U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION IV

Report No. 50-445/79-15; 50-446/79-15

Docket No. 50-445; 50-446 Category A2

Licensee: Texas Utilities Generating Company
2001 Bryan Tower
Dallas, Texas 75201

Facility Name: Comanche Peak, Units 1 & 2

Investigation at: Comanche Peak Steam Electric Station, Glen Rose, Texas

Investigation conducted: May 29 through June 4, 1979

Inspectors: W A Crossman 6/21/79
for R. G. Taylor, Reactor Resident Inspector, Project Sections Date

W A Crossman 6/21/79
W. A. Crossman, Chief, Projects Section Date

Approved: W A Crossman 6/21/79
W. A. Crossman, Chief, Projects Section Date

Investigation Summary:

Investigation on May 29 through June 4, 1979 (Report No. 50-445/79-15; 50-466/79-15)
Areas Investigated: Special investigation of allegation received regarding improper and potentially very poor welding of inter-plate seams in the Unit 1 Refueling Pool, spent fuel pools, and transfer canal of the common facility Fuel Handling Building. The investigation involved twenty-eight inspector-hours by the Reactor Resident Inspector (RRI) and the Chief, Projects Section.
Results: The allegations were neither specifically confirmed nor refuted. The allegations, if confirmed, would have no safety significance. No items of noncompliance or deviations were identified.

INTRODUCTION

Comanche Peak Steam Electric Station (CPSES), Units 1 and 2 are under construction in Somervell County, Texas, near the town of Glen Rose, Texas. Texas Utilities Generating Company is the Construction Permit holder with Brown and Root, Inc. as the constructor and Gibbs and Hill, Inc. as the Architect/Engineer.

REASON FOR THE INVESTIGATION

The Region IV Reactor Construction and Engineering Support Branch received a telephone call from a former CPSES employee who reported several allegations indicating a potential breakdown in the CPSES Quality Assurance program and a possible threat to the health and safety of the public. The substance of the allegations also appeared in an edition of the Fort Worth Star-Telegram published on May 30, 1979.

SUMMARY OF FACTS

The Region IV Reactor Construction and Engineering Support Branch received a telephone call on May 25, 1979, from a party who identified himself as a former CPSES employee who had worked as a Boilermaker welder. The call was taken jointly by the Branch Chief and the Section Chiefs of the Projects Section and the Engineering Support Section who in turn provided the information to the assigned Resident Reactor Inspector at CPSES on May 29, 1979. The allegations were reviewed with the alleger in an interview which took place on May 30, 1979, at his home. Each of the following allegations relate to welding of stainless steel liners in the Unit 1 Reactor Containment Building or in the common Fuel Handling Building:

1. Allegation No. 1[1/]

   Welding and weld repairs on the liners were difficult because water from concreting activities had run down the leak chase channels and out past the backing strip into the weld area. Welds finally completed were very poor; some welds had been slugged with weld rod and others were so thin that if buffed a second time with 120 grit, they would not have passed PT (Penetrant Test).

2. Allegation No. 2

   There are problems with the gate guide (refers to a gate in the Reactor Containment separating the refueling pool from a small storage pool and the transfer canal).

1/The statements above are the allegations as received. Clarifications obtained from the alleger during the interview of May 30, 1979, are indicated by parenthesis.

a. The gate guide between the large and small pool was welded in the shop. When the gate guide was installed in the pit, the end bevel was cut off so it could be fit-up. When the guide was installed, it was not rebeveled and where a fillet weld of 3/8" was required, only 3/16" fillet weld was made.

b. The gate guide had to be welded to both sides of the liner. When welding the back side, the welder had to crawl down between the rebar to get to the weld. The position was so crowded that the welder could not make a good weld. Also, the welder couldn't see what he was welding very well.

c. Six inches of the chase channels were left off the gate guide and added after the gate guide was installed. The rebar was so thick in the areas where welding was performed that "you could hardly get your finger through, much less the welding torch." Consequently, the welds were not made properly.

3. Allegation No. 3

Welders have no experience. They spend as much as 80 hours trying to make a test weld. They finally learn how to make a weld that will pass the qualifying test and then when they get into the field they don't know what they're doing.

4. Allegation No. 4

There is "lots" of QC coverup. QC is "buying-off" on welds over the phone. One QC inspector bought off a seam before he ever saw the seam and it was not a good weld because water was coming through while the weld was being made. (The buy-off involved was joint preparation and cleanliness preparatory to welding).

5. Allegation No. 5

Brown and Root is not following procedures in welding the liner plate. (The procedures referred to are welding procedures and specifically refer to use of a down-hand welding technique being used versus the procedurally required up-hand technique).

6. Allegation No. 6

Some of the top seams 18" above water level on the fuel pool had backing strips tack welded to the liner plate. There are places where the plate did not cover the backing strip. He would not guarantee the weld. The weld was probably 60% rust, air, concrete, etc.

CONCLUSIONS

Review of the CPSES Final Safety Analysis Report, Project Specifications and Engineering Drawings, as they pertain to the liner fabrication and installation, have led to the following conclusions relative to each allegation stated in the Summary of Facts above. To better understand these conclusions, the following considerations are necessary:

The liner systems are not installed to prevent or mitigate the consequences of any of the postulated design basis accidents, but rather are installed to prevent an excessive burden on the liquid waste collection and disposal system and to allow the wall and floor area to be more easily decontaminated after pool usage. The liners as a functioning element are, therefore, not considered safety related and are not normally included in the NRC inspection program.

The liners, as passive elements and parts of the building structure, are usually classified into seismic Category I since if one or more of the liner plates were to become detached from the wall, serious damage could be done to stored fuel assemblies. The plates are, therefore, secured to the concrete supporting structure with a system of weld studs attached to the back of the plate and embedded into the concrete. The weld stud system is not a factor in these allegations.

1. Allegation No. 1

The RRI, based on the interview with the alleger and with other welders, has become reasonably sure that there were difficulties encountered by the welders with water, moisture and in some instances with concrete on the weld surfaces and that in some instances, the welds may not be completely sound internally. These welds, however, serve no strength purpose and need only to be smooth and leak free, factors which are established by visual inspection, dye penetrant examinations, and by vacuum box tests of the joint after it is complete. The allegation, while probably true, has no safety consequence.

2. Allegations No. 2.a, b, & c

These collective allegations, while probably true in a substantial sense, also have no safety consequence. The weld joints in question only need to be smooth and leak free in the case of a. and b. and leak free in the case of c. The welds do not serve to lend strength to the structure.

3. Allegation No. 3

The project specifications for all welding, including the pool liners, require that welders be qualified under the requirements of the American Society of Mechancial Engineers, Boiler and Pressure Vessel Code, Section IX or a comparable requirement such as those of the American Welding

Society. Section IX of the ASME requires that a welder must perform a weld process involved and the as-welded coupon must pass specified tests when complete. No time limits are specified or implied as a requirement in Section IX for making the qualification test coupon weld. The RRI has verified previously that the site welder qualification program is in full compliance with Section IX.

4. Allegation No. 4

The RRI examined the circumstances surrounding the specific portion of the allegation and discussed the matter with the QC inspector directly involved. It appears that this man, on occasion, was depending on the inspections performed by a fellow inspector and so recorded on the appropriate weld data card. The joint was covered over with tape after it had been inspected for cleanliness and fit-up and the inspector released it over the phone based on the record card entries. Water in the leak chase channels appears to have been a constant problem. The QC inspector may have made a judgement error in not re-examining the joint, but not withstanding, the joint had been inspected and found satisfactory at that time. The RRI did not investigate the alleged "lots" of QC coverup because of the lack of specifics.

5. Allegation No. 5

As noted in the Summary of Facts, the general allegation of failing to follow procedures was subsequently refined in the interview with the alleger to relate specifically to an occasion where the alleger was directed by his supervision to weld down-hand rather than up-hand as required by the welding procedures. ASME Section IX indicates that such a change is in the category of a non-essential variable and, therefore, is not a prohibited change in the procedure, if recorded. It appears that the change was not recorded. Interviews with other welders on the same activity failed to reveal any similar experiences and supervision has denied directing the alleger to perform out-of-procedure. The RRI, therefore, has no mechanism by which to confirm the allegation. Again, assuming that the alleger did weld down-hand instead of up-hand for whatever reason, the consequences of such an action are essentially meaningless as related to a weld, since such a change has no effect on the finished weld of the type involved.

6. Allegation No. 6

The particular welds in question are even less consequential than the other seam welds in a functional sense. These welds, which are above the water line in the pools, do not need to be leak free, just smooth for the purposes of easy decontamination. The allegation, while perhaps true, has no consequence.

DETAILS

1. Persons Contacted

Alleger

The alleger, hereafter identified as Individual "A," is a former employee of Brown and Root, Inc. (the site general contractor). The person identified himself as a former welder assigned to the millwright/boilermaker unit of the construction force.

Principal Licensee Employee

Site Quality Assurance Supervisor

Brown and Root, Inc.

Project Construction Manager
Millwright/Boilermaker Superintendent
Individual "B," a welder currently working as a pipefitter but who was a Boilermaker
Individual "C," a welder currently working as a pipefitter but who was a Boilermaker
Individual "D," a quality control inspector who was assigned to inspection of pool liners

2. Background of Allegations

Individual "A" contacted the Region IV office at approximately 9:25 a.m. on Friday, May 25, 1979, to express concerns about the welding activities which had taken place on the spent fuel pools, cask loading pool and the transfer canal in the common Fuel Handling Building for both Units as well as that work accomplished in the Unit 1 refueling pool and temporary storage pool installed in the Reactor Containment Building.

The RRI was notified of these allegations on Tuesday, May 29, 1979, (May 28 a holiday) and initiated an immediate investigation. The first point of contact was the licensee's site Quality Assurance supervisor who informed the RRI that he was aware of the allegations, since his company had been apprised of them by a newspaper reporter employed by the Fort Worth Star-Telegram.

The site supervisor also informed the RRI that another welder, Individual "B," had expressed similar concerns to the Project Construction Manager on May 23, 1979, and that concerns had been forwarded to site Quality Assurance for investigation. The RRI was provided an informal memorandum giving the results of the investigation dated May 23, 1979.

Individual "A" also contacted the Project Construction Manager on May 24, 1979, and expressed essentially the same concerns as those expressed by Individual "B" and which in turn he expressed to the Region IV office on May 25, 1979. It appears that Individual "A" and his supervision, up through the Project Construction Manager, had reached a substantial point of disagreement and Individual "A" voluntarily terminated his employment at the site as of May 24, 1979. The voluntary termination is a matter of record in Individual "A's" employment file.

3. Investigation

The RRI initiated the site phase of the investigation by extensively reviewing the CPSES Final Safety Analysis Report in order to ascertain the safety classification of the various pools and pool liners involved in the allegation and to review the functional descriptions. Reference to Section 3.2, "Classification of Structures, Components and Systems," in the FSAR does not indicate the liners as being safety related although the buildings in which they exist are shown to be in seismic Category I. Paragraph 3.8.3.7.1 provided a commitment to test the liner seams via a vacuum box for leak tightness and briefly described a leak chase system behind the liner seams. Paragraph 3.8.4.1.3 provided a brief additional description of the function of the liners. Figures 9.3-9 and 11.2-4 revealed that the extensive leak chase system has lead-out piping which leads to a building sump and hence into the liquid radioactive waste collection and disposal system.

The RRI then obtained Project Specification 2323-SS-18, Revision 3, "Stainless Steel Liners," to ascertain what requirements the design engineer had established for the liners. The RRI noted the following significant items from the specification:

a. The design engineer invoked the general quality assurance requirements of 10 CFR 50, Appendix B on the fabrication and installation work.

b. The design engineer provided three full pages of detail requirements relative to the system of studs to be welded to the reverse or concrete backed side of the liners.

c. The design engineer made reference to the inter-plate seam welds only by requiring that the welding procedures and welders be qualified to ASME, Section IX. Criteria for finished welds require that, "Surfaces of all welds shall be smooth and free of any irregularities such as serrations, ridges, crevices, or pinholes which may make it subsequently difficult to achieve an effective washdown of the liner surface." Under testing the design engineer provided the following, "All seam welds shall also be tested by vacuum box for leak tightness for their entire lenth." No other quality requirements were imposed on the seam welds.

d. The RRI then obtained the design engineer's drawings S-0831 through S-0834, SI-0560, MI-0581, all of which provide details of liner fabrication and installation. In addition, the RRI obtained vendor design detail drawings for the gate guide installed in the Containment Building between the refueling pool and the temporary storage pool. These drawings, taken collectively, showed that the design engineer had designed a system wherein the liner plates and the gate guide would be supported by and anchored to the surrounding concrete walls by a very extensive system of "T" headed studs welded to the concrete sides of the plates and gate guide frame. The seam welds are entirely from plate-to-plate and provide no attachment into the basic building structure.

The RRI concluded on the basis of the above information that the liner system had been designed such that resistance to seismic effect was vested in the "T" headed stud installation and that the seam welds were necessary only to provide a very low leakage path for the pool water and that what leakage might occur would be drained to an appropriately designed method of disposal.

The RRI interviewed Individual "A" on May 30, 1979, in conjunction with the Region IV Reactor Construction and Engineering Branch, Projects Section Chief, in order to gain additional information relative to each of the allegations received over the telephone on May 25, 1979. The additional information and clarifications were as noted in the Summary of Facts included in this report. In addition, Individual "A" acknowledged that he had only very recently become aware that the stud system existed for holding the plates in place and was, in fact, unaware that the leak chase channels were piped to a collection point for controlled collection and disposal of any leakage which might occur.

The RRI interviewed Individual "B" in the presence of the licensee's site QA supervisor, also on May 30, 1979. (This arrangment was allowed since Individual "B" only came to the attention of the RRI through the assistance of the licensee's representative.) The allegations of Individual "A" were reviewed in detail with Individual "B" who essentially confirmed Allegations 1, 3 and 6, but indicated he had not worked in the Allegation 2 area and further indicated that he had no complaints about lack of effective QC nor had he been instructed not to follow welding procedures.

The RRI interviewed Individual "C" on May 31, 1979, with the same results as those obtained in the interview with Individual "B." Individual "C" indicated that he perhaps was one of the persons referred to by Individual "A" in Allegation 3. He also indicated that he had very limited welding experience before coming to work at CPSES and none in "Heliarc" weld process. He was given some forty hours of very informal training and then used fifty-two hours to make his weld test coupon, a duration that he now considers to be excessive. He now thinks that he is a good welder.

The RRI interviewed Individual "D" on May 30, 1979, and again June 1, 1979, to develop any facts relative to the specific allegation of "buying-off" joints over the phone. Individual "D" categorically denied that he, or to his knowledge any other QC inspector assigned to this work area, had ever "bought-off" a designated inspection point without making the required inspection. On June 1, 1979, Individual "D" indicated that there had been very few occasions when he had given consent to the welders to weld up a seam that, by the inspection reports, had been previously inspected for fit-up and cleanliness. He also indicated that he and others had repeatedly stopped work on welding of seams where it came to their attention that water or moisture was interfering with good welding.

The RRI interviewed the Boilermaker Superintendent on June 4, 1979, relative to his knowledge and/or participation in any of the allegations. He categorically denied ever directing welders to make welds where water or moisture was present, but acknowledged that it was a constant problem. He indicated that he finally received engineering permission to drill holes through the liner at the ends of the leak chase channels so that air could be blown through to dry out the channels and that this action helped a great deal. He indicated that he had continuely attempted to impress the welders with the importance of making good seam welds.

4. RRI's Assessment of the Liners

The RRI observed some of the welding work on the refueling pool in the Unit No. 1 containment during the latter part of 1978 and the early part of 1979 incidental to making inspection of other activities in the same work area. The welding appeared to be normal and the dye penetrant examinations appeared to be properly accomplished. The finished surfaces examined have been uniformily smooth and appear sound. The RRI also examined some unfinished areas in the Unit 2 spent fuel pool and can appreciate the difficulties that may be encountered in removing some of the concrete laitance from the vertical weld joint areas.

November 21, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

PREFILED TESTIMONY OF C. THOMAS BRANDT REGARDING CASE'S FURTHER "EVIDENCE" OF A QUALITY CONTROL BREAKDOWN IN THE CONSTRUCTION, INSTALLATION AND INSPECTION OF THE STAINLESS STEEL LINER PLATE

Q1. Mr. Brandt, have you had an opportunity to review the memorandum concerning the stainless steel liner plate filed by the Citizens Association for Sound Energy on November 15, 1984?

A1. Yes.

Q2. Mr. Brandt, directing your attention to page two of that memorandum, CASE contends that applicants incorrectly assert that the liner plate is not safety-related. Do you see that passage?

A2. Yes. It is set out in the first three paragraphs on the page.

Q3. Is that contention correct?

A3. No. CASE's contention shows a lack of understanding of my testimony and the procedures applicable to the fabrication and installation of the stainless steel liner plate. As I testified before, the fabrication and installation of the stainless steel liner have been designated safety-related activities by the architect engineer. I would like to note my testimony on this point appears at page 45,315 of the transcript of this proceeding. Therefore, CASE is factually incorrect when it asserts that applicants have testified that the liner plate is not safety related. What I testified to, and what CASE appears not to understand, is that the welds in question are non-structural; this point is different from, and unrelated to, the fact that the fabrication and installation of the liner plate are safety-related activities.

The significance of the welds being non-structural is that the architect-engineer did not impose stringent requirements such as those imposed by the ASME code, for the fabrication, installation, inspection and testing of the liner and the welding associated with these activities. The architect-engineer's only concern was that the welds not leak. Accordingly, welding on the liner place is not now, nor has it even been, under the jurisdiction of the ASME Code.

Only two matters remotely tie the liner plate to ASME activities, but neither of these matters apply ASME fabrication and installation requirements to the liner plate.

First, the specification for the liner plate requires that welders who work on, and welding procedures used in connection with, the liner plate be qualified in accordance with Section IX of the ASME Code. This Section, however, is limited to the qualifications of procedures and welders, and it is not a fabrication code. Accordingly, the Code's fabrication requirements simply do not apply to the liner plate. Second, as an administrative matter, the inspection group originally assigned to perform these inspections was the ASME group. In February 1982, responsibility for these inspections was transferred to the non-ASME inspection group; this transfer was also an administrative matter. Again, I want to emphasize that these assignments were unrelated to the applicability of the ASME Code requirements to the fabrication and installation of the liner plate.

Q4. Mr. Brandt, directing your attention to pages two and three of CASE's memorandum, CASE asserts that the correct traveler form was used for weld no. 988, and that you either were wrong in testifying that all travelers were initiated on the wrong form or that you knew that some travelers were initiated on the correct form and your testimony was deceptive. Do you see these allegations?

A4. Yes, I do.

Q5. Is CASE correct?

A5. No. First, my testimony was that I could find no evidence that the correct traveler form was used before April 18, 1979. My review of the travelers indicates that the correct form was used after that date. Second, all of my testimony, as I have stated several times, is limited to the travelers for the Unit 2 refueling cavity, which is located inside the Unit 2 reactor building. All thirteen hundred travelers at issue in this proceeding are for that cavity. I would like to point out that I made this point on pages 15,921-923, 15,927 of the transcript of this proceeding. Traveller 988 cited by CASE is not for a weld in this cavity. It is for a weld in the Unit 2 fuel transfer canal, which is located inside the fuel building. This is not only a completely different cavity; it is for a cavity located in a completely different building. Thus, CASE's allegation is premised on a traveler that was not even included in the travelers that were the subject of my testimony.

Q6. Directing your attention to page 3 of Exhibit I to CASE's memorandum, CASE alleges that certain welds lack QC verification of the fit-up and cleanliness of the outside welds. In support of this allegation, CASE identifies a total of 147 welds which it claims lack QC verification of the fit-up and cleanliness of outside welds. Do you see those allegations?

A6. Yes I do.

Q7. Have you reviewed the travelers for these welds?

A7. Yes.

Q8. What were the results of your review?

A8. In each instance, I found that there was either a chit and/or a traveler documenting QC verification of the fit-up and cleanliness of the outside weld. Accordingly, CASE's allegation is factually wrong.

Q9. CASE asserts on page three of Exhibit 1, "it is evident that the chits [attached to the 147 travelers] were not intended to verify step 1, but was [sic] intended to verify Step 3 and/or 2 only." Is this correct?

A9. No. The chits themselves reflect that they document QC verification of the fit-up and cleanliness of the outside weld.

Q10. CASE also alleges on page 3 that 170 other welds lack QC verification for fit-up and cleanliness of the outside weld. Did you review the documentation for these welds?

A10. Yes.

Q11. What were the results of your review?

A11. With the exception of weld 326, I found that there was a chit and/or traveler substantiating the QC inspection of the fit-up and cleanliness of the concrete side of these welds. Thus, with the exception of weld 326, CASE's allegation is factually wrong.

Q12. Have you determined why there was no documentation verifying the cleanliness and fit-up of the outside weld for traveler 326?

A12. Yes, I have.

Q13. Why was documentation of the QC verification for this weld not found during your review?

A13. The weld has not been made. It is a weld between an angle and the top plate of the cavity, which as of November 20, 1984, had not yet been fit-up.

Q14. CASE next states on page four of Exhibit 1 that five welds lacked QC verification of fit-up and cleanliness for the outside welds prior to welding which allegedly renders their conditions indeterminate, contrary to procedure and 10 C.F.R. Part 50, Appendix B, Criteria V. Do you agree with this characterization?

A14. I cannot agree with CASE's position. I do agree with CASE's contention that, because of the dates of the signatures, the chits attached to these travelers do not definitely establish that the five cleanliness and fit-up inspections were performed prior the time the backing strip was tack-welded to the plates. This is a violation of site procedures, and I have directed that an NCR be written to address this deficiency.

While I agree that there is a paper problem with these five travelers, I cannot agree that the deficiency is technically significant. The fit-up of the plates associated with the travelers identified by CASE was reverified and documented and the cleanliness of the inside joint was verified and documented prior to making the inside welds. Under these circumstances, the verification of the fit-up and cleanliness of the plates prior to tack-welding the

backing strip to the plates is not a technical concern. The only purpose of verifying the cleanliness of the plates prior to tack-welding the backing strip to the plates was to assure that the backing strip could be securely tacked on and would not become dislodged inside the leak chase channel. The sole purpose for the inspection is to ensure that the backing strip remains in place until the time of the inside fit-up. The reason for verifying fit-up prior to tack-welding the backing strip to the plates was to prevent difficult rework which would be required after the attachment of the leak chase channel if the original fit-up between the plates was out of tolerance. In any event, if the backing strip had dislodged or if the fit-up have been improper those deficiencies would have been noted when the cleanliness and fit-up inspections were performed for the inside welds.

Q15. On page five of Exhibit 1, CASE identifies a number of welds which were done using welding procedure 88023 and claims that the correct procedure for those welds was welding procedure 88025. Do you agree with this assertion?

A15. No. The welds CASE identified are embed to plate welds. All welds made on the liner plates between embeds and plates are groove welds in which the deposited weld metal thickness (joint thickness) is .1875" (the thickness of the plate). The proper procedure for making this weld in 1978 was WPS 88023, which was qualified for thickness ranges .0625" through .750". Prior to October 15, 1979, WPS 88025

was qualified for welds with thicknesses of 0.75" through 3.5". On October 15, 1979, WPS 88025 was revised and the thickness range was expanded from 0.75" through 3.5" to 0.185" through 3.50". After this date either WPS 88023 or WPS 88025 could have been followed when making the welds to which CASE refers. Therefore, CASE is wrong in contending that the wrong procedure was used in making the referenced welds. To confirm my observations on this point, copies of WPS 88023, WPS 88025 and 1977 ASME IX, QW 202.2 are appended to my testimony as attachments 1, 2 and 3 respectively.

Q16. On page six of Exhibit 1, CASE identified 243 travelers which CASE claims lack QC verification for Step 5, fit-up and cleanliness of the inside welds. Have you reviewed the traveler packages for these welds?

A16. Yes.

Q17. What was the result of your review?

A17. It is difficult to understand CASE's allegations with respect to the various welds included on the lists on page 6 of Exhibit 1 to CASE's memorandum. Initially, it is important to note that CASE's list includes five-line travelers and eight-line travelers. With respect to the five-line travelers, for example weld 6, the fifth line is for the final V.T. inspection, not for a fit-up and cleanliness inspection. Thus, CASE's allegations for the five-line travelers does not make any sense. In any event,

where the fifth line of the five-line traveler is unsigned, it simply means that weld is in process, and it does not reflect any paper or technical deficiency.

The eight-line travelers on the list fall into several categories. First, many of the travelers are for welds that are welded on one side only (welds 875, 896, 901, 908, 909, 910, 912, 682, 713, 714, 779, 783, 784, 785, 797, 798, and 799). For these welds CASE's allegation is wrong because there is welding on only one side of the liner; consequently, there are no fit-up or cleanliness inspections to be performed on the second side of the liner. Second, CASE is correct with respect to a small group of eight-line travelers (welds 12, 51, 59, 65,66, 72, 73, 90, 93, 107, 147, 203, 709, 851, and 907), and I have directed that an NCR be written identifying the welds for which the inside fit-up and cleanliness inspections have not been documented. Finally, my examination of all of the remaining eight-line travelers on CASE's list reveals that CASE is factually wrong because the inside fit-up and cleanliness inspections were performed and documented.

Q17. On pages 7-8 of Exhibit 1, CASE lists twenty-seven (27) welds which CASE contends are missing the final V.T. of the inside weld. Have you reviewed this allegation?

A17. Yes.

Q18. What conclusions have you drawn as a result of that review?

A18. This is another example of CASE's lack of understanding of the fabrication and inspection process. CASE is correct in noting that a final visual inspection has not been performed for these welds, but the final visual inspection has not been performed because the welding/inspection process has not been completed.. My review of the travelers indicates that no holdpoints have been bypassed and no violation exists for any of these welds.

Q19. Mr. Brandt, CASE also lists twenty-two (22) welds on page 8 for which WFMLs are not in the package. Have you had an opportunity to review this allegation?

A19. Yes. However, the absence of WFMLs in these traveler packages does not constitute a violation of procedure or a deficiency. There is simply no requirement specifying that a copy of the applicable WFML is to be kept in each traveler. I might also add, there is no requirement for filler metal traceability on any of these welds.

Q20. On pages 9-15 of Exhibit 1, CASE alleges that WFMLs are referenced on travelers indicating that new welding was done, but there is no QC verification or involvement when the welding is done. Assuming this to be true, what significance does this allegation have?

A20. Although I have not reviewed all the travelers listed by CASE on pages 9-15, I have reviewed enough to lead me to believe that this is another instance where CASE does not understand the requirements and/or the fabrication sequence. In all travelers I reviewed, no inspection hold-

points have been bypassed. If CASE is attempting to infer that QC must perform some type of "verification" each day welding is performed, this simply is not the case. All required inspections are procedurally described, and there is no requirement for "verification" each day welding is performed. From the sample I reviewed, I am unable to detect any violation.

Q21. Mr. Brandt, turning your attention to pages 16-20 of Exhibit 1, CASE lists numerous welds for which welding was done, but no QC verification or involvement is shown, and that WFMLs are attached to, but not references on, the travelers. What significance, if any, is there to this allegation.

A21. None. Once again, as I discussed above, this is apparently another instance where CASE is attempting to assert that verification of welding must be performed on each day that welding occurs. Of the travelers that I reviewed in connection with this allegation, all welds were still in-process, i.e., they had not yet received final inspection. CASE's observation that WFMLs are attached to, but not referenced on, the travelers is correct; however, the allegation is without significance. This information is not required by specification, and serves no quality function. The millwrights are procedurally required to enter this information but they simply have not done so as of this date.

Q22. Mr. Brandt, CASE identifies 5 NCRs on page 21 of Exhibit 1 which describe welds for which vacuum box testing was improperly noted as not applicable. Is there significance to this observation?

A22. No. It was an error made by the inspector, but was properly reported and dispositioned on an NCR.

Q23. On page 22, CASE lists fifty-seven (57) welds which it alleges are deficient because final V.T. has been performed without vacuum box and/or liquid penetrant examination being performed. Have you reviewed this allegation?

A23. Yes, I have.

Q24. What was the result of your review?

A24. CASE apparently misunderstands the inspection testing sequence. The final V.T. precedes the vacuum box testing and the liquid penetrant examination. As these welds are clearly still in process, no holdpoints have been bypassed and no violation exists.

Q25. On the bottom of page 22, CASE notes "the final V.T. of the inside welds were signed off on the following welds by other inspectors." What is the significance, if any, of this observation?

A25. I am not quite sure to whom CASE is referring by the use of the phrase "other inspectors." I assume CASE is referring to the fact that the final V.T. has been performed by inspectors other than those who performed the P.T. and/or V.B. test. If this is CASE's allegation, it is without

merit because there is no requirement that the same inspector perform V.T. and P.T. and/or vacuum box testing. No violation exists.

Q26. Mr. Brandt, on page 23 of Exhibit 1, CASE lists 131 welds which it alleges are deficient because the "completion of weld inspection block on attachment 1 signed off as completed prior to the completion on welds prior to [sic] vacuum box testing and/or P.T. inspection being performed." Have you reviewed this allegation?

A26. Yes, I have.

Q27. What did your review indicate?

A27. The welds listed fall into several different categories. For a number of welds which CASE asserts that "completion of weld inspection block on attachment 1 signed off as completed prior to the completion on welds prior to [sic] vacuum box testing and/or P.T. inspection being performed," CASE is incorrect as the travelers clearly indicate that the weld is still in process. Welds 5, 7, and 8 are examples of this category. As the welds are incomplete, no violation exists. For a small group of welds, (weld numbers 1240, 1242, 1245, 1248, 1182, 1209, and 1210), CASE is correct and I have directed that an NCR be written identifying the condition as nonconforming. For all other welds listed on page 23, CASE is incorrect because the referenced tests are not required; therefore, no violation exists.

Q28. CASE alleges on page twenty-four of Exhibit 1 that "[m]any NCR's were written for welds that James Cole had N/A'd the vacuum box test on. The vacuum box test has been reestablished on all but the ones below." Have you had an opportunity to review this allegation and the travelers involved with this allegation?

A28. Yes, I have.

Q29. What was the result of your review?

A29. Apparently CASE alleges that vacuum box was required for these welds. CASE lists eighty-eight (88) welds which it believe are deficient. As a result of my review, I have determined that with one excpetion (weld 932) that CASE's allegation is incorrect. All other wleds are not pressure boundary welds and therefore do not require vacuum box testing, and the step is properly marked not applicable ("N/A") on the traveler. I have directed that an NCR be written for weld 932 noting that the vacuum box test for that weld was improperly marked "N/A."

Q30. Mr. Brandt, CASE alleges on the bottom of page twenty-four of Exhibit 1, that "PT test has been performed on these welds but vacuum box has not". Have you had an opportunity to review this allegation and the related travelers.

A30. Yes I have.

Q31. What were the result of your review of these travelers?

A31. CASE lists an additional forty-eight (48) welds for which vacuum box has not been performed. For four (4) of these welds (welds 1230, 1232, 1235, and 1238), CASE is correct

and I have directed that an NCR be prepared describing this condition. For all other welds listed here, CASE is incorrect; the step has properly been marked not applicable as these welds do not require vacuum box testing.

Q32. Mr. Brandt, directing your attention to page twenty-five of Exhibit 1, in particular to CASE's discussion of NCR M-83-01847 dated 7/7/83. CASE states that "The NCR was written in 1983 and a hold tag applied. It has not been dispositioned yet, and there is no copy of this NCR in traveler 151. There is no RPS in package for weld 154. 154 was signed off by Don Vogt, S.M. McCoy, for steps 2, 3, and 4. Jim Cole inspected 151 on 4/20/80 and 153 on 4/24/80." What is the significance, if any, of these allegations?

A32. First, CASE is incorrect in stating that "...it has not been dispositioned yet." In fact, CASE describes the disposition of this NCR on page 25 of Exhibit 1. Second, original NCRs are not filed with traveler packages, nor does the lack of a copy of the NCR in package 151 constitute a violation of any code, standard, specification, or procedure. Third, CASE's observation that no RPS is in package 154 is correct, but it is without significance for two reasons: first, the repair is not yet complete, and second, the repair, when completed, will be of weld 151, not weld 154, and accordingly a copy of the RPS will be in package 151, not 154. Fourth, with respect to CASE's observation that "Jim Cole inspected weld 151 on 4/20/80, [actually 4/2/80] and 153 on 4/24/80," CASE is apparently

speculating on Mr. Cole's ability as an inspector. There is no indication that weld 153 was improperly inspected. The NCR clearly states that the backing bar had been ground through. No evidence exists which indicates that the backing bar was not intact when Mr. Cole performed his inspection on 4/24/80, and, as CASE notes, the incident (grinding through the backing bar) was properly reported as nonforming. In the other incident described, i.e., the failure of the backing bar to continue for the full length of the weld at the intersection of welds 166 and 153, CASE again seems to allege that this weld was improperly inspected by Mr. Cole. Although not extremely clear from the face of the document, what Mr. Halcomb, the originator of the NCR, was attempting to indicate by attaching the Chit for first fit-up of weld 154, was that the "deficient" backing strip was from weld 154, not from weld 151. Therefore, Mr. Cole clearly was not involved with this deficiency. The deficient condition becomes clearer after looking at the drawing. Weld 151 is a vertical weld which attaches a plate (A35) to a gate guide. Although the vertical weld continues on down the gate guide, it is numbered differently for each plate it attaches. Welds 151, 155, 157, and 159 all form the vertical weld which attaches a gate guide to plates A35, B35, M35 and M35, respectively. This weld (although 4 weld numbers) was fit up on 5/17/79. The backing strip for this weld (weld numbers 151, 155, 157, and 159) was continuous for the length of the weld. The fact

that the backing strip for weld 154 lacked 3/8" from running the full length of the weld was properly reported on an NCR, and is attributable to inspector error.

Q33. On page 26 of Exhibit 1, CASE refers to a numbering discrepancy which was reported on NCR M-83-00907. What significance, if any, is there for this allegation?

A33. This allegation is correct, however without significance. In this case the construction group which issued the travelers, assigned separate weld numbers for the welds attaching the backing strip and leak chase to the gate guide. Although clearly indicated on the traveler, the millwrights were not timely in assignment of these weld numbers to the marked-up drawing which they were procedurally required to maintain. This condition was properly identified by QC on an NCR and the situation was corrected. In no way was this an inspection deficiency.

Q34. Mr. Brandt, on page 27 of Exhibit 1, CASE identifies two nonconformance reports, NCR M84-01969 and NCR M84-00498. Have you had a chance to review CASE's allegation regarding these NCRs?

A34. Quite frankly, I am unable to find that CASE alleges anything with regard to these two NCRs. Both identified problems, and both were properly dispositioned in accordance with site procedures. CASE's note regarding the absence of a copy of the NCR in all of the packages is not a violation of any requirement. As I stated earlier, the original NCR is filed in a location separate from the

traveler package. All packages do contain the corrected PT report and reference NCR M-84-00948. Other than the deficiency which was reported on these two NCRs, I am not aware of any deficiency in the way they were processed or dispositioned.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Prefiled Testimony of C. Thomas Brandt Regarding CASE's Further 'Evidence' of a Quality Control Breakdown in the Construction, Installation and Inspection of the Stainless Steel Liner Plate" in the above-captioned matter were served upon the following persons by hand-delivery or deposit in the United States mail,* first class, postage prepaid, this 20th day of November, 1984:

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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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Bruce L. Downey

cc: Homer C. Schmidt
John W. Beck
Robert Wooldridge, Esq.

20594

Brown & Root, Inc. HOUSTON, TEXAS

WELD PROCEDURE NO. 38023
REVISION 4
PAGE 1 OF 2

APPLICABLE CODE(S)
ASME Sec. IX
ASME Sec. III
ANSI B31.1

WELD PROCEDURE SPECIFICATION
COMANCHE PEAK STEAM ELECTRIC STATION

SUPPORTING PQR(S)
08088A204 Rev. 3
08088A106 Rev. 4
08088A114 Rev. 1

BASE METAL
P NO. 8 GROUP 1 TO P NO. 8 GROUP 1
THICKNESS RANGE 0.065" through 0.750"
DIAMETER RANGE Unlimited

JOINT PREPARATION
Weld ends may be prepared by machining, flame arc cutting, and/or grinding.

PROCESS(ES)
Gas Tungsten Arc

CLEANING (INITIAL & INTERPASS)
Weldor surfaces shall be wire brushed or ground as required to remove slag, scale, or other contaminants.

POSITION
All Positions
PROGRESSION Upward

GAS
SHIELDING Argon FLOW RATE 15 CFH Min.
PURGE Argon (1) FLOW RATE 5 CFH Min.
TRAILING N/A FLOW RATE N/A

FILLER METAL
PROCESS GTAW SFA NO. 5.9 F NO. 6 A NO. 3
PROCESS N/A SFA NO. N/A F NO. N/A A NO. N/A
OTHER N/A

FLUX
CLASSIFICATION N/A
PARTICLE SIZE N/A
TRADE NAME N/A

VOID

CPSES DOCUMENT CONTROL CENTER COPY

PREHEAT
PREHEAT TEMP., °F 600F
INTERPASS RANGE, °F 600F - 800F

POST WELD HEAT TREATMENT
TYPE None
TEMPERATURE N/A
TIME N/A

ADDITIONAL OR SUPPLEMENTARY REQUIREMENTS

1. Prior to the start of welding, the exiting gas from the purge area shall be checked for its oxygen content. Oxygen content of the exiting gas must be 2% or below before welding can commence. The purge shall be maintained for at least two (2) passes (i.e., Root and one Fill).

2. All weld joints shall be free of moisture, oxide, grease, oil and protective coatings. All slag and/or surface defects shall be removed as prescribed from each weld bead prior to the continuation of welding.

(1) Purge requirement shall be deleted when backing strip is utilized.

PREPARATION APPROVAL — DATE
[signature] 9-20-78
WELDING ENGINEERING
[signature] 9-20-78
MATERIALS ENGINEERING
[signature] 9-20-78
QUALITY ASSURANCE

ISSUE DATE September 20, 1978
NSSS SUPPLIER N/A
ENGINEER Approval GHF 3230 10-6-78
PROJECT NO. CR-0172

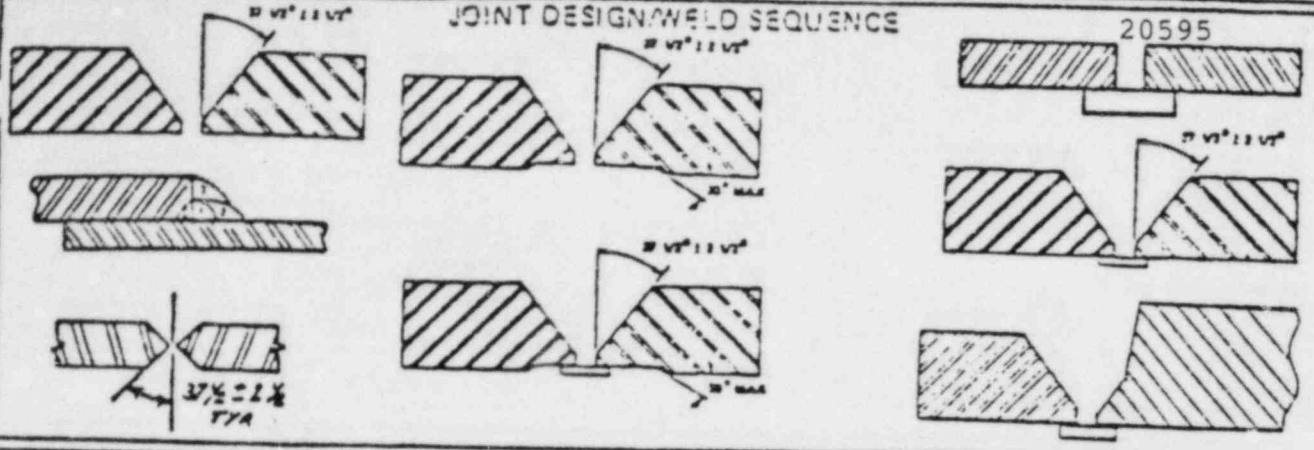
ATTACHMENT 1

P NO. 8 GROUP 1 TO P NO. 8 GROUP 1
THICKNESS RANGE 0.0625" TO 0.750"

REVISION 4
PAGE 2 OF 2

JOINT DESIGN/WELD SEQUENCE

20595



WELD PARAMETERS

PASS	PROCESS	FILLER METAL SIZE	FILLER METAL CLASS	GAS/FLUX TYPE	GAS/FLUX Min. FLOW	ELECTRICAL DATA TYPE	ELECTRICAL DATA AMPERAGE	ELECTRICAL DATA VOLTS	TRAVEL IPM	MAX. BEAD WIDTH
1	GTA	1/16"	See Note 7	Argon	15 CFH	DCSP	100 Max.	11 Max.	-	3/8"
		or								
	GTA	3/32"	See Note 7	Argon	15 CFH	DCSP	100 Max.	11 Max.	-	3/8"
2-3	GTA	1/16"	See Note 7	Argon	15 CFH	DCSP	115 Max.	11 Max.	-	3/8"
		or								
	GTA	3/32"	See Note 7	Argon	15 CFH	DCSP	115 Max.	11 Max.	-	3/8"
4&ON	GTA	3/32"	See Note 7	Argon	15 CFH	DCSP	140 Max.	11 Max	-	3/8"
		or								
	GTA	1/8"	See Note 7	Argon	15 CFH	DCSP	140 Max.	11 Max	-	3/8"

PREHEAT	60°F	BACK GOUGING METHOD	N/A
INTERPASS TEMP.	60°F - 350°F	CONTACT TUBE TO WORK (IN.)	N/A
SINGLE OR MULTIPLE ARC	Single	ORIFICE OR CUP SIZE	3/8" Min
SINGLE OR MULTIPLE PASS	Multiple	WELD PROGRESSION	Upward

SPECIAL INSTRUCTIONS

1. Preheat shall be established prior to the start of welding.
2. The interpass temperature (above 150°F) shall be checked using temperature indicating crayons or an approved equal.
3. The number of weld beads may vary with section thickness.
4. The starts and stops of all tack welds shall be tapered by grinding so that the initial pass can be properly consume the tack.
5. Tack welds which are used at the root of joints shall be complete penetration.
6. The non-consumable electrode for the Gas Tungsten Arc process shall conform to AWS A5.12 Class EWTh-1 (1% Thoriated Tungsten) or Class EWTh-1 (2% Thoriated Tungsten).
7. The type of bare wire selected for the base metal to be welded shall be as follows:

BASE METAL TYPE	BARE WIRE TO BE USED
304 or 304L to 304 or 304L	ER308 or ER308L
316 or 316L to 316 or 316L	ER316 or ER316L
304 or 304L to 316 or 316L	ER316 or ER316L

Brown & Root, Inc. HOUSTON, TEXAS

PQR No. 0808AA204 Rev. 3

PROCEDURE QUALIFICATION RECORD

20596

Material Spec. SA-312 TP304 to SA-312 TP304

P No. 8 Gr. No. 1 to P No. 8 Gr. No. 1 Thickness and O.D. .280" Wall Thickness x 6.0"O.D.

Welding Processes 1. Gas Tungsten Arc 2. N/A

Manual or Automatic 1. Manual 2. N/A

Thickness Range 1. - 2. N/A

Total Qualified Thickness Range 0.0525" thru .550"

FILLER METAL

F-No.	1. 6	2. N/A
A-No.	1. 8	2. N/A
SFA Spec.	1. 5.9	2. N/A
AWS Class.	1. ER308	2. N/A
Filler Size	1. 3/32"	2. N/A
Trade Name	1. ARCOS	
	2. N/A	

Describe Filler Metal if not included in Section IX
1/8" x 5/32" Arcos Consumable Insert

FLUX OR ATMOSPHERE

Trade Name	1. -	2. N/A
Shielding Gas	1. Argon	2. N/A
Flow Rate	1. 16CFH Min.	2. N/A
Purge	1. 16CFH Min.	2. N/A

WELDING PARAMETERS

Joint Type	Single Vee Groove Weld	
Position	6G Upward	
Backing	Consumbale Insert (Type K)	
Preheat	60°F	
IPT Range	60°F - 350°F	
PWHT	None	
Passes/Side	1. Multiple	2. N/A
No. of Arcs	1. Single	2. N/A
Current	1. DCSP	2. N/A
Amps	1. 70-100	N/A
Volts	1. 8-10	N/A
Travel Speed	1. 1" - [illegible]	N/A
Deviation	1. 3/8"	N/A
Bead Type	1. Strin[illegible]	/A

TENSILE TEST

Specimen No.	Dimensions Width	Thickness	Area	Ultimate Total Load Lb.	Ultimate Unit Stress psi.	Type of Failure and Location
QW-462.1(b)#1	0.724	0.208	.1506	13,100	87,000	Weld
QW-462.1(b)#2	0.710	0.205	.1474	13,300	90,200	Weld

GUIDED BEND TESTS

Type and Figure No.	Result	Type and Figure No.	Result
QW-462.3(a) Face	Satisfactory	QW-462.3(a) Root	Satisfactory
QW-462.3(a) Face	Satisfactory	QW-462.3(a) Root	Satisfactory

Welder's Name Jimmy E. Hite Clock No. 2314 Stamp No. AAC

Who by virtue of these tests meets welder performance requirements.

Test Conducted by Southwestern Laboratories Laboratory Test No. 29559-60

per Mr. Don Sorow Address Houston, Texas

Date 2-20-76

We certify that the statements in this record are correct and that the test welds prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Signed BROWN & ROOT, INC.
(Manufacturer)

Date 3-7-78 By [signature]

Brown & Root, Inc. HOUSTON, TEXAS

PQR No. 08099A204 Rev. 3

SUPPLEMENTAL TESTS

TOUGHNESS TEST TYPE _____ PER _____
SIZE _____ PER _____ 20597

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER. _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

CHEMICAL ANALYSIS % METHOD Wet Chemical PER ASTM E350-74

ELEM.	C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Ti	N	Cb	Fe
WELD	.038	1.76			.42	19.89	9.45	.29			.059	0.0	
	Approximate Delta Ferrite Content: 9% (Schaeffler Diagram per Figure NA32-1 of the ASME Section III Code)												

ADDITIONAL TESTS

Delta-ferrite tests were conducted on the completed weld at 12:00, 3:00, 6:00, and 9:00 o'clock with a severn ferrite indicator. All positions recorded a 7.5 to 10% delta-ferrite content.

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No. 08099A204 Rev. 3 and the requirements of N/A.

Signed BROWN & ROOT, INC.

Date 3-7-78

By A. A. Fonseca

Brown & Root, Inc. HOUSTON, TEXAS

PQR No. 0308AA204 Rev. 3

SUPPLEMENTAL TESTS

TOUGHNESS TEST TYPE _____ PER _____

SIZE _____ PER _____ 20598

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

CHEMICAL ANALYSIS % METHOD _____ PER _____

ELEM.	C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Ti							Fe
WELD																	
BASE																	

ADDITIONAL TESTS

Bend tests were examined at 10X magnification after bending to meet the acceptance criteria of "Interm Regulatory Guide 1.31." No fissures exceeding 1/64" were present.

Radiographic Report of Welder Qualification: Radiographic report MQRT 00009, was run in accordance with Section IX, 1974, Paragraph QW-142. The acceptance criteria of Section VIII, Division 1 was herein met.

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No. 0308AA204 Rev. 3 and the requirements of N/A.

Signed BROWN & ROOT, INC.

Date 3.7.78

By [signature]

Brown & Root, Inc. HOUSTON, TEXAS	PQR No. 0808AA204 Rev.3
SUPPLEMENTAL TESTS	Page 4 of 4

TOUGHNESS TEST · TYPE _____ PER _____
SIZE _____ PER _____ 20599

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

Two (2) specimens were sensitization tested in accordance with ASMT A262-70, Practice E. Specimens were examined at 20X magnification for presence of microcracking. No fissures were present.

The following parameter excerpts have been extracted from the actual parameters utilized within qualification of said procedure and are calculated to asseverate that the maximum energy input range during qualification is within that prescribed by the PSAR.

ADDITIONAL TESTS

		ENERGY INPUT RANGE
GTAW Process		
Amperage	80	90
Voltage	10	8
Travel Speed (in. per/min.)	2.0	1.0
Kilojoules/inch	24.000 min.	43.200 max.

Note: Parameters noted are indicative of the maximum and minimum energy input range and do not necessarily reflect the maximum/minimum amperage/voltage utilized during qualification

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No 0808AA204 Rev. 3 and the requirements of N/A

Date 3.7.78

Signed BROWN & ROOT, INC.

By _____

Brown & Root HOUSTON, TEXAS

PQR No. 0803A8106 Rev. 4

PROCEDURE QUALIFICATION RECORD

20600

Material Spec. SA-312 TP 304 to SA-312 TP 304

P No. 8 Gr. No. 1 to P No. 8 Gr. No. 1

Thickness and O.D. 0.280" Nom. Thickness x 6.0"

Welding Processes	1. Gas Tungsten Arc	2. Shielded Metal Arc
Manual or Automatic	1. Manual	2. Manual
Thickness Range	1. -	2. -

Total Qualified Thickness Range 0.0625" thru 0.560"

FILLER METAL

F-No.	1. 6	2. 5
A-No.	1. 8	2. 8
SFA Spec.	1. 5.9	2. 5.4
AWS Class.	1. ER308	2. E309-16
Filler Size	1. 3/32"	2. 3/32"&1/8"
Trade Name	1. Arcos	
	2. Arcos	

Describe Filler Metal if not included in Section IX

N/A

FLUX OR ATMOSPHERE

Trade Name	1. -	2. N/A
Shielding Gas	1. Argon	2. N/A
Flow Rate	1. 15 CFH Min.	2. N/A
Purge	1. 10 CFH Min.	2. N/A

WELDING PARAMETERS

Joint Type	Single Vee Groove Weld	
Position	6G Upward	
Backing	None	
Preheat	60°F	
IPT Range	60°F-350°F	
PWHT	None	
Passes/Side	1. Multiple	2. Multiple
No. of Arcs	1. Single	2. Single
Current	1. DCSP	2. DCRP
Amps	1. 89-95	2. 70-95
Volts	1. 8-10	2. 16-22
Travel Speed	1. 3-4 IPM	2. 2.5-5.0 IPM
Oscillation	1. 5/16" Max.	2. 5/16" Max.
Bead Type	1. Stringer	2. Stringer

TENSILE TEST

Specimen No.	Dimensions Width	Dimensions Thickness	Area	Ultimate Total Load Lb.	Ultimate Unit Stress psi	Character of Failure And Location
QW-462.1(b) #1	.732	.146	.1069	9,750	91,200	Weld
QW-462.1(b) #4	.733	.156	.1143	10,100	88,400	Weld

GUIDED BEND TESTS

Type and Figure No.	Result	Type and Figure No.	Result
QW-462.3(a) Face	Satisfactory	QW-462.3(a) Root	Satisfactory
QW-462.3(a) Face	Satisfactory	QW-462.3(a) Root	Satisfactory

Welder's Name Jimmy Hite Clock No. 2314 Stamp No. AAC

Who by virtue of these tests meets welder performance requirements. Laboratory Test No. 17923

Test Conducted by Southwestern Laboratories Address 222 Cavalcade, Houston, TX

per Henry Wabenicht Date May 6, 1975

We certify that the statements in this record are correct and that the test welds prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Signed Brown & Root, Inc. (Manufacturer)

Date 9-20-78 By T. J. Patarozzi

Brown & Root, Inc. HOUSTON, TEXAS

PQR No 0308AB106 Rev. 4

SUPPLEMENTAL TESTS

TOUGHNESS TEST TYPE _____ PER _____ 20601

SIZE _____ PER _____

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

CHEMICAL ANALYSIS % METHOD Wet Chemical PER ASTM E350-74

ELEM.	C	Mn	P	S	Si	Cr	Ni	Mo	Cu	Ti	N	Cb				Fe
WELD	.079	1.59			.70	19.79	9.13	.29			.060	0.0				
BASE	Approximate Delta Ferrite Content: 7% (Schaeffler Diagram per Figure 2433-1 of the ASME Section III Code).															

ADDITIONAL TESTS

Bend tests were examined at 10X magnification after bending to meet the acceptance criteria of "Interim Regulatory Guide 1.31." No fissures were present.

Radiographic Report of Welder Qualification: Radiographic report WQRT 00030 was run in accordance with Section IX, 1974, Paragraph QW-142. The acceptance criteria of Section VIII, Division I was herein met.

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No. 0308AB106 Rev. 4 and the requirements of N/A.

Signed Brown & Root, Inc.

Date 9-20-78

By T. J. Pattani

Brown & Root, Inc. HOUSTON, TEXAS

PQR No. 0308-AA-114 Rev. 1

SUPPLEMENTAL TESTS

TOUGHNESS TEST TYPE _____ PER _____
SIZE _____ PER _____ 20602

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

CHEMICAL ANALYSIS % METHOD Wet Chemical PER ASTM E350-74

ELEM.	C	Mg	Si	Ni	Mo	Cr	N	Cb		
WELD	.013	1.61	.35	9.38	.07	19.96	.0526	<.01		

Approximate Delta Ferrite Content: 10% (Schaeffler Diagram per Figure 2433-1 of the ASME Section III Code)

ADDITIONAL TESTS

1. Bend tests were examined at 10X magnification after bending to meet the acceptance criteria of "Interim Regulatory Guide 1.31." No fissures were present.
2. Delta-Ferrite tests were conducted at twelve (12) points (six per side), along the length of the procedure qualificationcoupon. Ferritescope MTE/725 was used and the following results noted:

Position	Delta-Ferrite Number
All	All positions ranged between 9.5 and 11.5

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No. 0308-AA-114 Rev. 1 and the requirements of N/A

Date 9-20-78

Signed Brown & Root, Inc.

By T. J. Dalrymple

Brown & Root, Inc. HOUSTON, TEXAS

PQR No. 080SAA114 Rev. 1

SUPPLEMENTAL TESTS

TOUGHNESS TEST TYPE _____ PER _____
SIZE _____ PER _____ 20603

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

ADDITIONAL TESTS

1. Two (2) specimens were sensitization tested in accordance with ASTM A262-70, Practice E. Specimens were examined at 20X magnification for presence of microcracking. No fissures were present. In addition, Westinghouse Document WCAP - 8678 states that energy input of 80 KJ/inch for base metal thickness of 3/4" resulted in no sensitization of the base metal.

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No 080SAA114 Rev. 1 and the requirements of N/A

Signed Brown & Root, Inc.

Date 9-20-78

By T. J. Portanova

Brown & Root, Inc. HOUSTON, TEXAS	PQR No. 0809AB106 Rev. 4
SUPPLEMENTAL TESTS	Page 3 of 3

TOUGHNESS TEST TYPE _____ _____ PER _____ 20604
SIZE _____ PER _____

SPECIMEN IDENTIFICATION	TEST TEMP	NOTCH LOCATION	ENERGY FT-LBS	MILS LAT. EXP	% SHEAR	DROP WEIGHT BREAK	DROP WEIGHT NO BREAK

HARDNESS TEST TYPE _____ PER _____

NO.	WELD METAL	HEAT AFFECTED ZONE	BASE METAL

FILLET WELD TEST FIG _____

MACRO TEST RESULTS	FRACTURE TEST RESULTS

ADDITIONAL TESTS

1. Delta Ferrite tests were conducted on the completed weld test pad at six equidistant locations at the centerline with a severn ferrite indicator. All positions recorded the following delta-ferrite content:

   Greater than 7.5, less than 10%.

2. Two (2) specimens were sensitization tested in accordance with ASTM A262-70, Practice E. Specimens were examined at 20X magnification for presence of microcracking. No fissures were present. In addition, Westinghouse document WCAP-8678 states that energy input of 80 KJ/inch for base metal thickness of 3/4" resulted in no sensitization of the base metal.

We certify that the statements in this record are correct and that the tests were conducted in accordance with PQR No. 0809AB106 Rev. 4 and the requirements of N/A

Signed Brown & Root, Inc.

Date 9-20-78

By T. T. Tanaji

Brown & Root, Inc. HOUSTON, TEXAS | PQR No. 0809AA114 Rev.

PROCEDURE QUALIFICATION RECORD

Material Spec. SA-240 Type 304L to SA-240 Type 304L 20605
P No. 8 Gr. No. 1 to P No. 8 Gr. No. 1 Thickness and O.D. 1-3/4" plate
Welding Processes 1. Gas Tungsten Arc 2. N/A
Manual or Automatic 1. Manual 2. N/A
Thickness Range 1. - 2. N/A
Total Qualified Thickness Range 0.1875" thru 3.500"

FILLER METAL

F-No.	1. 6	2. N/A
A-No.	1. 8	2. N/A
SFA Spec.	1. 5.9	2. N/A
AWS Class.	1. ER308 & 308L	2. N/A
Filler Size	1. 3/32" & 1/8"	2. N/A
Trade Name	1. 3/32" Arcos; 1/8" Sandvik	
	2. N/A	

Describe Filler Metal if not included in Section IX

FLUX OR ATMOSPHERE

Trade Name	1. -	2. N/A
Shielding Gas	1. Argon	2. N/A
Flow Rate	1. 20 CFH Min.	2. N/A
Purge	1. 20 CFH Min.	2. N/A

WELDING PARAMETERS

Joint Type	Double Vee Groove Weld	
Position	2G	
Backing	None	
Preheat	60°F	
IPT Range	110°F through 350°F	
PWHT	None	
Passes/Side	1. Multiple	2. N/A
No. of Arcs	1. Single	2. N/A
Current	1. DCSP	2. N/A
Amps	1. 100-130	2. N/A
Volts	1. 11	2. N/A
Travel Speed	1. 2.1-4.0 IPM	2. N/A
Oscillation	1. 3/8" Max	2. N/A
Bead Type	1. Stringer	2. N/A

TENSILE TEST

Specimen No.	Dimensions Width	Thickness	Area	Ultimate Total Load Lb.	Ultimate Unit Stress psi	Character of Failure And Location
QW-462.1(a) #1	1.002	1.614	1.617	144,700	89,487	Weld Metal
QW-462.1(a) #2	1.005	1.491	1.498	134,000	89,453	Weld Metal

GUIDED BEND TESTS

Type and Figure No.	Result	Type and Figure No.	Result
QW-462.2(a) Side	Satisfactory	QW-462.2(a) Side	Satisfactory
QW-462.2(a) Side	Satisfactory	QW-462.2(a) Side	Satisfactory

Welder's Name Curtis Marquis S.S.No. 260-64-7775 Stamp No. AAJ
Who by virtue of these tests meets welder performance requirements.
Test Conducted by Materials Engineering Lab. Laboratory Test No.
per G. E. Dawson Address 3100 Clinton Dr., Houston, Texas
Date March 9, 1978

We certify that the statements in this record are correct and that the test welds prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Signed Brown & Root, Inc.
(Manufacturer)
Date 9-20-78 By T. J. Portargain

Brown & Root, Inc. HOUSTON, TEXAS

WELDING PROCEDURE NO WPS – 83025
REVISION 3
PAGE 1 OF 2

WELDING CODE
ASME B & PV SECTION IX

WELDING PROCEDURE SPECIFICATION

SUPPORTING PQR(S)
20606
*0809AA114 Rev. 3

WELDING PROCESS(ES) 1. Gas Tungsten Arc TYPE Manual
2. N/A TYPE N/A

BASE METALS (QW-403)
P No. 8 Gr. No. 1 to P No. 8 Gr. No. 1
Thickness Range .187 thru 1.5 IN
Pipe Dia Range Unlimited IN.
Range for Fillet. Thk All Dia. Unlimited IN

POSTWELD HEAT TREATMENT (QW-407)
Type N/A
Temperature N/A °F
Time Range N/A

FILLER METALS (QW-404)
F No. 1. 6 2. N/A
A No. 1. 8 2. N/A
SFA Spec. No. 1. 5.9 2. N/A
AWS Class. No. 1. ER308 2. N/A
Size of Electrode 1. N/A 2. N/A IN.
Size of Filler 1. 3/32, 1/8 2. N/A IN.
Electrode – Flux Class N/A
Consumable insert N/A

GAS (QW-408)
Shielding Gas 1 Argon
Percent Comp. 100
Shielding Gas Flow Rate 15 CFH (min.)
Purge Gas Argon (6) Flow Rate 5 CFH (min.)
Trailing Shielding Gas Composition N/A

ELECTRICAL CHARACTERISTICS (QW-409)
Current 1. DCSP 2. N/A
Amps Range 1. 50-150 2. N/A
Volts Range 1. 8-14 2. N/A
Tungsten Elec. Size/Type 1/16"-1/8"/EsTh-1 or 2

POSITION (QW-405)
Welding Position All
Welding Progression Upward

TECHNIQUE (QW-410)
String or Weave Bead 1. Stringer 2. N/A
Orifice or Gas Cup Size 1/4 - 1/2 IN
Initial and Interpass cleaning: Welding surfaces shall be wire brushed or ground as required to remove slag, scale or other contaminants.
Method of back gouging N/A

PREHEAT (QW-406)
Preheat Temp 60 °F (Min)
Interpass - Temp. Range 60-350 °F
Preheat Maint BU °F

Oscillation 1. N/A 2. N/A IN
Contact Tube to work distance N/A IN.
Multiple or Single Layer 1. Multiple
(Per Side) 2. N/A
Multiple or single electrodes Single
Travel Speed (Range) 1. N/A 2. N/A IPM
Peening: N/A

JOINT DESIGN (QW-402)
Groove Design Single V or U
Joint Type OB Yes OI N/A BS No
Backing Matl Type Similar to base material

REMARKS *This PQR includes Supplemental Test Results.

Prior to the start of welding, the existing gas shall be checked for oxygen content. It must be 2% or lower before welding can commence. Maintain purge for at least two layers (i.e., root and one fill). Westinghouse supplied components require purge maintenance for at least three layers (i.e., root and two fills).

PREPARATION/APPROVAL
Welding Engineering — DATE 10-12-77
Materials Engineering — 10-12-77
Quality Assurance — 10-12-77

Fab. Code: ASME Section III, ANSI B31.1
Project CPSES
Job No. CR-0171

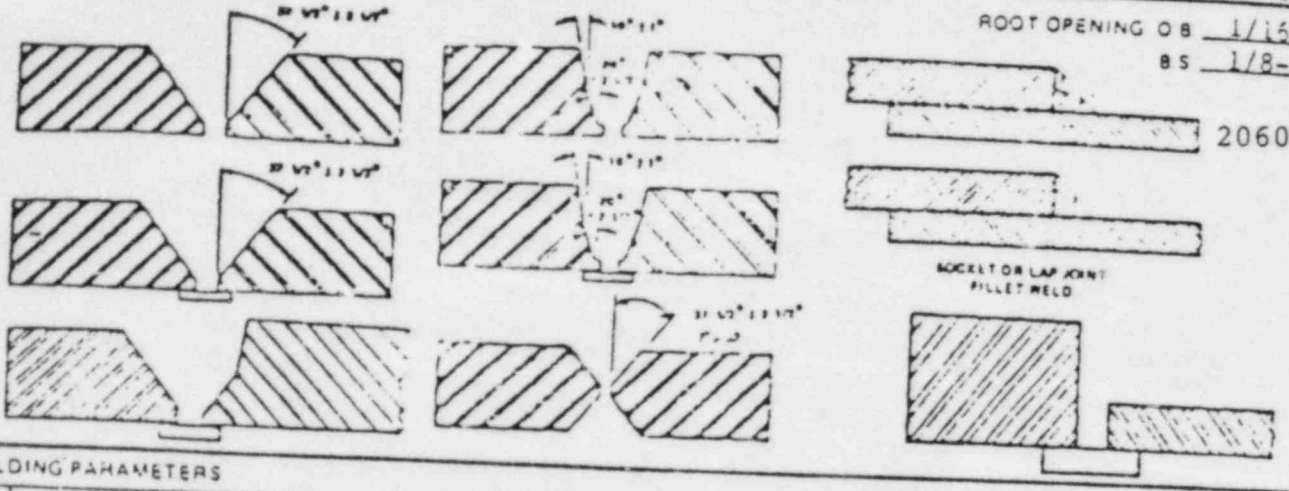
ATTACHMENT 2

WELDING TECHNIQUE SHEET

P NO. 8 GROUP 1 TO P NO 8 GROUP 1
THK. RANGE .197 thru 3.50 IN

WELDING PROCEDURE NO.
WPS 88025
REVISION 3
PAGE 2 OF 2

TYPICAL JOINT DESIGNS PERMITTED



ROOT OPENING O B 1/16-3/16 IN
B S 1/8-1/4 IN

20607

WELDING PARAMETERS

*SINGLE VALUES ARE MINIMUM

LAYER	WELDING PROCESS	FILLER METAL SIZE (IN.)	FILLER METAL AWS CLASS	GAS TYPE	GAS FLOW RATE* CFH SHIELD	GAS FLOW RATE* CFH PURGE	ELECTRICAL DATA TYPE/ POLAR	ELECTRICAL DATA AMPERAGE RANGE	ELECTRICAL DATA VOLTS RANGE	TRAVEL SPEED (IPM)	MAX BEAD WIDTH (IN.)
1-3	GTA or	3/32	See Note 5	Argon	15	5	DCSP	50-150	8-14	N/A	3/8
	GTA	1/8	See Note 5	Argon	15	5	DCSP	50-150	8-14	N/A	3/8
Alt. 3 & on	GTA or GTA	3/32	See Note 5	Argon	15	N/A	DCSP	50-150	8-14	N/A	3/8
		1/8	See Note 5	Argon	15	N/A	DCSP	50-150	8-14	N/A	3/8

Maximum thickness of any single deposited layer shall not exceed 1/2".

PREHEAT TEMP 60 °F (Min.)
INTERPASS TEMP 60-350 °F
PREHEAT MAINT. 60 °F
TUNGSTEN ELECT SIZE & TYPE 1/16-1/8 IN
EWTh 1 or 2

PEENING Not allowed
BACK GOUGING METHOD N/A
CONTACT TUBE TO WORK DIST. N/A IN
ORIFICE OR CUP SIZE 1/4 - 1/2 IN
WELDING PROGRESSION Upward

INSTRUCTIONS

1. Preheat and interpass temperature (above 150°F) shall be checked using temperature indicating crayons or an approved equal.
2. Tack welds shall employ the parameters for the root pass.
3. Tack welds shall be complete fusion; the starts and stops shall be tapered by grinding so that the initial pass will properly consume the tack.
4. All welding shall utilize stringer beads.
5. Bare wire selected for the base metal to be welded shall be as follows:

BASE METAL TYPE	ARE WIRE TO BE USED
304 or 304L to 304 or 304L	ER308 or ER308L
316 or 316L to 316 or 316L	ER316 or ER316L
304 or 304L to 316 or 316L	ER316 or ER316L

For Westinghouse supplied Reactor Coolant Piping, ER308 will be used for base metal type 304 or 304L to 316 or 316L.

6. Purge requirement may be deleted for socket welds or when specified by the Project Welding Engineer.
7. Preheat maintenance shall be continuous during welding only; cool completed weld in still air.
8. Variation in the joint geometries shown above is permitted provided the joint is single or double welded and the root spacing maintained within the specified tolerances.

Brown & Root, Inc. HOUSTON, TEXAS		WPS NO. 88025

WELDING PROCEDURE SPECIFICATION CHANGE NOTICE 20608

CURRENT REVISIONS ARE INDICATED BY CHANGE BARS.

REV.	DATE	ORIGINATOR	APPROVAL*
1	9-[illegible]	J. Bronicki	R P Chichester
2	3-20-79	J. Bronicki	R P Chichester
3	10-[illegible]	J. Bronicki	R P Chichester

REVISION NO.	DESCRIBE THE CHANGE
1	Noted PDR revision. Revised thickness range, joint details, maximum values of amps and volts and deleted reference to travel speeds.
2	Retyped on new form. Added the following information: fillet weld [illegible] and diameter, electrode - flux classification, product maintenance, joint description, trailing shielding gas, tungsten size and type, bead type, initial and interpass cleaning, back gouging method, oscillation and root spacing. Noted PQR revision. Added [illegible] to amp and volt values. Added Westinghouse requirement for RCP welds.
3	Added preheat maintenance, [illegible], root spacing, cup size ranges and notes 7 and 8. Noted PQR revision. Revised thickness range. Added layer thickness limitation.

* REVISIONS MUST BE APPROVED BY THE MANAGER OF MATERIALS ENGINEERING OR HIS DESIGNEE

Brown & Root, Inc. HOUSTON, TEXAS

WPS/PQR NO. 0508AA114

CHANGE NOTICE
PROCEDURE QUALIFICATION RECORD
QUALIFYING WELDING PROCEDURE SPECIFICATION

20609

ESSENTIAL VARIABLES CANNOT BE CHANGED

CURRENT REVISIONS ARE INDICATED BY CHANGE BARS.

WPS.PQR	REV.	DATE	ORIGINATOR	APPROVAL*
PQR	1	[illegible]	[illegible]	[illegible]
PQR	2	[illegible]	[illegible]	[illegible]
WPS.PQR	3	[illegible]	[illegible]	[illegible]

WPS/PQR.	REVISION NO.	DESCRIBE THE CHANGE
PQR	1	Deletion of heat input parameters and addition of Westinghouse WCAP-8678 reference.
PQR	2	Retyped on new form. Added the following information: WPS number, joint sketch & dimensions, O.D. range qualified, thickness range qualified per process, electrode size, electrode-flux class., consumable insert, welding progression, PWHT type & time range, purge flow rate, bead width, orifice or gas cup size. Changed "passes/side" to "multi or single layer", "number of arcs" to "multiple or single electrode". Deleted reference to "atmosphere trade name", "backing", and "who by virtue of these tests meets welder performance requirements". Changed filler trade name to "N/A". Information previously indicated under "oscillation" is entered under "bead width" and filled "N/A" under oscillation. Changed welding pos & purge flow rate from 20CFH min. to 2.
WPS	3	Deleted reference to supporting PQR and added peening, preheat maintenance and cup size range.
PQR	3	Change "thickness range qualified" to "deposited weld metal thickness". Added joint dimension information, tungsten size and type, peening and backgouging.

* REVISIONS MUST BE APPROVED BY THE MANAGER OF MATERIALS ENGINEERING OR HIS DESIGNEE

Brown & Root, Inc.

HOUSTON, TEXAS

ASME SEC IX

Welding Procedure Specification No. 0808AA114 Date 3-13-78

Revisions 3

20610

WELDING PROCESS(ES) 1 Gas Tungsten Arc TYPE Manual

2 N/A TYPE N/A

BASE METALS (QW-403)

P No 8 Gr. No 1 to P No 8 Gr. No 1

Thickness Range .187 thru 3.5 IN

Pipe Dia. Range Unlimited

POSTWELD HEAT TREATMENT (QW-407)

Type N/A

Temp N/A °F

Time N/A

FILLER METALS (QW-404)

F No. 1 6 2 N/A

A No 1 8 2 N/A

SFA Spec No 1 5.9 2 N/A

AWS Class No 1 ER308L 309L 2 N/A

Size of Electrode 1 N/A 2 N/A

Size of Filler 1 3/32, 1/8 2 N/A IN

Electrode – Flux Class N/A IN

Consumable Insert N/A

GAS (QW-408)

Shielding Gas(es) Argon

Percent Comp. 100

Shielding Gas Flow Rate 20 Min.

Flow Rate 20 Min. CFH

Trailing Shielding Gas Composition N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current 1 DCSP 2 N/A

Amp. Range 1 100-130 2 N/A

Volt Range 1 9-14 2 N/A

Tungsten Elec. Size Type 1/16"-1/8"/EWTh-1or2

POSITION (QW-405)

Welding Position 2G

Welding Progression N/A

TECHNIQUE (QW-410)

String or Weave Bead 1 Stringer 2 N/A

Bead Width 1 3/8" 2 N/A IN. (Max.)

Orifice or Gas Cup Size 1 1/4-1/2 2 N/A IN

Initial and Interpass Cleaning: Welding surfaces shall be wire brushed or ground as required to remove slag, scale or other contaminants.

Method of back gouging Arc air and/or Grinding

Oscillation 1 N/A 2 N/A IN

Contact Tube to Work Distance N/A IN

Multiple or Single Layer 1 Multiple

(Per Side) 2 N/A

Multiple or Single Electrodes Single

Travel Speed Range 1 Manual 2 N/A IPM

Peening Not Allowed

PREHEAT (QW-406)

Preheat Temp 60 °F (Min.)

Interpass - Temp. Range 110-350 °F

Preheat Maint. N/A

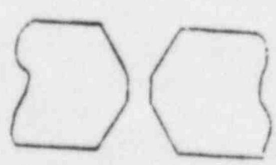
JOINT DESIGN (QW-402)

Groove Design Double V

Joint Type DB Yes CI N/A BS N/A

Backing Mat'l Type N/A

Sketch/Comments



Gap: 1/8"

Land: 1/16" + 1/32", -0

Bevel: 37-1/2° ± 2-1/2°

Prepared by

WELDING ENGINEERING DATE 6-18-79

Approved by

MATERIALS ENGINEERING DATE 6-18-79

BROWN & ROOT, INC. HOUSTON, TEXAS

PROCEDURE QUALIFICATION RECORD

PQR No.	Rev.
[illegible]114	[illegible]
WPS No.	
[illegible]114	[illegible]

WELDING PROCESS (ES) 1. Gas Tungsten Arc TYPE Manual
2. N/A TYPE [illegible]

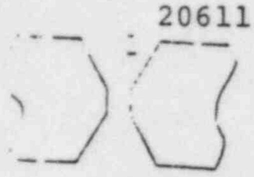
BASE METALS (QW-403)

Mat'l Spec. SA - 240 To SA - [illegible]
Type or Grade 304L [illegible]
P No 8 Gr. No 1 To P No 8 Gr No [illegible]
Coupon OD N/A Thickness 1.75 [illegible] IN.
O. D. Range Qualified Unlimited
Deposited Weld Metal Thk 1 1.75 2. N/A IN.
Total Thk Range Qualified [illegible] IN.

JOINTS (QW-402)

[illegible]
Angle [illegible]
Root [illegible]
Opening N/A
B S
Mat'l N/A

20611



(Joint Design Used)

FILLER METALS (QW-404)

F No. 1. 6 2.
A No. 1. 8 2. N/A
SFA Spec. No. 1. 5.9 2. N/A
AWS Class. No. 1 ER308, 308L 2. N/A
Size of Electrode 1. [illegible] 2. N/A IN.
Size of Filler 1. 3/32, 1/8 2. N/A IN.
Electrode – Flux Class N/A
Consumable Insert 1. N/A
Trade Name N/A

GAS (QW-408)

Shielding Gas [illegible]
Flow Rate [illegible] CFH
Purge Gas [illegible]
Flow Rate [illegible] CFH

POSITION (QW-405)

Welding Position 2G
Welding Progression N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current 1. [illegible] 2. N/A
Amperes 1. [illegible] 2. N/A
Volts 1. [illegible] 2. N/A
Tungsten Elect. Size/Type Not Recorded

PREHEAT (QW-406)

Preheat Temp. 60 °F
Interpass Temp. [illegible]-350 °F

POSTWELD HEAT TREATMENT (QW-407)

Type N/A
Temperature N/A °F
Time Range N/A

TECHNIQUE (QW-410)

Stringer or Weave Bead 1. Stringer 2. N/A
Bead Width 1. [illegible] Maximum 2. N/A IN
Orifice or Gas Cup Size 1. [illegible]/16 2. N/A IN.
Oscillation 1. N/A 2. N/A IN.
Multi or Single Layer 1. Multiple
(Per Side) 2. N/A
Multi or Single Electrode Single
Travel Speed 1. [illegible] 2. N/A IPM
[illegible]
[illegible]

TENSILE TEST

Specimen No.	Fig. No.	Width	Thickness	Area, in.²	Ultimate Total Load	Ultimate Unit Stress, psi	Character of Failure And Location
1	QW-462.1(a)	1.002	[illegible]	1.61[illegible]	[illegible]	[illegible]	[illegible] Metal
2	QW-462.1(a)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] Metal

GUIDED BEND TESTS

No.	Fig. No.	Type	Result	No.	Fig. No.	Type	Result
1	QW-462.2(a)	SB	Satisfactory	3	[illegible]	[illegible]	Satisfactory
2	QW-462.2(a)	SB	Satisfactory	4	QW-462.2(a)	[illegible]	Satisfactory

Welder's Name Curtis Marquis SS No. [illegible]

Test Conducted by B&R Materials Engineering Lab Laboratory Test No. [illegible]-42
per George Du[illegible] Address 3100 [illegible] Houston, Texas
Date [illegible]

We certify that the statements in this record are correct and that the test [illegible] were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Signed BROWN & ROOT, INC.
(Manufacturer)

Date 6-18-79 By R. P. [illegible] / [illegible]

Brown & Root, Inc. HOUSTON, TEXAS

PGR NO.

SUPPLEMENTAL TEST RESULT CHANGE NOTICE 20612

CURRENT REVISIONS ARE INDICATED BY CHANGE BARS

REV	DATE	ORIGINATOR	APPROVAL*
1	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]

REVISION NO.	DESCRIBE THE CHANGE
1	Deletion of heat input parameters and addition of Westinghouse WPS-8019 reference.
2	Typed or new form.
3	Added testing laboratory, lab test no. and testing date.

* REVISIONS MUST BE APPROVED BY THE MANAGER OF MATERIALS ENGINEERING OR HIS DESIGNEE

BROWN & ROOT, INC. HOUSTON, TEXAS			No. 3
SUPPLEMENTAL TEST RESULTS	CPSES		CR-0172

20613

CHEMICAL ANALYSIS% MELTED Wet Chemical PER ASTM E350-74

ELEM.	C	Mn	Si	Ni	Mo	Cr	N	Cb
WELD	.013	1.61	.35	9.3-	.07	19.--	.05-.6	<.01

SENSITIZATION

Two (2) specimens were sensitization tested in accordance with ASTM A262-70, Practice E. Specimens were examined at 200X magnification for presence of microcracking. No fissures were present.

MICRO FISSURE

Bend test were examined at 10X magnification after bending to meet the acceptance criteria of "Interim Regulatory Guide 1.31." No fissures were present.

DELTA-FERRITE

Delta-Ferrite tests were conducted at twelve (12) points (six per side) along the length of the procedure qualification coupon. A Ferritescope MK II 725 was used and the following results noted:

All positions ranged between 9.5 and 11.5 FN.

Approximate Delta Ferrite Content: [illegible] Diagram per Figure 2433-1 of the ASME Section III Code)

Test conducted by B&R Materials Engineering Lab. Lab No 75-42
Address: 3100 Clinton Drive, Houston, Texas
per George Dawson Date March 2, 1978

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the above listed PQR and per requirements of the listed code/standard(s).

Signed Brown & Root, Inc.

Date 6-18-79 By R. F. Culbertson / QA

the necessary Procedure Qualification Record(s) (PQR).

S77 S78 **QW-201.2 Procedure Qualification Record (PQR).** The specific facts including the base metal specification Type and Grade (or chemical analysis and mechanical properties), and the essential variables (as listed in QW-252 through QW-282) used in qualifying a WPS shall be recorded in a form called Procedure Qualification Record (PQR). This form shall also record the test results.

It is required that the essential and nonessential variables of a WPS be followed in welding the test coupons. The WPS identification (including date and revision number) shall be listed on the PQR. These documents shall be certified by the manufacturer or contractor and shall be available for examination by the Authorized Inspector. A suggested format is given in QW-483. This PQR format may be changed to fit the needs of each manufacturer or contractor.

A change in any essential variable shall require requalification, to be recorded in another PQR. A change in any nonessential variables does not require requalification. A change from one welding process to another welding process is considered a change in an essential variable.

QW-201.3 Combination of Welding Processes or Procedures. More than one process or procedure may be used in a single production joint. Each welding process or procedure shall be qualified either separately or in combination with other processes or procedures (within the thickness limits specified in QW-202.2, QW-403, and QW-451) for the base metal thickness and for the deposited weld metal thickness range for each of the processes or procedures to be used in the production joint. For multiprocess or multiprocedure applications, the qualified thickness of each process or procedure shall not be additive in determining the maximum thickness of the production joint to be welded. One or more processes or procedures may be deleted from a production joint qualified by a combination of processes or procedures provided each remaining process or procedure has been, in the specific combination welding process or procedure qualification, qualified (within the thickness limits specified in QW-202.2, QW-403, and QW-451) for the deposited weld metal thickness range for each of the processes or procedures to be used in the production joint.

QW-202 Type of Tests Required 20614

S77 **QW-202.1 Mechanical Tests.** The type and number of test specimens that must be tested to qualify a welding procedure are given in QW-451, except that, where qualification is for fillet welds only, the requirements are given in QW-202.2 and, where qualification is for stud welds only, the requirements are given in QW-202.3. All mechanical tests shall meet the requirements prescribed in QW-150, QW-160, QW-170, or QW-180 as applicable.

QW-202.2 Base Metals—Groove and Fillet Welds. Except for vessels or parts of vessels constructed of P-11 (excluding P-11A Subgroup 1 and 2) metals, WPS qualification tests for groove and fillet welds may be made on groove welds using reduced-section tension specimens and guided-bend specimens. The groove-weld tests shall qualify the WPS for use with groove welds within the range of essential variables listed. Groove-weld tests shall also qualify for use with fillet welds in all thicknesses of metal, sizes of fillet welds, and diameters of pipe or tube, within the other remaining applicable essential variables. Where a WPS qualification of fillet welds only is required, tests shall be made in accordance with QW-180. The tests shall qualify the fillet WPS for use only with fillet welds in all thicknesses of metal, sizes of fillet welds, and diameters of pipe or tube, for use within the other remaining applicable essential variables.

For vessels, or parts of vessels, constructed of P-11 (excluding P-11A Subgroup 1 and 2) metals, WPS qualification tests for groove welds shall be made on groove welds, using reduced-section tension specimens and guided-bend specimens. The groove-weld tests shall qualify the WPS for use only with groove welds within the range of essential variables listed. WPS qualification tests for fillet welds shall be made in accordance with QW-180. The tests shall qualify the fillet WPS for use only with fillet welds in all thicknesses of metal, sizes of fillet welds, and diameters of pipe or tube, for use within the other remaining applicable essential variables.

Groove weld procedure qualifications shall encompass thickness ranges to be used in production, for both the base metals to be joined or repaired and the deposited weld metal to be used, except as allowed in (1) below for both the base metal and the deposited weld metal.

(1) For welding procedure qualifications made with the SMAW, SAW, GTAW, GMAW, or PAW welding processes, using weld layer(s) of ½ in. (13 mm) or less in thickness, there is no limit on the minimum depth of deposited weld metal for repair or

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"built-up" welding, not on the minimum thickness of the thinner of the base metals being joined where they are of dissimilar thickness, and groove weld procedure qualification made in base metal having a thickness of 3 in. (76 mm) or more shall be applicable for production use for deposited weld metal thickness up to the maximum given in QW-451 for:

(a) Repair or "built-up" welds in any thickness of base or weld metal, with no limit on the minimum depth of deposited weld metal, and

(b) Welds joining dissimilar thickness of base metals in which the base metal on one side is equal to or less than the maximum thickness qualified in the

[illegible] the other side [illegible] or [illegible] greater thickness.

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QW-202.3 Stud Welding. Procedure qualification tests for stud welds shall be made in accordance with QW-192. The procedure qualification tests shall qualify the welding procedures for use within the range of the essential variables of QW-261. For studs welded to other than P-No. 1 metals, five additional welds shall be made and subjected to a macro examination, except that this is not required for studs used for extended heating surfaces.

BRANDT

JUDGE BLOCH: What's the difference?

THE WITNESS: Section NF you can construct something to. Section NF of the code gives you design criteria, procurement criteria, installation criteria, and inspection criteria. Section 9 does not do that.

JUDGE BLOCH: Okay.

BY MR. ROISMAN:

Q I'm going to show you what appears to be the QA portion of the FSAR for Comanche Peak, and ask you if you could identify in it -- show us the chart that you were referring to that lists the stainless steel liner plates as "nonsafety." I don't think this is a trick question, I just want the witness to do that so we will have it pinned down.

MR. WATKINS: I do want to be sure this is the current FSAR.

MR. ROISMAN: Okay. I think that's fair.

MR. WATKINS: I would like to ask or ask the Chairman to ask whether the witness knows this is a current copy of the FSAR. It's not an exhibit in this phase of the proceeding.

JUDGE BLOCH: Can the witness verify for us whether or not this is a current copy of the FSAR?

THE WITNESS: No, I cannot.

MR. ROISMAN: Mr. Chairman, I assume it's

possible to tell because there are amendment dates that are on there. The witness could tell us at least through what date that's relevant. We are going through a whole period of time here so there would be some relevance in at least pinning that much down, even if we don't know that we have the 1984 version.

JUDGE BLOCH: Mr. Watkins, how can we get a stipulation as to having the current copy?

MR. WATKINS: I'm not objecting to questions based on this document. We would like the opportunity to review that we know to be the current FSAR, so long as it's understood that Mr. Brandt's answers are on the basis of what this document is and I would like the pages of this document on which he's questioned bound into the record.

JUDGE BLOCH: Any objection, Mr. Roisman?

MR. ROISMAN: I don't have any objection to having it bound in. I don't have an extra copy of it at this moment.

JUDGE BLOCH: We'll arrange to have it bound in as an exhibit with the understanding that Mr. Watkins will correct it if he finds it's not the currents FSAR.

JUDGE GROSSMAN: Is it the current FSAR you want anyway here?

MR. ROISMAN: It is the current. We have been

led to believe that this is. I can't independently verify that.

JUDGE BLOCH: Judge Grossman's question was do you want the current one or the earlier one that might have been applicable when the liner plates were made?

MR. ROISMAN: We are interested in both. We want to know what it is now and what it was back then.

JUDGE BLOCH: The liner plates are still being made?

MR. ROISMAN: There's still some fabrication on them, is my understanding.

JUDGE GROSSMAN: I haven't seen that. Are there dates on each page there?

MR. ROISMAN: Yes. It tells you "amendment as of" and then it gives a date which presumably are the most current amendments. I believe the dates Mr. Brandt is looking at appear to be 1981 -- well, no, there's some '82. It just depends on when the amendment took place.

JUDGE GROSSMAN: My recollection is that the liner plates we are talking about, a lot of them were in 1981, those travelers.

MR. ROISMAN: That's correct. Why don't we do this. I had thought it was a quicker process. When we take a break I'll take Mr. Brandt --

JUDGE BLOCH: We'll use that as a basis for

questions and then Mr. Watkins will correct it if it turns out to be wrong.

MR. ROISMAN: Mr. Brandt seems to be still looking and rather than have us all sit and look, he can do that at a break and I'll just move on to something else and he can do that later.

MR. WATKINS: I want to make sure he has enough time to review.

JUDGE BLOCH: How much time do you need to review that?

THE WITNESS: I don't know. The table is 50-something pages long.

MR. ROISMAN: He indicated earlier, I think in answer to a question about the appropriate table of the FSAR, that this stainless steel liner was listed as "non-safety," and I'm asking him to identify where that is in there.

MR. WATKINS: To correct the testimony, that it was "non-ASME."

JUDGE BLOCH: Non-ASME.

MR. ROISMAN: I believe it was non-safety. I don't know what his current testimony is but --

THE WITNESS: What I intended was non-ASME. My prefiled testimony clearly states that it is safety-related, and it is considered safety-related by the designer.

JUDGE BLOCH: Why don't we accept Mr. Roisman's suggestion and hold the study of that document for the next break and we can prolong that break if Mr. Brandt needs it.

MR. ROISMAN: Okay.

JUDGE BLOCH: That would seem to be something that could be handled by stipulation of counsel, frankly. I mean, that table either says it or it doesn't.

MR. ROISMAN: I hope that's correct.

JUDGE BLOCH: I think we have shifted the burden to Mr. Watkins reading it during the break. It seems we can have a stipulation of counsel as to what that table says or doesn't say. It doesn't seem to me that we need testimony as to whether it is or is not ASME in the table.

MR. WATKINS: I'll have to consult with my expert during the break, your Honor.

JUDGE BLOCH: Okay.

BY MR. ROISMAN:

Q I would like to take a look at weld 62, 63, and 64. If you have them there, I'll have them here and then we can talk about them.

JUDGE BLOCH: The witness is looking for the documents about that weld. This refers to the second set of testimony and second filing? This is for your further evidence submittal?