Intervenors' proposed findings of fact. Cf. Joint Intervenor PF 73. See, however, Applicant PF 141.

64. In their proposed finding 70, Joint Intervenors ignore the obvious fact that there was no need for Applicant to examine the radiographs because the pipe had already been reworked to the original specifications.

^{42/} Joint Intervenors attack the testimony of Mr. Laux on this point as hearsay, Joint Intervenor PF 67, n.39. Mr. Laux was reporting on conversations he had with the welding QC inspector and with a Staff inspector while examining photographs of the weld. Tr. 1593-94 (Laux). This is reliable evidence. In any case, evidence of a hearsay character is generally admissible in administrative proceedings. Duke Power Company (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 N.R.C. 397, 412 (1976). Further, Mr. Laux's testimony is not contradicted, as Joint Intervenors assert, by IE Inspection Report No. 81-04.

65. It is not true, as Joint Intervenors unequivocally state, that out-of-roundness or ovality is an unacceptable condition in welded SA-358 pipe. See Joint Intervenor PF 71. The evidence clearly shows that the ASME Code tolerates a certain degree of ovality. Applicant SA-358 Piping Testimony at 5.

66. Joint Intervenors assert that Applicant did not establish measures to assure identification of deficiencies. See Joint Intervenor PF 71, 72. Evidently, Joint Intervenors are of the view that the entire ASME Code should be reproduced in Daniel Quality Control Procedures, and that safety somehow would be advanced over the situation where the procedure references the Code as a separate document. This is what the complaint boils down to, and the Board finds it to be frivolous. The Daniel procedure provides that the ASME Code requirements are the acceptance criteria for weld inspections. Tr. 1585 (Laux). Daniel does not translate or specifically reiterate in its procedures each and every parameter addressed by ASME Code requirements. The fact that Daniel chose to highlight and emphasize "burn thru" in a later revision to the procedure does not mean that its inspectors would not have been previously aware that such a condition was rejectable. The Daniel inspectors were aware that such a condition would be unacceptable. Tr. 1671-1672 (Laux).

67. Whether or not Applicant's witnesses were personally familiar with ARMCO (pipe manufacturer) quality

control procedures to identify ovality is irrelevant. See Joint Intervenor PF 73. In order for ARMCO to certify that the material is in compliance with the requirements of SA-358 it would have been necessary to perform an ovality test, which the material specification requires. Tr. 1670-1671 (Stuchfield). In addition, the spool fabricator (Dravo) would measure the pipe if it were visibly out-of-round, Tr. 1598 (Stuchfield), and any out-of-roundness would have been observed at the site at the time of fit-up of the pipe and to the valve to which it was eventually welded. Tr. 1600 (Stuchfield). Any observed violations of requirements are required to be reported by site personnel pursuant to Daniel QC procedures. Tr. 1600-1601 (Laux).

68. Joint Intervenors' proposed finding 74 ignores the testimony provided by Staff witnesses, subsequent to the preparation of Staff Exhibit 7, that the potential indication from photographs of fissures or cracks in the excess reinforcement was in fact merely evidence of the overlap condition. Tr. 1712-1714 (Beeman). See Applicant PF 149.

69. Joint Intervenors' allegations concerning compliance with procedures in the dispositioning of nonconformances have already been addressed adequately by the Board, where we found that Joint Intervenors generally do not understand the procedures. Compare Joint Intervenor PF 75-79 with Applicant PF 136-138, 143. It need only be added that the excessively technical case Joint Intervenors attempt to make on

the use of NCRs versus DRs makes even modest sense only if it is assumed that by once initiating an NCR for a nonconformance, Daniel has irrevocably lost (to Bechtel) the capacity to establish the conditions for a rework DR disposition. That simply is not the case, and Joint Intervenors cite no evidence in support of the preposterous theory that a void was created when Bechtel returned the NCR without disposition. See Joint Intervenor PF 78. Having the authority initially to have dispositioned the nonconformance on a DR without Bechtel's review, Daniel had ample authority to rework the nonconformance upon receipt of an erroneous Bechtel response to the NCR. Applicant SA-358 Piping Testimony at 16, 17; Tr. 1625-1627 (Laux).

70. Joint Intervenors cite to their Exhibits 47, 50 and 51. See Joint Intervenor PF 76-78. Those documents were neither offered nor received into evidence.

71. Joint Intervenors no longer explicitly assert that this piece of SA-358 pipe is unsafe. Indeed, they do not address the overwhelming evidence on the numerous tests or examinations which have been performed on the pipe. See Applicant PF 150. Rather, Joint Intervenors are left with the mere hypothesis that if melt-thru or drop-thru occurred, then other SA-358 piping in the plant may be suspect. See Joint Intervenor PF 80-84. In view of the Board's findings that melt-through or drop-through did not occur, there is no basis at all for even this hypothetical conjecture. Since there is

no other basis, from this contention, upon which to question the effectiveness of the QA/QC program, the Board has no reason to share Joint Intervenors' concern that other SA-358 pipe may be suspect.

72. Joint Intervenors conclude their proposed findings with an observation -- wholly unnecessary to the Board's decision-making on this issue -- that but for the efforts of an anonymous allegor, the news media and Joint Intervenor representative Mrs. Drey, the NRC Staff would not have conducted the two investigations of these nonconformances and would not have issued a Notice of Violation. Joint Intervenor PF 84. The Board, of course, is not in business to issue awards. We must observe, however, that all of the allegor's allegations were found to be without merit, that the one item of noncompliance found with respect to radiographic examination was not one of the allegations, and that the investigation concluded that the nonconformances in the pipe had been identified and corrected as required, and that examinations showed the pipe to be acceptable. See Staff Ex. 7 at 2, 3.

D. Centerline Lack of Penetration in SA-312 Piping

73. Joint Intervenors' proposed findings on part II.A.2 of their Contention No. 1, concerning centerline lack of penetration (CLP) in SA-312 pipe, focus on two major contentions: (1) Joint Intervenors' allegation that there is

insufficient evidence to support the conclusion that the maximum amount of CLP that may exist in the SA-312 pipe at Callaway is 26 percent CLP; and (2) Joint Intervenors' contention that the SA-312 pipe has been improperly evaluated and accepted for use at Callaway.

74. Prior to addressing these areas of concern raised by Joint Intervenors, the Board is compelled to comment on the improper referencing of Joint Intervenor Physical Exhibits in Joint Intervenors' proposed findings 86 and 87. In proposed finding 86, Joint Intervenors quote from Applicant SA-312 Piping Testimony in describing the fabrication of double-welded SA-312 and then reference their Physical Exhibit D. Joint Intervenor Physical Exhibit D has been described as a piece of single-welded pipe, approximately six inches long and having a diameter of one and one-quarter to one and one-half inches. Tr. 1663 (Stuchfield). Conversely, the SA-312 pipe in question here is double-welded and, for the SA-312 pipe used at Callaway, has a diameter of eight to fourteen inches. Applicant SA-312 Piping Testimony at 16; Applicant Ex. 10, enclosed Table. Similarly, Joint Intervenors reference Physical Exhibits E, F and G as examples of pipe fittings. Joint Intervenor PF 87. These exhibits were admitted with the understanding that they are not examples of the specific pipe fittings in use at the Callaway Plant. Tr. 1780-1781. The Board, therefore, will not consider these Physical Exhibits as representative of the pipe or pipe fittings at the Callaway Plant.

75. Joint Intervenors assert that the maximum extent of CLP in the SA-312 piping in use at the Callaway Plant is not known. The record in this proceeding is clear, however, that the investigation of SA-312 pipe by Bechtel found that the maximum quantity of CLP discovered in production pipe at Pullman Power Products (Pullman) was 26 percent and that the pipe examined by Bechtel was representative of the SA-312 pipe installed at Callaway. Applicant PF 162. Joint Intervenors contest this point claiming that there is no support for the statement that the Callaway pipe and the pipe examined by Bechtel were manufactured in the same manner, beyond the fact that the same Youngstown Welding and Engineering Company (YWEC) welding procedure was in effect. Joint Intervenor PF 111, 113. This assertion is contrary to the sworn testimony in the record that the Callaway pipe and Pullman pipe were manufactured by YWEC during the same time span, using the same base material, the same wall thicknesses, the same machines and, as far as could be determined, the same welding operators. Applicant SA-312 Piping Testimony at 24; Tr. 1814 (Stuchfield). Joint Intervenors present no evidence to the contrary to support their contention that the Pullman pipe was not representative. The Board will not ignore the sworn testimony of Applicant's witnesses unless it is refuted by facts, not mere supposition.

76. Joint Intervenors also question the sample size examined by Bechtel and the manner in which the samples were selected. Joint Intervenor PF 111. With respect to the

selection of the samples, the Board finds that Bechtel examined all accessible pipe ends located at the Pullman facility. Applicant Ex. 11 at 2, 20. Joint Intervenors raise the "possibility" that the pipe examined by Bechtel may have been cut (thereby allowing Bechtel to examine two ends of the same cut). Again, the Board accords little weight to Joint Intervenors' speculation. Furthermore, it is clear that the determination of the maximum amount of CLP would not be effected if, as Joint Intervenors suggest, two ends of the same cut were examined, since they would both reveal the same amount of CLP. Joint Intervenors also claim that "only 2% of the subject pipe was selected for examination..." (emphasis added). As shown above, Bechtel did not perform a selective examination, but rather examined all pipe ends available at Pullman.

77. Applicant's conclusion that the extent of CLP that may exist in SA-312 piping installed at Callaway will be no greater than the 26 percent found by Bechtel in the Pullman pipe is further supported by the fact that in intentionally producing test samples with greater than this level of CLP, Bechtel was required to use welding parameters outside the range of parameters used by YWEC. See Applicant PF 162. Joint Intervenors contend, however, that due consideration has not been given to the possibility of welding arc misalignment. See Joint Intervenor PF 109, 113. Joint Intervenors assert that gross misalignment can occur and, in combination with the wide

range of welding parameters allowed by YWEC's procedures, can result in large amounts of CLP. Joint Intervenors go to great lengths in postulating the amount of CLP which could result from arc misalignment. See Joint Intervenor PF 113 at n.43^{43/} However, Joint Intervenors' arguments ignore unrefuted testimony in the record that the extent of misalignment is "quite restricted" by the configuration of the welding machine itself. Tr. 1882 (Stuchfield); see also, Tr. 1814 (Stuchfield). There is no evidence in the record that misalignment of the magnitude suggested by Joint Intervenors could occur.^{44/} Furthermore, Applicant has established that the effect of arc misalignment is de minimus when coupled with other factors which might cause

43/ Joint Intervenors' presentation in footnote 43 to their proposed findings amounts to no more than an attempt to offer additional testimony. Such "testimony" is not presented under oath, has not been subjected to cross-examination or rebuttal, and will not be considered by the Board. See, paragraph 2, supra.

44/ Joint Intervenors would have the Board also find fault with the lack of documentation of the methods by which YWEC controlled the alignment of the welding arcs. See Joint Intervenor PF 107, 126. In this regard, the Board notes that the NRC Office of Inspection and Enforcement conducted an extensive review of YWEC's welding process and procedures and found, inter alia, that the YWEC Welding Procedure Specification (Joint Intervenor Ex. 61) was written and qualified in accordance with the ASME Code. Joint Intervenor Ex. 65 at 9. Mr. Stuchfield testified that methods of controlling arc alignment are not normally included in a welding procedure specification; further, the I&E inspection report which lists the ASME Code welding parameters does not include arc alignment. Tr. 1805 (Stuchfield); Joint Intervenor Ex. 65 at 9. The Board, therefore, rejects Joint Intervenors' argument that the failure to include a method of controlling arc alignment in the YWEC Welding Procedure Specification is a fatal flaw.

CLP. Thus, in the "worst case" situation postulated by Joint Intervenors, the amount of arc misalignment is not relevant. See Applicant PF 162 at n. 73 and citations therein.^{45/}

78. Joint Intervenors' proposed finding 112 asserts that Bechtel's conclusion as to the maximum amount of CLP is suspect because of the possibility that CLP can vary along the length of a piece of pipe. This assertion is based on the testimony of Applicant's witness Mr. Stuchfield, but overlooks the qualifications inherent in that testimony. Mr. Stuchfield stated, that while it is "difficult to be specific...approximately four or five percent would be potentially the maximum that would occur...". Tr. 1879 (Stuchfield). Mr. Stuchfield further testified that "[t]here is a potential of course that [the extent to which CLP varies along a length of pipe] could increase from the four or five percent... But...generally the four or five percent is a reasonable estimate of the variation...". Tr. 1883 (Stuchfield).^{46/}

^{45/} Joint Intervenors also contend that a "grossly misaligned arc" could be impossible to determine visually. Joint Intervenor PF 106. This statement is a mischaracterization of the testimony of record. Mr. Stuchfield testified that he did not believe that misalignment could be visually determined in a case where the arc was misaligned, but close enough to the seam to allow welding to occur. Tr. 1805 (Stuchfield). The Board does not view such a description as being "gross misalignment."

^{46/} Furthermore, the Board notes that even if the variance along the length of pipe was as much as an additional 9 percent CLP, as suggested in Joint Intervenors' proposed finding 112, the maximum amount of CLP would still be less than the amount of intentionally produced CLP in piping which was hydrostatically tested and withstood pressures far in excess of the

[Continued Next Page]

79. In a final attempt to discredit Applicant's conclusion that the extent of CLP in the SA-312 pipe at Callaway does not exceed 26 percent, Joint Intervenors' proposed finding 114 states that a statistical analysis conducted by Aptech concluded that 36 percent CLP was the maximum that could be expected to be found in the pipe examined by Bechtel. Joint Intervenors also claim that Dr. Egan of Aptech denied this finding at the hearing. The Board cannot view Dr. Egan's testimony or the Aptech analysis as supporting these contentions. During the hearing, Joint Intervenors asked Dr. Egan whether "36 percent CLP was considered possible by the Aptech evaluation." Dr. Egan testified that this amount was not considered possible, but was the worst case figure chosen for Aptech's analysis. Tr. 1813 (Egan). We do not view this as at odds with the Aptech report. Aptech performed a log-normal distribution of the defect sizes discovered by Bechtel which showed that the mean defect size is 11.9 percent CLP and that, at 95 percent confidence, the 95 percent occurrence level is estimated to be 36 percent of the wall thickness, which is assumed to be a worst case estimate. Applicant Ex. 13 at p. 4-4 and Figure 4-2. It is important to note, moreover, that using this worst case estimate of 36 percent CLP, Aptech

[Continued]

SA-312 piping design requirements. See paragraph 86, infra; Applicant PF 163.

concluded that the possible presence of CLP in SA-312 piping was not a concern. See Applicant PF 164, 165.

80. In summary, Joint Intervenors have presented no evidence which rebuts Applicant's conclusion that the SA-312 pipe at the Callaway Plant contains more than 26 percent CLP. Indeed, the evidence presented by Applicant and the conclusion drawn therefrom have been corroborated by Staff witness Rutherford, who testified that, of the random samples of SA-312 pipe evaluated at the Franklin Research Center, the largest degree of CLP discovered was 19 percent. Tr. 1899 (Rutherford); see also, Rutherford Testimony at 4.

81. We turn now to the other major concern raised by Joint Intervenors -- the evaluation and acceptance of the SA-312 piping. As noted by Joint Intervenors, the ASME Code requires that Class 2 SA-312 pipe be nondestructively examined. Joint Intervenor PF 115; see also, Applicant PF 156. Accordingly, all SA-312 pipe manufactured by YWEC was ultrasonically examined in accordance with ASME Code requirements. It was determined during the Bechtel investigation, however, that the Code-required ultrasonic examination cannot reliably detect CLP in this type of pipe. Applicant PF 161. Joint Intervenors argue, however, that Code acceptance criteria for other nondestructive examination techniques (liquid penetrant, radiography) require rejection of SA-312 pipe found to contain up to 26 percent CLP. See Joint Intervenor PF 115 and n.45. This argument is of little substance or relevance. The

evidence has established that the examination techniques referred to by Joint Intervenors have been shown to be inappropriate for testing for CLP in SA-312 pipe of the type of concern here, or else have been found to be ineffective in detecting CLP. Applicant SA-312 Piping Testimony at 11, 13, 14; Tr. 1825, 1841 (Stuchfield); Applicant Ex. 11 at 3; see also, Applicant PF 156.

82. Joint Intervenors assert that, since the examinations prescribed by the ASME Code could not detect CLP, Applicant "substituted" the etch test, which is not recognized by the Code. Joint Intervenor PF 116; see also, Joint Intervenor PF 127. This is incorrect. It must be reiterated that the required nondestructive examination was performed on all SA-312 pipe and the etch test was not adopted as a substitution for such examination. Rather, the etch test was used by Bechtel in its investigation solely to determine the amount of CLP in the SA-312 pipe produced by YWEC. See Applicant SA-312 Piping Testimony at 22-24; Applicant Ex. 11 at 2, 3. Joint Intervenors also claim that since the etch test can detect CLP, by applying the acceptance criteria for liquid penetrant testing to the etch test, one can determine the amount of CLP which would be rejectable under ASME Code standards. Joint Intervenor PF 116. The Board cannot accept this viewpoint. Liquid penetrant testing is meant to detect surface phenomena, not internal imperfections such as CLP. Tr. 1825 (Stuchfield); Applicant SA-312 Piping Testimony at 10, 11. There has been no

showing that the acceptance criteria for external imperfections would be applicable or proper for internal imperfections such as CLP.^{47/}

83. Joint Intervenors' description of the mechanical tests performed on production SA-312 pipe, as described in their proposed finding 117, is incorrect in stating that only "small samples" of the pipe are subjected to tension, flattening and hydrostatic testing. Chemical analysis, tension tests and flattening tests are performed on a certain percentage of each lot of pipe; however, each length of production pipe is hydrostatically tested by the manufacturer.^{48/} Applicant SA-312 Piping Testimony at 16; Applicant Exhibit 17.

84. Joint Intervenors further assert that the mechanical properties of SA-312 pipe with up to 26 percent CLP

^{47/} Joint Intervenors cite Mr. Stuchfield, at Tr. 1842, as support for their claim that liquid penetrant criteria are applicable to the etch test. Mr. Stuchfield, however, was merely responding to a hypothetical possibility presented by Joint Intervenors' counsel and merely stated that he supposed the liquid penetrant criteria could be used, as it provides a dimension which could be measured. Tr. 1842 (Stuchfield). There is no factual basis in the record for Joint Intervenors' hypothetical question and the Board does not believe that Mr. Stuchfield's response, standing alone, is sufficient to reach a finding that the ASME Code provides for acceptance or rejection of SA-312 pipe based upon liquid penetrant criteria applied to the etch test. Indeed this would be a meaningless conclusion because the liquid penetrant test cannot detect an internal flaw such as CLP. Tr. 1825 (Stuchfield); Applicant SA-312 Piping Testimony at 10, 11; see paragraph 81, supra.

^{48/} This is most important, because the hydrostatic test exerts primarily hoop stress on the pipe which is the only significant stress component in terms of the problem of CLP in the longitudinal weld seam. See Applicant PF 163; paragraph 86, infra.

cannot be known because Bechtel did not perform flattening tests during its investigation.^{49/} Joint Intervenor PF 117; see also, Joint Intervenor PF 127. The decision not to perform the flattening test during the Bechtel investigation has been fully explained. See Applicant PF 163 at n. 74. The flattening test demonstrates the overall ductility of the weld area; this same mechanical property is also measured by the tension tests that were performed by Bechtel in its investigation. Tr. 1847 (Stuchfield). Furthermore, the flattening test will not screen for a defect in the center of the weld (such as CLP). Rather, it is designed to detect surface defects in the weld. Tr. 1848-1849 (Egan). In light of these facts, the Board finds that Bechtel's decision not to perform additional flattening tests was appropriate.

85. Joint Intervenors dismiss out-of-hand the favorable results of the burst tests performed during the Bechtel investigation on the special samples of SA-312 pipe which contained amounts of CLP up to 55 percent. Rather, Joint Intervenors' only comment is to attempt to draw a negative inference from the fact that these tests were performed by YWEC. Joint Intervenor PF 118, n.46, and PF 128. Joint Intervenors suggest that the performance of these tests by YWEC

^{49/} YWEC did perform the Code-required flattening test on the SA-312 pipe it manufactured, but as Joint Intervenors note, the extent of CLP in the samples tested by YWEC is not known. Tr. 1846 (Stuchfield).

violates Criterion X of Appendix B to 10 C.F.R. Part 50, which, in pertinent part, states that the "inspection of activities affecting quality.. shall be performed by individuals other than those who performed the activity being inspected."

Initially we note that the burst tests were not "inspection[s] of activities affecting quality" in the sense that one conducts a quality control inspection. Furthermore, as we have previously stated (see paragraph 13 at n.10, supra), the Board interprets this Criterion as preventing, for example, the person who welded the SA-312 pipe from performing subsequent quality control inspections of the pipe. To extend this Criterion to apply to corporate entities -- for example, prohibiting a Daniel quality control inspector from inspecting a weld made by a Daniel welder -- is to interpret this Criterion in a manner which surely was not meant by the Commission.

86. Rather than dismissing the burst tests as suggested by Joint Intervenors, the Board views the results of these tests as perhaps the most persuasive piece of evidence in terms of confirming the capability of SA-312 pipe to perform its intended function even with extreme amounts of CLP. As Applicant has demonstrated, the burst test determines the ability of the pipe to withstand hoop stress, which is the only significant stress exerted on the longitudinal weld in SA-312 pipe. The specially fabricated SA-312 pipe which contained 55 percent CLP did not burst until an internal pressure of 3000

psi was reached, well in excess of the ASME Code-required hydrostatic test pressure of 882 psi and correspondingly higher than the design and actual operating pressures for SA-312 piping applications. Applicant PF 163. Further, we note that the burst test results were also a "significant contributor" to the Staff's determination that SA-312 pipe is acceptable in systems having less than 85 percent Code-mandated hoop stress limits. Tr. 1906 (Rutherford).

87. Joint Intervenors suggest the Aptech analyses are suspect because they were based in part upon the results of the burst tests. Joint Intervenor PF 119. Why such a basis would cast doubt on the analyses is unclear. Nonetheless, Joint Intervenors are factually incorrect -- the analyses were not based on the burst test results. Rather, the burst test results were confirmation of the independent computer calculations performed in Aptech's fracture analysis (Applicant Ex. 12). Applicant SA-312 Piping Testimony at 31-32; see Applicant Ex. 12 at pp. 9-1, 9-11 and 9-12. Joint Intervenors also claim that the Aptech fracture analysis is suspect because of Aptech's finding that the critical CLP flaw size is greater than the wall thickness itself. Contrary to Joint Intervenors' assertion that one could then assume that completely unwelded pipe would be acceptable, Applicant relies on this finding solely to demonstrate that a catastrophic failure is not possible in SA-312 piping with CLP. Rather, if such piping were to fail, it would exhibit a leak-before-break failure

mode. Applicant SA-312 Piping Testimony at 30, 32; see Rutherford Testimony at 5; Applicant PF 164.

88. Joint Intervenors' proposed finding 121 misconstrues Applicant's conclusion with respect to the use of SA-312 piping in systems having less than 85 percent of Code allowable hoop stress. Applicant does not rely on footnote 3 to Table 1-7.2 of ASME Code Section III as a means for eliminating nondestructive examination of SA-312 pipe. Tr. 1838 (Stuchfield). Rather, knowing that the nondestructive examination which was performed on such pipe is unable to reliably detect CLP, Applicant looks to footnote 3 to provide an efficiency factor which will impose a penalty on the allowable hoop stress for systems in which such SA-312 piping is used.^{50/} Applicant PF 168-170.

89. Similarly, we dismiss Joint Intervenors' concern over an alleged inconsistency between the nondestructive examination requirements of ASME Code, Section NC 2550 and Applicant's interpretation of footnote 3. Joint Intervenor PF 120, 121. Mr. Stuchfield testified that there is, indeed, some confusion within the Code itself as to whether the

^{50/} To explain, under the terms of footnote 3, SA-312 pipe which has been ultrasonically examined may be used in systems having up to 100 percent of the Code allowable hoop stress. In that conventional ultrasonic examination (and other Code-specified examination techniques) cannot detect CLP, it is assumed that such examination has not been performed, a 15 percent penalty is imposed, and therefore such pipe may only be used in systems having up to 85 percent Code allowable hoop stress. See Applicant PF 168-170.

nondestructive examination had to be performed in the first place. Tr. 1833 (Stuchfield). There is no basis, however, for concern over this confusion, because in this case, the nondestructive examination was performed on all SA-312 piping in accordance with the requirements of ASME Code, Section NC 2550. Footnote 3 only came into play when it was determined that a penalty on the allowable hoop stress should be imposed because the mandated examination technique was found to be ineffective. Moreover, the Board notes that Bechtel's recommendation that SA-312 pipe is acceptable for use in systems with less than 85 percent Code allowable hoop stress was subjected to an extensive review by the Staff (Offices of Standards Research, Nuclear Reactor Regulation and Inspection and Enforcement) and accepted. Tr. 1899, 1906 (Rutherford); see also, Rutherford Testimony at 4. The Board therefore reiterates its finding that the use of the efficiency factors in footnote 3 is appropriate to establish an acceptable stress level limit for systems containing SA-312 pipe.^{51/}

90. The last concern raised by Joint Intervenors deals with the evaluation and acceptance of SA-403 fittings made from SA-312 pipe. As Joint Intervenors have noted, Aptech stated that its findings may not be applicable to fittings, and

^{51/} With respect to the issue of the acceptability of using SA-312 pipe in systems having less than 85 percent of the Code allowable hoop stress, the Board notes that the burst test results provide added assurance that the SA-312 pipe will adequately perform its design function. See paragraph 86, supra; Tr. 1906 (Rutherford).

that the stresses to which these fittings are subjected may require a separate evaluation. Joint Intervenor PF 122. We note, however, that the Aptech report was a generic analysis of SA-312 pipe and was not related to specific applications of the piping or fittings in specific facilities. Tr. 1859 (Egan). However, based upon information pertaining to the nature and use of SA-403 fittings at Callaway, Dr. Egan of Aptech testified that a separate evaluation was not necessary for the SA-403 fittings at Callaway because the longitudinal welds in such fittings are in the neutral axis and therefore, the stresses on such welds will be no greater than the stresses seen in the straight lengths of piping. Tr. 1856-1860, 1876 (Egan); see also, Applicant PF 172, n.84. This evidence is uncontested and, despite Joint Intervenors' protestations that Aptech's conclusions were based upon "undocumented" discussions with Bechtel, the record is sufficient to conclude that any concern regarding the failure of SA-403 fittings is unfounded.

91. Joint Intervenors further contend that Applicant's initial response to I&E Bulletin 79-03 should have included a listing of all SA-403 fittings, as well as SA-312 pipe. In support of this proposition, Joint Intervenors cite Staff witness Rutherford who testified that the Staff intended the Bulletin to apply to all pipe products made from SA-312 welded material. Joint Intervenor PF 123. Be that as it may, the Board's reading of I&E Bulletin 79-03 leads us to conclude that the Staff's intentions were not set forth with clarity.

I&E Bulletin 79-03 requires licensees and applicants to take the following action:

1. Determine whether ASME SA-312, type 304 or other welded (without filler metal) pipe manufactured by [YWEC] is in use or planned for use in safety-related systems....
2. For those safety-related systems where the subject piping is in use..., identify the application of the piping including system, pipe location, pipe size and design pressure temperature requirements.

Staff Ex. 7, Exhibit XI at 2, 3 (emphasis added). While the Staff may have intended the Bulletin to cover all products made from SA-312, the Bulletin itself does not make this clear and the Board therefore cannot find fault with Applicant's response. See also, Staff PF 107, 120. We note moreover, that irrespective of the scope of Applicant's response to I&E Bulletin 79-03, the record is clear that no SA-403 fittings are used in piping systems at Callaway which have hoop stresses in excess of 85 percent of the ASME Code allowable stresses. Applicant SA-312 Piping Testimony at 39.

92. In summary, the Board finds that the SA-312 manufacturing process has been appropriately investigated, the extent to which CLP is present in SA-312 piping has been determined, and the SA-312 pipe has been thoroughly evaluated and properly accepted.

E. Preassembled Piping

93. Joint Intervenors contend that the initial discovery of the deficiencies in the G&W preassembled pipe

formations by a craft worker during a "nonrequired inspection" constitutes a failure of Applicant's Quality Assurance program. Joint Intervenor PF 138. Applicant's site QA and QC programs are not, however, limited to formal, required quality control inspections. Rather, responsibility for assuring the quality of materials used in and work performed on the Callaway Plant is incumbent upon all personnel. See Applicant PF 38, 185.

94. There is no support in the record for Joint Intervenors' assertion that the weld deficiencies associated with the G&W formations include incomplete penetration and slag inclusion. Compare Applicant Preassembled Piping Testimony at 13 and Joint Intervenor Ex. 69, Final Report at 1, with Joint Intervenor PF 139.

95. Joint Intervenor proposed finding 139 claims that "[o]ver half" of the G&W radiographs were defective. Radiographic technique deficiencies were found in 35 to 50 percent of the radiographs. Applicant PF 177; Joint Intervenor Ex. 69, Final Report at 1.

96. Joint Intervenors are incorrect in asserting, in proposed finding 140, that, at the time the deficiencies were discovered, approximately one-half of the formations at the Callaway Site had been "completely installed." Applicant witness Laux, at the transcript pages cited, is surmising that approximately one-half of the formations had connection welds performed. Tr. 1936 (Laux). Joint Intervenors have improperly expanded this testimony to assume that the formations had been "completely installed."

97. Joint Intervenors attempt to confuse the record by claiming that the Bechtel inspection at the G&W facility prior to the discovery of the deficiencies was the "highest level" afforded to a vendor facility. Joint Intervenor PF 131, 142, 144. Joint Intervenors here overlook the fact that the inspection program prior to the discovery was an itinerant program, in which the Bechtel inspector was not present at all times. Tr. 1954-55 (Porter). While the Level III inspection at G&W is the highest level of itinerant inspection, it is by no means the absolute highest level of inspection provided by Bechtel. Indeed, following the discovery of the G&W deficiencies, the inspection effort was upgraded to provide for a resident inspector performing a 100 percent inspection of manufacturing milestones. Tr. 1957 (Porter); Applicant PF 181.

IV. PROPOSED CONCLUSIONS OF LAW

98. Because, in the foregoing findings of fact, the Board has reviewed the evidence thoroughly and decided against Joint Intervenors on each aspect of their Contention No. 1, it follows that the Board does not adopt Joint Intervenors' General Conclusions of Law (Joint Intervenor PF 167-178). Those proposed conclusions of law are not supported by the Board's findings of fact, and in many cases raise subjects which have been addressed earlier in this partial initial decision.

99. Joint Intervenors attempt to advise the Board on Applicant's evidentiary burden. See Joint Intervenor PF 167 at

n.50. The matter is not as confusing as Joint Intervenors suggest. Commission proceedings are subject to the provisions of the Administrative Procedure Act. 42 U.S.C. § 2231; Commonwealth Edison Company (Zion Station, Units 1 and 2), ALAB-616, 12 N.R.C. 419, 421 (1980). In adjudicatory proceedings subject to the Administrative Procedure Act, the proponent of a rule or order has to satisfy a "preponderance of the evidence" standard in order to meet its burden of persuasion. Steadman v. Securities and Exchange Commission, 450 U.S. 91, 101 S.Ct. 999, 1009 (1981). Therefore, Applicant's evidentiary burden here is met by providing the Board, by a preponderance of the evidence, with reasonable assurance that the public health and safety has been protected as to the issues raised in this case. Zion, ALAB-616, supra, 12 N.R.C. at 421; Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-463, 7 N.R.C. 341, 360 (1978); and cases cited therein.

100. Joint Intervenors would have this Board conclude as follows:

The evidence also suggests that because of the firing of ironworker foreman Bill Smart, following widespread publicity about his allegations of construction deficiencies at the plant, other construction workers have been unwilling to come forward with evidence of nonconformances.

Joint Intervenor PF 167. See also, Joint Intervenor 175. No evidence, suggestive or otherwise, is cited to support this proposition. Issues associated with Mr. Smart's firing --

which the Board knows to have been the subject of a separate NRC investigation outside of this operating license proceeding -- were not pleaded in Joint Intervenors' Contention No. 1 nor admitted by the Board for litigation. Over the objections of Applicant and the NRC Staff, the Board received some evidence on the Smart case in order to ascertain whether Joint Intervenors could establish any nexus to their contentions. Having heard the evidence presented by Joint Intervenors, Board Chairman Gleason commented, near the end of the hearing, ". . . that we have found no ties to Mr. Smart's firing and discharge with the issues of the Contentions that are before us. . .". Tr. 2002. There have been no subsequent developments to change the Board's conclusion.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

Thomas A. Baxter

Thomas A. Baxter, P.C.

Richard E. Galen

Richard E. Galen

Counsel for Applicant

1800 M Street, N.W.
Washington, D.C. 20036

(202) 822-1000

Dated: April 5, 1982