EXHIBIT 7 TO
ATTACHMENT 1

Pullman Swindell
Division of Pullman Incorporated

441 Smithfield Street
Pittsburgh, Pennsylvania 15222
(412) 562-7000
Telex 866 500

Metallurgical Examination
Cracked Field Weld No. 212
Feed Water Pipe to Nozzle; Steam Generator 1-2.

Pacific Gas & Electric Co.
Diablo Canyon Nuclear Project

by

Pullman Power Products Co.
Williamsport, Pennsylvania

Date: 6/23/77

Prepared by: R.H. Caughey

R.H. Caughey
Chief Metallurgist

INTRODUCTION

On March 17, 1977, during hot functional testing, a water leak was discovered in the butt weld (Field Weld No. 212, line K16-555-16IV) which joined the 16 inch diameter feed water pipe to the No. 4 nozzle on steam generator 1-2. The line pressure and temperature at this time was approximately 90 p.s.i. and 300°F respectively.

Subsequent on site non-destructive testing by both ultrasonic and radiographic means (by both Kellogg and P.G. & E. representatives) led to the conclusion to cut out and totally replace this weld. A satisfactory, acceptable replacement was completed during the period March 19-25, incl. 1977.

A summary of these events are described in Kellogg's report dated April 12, 1977 prepared by J.P. Runyan, Field QA/QC Manager. A copy of this report is attached (Appendix I, pages 11-15)

Incident with this replacement a spool piece was salvaged for subsequent laboratory examination by P.G. & E. It contained a conveniently large portion of the weld deposit and a representative portion of both the nozzle and pipe components. A sketch which describes the dimension of this piece; also the crack path and the extent of the crack relative to the weld deposit is included with the Kellogg report referenced above (Appendix I).

Kellogg, for the purpose of a laboratory examination, requested P.G. & E. to furnish representative specimens cut from this spool piece. Two were received.

The report which follows covers a description of these samples and the results and conclusions determined from this investigation.

PROCEDURE & RESULTS OBTAINED

A. History

Pertinent to this investigation was a complete review of the records appertaining to field weld joint No. 212, namely; the weld procedure; welder qualification records, heat treatment; material certifications; nondestructive examination personnel qualification and N.D.E. results. The following information was gleaned from the recorded documents on file with respect to this weld:

1. WELD HISTORY REVIEW

Field weld 212 was fit-up and tack welded on Friday May 18, 1974. On Monday May 21, 1974 the tack welds and insert were removed. A new insert was installed on May 22, 1974. It is not documented as to why the original insert was removed, however, discussions with field inspectors who were on site at the time indicate that surface rust may have occurred over the weekend and the insert was removed to reclean the weld prep and install a new insert prior to consuming the ring.

The root pass was made on May 22, and acceptad visually May 23, 1974. Welding proceeded following Q.C. acceptance and was completed on May 24, 1974.

The weld surface was ground and final visual inspection completed on May 28, 1974.

Other than replacing the insert no umusual or out of the ordinary circumstances were recorded.

2. PREHEAT AND POSTHEAT

A review of the heat charts on F.W. 212 indicate that the weld area was preheated to 200°F min. prior to tack welding and subsequent welding.

The weld was preheatad on May 22, 23, and 24. The heat was turned off at the end of each shift allowing the weld to cool.

2. PREHEAT AND POSTHEAT (Con't)

Following completion of the weld on May 24, the weld was allowed to cool and no further heating was performed until post weld heat treatment on June 24, 1974.

Preheat and post heat records from other welds of the same type indicate a similar history. NOTE: Other welds reviewed were the remaining three feedwater nozzle to pipe and all four main steam nozzle to pipe and all four main steam nozzle to pipe welds in Unit I and the main steam nozzle to pipe welds in Unit II. The feedwater nozzle to pipe welds are not welded in Unit II.

3. WELDING PROCEDURE AND WELDER PERFORMANCE QUALIFICATION RECORDS

Field Weld 212 was made using weld procedure number 200. The procedure was reviewed to assure compliance with ASME Section IX. No deviations were noted. The results of the procedure qualification tests were evaluated. Included were bend tests, tension tests, and Charpy V Notch tests. All results were acceptable.

Welder performance qualification records were reviewed. The records were in order and the welder was found to be properly qualified. In addition, records of other welds performed by the same welder were reviewed. It was determined that his performance record was good. There was no reason to suspect that welders capability or performance was below standard.

4. MATERIAL CERTIFICATIONS

Material Certifications of the weld material and pipe-side base material was reviewed for compliance with material specifications and job specifications, including supplementary requirements. All were found to be in compliance. The nozzle base material certifications were not available for review by M.W. Kellogg.

5. NONDESTRUCTIVE EXAMINATION PERSONNEL, PROCEDURES AND REPORTS

The original radiographs of F.W. 212 were reviewed. There was an area along with nozzle side of the root with greater density than other areas of the weld. This area is typical of other similar welds. The higher density is caused by the nozzle counterbore which is approximately 1/4" wide. There was no evidence of linear indications in the area where the crack occurred. Review of the radiographs of other similar welds did not show evidence of linear or crack-like indications.

B. Metallurgical Examination

A description of the two (2) specimens received from P.G. & E. follows:

One represented by about 1/2 inch of the circumference contained the full depth, "front" face of the crack as viewed toward the pipe component. An enlarged photograph showing the "front" face is displayed in Fig. 1 Page 8. This surface had been fully protected from post atmosphere affects by the application of a lacquer. The coating was removed for photographing.

The second (also about 1/2 inch of circumference) contained the full cross section of the weld joint. It had apparently been removed from a location where cracking had not occurred. A photograph of this sample is not included. It will be discussed with relation to microscopic examinations which were conducted on both specimens.

Photomicrographs of both specimens are displayed in Fig. 2 and 3* respectively. Both represent the existing metallic structure in the locus of the weld root on the nozzle side of the weldment.

Noteable in Fig. 1, or the "front" face of the crack cross section is the distinct, variously "shaded" areas. There appears to be four in number as illustrated in the accompaning sketch.

* Figure 2, Page 9
  Figure 3, Page 10

DISCUSSION

Fractured or cracked areas showing these distinctions are typically associated with fatique failures caused by the imposition of cyclic stress.

From this photograph the clear indication is that crack initiation took place in the root of the weld in the forged nozzle and ultimately propagated to failure through the weld deposit in at least 3 stages as shown in the sketch. (The cycling involved could have resulted either from multiple hydrotesting or from cyclic exposure during hot functional testing. These facts were not contained in the reported history cited above).

In such cases the causual phenomenon is usually a preexisting discontinuity which may be either an inherent metallurgical plane of weakness or a physical crack like defect.

In the photograph of the fractured surfaces (Fig. 1) the first distinct area is the root of the weld joint. Close visual examination by macroscopic means showed sporadic small areas (light areas in the photograph) which were relatively bright or "shined".

Fig. 2 is a photomicrograph of the metallic structure which was found to exist in one of these areas. The indication is that these are associated with remanent, weld bevel "land" material of the forged nozzle component. The suggestion is that, crack initiation stemmed from this locus; also that the initiating defects were localized, incipient root cracks through the land area.

What is not clear from this examination is the cause for the defects. In the history of the field fabrication of this particular weld (cited above) the fact that repetiture preheating and cooling was permitted to take place on four separate occassions before the weld was completed, could be one factor. Thereby inordinately high thermal stresses could have resulted in incipient cracks.

DISCUSSION (Con't)

Another contributing factor under these circumstances (which cannot be overlooked) could be the relative hardenability of the forged nozzle material the reported composition of which was a nickel, molybdenum bearing steel or A.S.T.M. A508-CL2. This is an air hardening composition. It is possible due to the noted in attention especially to cooling affects, following the root pass welding, that, air hardened, crack sensitive microstructures could have been effected and sporadic cracks on cooling promoted in the initial land area. (Microstructure affects in the specimens examined would, of course, be obscured by the subsequent stress-relief heat treatment.)

Understanding this weld (NO. 212) was one which was completed under restrained conditions (or as a closure weld) the possible circumstances i.e., in attention to preheating and cooling and metallurgical transformations, would augment the cracking tendencies.

Fig. 3 or the photomicrograph of the uncracked weld joint (localized at the root weld in nozzle forging) shows the normally expected microstructure; good penetration; and no evidence for lack of fusion or cracking. Certain evidence of small cracks are shown to exist in the I.D. surface of the forging. But there is no reason to believe these or like defects could have contributed to ultimate failure, once the weld was completed and stress relieved.

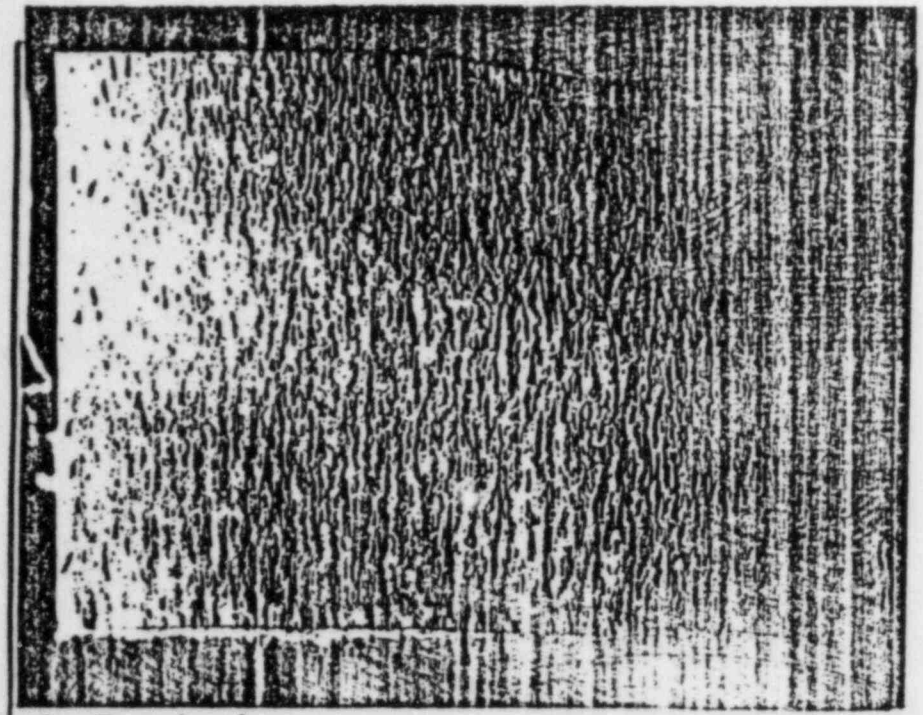
CONCLUSIONS

1. The crack failure in the FW212 resulted from crack like defects which apparently existed in the weld bevel land.

2. The cause for the crack defects is not clear. They are believed, however, to have resulted from the welding process and probably portand the affects of repetitive preheats and cooling applied before welding was completed. Imposition of high thermal stress, especially in the early stages of welding, is a plausible explanation.

3. Ultimate failure through the weld deposit was due to a cyclic fatique stress phenomenon, which it is suggested was the consequence of repetitive loading due either to preliminary hydrotesting or inherent in the hot functional testing program.

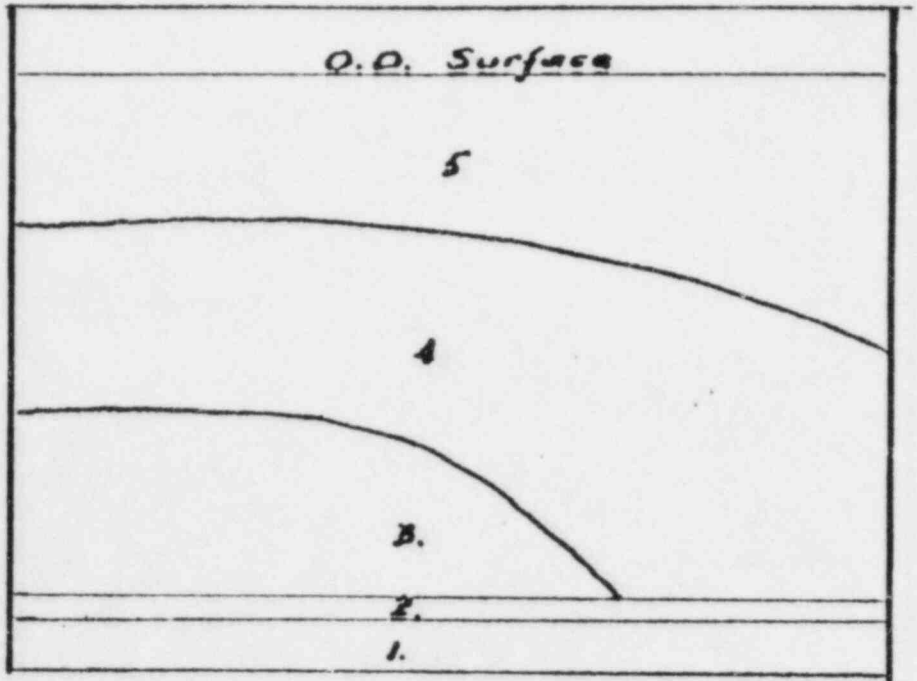
4. The fact that cracking was only discovered during the hot functional testing, and not evident from preliminary in-process inspections i.e., ultrasonic and radiography (probably due to the inherent insensitivity of these procedures to indicate small incipient cracking) the recommendation is hereby made that all like welds should be reinspected upon the completion of functional testing and before service in order to discover any evidence of crack propagation or enlargement; not withstanding the fact that in process documents failed to disclose the possibility of similar incidents.



As Received 5X

Photograph

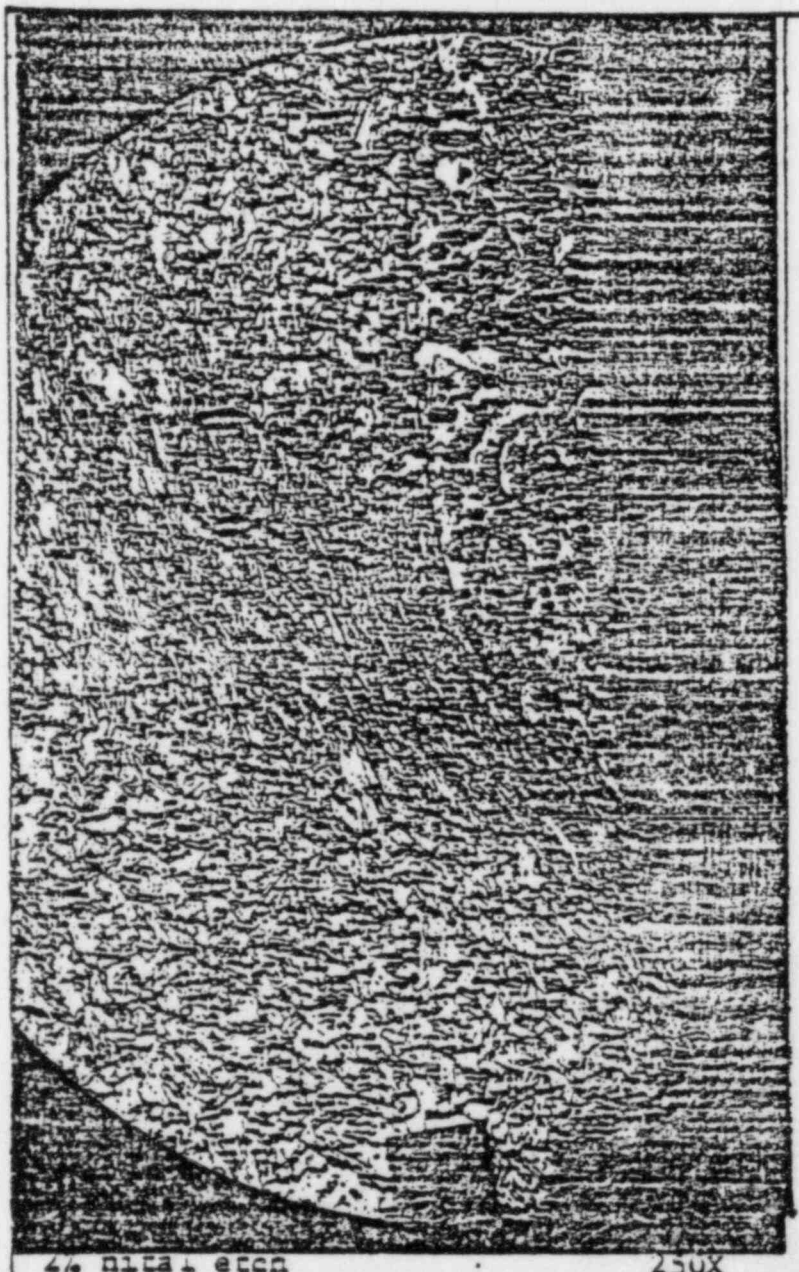
Crack "Front" Face; Viewed Toward Pipe Component.



LEGEND

1. K-insert, weld reinforcement.
2. Remanent weld bevel land; probable crack initiation region. Refer to photomicrograph, Fig. 2.
3. 2nd-crack stage.
4. 3rd-crack stage.
5. Final stage, thru wall penetration.

Fig. 1



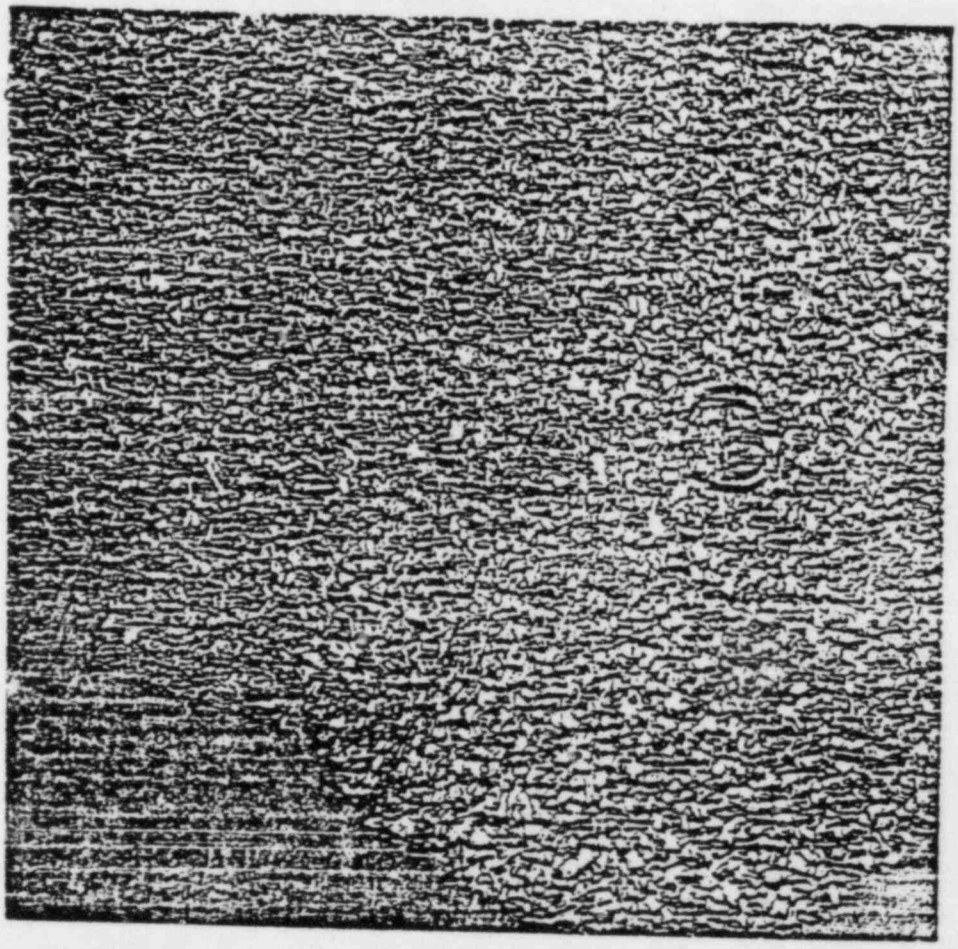
4% nital etch 250X

A. Remanent weld bevel land in forged nozzle.

B. K-insert, weld I.D. Reinforcement.

Photomicrograph
Crack Evidence in Initial Weld Bevel Land

APPENDIX I



2% Nital Etch 100X

A. Nozzle Forging

B. K-insert root weld and I.D. Reinforcement

Photomicrograph; Root Weld Nozzle Forging Component

Fig. 3

DIABLO CANYON NUCLEAR PROJECT
JOB # 7177
SPEC # 8711

QUALITY ASSURANCE REPORT

OF

Crack in Steam Generator Feedw
Nozzle to pipe weld
(Generator No. 1-2)

THE M.W. KELLOGG CO.
Avila Beach, Ca.

PREPARED BY J. P. Runyan
J. P. RUNYAN
Field Q.A./Q.C. Manager

DATE April 12, 1977

QUALITY ASSURANCE REPORT

OF

CRACK IN STEAM GENERATOR FEEDWATER NOZZLE TO PIPE WELD (GENERATOR NO. 1-2)

PURPOSE

To document events from the time of discovery of the leak until the completion of the repair.

SCOPE

This report covers the on site findings, the review of documentation including preheat and postheat charts, radiographs from the defective weld, the subsequent procedures for removing the defective area and performing the repair.

FINDINGS

On Thursday, March 17, 1977 a leak was observed in field weld 212, line K16-333, by P.G.& E. We were advised of the leak on that date.

The weld in question is where the 16" feedwater pipe ties into nozzle #4 on Steam Gererator 1-2.

Visual observation revealed a weep type leak which occasionally sprayed a fine stream of water. When observed with a 10X magnifing glass there appeared to be a small intermittant linear indication approxiately 3/8" in length in the center of the weld running around the pipe. Magnetic particle examination of the area with a D.C. converted yoke did not show evidence of a linear defect.

P.G.& E. requested that we grind the area. As grinding proceeded, the indication opened to reveal a linear defect approximately 2" long when the weld crown was flush with the pipe surface. At this point the grinding was stopped. We were requested to perform an Ultrasonic examination to determine the extent of the indication. The pipe temperature was approximately 180° F which made it impossible to perform U.T. with the standard transducers on site.

We were then instructed to "hold" until P.G.& E. Engineering Research arrived with their U.T. equipment and high temperature transducers. The weld was radiographed at this time. The radiograph revealed evidence of a linear indication which appeared to be approximately 6" in length.

On Friday, March 18, 1977 P.G.& E. Engineering Research arrived and performed Ultrasonic examination of the weld. They reported that there was a crack which appeared to extend approximately 2/3 of the distance around the weld. Based on there findings it was determined that the weld would be cut out and replaced.

WELD REMOVAL

The weld was cut by grinding approximately 1/2" from the center line on the nozzle side and at F.W. 503 on the pipe side. The end of the pipe was then cut to remove a ring which included most of the weld and approximately 4" of pipe.

The piece was examined visually and by liquid penetrant on the O.D. and I.D. and a sketch made to reflect the observations. (Sketch Attached)

The piece was shipped to P.G.& E. research lab on March 20 for analysis.

REPAIR

A piece of 16" pipe was removed from stores to replace the piece which was cut out. The pipe end preps, gamma hole and vent were machined in the P.G.& E. machine shop on March 19, 1977. The nozzle end prep at F.W. 212 and pipe end at F.W. 503 were ground in place on March 20. A liquid Penetrant examination was performed at that time to assure complete removal of any indications.

The new piece was moved into place and fit up on March 20. Preheat was applied prior to tack-up,(Ref. Chart # 547). After the fit up was approved by M.W. Kellogg Q.C. both roots were welded. Magnetic particle inspection was performed. Following magnetic particle acceptance two additional passes were welded in each weld.

Radiography was performed on March 21, 1977. The radiographs of F.W. 503 pipe to pipe wereacceptable. F.W. 212, pipe to nozzle, had excessive porosity at the window closures. These areas were ground, rewelded and re-radiographed. One area had excessive porosity, the other had a linear indication approximately 1/2" long and an area which appeared to be suck back.

At this time, March 21, 1977, P.G.& E. Q.A. placed a "hold" on all work until their Engineering could review the total program and process appropriate paperwork. "This hold was not because of the difficulty in welding the window closures".

No work was performed on March 22, 1977.

On March 23, 1977 an on site meeting was held to review findings, work to date, and procedures for completion of the repair. Attending the meeting were representatives from P.G.& E. Engineering, Q.A., General Construction, Division, Westinghouse, M.W. Kellogg site Manager, Corporate Q.A. Manager, and the writer.

A. It was determined that the procedure as outlined by D.R. 3366 was acceptable except that the preheat would be raised to 300° Min. for completion of the welding.

B. The problem of making an acceptable closure weld was discussed. It was determined that the positive pressure maintained in the system was to high and that water remaining in the generator caused vapor to be carried out the window openings.

C. P.G.& E. Division agreed to drain the generator and reduce the purge pressure until the closure welds could be made.

On March 24, 1977 the defective areas at the closures were ground out and Magnetic particle performed to assure complete removal. No welding was performed since P.G.& E. had not removed the Hold. Preheat was being maintained through the "hold" period.

On March 25, 1977 the hold was released. The windows were closed and radiograph made. Both areas were acceptable and welding continued. The weld was completed on the afternoon of the 25th. Radiographs were shot in the hot as welded condition. No rejectable indications were noted. Post weld heat treatment was then performed.

On March 26, 1977 following post weld heat treatment, the weld was ground, re-radiographed, liquid penetrant inspected and ultrasonically examined. No rejectable indications were noted. The vent line and gamma plug were completed, inspected and the system turned over to division for resumption of testing.

SUBSEQUENT INVESTIGATION

Because of the unknown origin of the crack it was determined that other welds of the same type and welded using the same procedure should be reviewed to determine if the defect could be a generic nature.

Each of the remaining three feedwater nozzle welds and the four Main Steam nozzle welds were ultrasonically examined. The original radiographs were reviewed and the feedwater nozzle welds were re-radiographed. There was no evidence of like indications in any of the welds and no evidence of change in any of the noted, acceptable, indications since the original inspections.

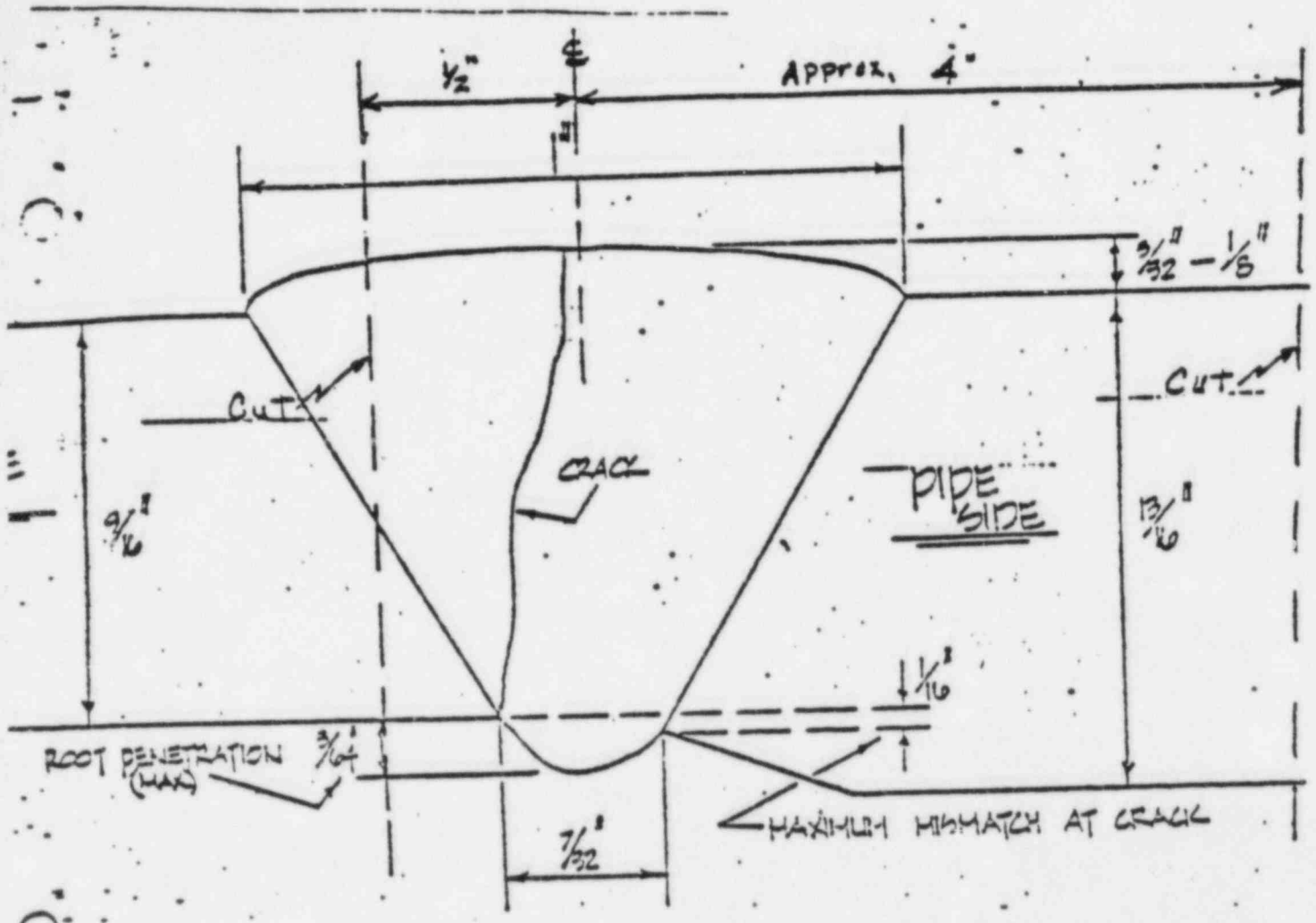
There was, however, an indication noted in F.W. 197 on generator 1-1. This indication was present on the original radiographs but had not been noted on the radiographs report. A second set of radiographs were on file for F.W. 197. This set also exhibited the same indication, however, the radiographic report did reflect the condition as being a drop thru. The indication had apparently been evaluated and determined acceptable at the time.

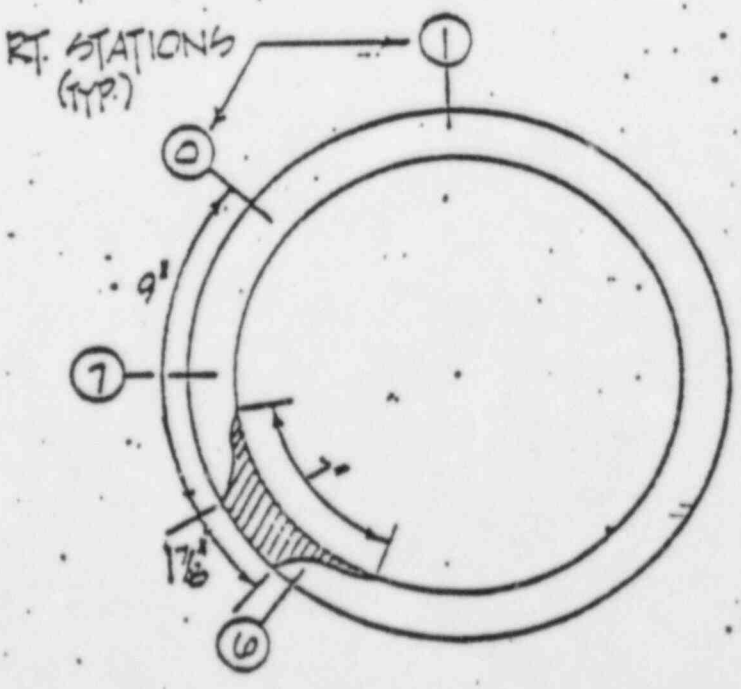
Because of the problem with F.W. 212 it was determined that any questionable situation should be resolved. It was therefore determined that the drop thru should be removed. A D.R. was initiated and the repair was made. The indication was removed by grinding. No welding was required. (See D.R. 3370 Attached)

SUMMARY

To date the metallurgical analysis has not been completed of the crack sample. We had requested, from P.G.& E., a piece of the defective material for our own analysis. This was received on Thursday, April 7, 1977 and forwarded to E. F. Gerwin in Williamsport.

It is my belief that the crack was peculiar to F.W. 212 only and not of a generic nature. Therefore, at this time we are assuming that no further repair will be required and that when the disposition of D.R. 3370 is completed the subject will be closed.





NOTE:

1. WALL THICKNESS MEAS'R. ARE APPROXIMATE
2. REF. TO D.R. 3366 REV A
3. STEAM GENERATOR 1-2
   F.W. # 212
   W.O. 500140
   LINE # R16-555-10"

DR 3366 Rev 1
ATTACHMENT # 2

APPM F-114

EXHIBIT 8. TO ATTACHMENT 1

PULLMAN POWER PRODUCTS

EVALUATION OF DISCREPANCY REPORT IN RELATION TO REQUIREMENTS OF 10CFR PART 21

D.R. # 3453 Rev1, to which this page is attached and become a part of, (is not, may be) considered to be reportable to the NRC under the requirements of 10CFR Part 21.

PULLMAN POWER PRODUCTS

by _____

Pacific Gas & Electric Company (does, (does not) consider this discrepancy reportable and (has reported, (will not report) the above discrepancy.

This form returned to Pullman Power Products on 9/12/77 .
DATE

PACIFIC GAS & ELECTRIC CO.

by R.D. Tyler

FORM F-114

PULLMAN POWER PRODUCTS

EVALUATION OF DISCREPANCY REPORT IN RELATION
TO REQUIREMENTS OF 10CFR PART 21

D.R. # 3453, to which this page is attached and become a part of, (is not, may be) considered to be reportable to the NRC under the requirements of 10CFR Part 21.

PULLMAN POWER PRODUCTS

by _____

Pacific Gas & Electric Company (does, does not) consider this discrepancy reportable and (has reported, will not report) the above discrepancy.

This form returned to Pullman Power Products on 8/29/77.
DATE

PACIFIC GAS & ELECTRIC CO.

by _____

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3453 Rev. 1 Rev 2
ISO. NO. 500146 Sht. 4 of 5
UNIT NO. 1
CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 8-26-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16"; Spool Piece 500; El. 154'-4½"; Area G; Sect. 1

EXPLANATION OF DISCREPANCY: Reference P.G.&E. Drawing 500146, Rev. 9B

Per P.G.&E.'s request, an internal inspection of F.W. 244 on Steam Generator 1-4 Feedwater Nozzle will be performed. The line entry will be made in the following manner, see Recommended Disposition.

FOR INFORMATION ONLY

RECOMMENDED DISPOSITION:

1. Measure 2" from F.W. 244 center upstream on pipe (Spool Piece 500) circumscribe the pipe using a wrap around, then prick punch the scribe line.
2. Using air-arc, cut the pipe all around maintaining less than a 40° total bevel to within approximately 1/8" from the I.D. (See Sketch #1).
3. Using a thin blade grinder, cut through the center of the bevel, then dress up both bevels (See Sketch #1).
4. Jack pipe away from cut on upstream side per Superintendent's instruction. Install a dam in nozzle beyond F.W. 244 to prevent air from entering Steam Generator.
5. Clean and inspect F.W. 244 internally as directed by P.G.&E.

(Con't on Page 2)

Approved By: M.W.K. Field Q.A. Mgr. J.P. Runyan Date 8/26/77 Customer R.D. Styles MVR 3553 Date 8/29/77

FINAL DISPOSITION: ☒ In Accordance With Above
Work Completed Insp. A.B. Burke Date: 11-2-77

☒ Other (explanation and approval required)
Work Completed Insp. A.B. Burke Date: 11-2-77

EXPLANATION (IF NECESSARY):
Revision 1 - Delete Step 6 in its entirety (access was achieved). Refer to Attachment #1 for results of initial inspection and recommended disposition.
Revision 2 - See Page 3 of 3 and Attachment #3. DEVIATION 244

Rev #2 J.P. Runyan 9/7/77 - R.D. Styles 9-26-77
Rev #1
M.W.K. Field Q.A. Manager J.P. Runyan Date 8/30/77 Customer R.D. Styles MVR 3553 Date 8/29/77

STEPS TO PREVENT RECURRENCE For Applicable

Field Q.A. Manager

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other
☒ Customer ☐ Receiving ☐ Field Inspector ( )

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3453 Rev. 1 RE
ISO. NO. 500146 Sht. 4 of
UNIT NO. 1
CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 8-26-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16"; Spool Piece 500: El. 154'-4½"; Area G; Sect 1

RECOMMENDED DISPOSITION: (CON'T)

6. If access to F.W. 244 I.D. cannot be achieved, proceed with alternate instructions (See Sketch #2).

7. Upon completion of inspection, remove dam, grind bevel to facilitate fit-up as needed, clean and fit to ESD-215 and ESD-220.

8. Weld out using F.W. 549 and procedure 4/5.

9. Inspect and NDE to ESD-215 and ESD-206.

10. Add all information to process sheet and isometrics.

FOR FIELD CONSTRUCTION ONLY

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3453 REV 2
ISO. NO. 500146 Sht. 4 of 5
UNIT NO. 1
CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 8-26-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16": Socol Piece 500; El. 154'-4½"; Area G; Sect. 1

D.R. 3453, Revision 2

EXPLANATION OF DISCREPANCY:

During the performance of grinding per D.R. 3453, Revision 1, Step #5, four (4) indications of heavy drop through with roll over were removed along with all of the existing root penetration. Re-inspection revealed a linear indication 11" long on the fusion line to the Feedwater Nozzle. Further grinding, to a maximum depth of .110", removed the linear indication (see Attachment #3).

RECOMMENDED DISPOSITION:

Add the following to Step #5 and delete original Steps #7, 8, 9 and 10. Perform the following repair:

A. Grind the bevels to facilitate Fit-Up of F.W. 549.
B. M.T. I.D. of F.W. 244 using ESD-247 coil method, and clean grooved root pass at F.W. 244 per ESD-215.
C. Remove the dam from the nozzle at F.W. 244.
D. Preheat F.W. 244 to a minimum of 250°F, interpass not to exceed 550°F maximum. Maintain this preheat until stress relief begins.
E. Weld to procedure 200 (F.W. 244 R1), using E70S2 wire with the GTAW process, to conform to blended configuration of the balance of the weld. I.D. ONLY
F. Grind and polish the added weld metal to blend with base metal surfaces.
G. Inspect and NDE to ESD-215 and PGE DER TO PERFORM L.P. AT PREHEAT-TEMP. & FURNISH MWK WITH COPY OF PGE CERT.

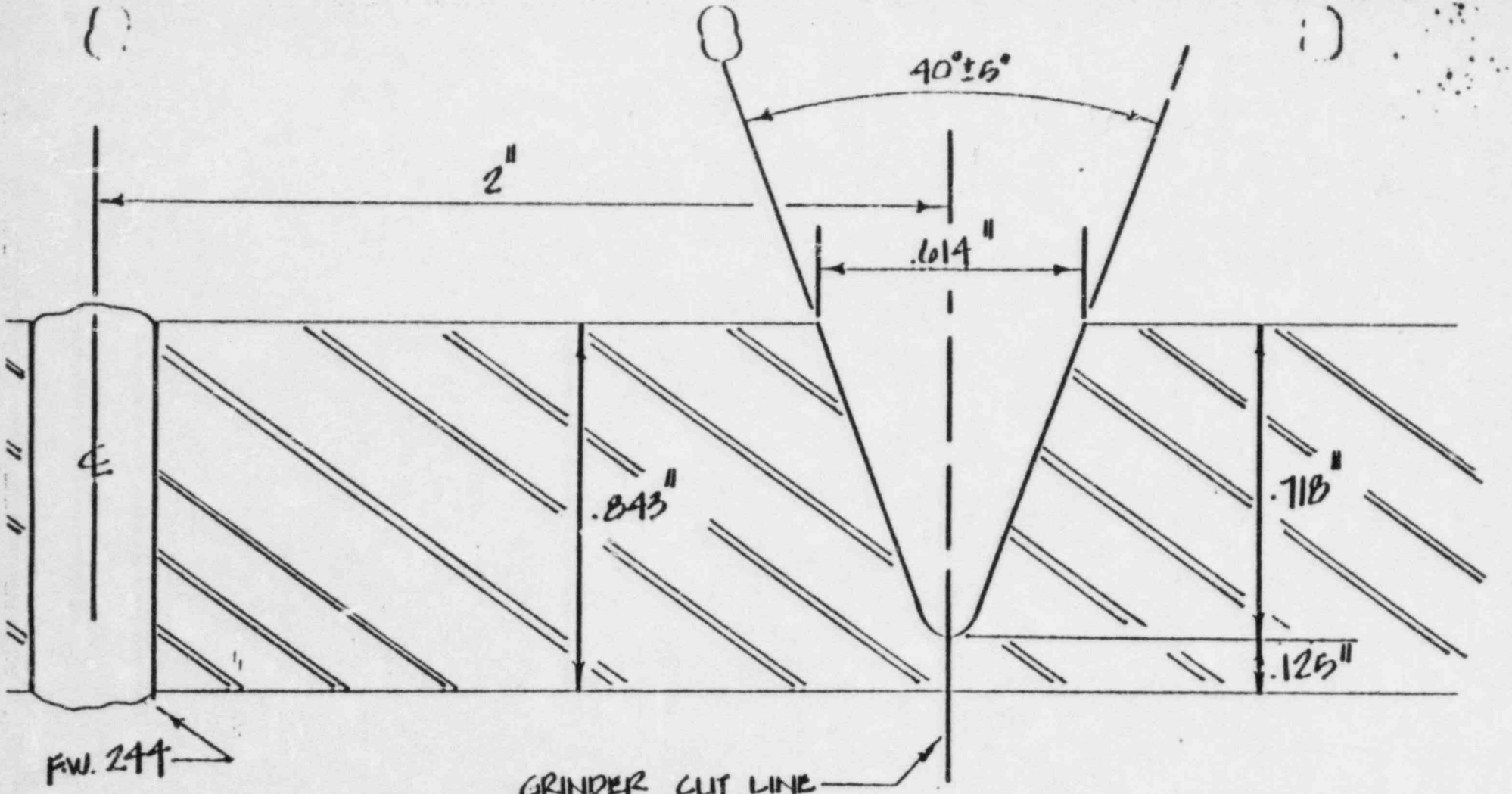
NOTE: Proceed with D.R. 3456, and X-ray weld, hot, for information only.

7. Upon completion of inspection, remove dams from F.W. 549 pipe side, clean and fit F.W. 549 to ESD-215 and ESD-220.
8. Weld out using F.W. 549 with procedure 4/5 A.D.
9. Grind F.W. 549 for X-ray.
10. Inspect and NDE F.W. 549 to ESD-215 ~~& PGE DER TO PERFORM L.P. AT PREHEAT-TEMP. & FURNISH MWK WITH COPY OF PGE CERT.~~ 9/30/77 11 AM

NOTE: X-ray weld hot for information only.

11. Stress relieve at F.W. 244 R1 and F.W. 549 1100°F to 1150°F per ESD-218.
12. NDE F.W. 244 R1 and F.W. 549 to ESD-207.
13. " " " " to ESD-211 9/30/77

14. ADD INFORMATION TO PROCESS SHEETS.



3X ACTUAL SIZE

DR-#3453

SKETCH #1

ALTERNATE INSTRUCTIONS

1. Cut out F.W. 509 using air-arc and taking necessary steps to maintain the ability to bevel the 45° ell side of the weld to 20°± 2½° and a 3/32"± 1/16" land. Also, cut out F.W. 339 shown on Iso. 3-246.

2. Requisition: 8 5/8"+ of 16" Pipe, Schedule 80 A106 Gr B and a 3/4" 3000# S.W. Half Coupling or soc-o-let A105.

3. Install the 3/4" half coupling or soc-o-let four (4) inches from the end of the 16" pipe.

4. Clean and Fit to ESD-215 and ESD-220.

5. Weld out with procedure 92/93 (F.W. 831).

6. Inspect and NDE to ESD-215 and ESD-211.

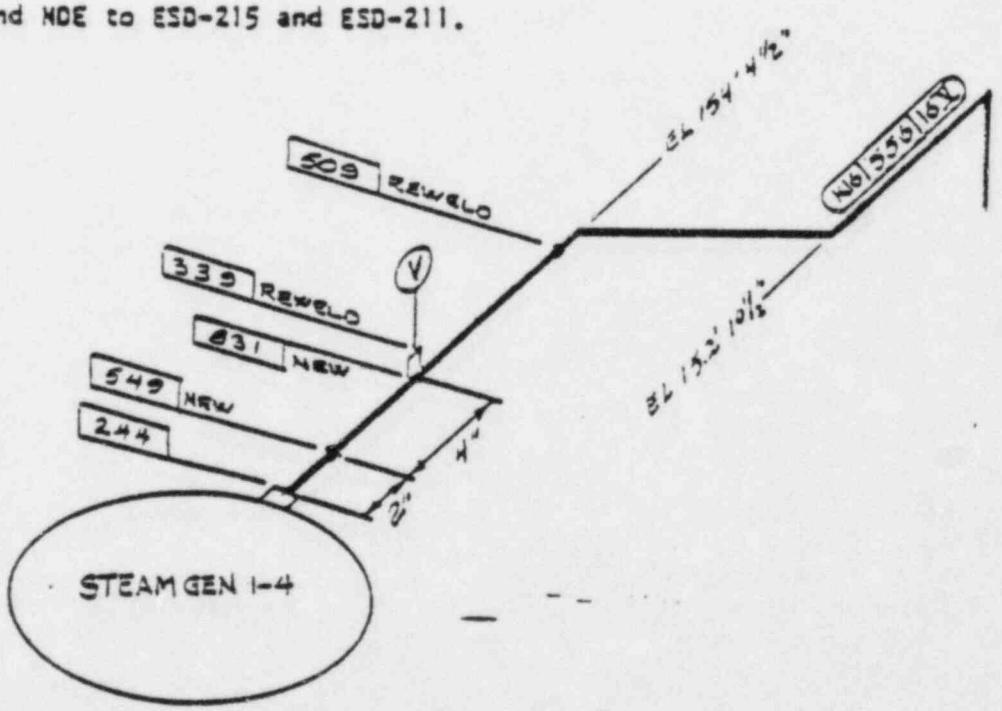
7. Upon completion of F.W. 244 I.D. inspection and P.G.&E.'s direction, fit-up 16", Schedule 80 pipe and proceed with Step 7 of attached D.R. using F.W. 549 and F.W. 509.

8. Reweld F.W. 339, as shown on Iso. 3-246, maintain original line configuration.

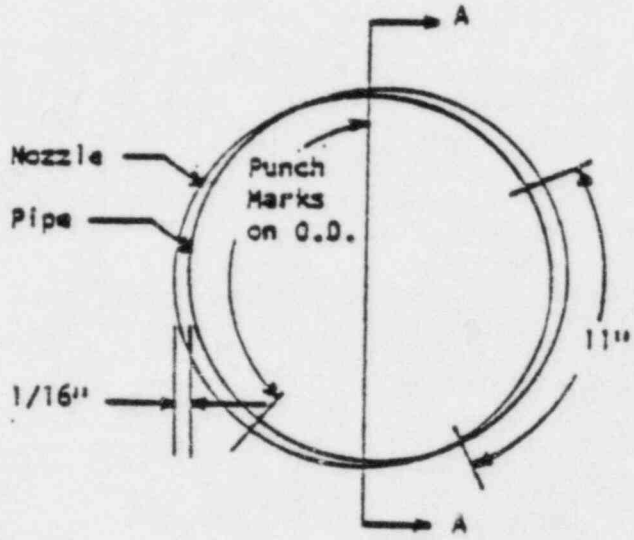
9. Clean and Fit-up to ESD-215 and ESD-220.

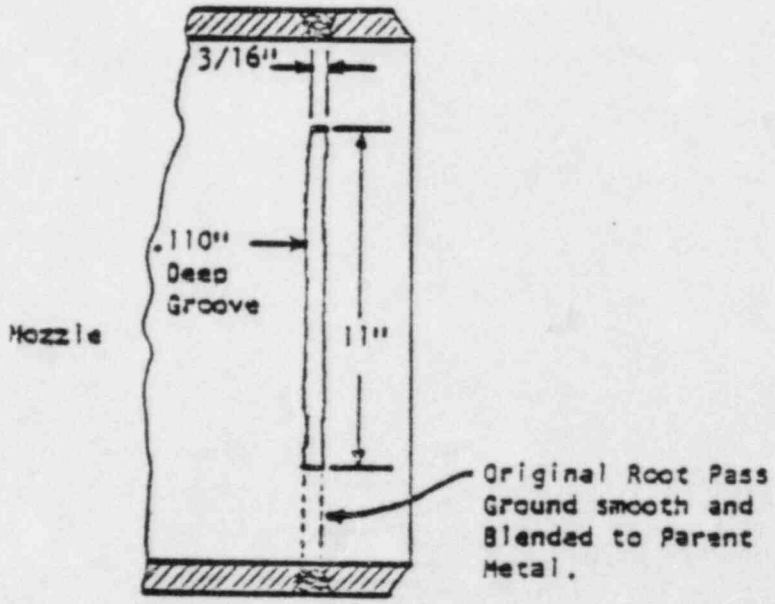
10. Weld out with procedure 92/93.

11. Inspect and NDE to ESD-215 and ESD-211.



Findings at F.W. 244





Section A-A

NOTE: Average Wall Thickness = .580" to .600"
Remaining Wall At Groove = .450"
Punch Marks On The O.D. = .047" Deep
(Punch Marks are directly on the fusion line of F.W. 244 to 1/8" inside the fusion line .047" deep.)

INTEROFFICE CORRESPONDENCE

ATTACHMENT #1
DR-3453 Rev. 1

TO J. P. RUNYAN, Q.A./Q.C. MANAGER

DATE AUGUST 31, 1977

FROM D. R. GESKE, NDE SUPERVISOR

SUBJECT LIQUID PENETRANT EXAMINATION, F.W. 244, INSIDE DIAMETER

On August 31, 1977, F.W. 244, Line K16-556, Isometric 1-03-500146, Feedwater piping to Steam Generator 1-4 Nozzle, was liquid penetrant examined on the inside diameter.

The following indications were noted:

1. 2" from top center of nozzle, a small faint transverse linear-nonrelevant due to weld geometry.
2. 7" from top center of nozzle, heavy 1" drop through with roll over.
3. 9" from top center of nozzle, heavy 2" drop through with roll over.
4. 37" from top center of nozzle, heavy 1½" drop through with roll over.
5. 39" from top center of nozzle, heavy 1/2" drop through with wire protrusion.
6. Approximately 1/16" mismatch exists from 7:00 to 9:00 facing the nozzle.

We recommend that the root pass be ground and polished to blend with base metal surfaces. Particular care should be taken to avoid the removal of base material. Then re-examine the I.D. with liquid penetrant, if acceptable, proceed to "Recommended Disposition", Step 7 of D.R. 3453, Revision 1.

Donald R Geske

Donald R. Geske
NDE Supervisor

DRG/js

DR = 45

SCHEDULE TO CUT, INSPECT, PREPARE I.C F/W NOZZLE

PLAN: AIR-ARC CUT PIPE 2" FROM NOZZLE WELD.
STOP SHORT OF PIPE I.D MAINTAINING N2
PURGE ON S/C. REMOVE N2 PURGE PRESSURE.
FINISH CUT OF PIPE WITH THIN GRINDING DISK.
PULL EXTENSION LINE CAST FROM NOZZLE 3½"
TO 4", INSERT PURGE DAM INTO THE S/C
NOZZLE TO HOLD POSITIVE PURGING GAS.
(PURGE DAM WILL NOT HOLD PRESSURE)
CONTINUE WORK BY HOLDING LINE AWAY
FROM CUT A MINIMUM OF 3/4".
CLEAN I.D. OF NOZZLE WELD WITH EMBRAND
WATER UNTIL CLEAN.
PERFORM P.T.
IF P.T. IS ACCEPTABLE, REMOVE WELD PADS,
ACCOMPLISH FITUP AND DARE WELD.

ALTERNATE PLAN: IF MINIMUM OF 3½" OPENING
CANNOT BE ACCOMPLISHED IT WILL BE
NECESSARY TO DARE CLOSE CUT AT 45°
ELL, REMOVE 8" "PUP" AND FABRICATE ABOVE
ITEMS.

TIME REQUIRED:

1. CUT PIPE & PULL LINE @ 2:30 MW. 3 "2 MEN = 12 HRS
2. INSTALL PURGE DAM & RESTORE N2 BLANKET - 2 M-2
3. CLEAN I.D. OF WELD AND PERFORM P.T.
2 MEN = 2 HRS = Q.C. TIME FOR P.T. 2 HRS
4. POSITION WELD RIGHT FITUP = 2 MEN = 16 HRS
5. COMPLETE WELD = 3 M = 12 HRS
6. RADIOGRAPH WELD = NIGHT SHIFT (NO TIME LOST)
7. STRESS RELIEVE WELD = 1 MAN = 6 HRS

ALTERNATE PLAN: 1, 2, 3 SAME AS ABOVE

4. MAKE SECOND CUT AT 45° CL = 2 MEN = 8 HRS
5. POSITION WELD PREPS ON ADDITIONAL WELD = 2 MEN = 16 HRS
6. MAKE SECOND WELD = 3 MEN = 12 HRS

RADIOGRAPH & I/P CAN BE DONE AT SAME TIME AS ABOVE

BASED ON 40 HR WK - 8 HR DAY

START WORK 8-29-77 — COMPLETE 9-2-77

ALTERNATE 9-12-77

EXHIBIT 9 TO ATTACHMENT 1

PULLMAN POWER PRODUCTS

EVALUATION OF DISCREPANCY REPORT IN RELATION TO REQUIREMENTS OF 10CFR PART 21

D.R. # 3484, to which this page is attached and become a part of (is not, may be) considered to be reportable to the NRC under the requirements of 10CFR Part 21.

PULLMAN POWER PRODUCTS

by _____

Pacific Gas & Electric Company (does, does not) consider this discrepancy reportable and (has reported, will not report) the above discrepancy.

This form returned to Pullman Power Products on 10-10-77 .
DATE

PACIFIC GAS & ELECTRIC CO.

by R.D. ETTLER /JRH

F-47

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3484 Rev. 1
ISO. NO. 500146 Sht. 1 of 5
UNIT NO. 1
CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 10-7-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-554-16"; Piece #540; El. 154'-5"; Area F; Section 1

EXPLANATION OF DISCREPANCY:

Per P.G.&E. request, an internal inspection of F.W. 197 on Steam Generator 1-1 is to be performed. The line entry will be made in the manner described below.

⚠1 Inspection conducted October 11, 1977, required by Step #9 of the Recommended Disposition, revealed conditions requiring rework. (See Attachment #3, Report of Findings.)

⚠2 Inspection conducted October 13, 1977, required by Attachment #3 revealed further rework is required. (See Attachment #4, Report of Rework).

Attachment #1 (Sketch)
Attachment #2 (Sketch)
⚠1 Attachment #3 (Report of Findings)
⚠2 Attachment #4 (Report of Rework)

RECOMMENDED DISPOSITION:

1. Remove the 2", 3000# coupling at F.W. 827 from the pipe using air-arc and grinder (do not air-arc through). Clean and NDE removal area to ESD-220 and ESD-211 on F.W. 197 side of hole in pipe. Close hole with fire retardant material (Reference Attachment #1).

2. Circumscribe the pipe using wrap around at the edge of hole in pipe nearest F.W. 197. This should be approximately 1 5/8" from the center of F.W. 197 (Reference Attachment #1).

3. Prick punch the scribe line.

4. Using air-arc, cut the pipe all around and apply a bevel of not more than 30° from O.D. of pipe to within not less than 1/8" of the I.D. of pipe directly below

(Con't on Page 2)

Approved By: M.W.K. Field Q.A. Mgr. [signature] Date 10/11/77 Customer MWR M-3590 Date 10-10-77

FINAL DISPOSITION: ☒ In Accordance With Above
Work Completed Insp. [signature] Date: 11-2-77

☒ Other (Explanation and approval required))
Work Completed Insp. [signature] Date: 11-2-77

EXPLANATION (IF NECESSARY):

Revision 1 - Adds Attachment #3 (Report of Inspection Findings). P.G.&E. will indicate rework released on Attachment #3 under Recommended Rework. See ⚠ for other changes.

Revision 2 - See page 3 . . . (AND ATT. #4)

⚠1 M.W.K. Field Q.A. Manager [signature] Date 10/11/77 Customer MWR M-3590-R1 Date 10-13-77

⚠2 M.W.K. Field Q.A. Manager [signature] Date 10/14/77 Customer MWR M-3590-R2 Date 10-17-77

STEPS TO PREVENT RECURRENCE ☒ Not Applicable

Field Q.A. Manager [signature]

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other _____

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3484 Rev. 1
ISO. NO. 500146 Sheet 1 of 5
UNIT NO. 1
CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 10-7-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line [illegible]34-16"; Piece #540; El. 154'-5"; Area F; Section 1

RECOMMENDED DISPOSITION:

scribe line (do not cut through the pipe with air-arc). Using a 1/8" blade, grind through to I.D. of pipe.

5. Locate center of F.W. 500. Using wrap around, circumscribe weld center.

6. Prick punch scribe line.

7. Cut out F.W. 500 using air-arc maintaining a maximum bevel of 30° on ell side to within not less than 1/8" of the I.D. of pipe (do not cut through with air-arc). Using a 1/8" blade, grind through to I.D. of pipe.

8. Install dam in nozzle of Steam Generator 1-1 past F.W. 197.

⚠1 9. Clean and inspect F.W. 197 internally as directed by P.G.&E. Report findings of inspection before proceeding with Step #10. ⚠1 Proceed with rework requirements as directed by P.G.&E. on Attachment #3.

10. Upon completion of inspection, remove dam, grind bevels to facilitate fit-up as needed. AFTER GRINDING IS COMPLETE.

11. Install new pup, fit-up and inspect to ESD-215 and ESD-220.

12. Weld out F.W. 551 and F.W. 500, as shown on Attachment #2, to process 4/5AQ.

13. Inspect and NDE to ESD-215 and ESD-206.

14. Upon acceptance of R.T.'s of F.W. 551 and F.W. 500, clean and fit-up gamma plug, as shown on Attachment #2, to ESD-215 and ESD-220.

15. Weld out to process 7/8 using F.W. 832.

16. Inspect and NDE to ESD-215 and ESD-211.

17. Post weld heat treat to ESD-218 (F.W.'s 551, 500 and 832).

18. Add all information to isometric and process sheets.

Field Q.A. Manager [signature]

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other
☒ Customer ☐ Receiving ☐ Field Inspector 1

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

DISCREPANCY REPORT

D.R. NO. 3484 REV. 2
ISO. NO. 500146, Sht. 1 of 5
UNIT NO. 1
CODE NO. N/A

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 10-14-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell,Guest

DISCREPANT ITEM: NOTED

REVISION 2:

Adds Attachment #4 (Report of Rework). P. G. & E. will indicate rework released on Attachment #4 under Recommended Rework, adds rework to Recommended Disposition as Step 9a.

RECOMMENDED DISPOSITION:

. 5 3/8" Linear Removal.
A. Grind to remove the 5 3/8" linear.
B. P.T. to ESD 211 to insure complete removal.

. Non-metallic Inclusion Removal.
A. Blend base material to eliminate the two non-metallic inclusions.
B. U.T. to ESD 244 to determine wall thickness remaining.

. Pipe-side Rough Grind & Machining Lines.
A. Polish the pipe-side counter-bore to eliminate rough grind edges and machining lines.
B. P.T. to ESD 211 to insure complete removal.
C. Remove dam prior to Step 4.

. Preheat to 250° min. 550° max. interpass; maintain pre-heat until stress relief.

. Weld the 5 3/8" Grindout to original I.D. configuration using Procedure 200.

. Grind 5 3/8" repair for R.T. while maintaining pre-heat.

. M.T. to ESD 207 for Hot P.T. by P. G. & E. D.E.R.
P. G. & E. to indicate N.D.E. to be performed (Step 7).

. Weld area of inclusion removal, if needed, to original counter-bore configuration, using Procedure 4/5 AO.

Grind inclusion repair, if Step 8 is used, for R.T. while maintaining pre-heat.

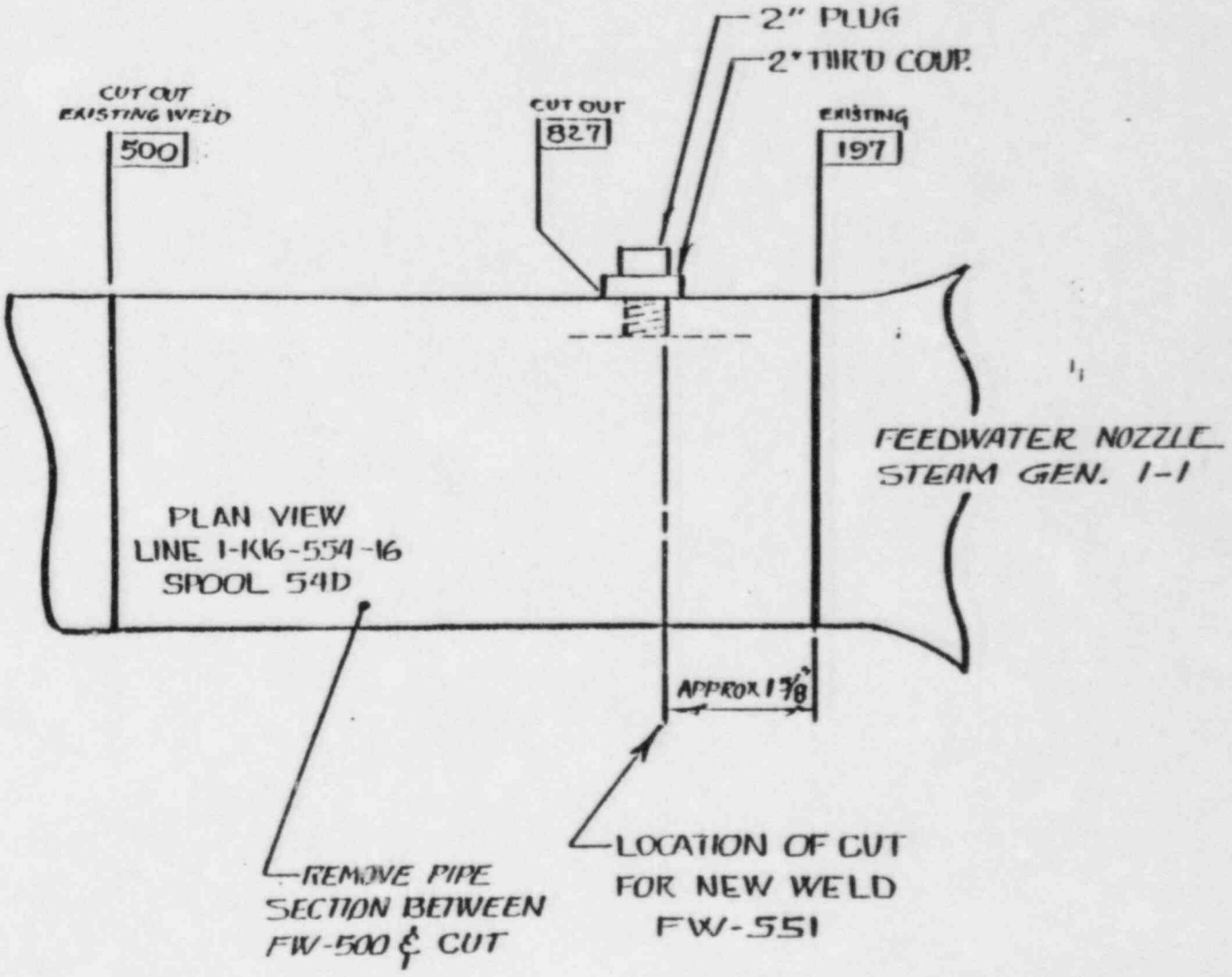
Perform Hot R.T. of repair area per ESD 207.

Proceed with Step 10 of the original D.R. 3484 Recommended Disposition.

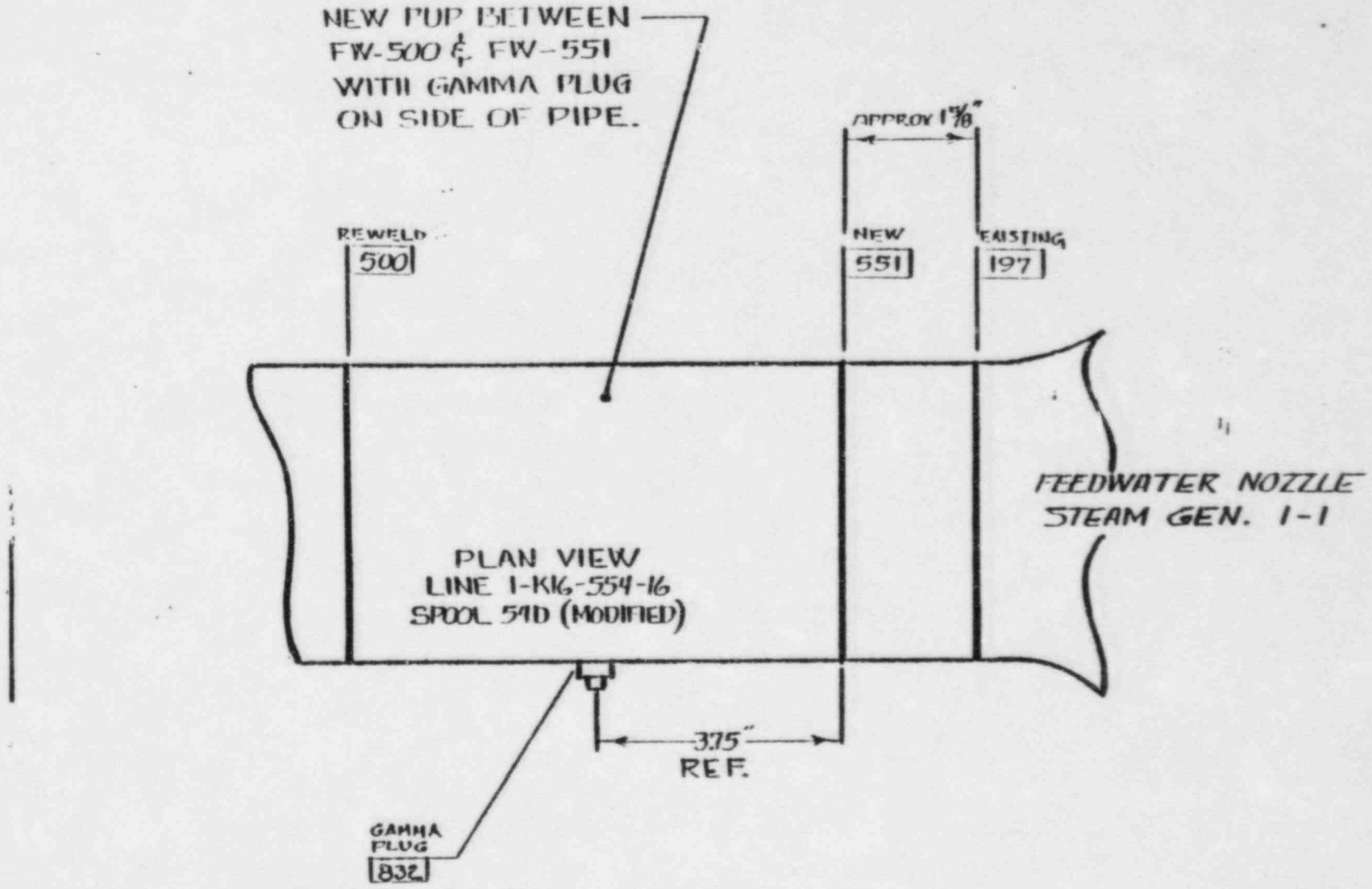
Field Q.A. Manager

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other
☒ Customer ☐ Receiving ☐ Field Inspector ( )

*ATTACH SKETCH IF NECESSARY



DR 3484 SKETCH 1



DR 3484 SKETCH 2

INTEROFFICE CORRESPONDENCE

TO J. P. RUNYAN, FIELD Q.A./Q.C. MANAGER DATE OCTOBER 12, 1977

FROM D. R. GESKE, N.D.E. SUPERVISOR

SUBJECT LIQUID PENETRANT EXAMINATION, F.W. 197, INSIDE DIAMETER

On October 11, 1977, the inside diameter of F.W. 197 was Liquid Penetrant examined per Step #9 of D.R. 3484. The following indications were noted. All dimensions refer to a clock-wise direction beginning at the top (12 o'clock) of the nozzle.

1. 8" clock-wise: 15" of mis-match with root pass roll over on the nozzle side.
2. 8" clock-wise: 1 3/4" of heavy roll over on the nozzle side and slight roll over on the pipe side. (Previous rework in this area removed drop-through with voids.)
3. 16" clock-wise: 1" of undercut on the pipe side of the root pass.
4. 18" clock-wise: 1" of undercut on the pipe side of the root pass.
5. 41" clock-wise: 3/16" crack-like linear on the land surface of the counter-bore 3/16" from the root edge, pipe-side.
6. 41½" clock-wise: 1/8" crack-like linear on the land surface of the counter-bore 5/32" from the root edge, pipe-side.
7. 41" clock-wise: 1/16" lack of penetration at the window close area.
8. 46½" clock-wise: 1 1/2" of heavy drop-through with root pass roll over on both sides of the root.
9. The entire pipe-side counter-bore has been rough ground to facilitate fit-up.

RECOMMENDED REWORK

1. Liquid Penetrant examine to redevelop the noted condition.
2. Grind and polish the root pass. Flush with the base metal from 8" clock-wise for 15", 41" clock-wise at window close, and 46½" clock-wise for 1 1/2". (Indications 1, 2, 3, 4, 7 and 8.)

ATTACHMENT #3

TO: J. P. RUNYAN, Q.A./Q.C. MANAGER DATE OCTOBER 12, 1977

SUBJECT: LIQUID PENETRANT EXAMINATION, F.W. 197, INSIDE DIAMETER

3. Grind and polish the land surface to remove the two (2) linear indications in the land area of the counter-bore. (Indications 5 and 6.) DO NOT REMOVE MORE THAN .010" OF BASE METAL.

   NOTE: If the crack-like linears join and grow, versus reduce in size and remove, suspend grinding and report the findings.

4. Polish the entire pipe-side counter-bore to eliminate rough grind edges. DO NOT remove more than .010" of base metal.

5. Liquid Penetrant examine all grind areas to redevelop indications, i.e. remaining undercut (Indications 3 and 4) and lack of penetration at the window close area (Indication 7).

6. Grind and polish to remove the remaining indications.
   DO NOT REMOVE MORE THAN .010" OF BASE METAL.
   NOTE: If the indications grow, versus reduce and remove, suspend grinding and report the findings.

7. Determine the remaining wall thickness using ultrasonic thickness measuring methods and report the findings.

8. Upon completion of rework, proceed with Step #10 of D.R. 3484 or revise D.R. 3484 to indicate further required rework.

Donald R Geske

Donald R. Geske
N.D.E. Supervisor

DRG/js

OK GRL 10/12/77

TO: J. P. RUNYAN, Q.A./Q.C. MANAGER

DATE OCTOBER 12, 1977

SUBJECT: LIQUID PENETRANT EXAMINATION, F.W. 197, INSIDE DIAMETER

3. Grind and polish the land surface to remove the two (2) linear indications in the land area of the counter-bore. (Indications 5 and 6.) ~~DO NOT REMOVE MORE THAN .010" OF BASE METAL.~~ REMOVAL OF .010" DID NOT REMOVE LINEARS. CONTINUE TO GRIND FOR REMOVAL. DO NOT REMOVE BELOW MINIMUM WALL REQUIRED.
   NOTE: If the crack-like linears join and grow, versus reduce in size and remove, suspend grinding and report the findings.

4. Polish the entire pipe-side counter-bore to eliminate rough grind edges. DO NOT remove more than .010" of base metal.

5. Liquid Penetrant examine all grind areas to redevelop indications, i.e. remaining undercut (Indications 3 and 4) and lack of penetration at the window close area (Indication 7).

6. Grind and polish to remove the remaining indications.
   DO NOT REMOVE MORE THAN .010" OF BASE METAL.
   NOTE: If the indications grow, versus reduce and remove, suspend grinding and report the findings.

7. Determine the remaining wall thickness using ultrasonic thickness measuring methods and report the findings.

8. Upon completion of rework, proceed with Step #10 of D.R. 3484 or revise D.R. 3484 to indicate further required rework.

Donald R Gaske

Donald R. Gaske
N.D.E. Supervisor

DRG/js

OK

INTEROFFICE CORRESPONDENCE

TO J. P. Runyan, Q.A./Q.C. Manager DATE October 14, 1977

FROM D. R. Geske, N.D.E. Supervisor

SUBJECT Result of Rework, F.W. 197 Inside Diameter

On October 12, 1977, the inside diameter of F.W. 197, Steam Generator 1-1 was reworked per Attachment #3 to D.R. 3484. At the end of shift, the rework had not been completed. The following indications remained.

1. 8" clock-wise from top center of the nozzle, 10" of root pass edge fusion line with slight weld metal remaining above the [illegible] metal.

2. 41" clock-wise from top center of the nozzle, 3/16" [illegible] on the pipe-side counter-bore. The original indication moved 1/32" laterally away from the weld. Tentative interpretati[illegible] was the open edge of a non-metallic inclusion in the pipe.

3. 41 1/4" clock-wise from top center of the nozzle, 1/8" linear on the pipe side counter-bore. The original indication moved 3/32" laterally away from the weld. Tentative interpretation was the open edge of a non-metallic inclusion in the pipe.

On October 13, 1977, the indications listed above were further reworked. Weld metal was reduced to minimum wall, .566", to eliminate the 10" root pass edge fusion line. In addition, the area of non-metallic inclusion was explored ultrasonically. The following are results of rework.

1. 41" to 41 1/4" clock-wise: two non-metallic inclusions .600" from the O.D. surface, parallel to the surface. The edge of each inclusion was exposed as a result of counter-bore machining. Total surface measures 5/8" x 3/16" with the longest dimension parallel to the weld.

2. 14 1/2" clock-wise: one linear indication 5 3/8" long, in the land surface of the nozzle, 1/16" from the original root pass weld metal. Observation, during weld metal removal and physical measurement, revealed that this indication was hidden by root pass roll over during the first penetrant examination.

3. Pipe side counter-bore surface was not reworked. Rough grind edges and machining lines remain.

ATTACHMENT #4

TO: J. P. Runyan, Q.A./Q.C. Manager DATE October 14, 1977

SUBJECT: Result of Rework, F.W. 197 Inside Diameter

Upon reaching minimum wall thickness with indication remaining, rework was suspended and a Q. A. Hold tag applied.

RECOMMENDED REWORK

1. Grind to remove the 5 3/8" linear indication 14 1/2" clock-wise from top center of the nozzle. Re-weld the ground-out to original weldment configuration.

2. Grind to remove the two non-metallic inclusions. Measure remaining wall thickness. Weld out to original wall thickness if required and grind to original configuration of the counter-bore.

3. Grind and polish the pipe-side counter-bore to eliminate rough grind edges and machining lines.

4. GRIND AND POLISH ROOT WELD FLUSH WITH PIPE/NOZZLE I.D. JRR 10-17-77

Donald R. Braske

Donald R. Braske
N.D.E. Supervisor

DRG/jf

OK JRR

INTEROFFICE CORRESPONDENCE

TO J. P. RUNYAN, FIELD Q.A./Q.C. MANAGER DATE OCTOBER 19, 1977

FROM D. R. GESKE, N.D.E. SUPERVISOR

SUBJECT REWORK OF F.W. 197 INSIDE DIAMETER

D.R. 3484, dated October 7, 1977, directed entry into line K16-554-16" approximately 1 5/8" on the pipe-side of F.W. 197. Entry was required to facilitate an internal inspection of the piping to nozzle weldment, identified as F.W. 197.

Entry into the line was completed on October 11, 1977, and the initial inspection was conducted using Liquid Penetrant methods per ESD-211. The inspection revealed conditions requiring rework. These conditions were added to the D.R. by means of Revision 1.

On October 12, 1977, P.G.&E. released the recommended rework noted in Revision 1 to D.R. 3484. The rework was released with a modification "Do not remove more than .010" of base metal". Rework actions were begun. Two (2) linear indications in the pipe-side land surface of the counter-bore were not removed with removal of .010" of base material. P.G.&E. further modified Revision 1 to D.R. 3484 on October 12, 1977, by indicating "Removal of .010" did not remove linears. Continue to blend for removal. Do not remove below minimum wall requirements". At the end of shift, the rework had not been completed.

On October 13, 1977, the remaining indications were further reworked. Pipe and weld wall thickness was reduced to minimum wall (.566") and both linears in the pipe-side counter-bore were explored ultrasonically. Results of these actions were added to D.R. 3484 with Revision 2 on October 14, 1977.

Rework was continued on October 17, 1977, based upon D.R. 3484, Revision 2. Further grinding of weld metal removed all of the existing indications except the pipe-side rough grind and machine lines. Wall thickness at the 5 3/8" linear was reduced to .350" with .520" at the non-metallic inclusions. Revision 2 to D.R. 3484 was then modified by P.G.&E. to include "Grind and polish root weld flush with pipe/nozzle I.D." Rework continued until end of shift.

Liquid Penetrant examination was conducted on October 18, 1977, after preliminary grind and polish of root pass removal and pipe-side counter-bore rough grind edges and machining lines. The examination revealed the following conditions:

1. 17" from top center of the nozzle - 4 1/2" x 1/8" area of a fine network of linears on either side of the weld centerline. These two networks were located in the base metal on the face of each counter-bore.

TO: J. P. RUNYAN, FIELD Q.A./Q.C. MANAGER DATE OCTOBER 19, 1977

SUBJECT: REWORK OF F.W. 197, INSIDE DIAMETER

2. 31" from top center of the nozzle - 2 1/2" fine linear on either side of the root pass removal area.

Both conditions noted above were reported by telephone. Further rework was stopped pending review by P.G.&E.

The areas in question were examined by a representative from P.G.&E. Mechanical, P.G.&E. D.E.R. and Westinghouse on October 18, 1977. Instruction from P.G.&E. Mechanical was to remove the indications by grind and polish. Further discussion resulted in instruction to proceed under the existing revision to D.R. 3484. Rationale applied was that the two (2) linears at 31" was part of root pass removal and the network of linears at 17" was part of the rough grind clean-up action.

Rework of the inside surface continued to the end of shift. All noted indications were removed and a preliminary Liquid Penetrant examination verified removal.

Liquid Penetrant examination per ESD-211 was re-applied on October 19, 1977. Examination revealed all previously noted discontinuities were removed and rework was concluded. Ultrasonic thickness measurements of remaining wall indicated average wall in the flush grind areas is .580". Grind areas are as follows:

1. 8" clock-wise from top center of the nozzle a 10" crescent groove .350" of remaining wall.

2. 31" clock-wise from top center of the nozzle a 2 1/2" crescent groove .420" of remaining wall.

3. 41" clock-wise from top center of the nozzle a 2" rounded grind-out .520" of remaining wall.

On October 19, 1977, rework of F.W. 197 inside surface was continued per D.R. 3484, Revision 2, Step #9A, Item 4.

Donald R Geske

D. R. Geske
N.D.E. Supervisor

DRG/js

Attachment - D.R. 3484,Rev. 2

THE M.W. KELLOGG COMPANY
A DIVISION OF PULLMAN INCORPORATED

LIQUID PENETRANT EXAMINATION RECORD

DATE 10-19-77

ISO/DWG NUMBER 500146A (DR 3484, Rev 2) "F" SHEET N/A

JOINT NUMBER FW-197 (INSIDE SURFACE AFTER GRIND OUT) JOB NO. 7177

MATERIAL 16" C.S. TO STEAM GENERATOR 1-1 NOZZLE

EXAMINATION PROCEDURE KPT- 8711 ESD- Z 11

ACCEPTANCE STANDARDS ASME SECTION III

LIQUID PENETRANT-BRAND MAGNAFLUX DYE CHECK

LIQUID PENETRANT BATCH NUMBER CLEANER 6J004 PENETRANT 2L095 DEVELOPER SM113

☒ ACCEPTED ☐ REJECTED Donald R Brake
SIGNATURE OF INSPECTOR

MAGNETIC PARTICLE EXAMINATION RECORD

DATE

/DLG NUMBER "F" SHEET N/A

JOINT NUMBER FW- JOB NO. 7177

MATERIAL CARBON STEEL

EXAMINATION PROCEDURE KMT- 8711 ESD-

ACCEPTANCE STANDARDS ASME

MAGNETIC PARTICLE POWDER BRAND MAGNAFLUX

MAGNETIC PARTICLE POWDER COLOR RED (8A)

COLOR OF COMPONENT METALLIC

INDICATIONS
Linear
Round
Aligned

☐ ACCEPTED ☐ REJECTED

THE M.W. KELLOGG COMPANY

POWER PIPING

RADIOGRAPHIC INSPECTION REPORT

JOB NO. 7177 [ ] SHOP [✓] FIELD

DATE 10-19-77

Customer	Description	Material Spec.
P. G. & E.	500146A FEEDWATER	K16-554

Material Thickness	Material Diameter	Acceptance Standard	Welding Specification	Type Seam
.580	16"	B31.1	ESG 207 KRT-2	BUTT

Source	Size of Source	Curies	Distance	Time	Focal Film Distance	Film Type	Film Size	Film Technique
IR 192	10 X 10	84	8"	20 sec.	—	T	4½ X 17	SINGLE [X]

Film Processing: Hand Tank @ 68° F

Radiographer: GESKE ASNT Level II

Fittings, Seam or Joint Number	Film Interval Number	Penetrameter	Accept.	Reject	Slag	Porosity	Crack	Lack of Pen.	Lack Fusion	Undercut	Surface	Shrink	Hot Tear	Sand	Chaplets	Date Film Exposed	Remarks -SINGLE VIEWING-	
FW147	0-1-2	INFO	✓			w/c										10-19-77	PIPE HOT 300°F	DGESK
RI TZ.	2-3-4	✓	✓			w/c												
	4-5-6	✓	✓		w/c	w/c											CLUSTER AT #6 ACCEPTABLE.	
	6-7-0	✓	✓			w/c												

NOTE: WELDMENT SHOT WHILE AT 300°F FOR INFORMATION ONLY PER DR 3484, REV 2.

Donald A Geske
10-19-77

APPROVED BY		
M.W.K.	CUST.	AUTH. INS.

THE M.W. KELLOGG COMPANY
A DIVISION OF PULLMAN INCORPORATED

LIQUID PENETRANT EXAMINATION RECORD

DATE _____

ISO/DWG NUMBER _____ "F" SHEET N/A

JOINT NUMBER FW- _____ JOB NO. 7177

MATERIAL _____

EXAMINATION PROCEDURE KPT- 8711 ESO-

ACCEPTANCE STANDARDS ASME

LIQUID PENETRANT BRAND MAGNAFLUX DYE CHECK

LIQUID PENETRANT BATCH NUMBER CLEANER _____ PENETRANT _____ DEVELOPER _____

☒ ACCEPTED ☐ REJECTED _____
SIGNATURE OF INSPECTOR

MAGNETIC PARTICLE EXAMINATION RECORD

DATE 10-19-77

ISO/DWG NUMBER 500146A (DR 3484 REV 2) "F" SHEET N/A

JOINT NUMBER FW-147 (INSIDE SURFACE AFTER WELD-OUT) (300°F) JOB NO. 7177

MATERIAL CARBON STEEL

EXAMINATION PROCEDURE KMT- 8711 ESO- ~~KMT~~ 247 Date 10-28-77

ACCEPTANCE STANDARDS ASME SECTION I

MAGNETIC PARTICLE POWDER BRAND MAGNAFLUX

MAGNETIC PARTICLE POWDER COLOR RED (8A)

COLOR OF COMPONENT METALLIC

INDICATIONS
Linear
Round
Aligned

NOTE: COIL METHOD WAS USED.
Date 10-28-77

☒ ACCEPTED ☐ REJECTED Donald R Baker

EXHIBIT 10 TO ATTACHMENT 1

10 CFR-21 (IS) or (IS NOT) ATTACHED

Pullman Power Products

DISCREPANCY REPORT

D.R. NO. 4642
ISO. NO. 500146
UNIT NO. 1
CODE NO. 1

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 11-8-82
PROJECT: Diablo Canyon JCS NO.: 7177 INSPECTOR: B. Hudson/MacCrae

DISCREPANT ITEM: ESD-246 and ESD-247 - Magnetic Particle Procedure/ Dry/Continuous Coil Method not per Spec 8711

EXPLANATION OF DISCREPANCY:

Internal Audit #101, A.A.R. #1, identified that there was no Procedure Qualification Record or ESD-246 and ESD-247.

Subsequent investigation has revealed that ESD-247 was used to MT examine the inside diameter of FW #197, Iso #500146, Steam Generator 1-1, DR #3484, on two occasions (see attached examination records) ESD-247 is listed on DR #3453 as well, under Recommended Disposition and is suspected to have been used (there is no examination record with the D.R.) to MT examine the inside diameter of FW #244, Iso #500146, Steam Generator 1-4. The welds in question are on lines K16-554-16 Z7 and K16-556-16 Z7, both Seismic Class 1 code.

The use of ESD-247 on Seismic Class 1 pipe without a Procedure Qualification Record is a nonconformance to Contract Specification 8711 Section 3 Table I and Notes to Table I, Section Paragraph 3.23, Section 5 Paragraph 1.2, Section 2 Paragraph 2.1 and Section 3 Paragraph 1.4.

--CONTINUED ON PAGE 2 OF DISCREPANCY REPORT--

RECOMMENDED DISPOSITION: INDICATE APPROVAL BY CIRCLING THE APPROPRIATE "RECOMMENDED DISPOSITION"

1. Accept-as-is all work examined by ESD-247

2. File a copy of this D.R. in the following locations:

   A. Document package for Iso #500146 FW 197 and original DR 3484

   B. Document package for Iso #500146 FW 244 and original D.R. 3453

   C. Originals of ESD 246 and 247

CR

X. P.G.&E. to disposition

PG&E G.C. QUALITY CONTROL
REVIEWED T.E. Quinn
DATE 2/9/83

Approved By P.P. Plant Q.A. Mgr. [signature] Date 11/20/82 Customer [signature] Date 2/9/83

FINAL DISPOSITION: ☒ In Accordance With Above "1" or "2" ☐ Other (explanation and approval required)
Work Completed Insp: [signature] Date: 2/10/83 Work Completed Insp: _____ Date: _____

EXPLANATION (IF NECESSARY):

P.P. Plant Q.A. Manager _____ Date _____ Customer _____ Date _____

TO PREVENT RECURRENCE ☐ Not Applicable

A/C Manager shall assure that N.D.E. procedures have the necessary Procedure Qualification records performed and included as part of the procedure prior to submitting to P.G.&E. for approval.

Plant Q.A. Manager [signature] 11/20/82

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other _____

(ISI or IIS NOT) ATTACHED

DISCREPANCY REPORT

Q.R. NO. ______
ISO. NO. 320146
UNIT NO. ______
CODE NO. 6

CUSTOMER: Pacific Gas & Electric SPEC. NO: 6711 DATE: 11-8-82
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: [illegible]

DISCREPANT ITEM: ESD 247 - Magnetic Particle Examination (Dry) Continuous Coil - not in Spec.

EXPLANATION OF DISCREPANCY:

Internal Audit # 101, AAR#1, identified that there is no Procedure Qualification Record for ESD 247. Subsequent investigation has revealed that ESD 247 was used to MT examine the inside diameter of FW# 197, ISO# 500146, Steam Generator 1-1, DR= 3434, on two occasions (see attached examine records). ESD 247 is listed on DR# 3453 under Recommended Disposition and is suspected to have been used (there is no examine record with the DR) to MT examine the inside diameter of FW = 244, ISO = 500146, Steam (continued)

RECOMMENDED DISPOSITION:

1. ESD 247 have a Procedure Qualification Record established by actual demonstration of the procedure.

AND

2. Accept as is all work examined by ESD 247

OR

3. Reject all work examined by ESD 247, and an audit be performed on all ASME Section I, B31.1 and Seismic Class I work to determine if ESD 247 was used to examine welds on these systems, and reexamine identified welds with a qualified NDE procedure.

OR

4. Accept FW's as is based on subsequent NDE performed during repair, [illegible]

Approved By: P.P.P. Field Q.A. Mgr. ______ Date ______ Customer ______ Date ______

FINAL DISPOSITION: ☐ In Accordance With Above ☐ Other (explanation and approval required)

Work Completed Insp: ______ Date: ______ Work Completed Insp: ______ Date: ______

EXPLANATION (IF NECESSARY):

P.P.P. Field Q.A. Manager ______ Date ______ Customer ______ Date ______

STEPS TO PREVENT RECURRENCE ☐ Not Applicable

Field Q.A. Manager

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other ______
☒ Customer ☐ Resident ☐ Field Inspector (______)

ATTACH SKETCH IF NECESSARY

10 CFR-21
(IS) or (IS NOT)
ATTACHED

Pullman Power Products

DISCREPANCY REPORT

Q.R. NO.	
ISO. NO.	[illegible]
UNIT NO.	1
CODE NO.	[illegible]

CUSTOMER:	Pacific Gas & Electric	SPEC. NO:	8711	DATE:	11-8-82
PROJECT:	Diablo Canyon	JOB NO.:	7177	INSPECTOR:	[illegible]

Generator 1-4. The welds are on lines K16-554-16IV and K16-556-16IV, both Seismic Class I wire. The use of ESD 247 on Seismic Class I pipe without a Procedure Qualification Record is a nonconformance to Contract Specification 8711 Section 3 Table I and Notes to Table I, Section 4.3.27, Section 5.1.2 Section 2.2.1 and Section 3.14

THE M.W. KELLOGG COMPANY
A DIVISION OF PULLMAN INCORPORATED

LIQUID PENETRANT EXAMINATION RECORD

DATE _____

ISO/CW NUMBER _____ "F" SHEET N/A

JOINT NUMBER FW- _____ JOB NO. 7177

MATERIAL _____

EXAMINATION PROCEDURE KPT- 8711 ESO-

ACCEPTANCE STANDARDS ASME

LIQUID PENETRANT BRAND MAGNAFLUX DYE CHECK

LIQUID PENETRANT BATCH NUMBER CLEANER PENETRANT DEVELOPER

☒ ACCEPTED ☐ REJECTED

SIGNATURE OF INSPECTOR

MAGNETIC PARTICLE EXAMINATION RECORD

DATE 10-19-77

ISO NUMBER SCO1146A (DR 3484 REV 2) "F" SHEET N/A

JOINT NUMBER FW-197 (INSIDE SURFACE AFTER WELD-OUT) (300%) JOB NO. 7177

MATERIAL CARBON STEEL

EXAMINATION PROCEDURE KMT- 8711 ESO- ~~REV~~ 247 dkb 10-28-77

ACCEPTANCE STANDARDS ASME SECTION I

MAGNETIC PARTICLE POWDER BRAND MAGNAFLUX

MAGNETIC PARTICLE POWDER COLOR RED (8A)

COLOR OF COMPONENT METALLIC

INDICATIONS

☒ Linear

Round

Aligned

NOTE: COIL METHOD WAS USED. dkb 10-28-77

☒ ACCEPTED ☐ REJECTED

Donald R Baker

SIGNATURE OF INSPECTOR

THE M.W. KELLOGG COMPANY
A DIVISION OF PULLMAN INCORPORATED

LIQUID PENETRANT EXAMINATION RECORD

DATE _____

SO/DWG NUMBER _____ "F" SHEET N/A

JOINT NUMBER FW- _____ JOB NO. 7177

MATERIAL _____

EXAMINATION PROCEDURE KPT- 8711 ESD- _____

ACCEPTANCE STANDARDS ASME _____

LIQUID PENETRANT BRAND MAGNAFLUX DYE CHECK _____

LIQUID PENETRANT BATCH NUMBER CLEANER _____ PENETRANT _____ DEVELOPER _____

☐ ACCEPTED ☐ REJECTED _____ SIGNATURE OF INSPECTOR

MAGNETIC PARTICLE EXAMINATION RECORD

DATE 10-20-77

SO/DWG NUMBER 500146A (DR 3484) "F" SHEET N/A

JOINT NUMBER FW- 197 (INSIDE SURFACE AFTER WELD) JOB NO. 7177

MATERIAL CARBON STEEL

EXAMINATION PROCEDURE KMT- 8711 ESD- 247

ACCEPTANCE STANDARDS ASME SECTION I

MAGNETIC PARTICLE POWDER BRAND MAGNAFLUX

MAGNETIC PARTICLE POWDER COLOR RED (SA)

COLOR OF COMPONENT METALLIC

INDICATIONS
Linear
Round
Aligned

☒ ACCEPTED ☐ REJECTED Donald R Brake
SIGNATURE OF INSPECTOR

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3453 Rev. 1 Rev 2

ISC. NO. 500146 Shr 4 of 5

UNIT NO. 1

CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 8-26-77

PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16"; Spool Piece 500; El. 154'-4½"; Area G; Sect. 1

EXPLANATION OF DISCREPANCY: Reference P.G.&E. Drawing 500146, Rev. 98

Per P.G.&E.'s request, an internal inspection of F.W. 244 on Steam Generator 1-4 Feedwater Nozzle will be performed. The line entry will be made in the following manner, see Recommended Disposition.

FOR INFORMATION ONLY

RECOMMENDED DISPOSITION:

1. Measure 2" from F.W. 244 center upstream on pipe (Spool Piece 500) circumscribe the pipe using a wrap around, then prick punch the scribe line.
2. Using air-arc, cut the pipe all around maintaining less than a 40° total bevel to within approximately 1/8" from the I.D. (See Sketch #1).
3. Using a thin blade grinder, cut through the center of the bevel, then dress up both bevels (See Sketch #1).
4. Jack pipe away from cut on upstream side per Superintendent's instruction. Install a dam in nozzle beyond F.W. 244 to prevent air from entering Steam Generator.
5. Clean and inspect F.W. 244 internally as directed by P.G.&E. (Con't on Page 2)

Approved By: M.W.K. Field Q.A. Mgr. J.P. Runyan Date 8/26/77 Customer R.D. Etzler MVR 3553 Date 8/29/77

FINAL DISPOSITION: ☒ In Accordance With Above

Work Completed Insp. A.B. Burke Date: 11-2-77

☒ Other (explanation and approval required)

Work Completed Insp. A.B. Burke Date: 11-2-77

EXPLANATION (IF NECESSARY):

Revision 1 - Delete Step 6 in its entirety (access was achieved). Refer to Attachment #1 for results of initial inspection and recommended disposition.

Revision 2 - See Page 3 of 3 and Attachment #3. DEVIATION 244

Rev #2 J.P. Runyan 9/7/77 R.D. Etzler 9-26-77

Rev #1 M.W.K. Field Q.A. Manager J.P. Runyan Date 8/31/77 Customer R.D. Etzler MVR 3553 Date 9/2/77

STEPS TO PREVENT RECURRENCE ☒ Not Applicable

Field Q.A. Manager

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other

☒ Customer ☐ Receiving ☐ Field Inspector ( )

ATTACH SKETCH IF NECESSARY

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

D.R. NO. 3453 Rev. 1 R

ISO. NO. 500146 Sht. 4 of

UNIT NO. 1

CODE NO. N/A

DISCREPANCY REPORT

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8771 DATE: 8-26-77

PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16"; Spool Piece 500; El. 154'-[illegible]"; Area G; Sect. 1

RECOMMENDED DISPOSITION: (CON'T)

6. If access to F.W. 244 I.D. cannot be achieved, proceed with alternate instructions (See Skatch #2).

7. Upon completion of inspection, remove dam, grind bevel to facilitate fit-up as needed, clean and fit to ESD-215 and ESD-220.

8. Weld out using F.W. 549 and procedure 4/5.

9. Inspect and NDE to ESD-215 and ESD-206.

10. Add all information to process sheet and isometrics.

DISTRIBUTION: ☒ Master Q.A. File ☒ Auth. Insp. ☒ Engineering Dept. ☐ Other

☒ Customer ☐ Receiving ☐ Field Inspector ( )

THE M.W. KELLOGG COMPANY

A DIVISION OF PULLMAN INCORPORATED

DISCREPANCY REPORT

D.R. NO. 3453 REV 2
ISO. NO. 500146 Sht. 4 of 5
UNIT NO. 1
CODE NO. N/A

CUSTOMER: Pacific Gas & Electric SPEC. NO: 8711 DATE: 8-26-77
PROJECT: Diablo Canyon JOB NO.: 7177 INSPECTOR: Runyan/Scannell/Guest

DISCREPANT ITEM: Line K16-556-16"; Scool Piece 500: El. 154'-4½"; Area G; Sect. 1

D.R. 3453, Revision 2

EXPLANATION OF DISCREPANCY:

During the performance of grinding per D.R. 3453, Revision 1, Step #5, four (4) indications of heavy drop through with roll over were removed along with all of the existing root penetration. Re-inspection revealed a linear indication 1" long on the fusion line to the Feedwater Nozzle. Further grinding, to a maximum depth of .110", removed the linear indication (see Attachment #3).

FOR INFORMATION ONLY

RECOMMENDED DISPOSITION:

Add the following to Step #5 and delete original Steps #7, 8, 9 and 10. Perform the following repair:

A. Grind the bevels to facilitate Fit-Up of F.W. 549.
B. M.T. I.D. of F.W. 244 using ESD-247 coil method, and clean grooved root pass at F.W. 244 per ESD-215.
C. Remove the dam from the nozzle at F.W. 244.
D. Preheat F.W. 244 to a minimum of 250°F, interpass not to exceed 550°F maximum. Maintain this preheat until stress relief begins.
E. Weld to procedure 200 (F.W. 244 R1), using E70S2 wire with the GTAW process, to conform to blended configuration of the balance of the weld. I.D. only
F. Grind and polish the added weld metal to blend with base metal surfaces.
G. Inspect and NDE to ESD-215 and PLATE DER TO REFORM L.P. AT PREHEAT-TEMP. FURNISH MWK WITH COPY OF DATA SHEET.

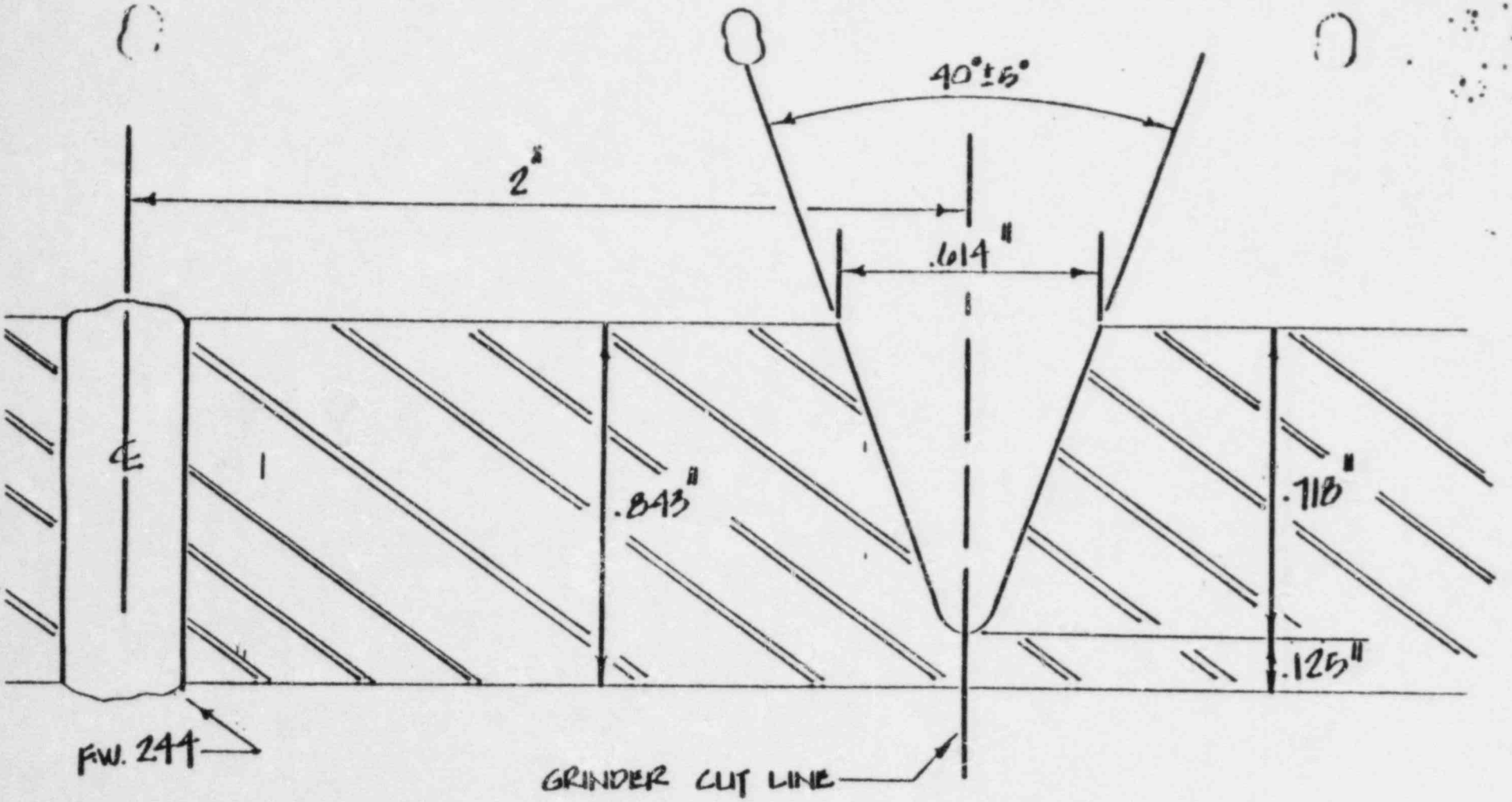
NOTE: Proceed with D.R. 3456, and X-ray weld, hot, for information only.

7. Upon completion of inspection, remove dams from F.W. 549 pipe side, clean and fit F.W. 549 to ESD-215 and ESD-220.
8. Weld out using F.W. 549 with procedure 4/5 A.D.
9. Grind F.W. 549 for X-ray.
10. Inspect and NDE F.W. 549 to ESD-215 ~~PLATE DER TO REFORM L.P. AT PREHEAT-TEMP. FURNISH MWK WITH COPY OF DATA SHEET.~~ 9/30/77 11AM

NOTE: X-ray weld hot for information only.

11. Stress relieve at F.W. 244 R1 and F.W. 549 1100°F to 1150°F per ESD-218.
12. NDE F.W. 244 R1 and F.W. 549 to ESD-207.
13. " " " " to ESD-211 9/30/77
14. Add information to process sheets.

DISTRIBUTION: ☒ Master Q.A. File ☒ Insp. Insp. ☒ Engineering Dept. ☐ Other
☒ Customer ☐ Receiving ☐ Field Inspector



3X ACTUAL SIZE

DR-#3453
SKETCH #1

ALTERNATE INSTRUCTIONS

1. Cut out F.W. 509 using air-arc and taking necessary steps to maintain the ability to bevel the 45° ell side of the weld to 20° ± 2½° and a 3/32" ± 1/16" land. Also, cut out F.W. 339 shown on Iso. 3-246.

2. Requisition: 8 5/8" ± of 16" Pipe, Schedule 80 A106 Gr B and a 3/4" 3000# S.W. Half Coupling or soc-o-let A105.

3. Install the 3/4" half coupling or soc-o-let four (4) inches from the end of the 16" pipe.

4. Clean and Fit to ESD-215 and ESD-220.

5. Weld out with procedure 92/93 (F.W. 831).

6. Inspect and NDE to ESD-215 and ESD-211.

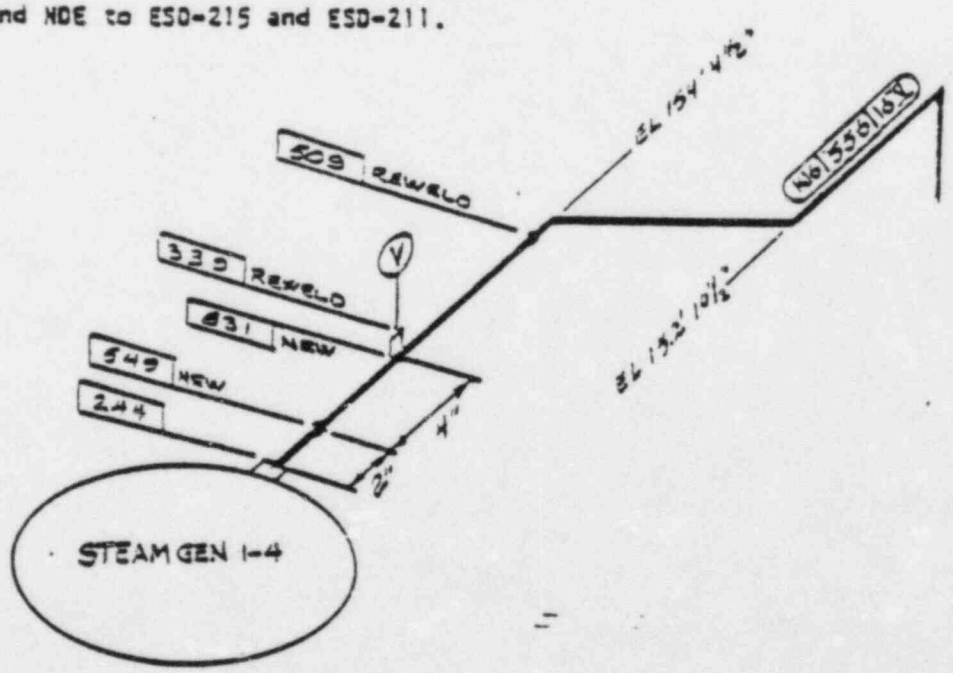
7. Upon completion of F.W. 244 I.D. inspection and P.G.&E.'s direction, fit-up 16", Schedule 80 pipe and proceed with Step 7 of attached D.R. using F.W. 549 and F.W. 509.

8. Rewald F.W. 339, as shown on Iso. 3-246, maintain original line configuration.

9. Clean and Fit-up to ESD-215 and ESD-220.

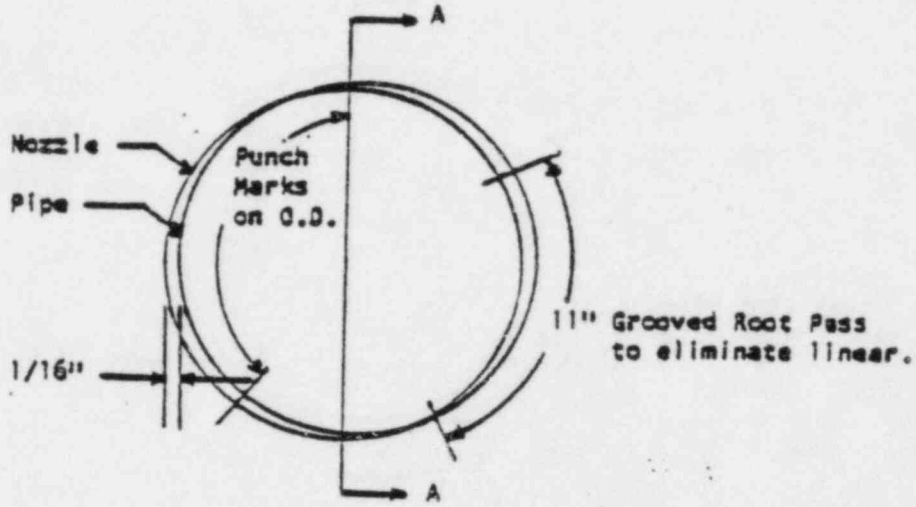
10. Weld out with procedure 92/93.

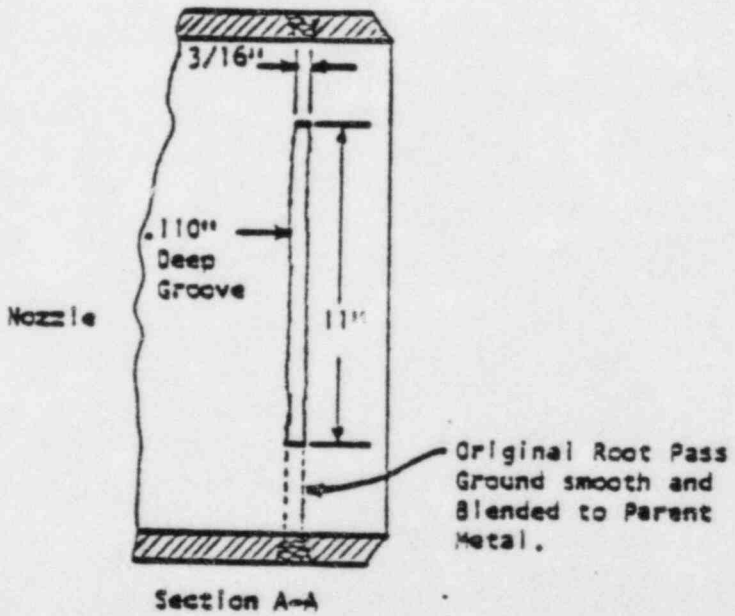
11. Inspect and NDE to ESD-215 and ESD-211.



SKETCH #2
DR 3453

Findings at F.W. 244





Section A-A

NOTE: Average Wall Thickness = .580" to .600"
Remaining Wall At Groove = .450"
Punch Marks On The O.D. = .047" Deep
(Punch Marks are directly on the fusion line of F.W. 244 to 1/8" inside the fusion line .047" deep.)

INTEROFFICE CORRESPONDENCE

ATTACHMENT #1
DR-3453 Rev. 1

TO J. P. RUNYAN, Q.A./Q.C. MANAGER

DATE AUGUST 31, 1977

FROM D. R. GESKE, NDE SUPERVISOR

SUBJECT LIQUID PENETRANT EXAMINATION, F.W. 244, INSIDE DIAMETER

On August 31, 1977, F.W. 244, Line K16-556, Isometric 1-03-500146, Feedwater piping to Steam Generator 1-4 Nozzle, was liquid penetrant examined on the inside diameter.

The following indications were noted:

1. 2" from top center of nozzle, a small faint transverse linear-nonrelevant due to weld geometry.
2. 7" from top center of nozzle, heavy 1" drop through with roll over.
3. 9" from top center of nozzle, heavy 2" drop through with roll over.
4. 37" from top center of nozzle, heavy 1½" drop through with roll over.
5. 39" from top center of nozzle, heavy 1/2" drop through with wire protrusion.
6. Approximately 1/16" mismatch exists from 7:00 to 9:00 facing the nozzle.

We recommend that the root pass be ground and polished to blend with base metal surfaces. Particular care should be taken to avoid the removal of base material. Then re-examine the I.D. with liquid penetrant, if acceptable, proceed to "Recommended Disposition", Step 7 of D.R. 3453, Revision 1.

Donald R. Geske

Donald R. Geske
NDE Supervisor

DRG/js

Response to Internal Audit #101, A.A.R. #1

A procedure qualification was performed in order to qualify ESD-247 as well as ESD-246 (ref. Internal Audit #101, A.A.R. #1).

As both ESD-246 and 247 have been withdrawn from use and the equipment listed in both procedures is no longer available for use, the equipment used for these PQR's was the Magnaflux Model P-90 for the coil technique only. All other factors are the same as specified in the procedures.

As the Magnaflux Model P-90 puts out less amperage than the equipment listed in ESD-246 and ESD-247, and acceptable results were obtained (i.e; I.D. and O.D. surface and I.D. subsurface indications were located), the demonstration of this technique is deemed adequate to approve this method employed by the equipment listed in the above procedures.

A record of the procedure qualification demonstration is hereby submitted along with this response. The originals will be filed with the applicable procedures.

In the event that either or both procedures are re-activated in the future, they will be revised to incorporate the Magnaflux Model P-90 into the list of equipment. As both procedures are currently withdrawn from use, no revision is deemed necessary at this time.

Michael S. MacCrae
MT Level III
11-9-82

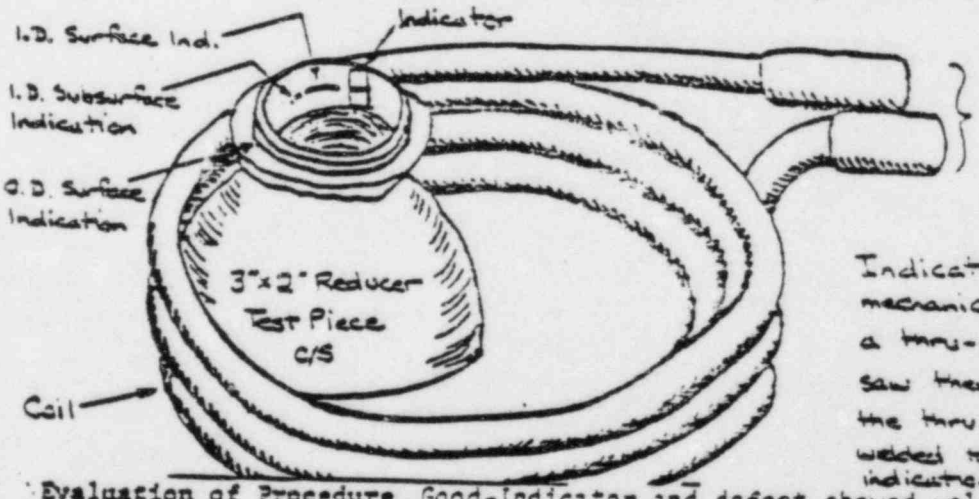
ENGINEERING SPECIFICATION – SPEC. NO. 8711

ENGINEERING DEPARTMENT ES D-246

MAGNETIC PARTICLE PROCEDURE QUALIFICATION RECORD

Procedure Qualification No. MT-3

Method Dry Powder Continuous; Half Wave D.C., Coil
Equipment Manufacture Magnaflux Corp.
Brand Name Magnaflux
Model Number P-90
Magnetic Particles: Brand Magnaflux Type Dry Color 8A-Red
Magnetization Current Half Wave Rectified D.C.
Out Put Amperes 1000 Amps.
Test Piece Position Vertical
Test Material Carbon Steel
Type Test Piece 3"x2" Reducer with cut fillet weld at socket end
Surface Condition Bare Metal
Pre-Cleaning Method None
Weather 70° Dry
Base Metal Color Dark Brown and Shiny Metal
Contrast of Particles to Base Metal Good
Method of Particle Application Powder Bulb
Method of Removing Excess Particles Blowing
Demagnetization None
Prod. Spacing and Amperage: 3 Coil Loops of 5 x Pipe Diameter with 1000 Amps.



Coil plugged into Magnaflux Model P. Half-wave Rectified DC Current. (110 Volt

Indications are induced mechanical defects made by a thru-wall cut of a band saw then compressed. Part of the thru wall cut was back-welded to produce sub-surface indications.

Evaluation of Procedure Good-Indicator and defect showed well.

Procedure: ☐ Approved ☐ Not Approved Test Conducted By M. MacCrae 11/9/92

M. S. MacCrae
MT Level III

PREPARED BY M. MacCrae DATE OF ISSUE 11/9/92 PAGE ___ OF ___
DATE OF REV. ___
APPROVED BY ___

ENGINEERING | SPECIFICATION - | SPEC. NO. 8711

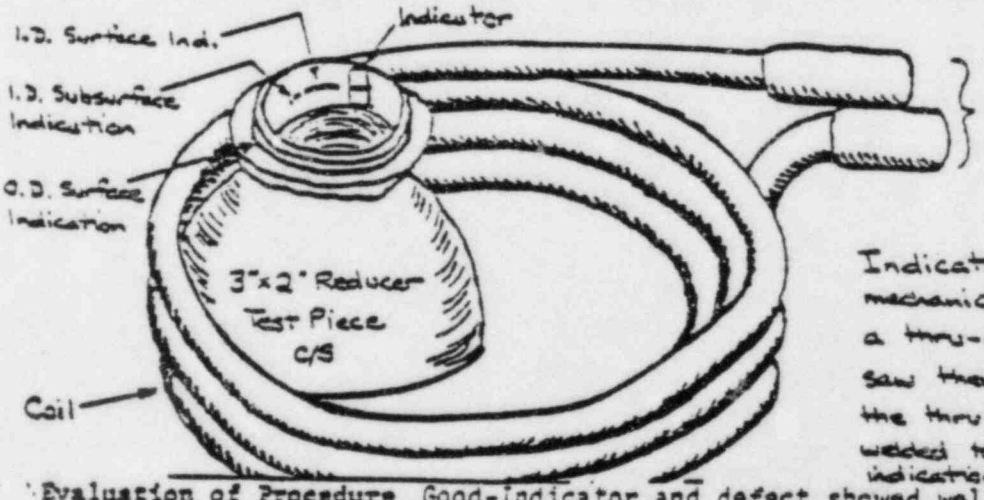
F-23

ENGINEERING DEPARTMENT | ES D-247

MAGNETIC PARTICLE PROCEDURE QUALIFICATION RECORD

Procedure Qualification No. MT-3

Method Dry Powder Continuous; Half Wave D.C., Coil
Equipment Manufacture Magnaflux Corp.
Brand Name Magnaflux
Model Number P-90
Magnetic Particles: Brand Magnaflux Type Dry Color 8A-Red
Magnetization Current Half Wave Rectified D.C.
Out Put Amperes 1000 Amps.
Test Piece Position Vertical
Test Material Carbon Steel
Type Test Piece 3"x2" Reducer with cut fillet weld at socket end
Surface Condition Bare Metal
Pre-Cleaning Method None
Weather 70° Dry
Base Metal Color Dark Brown and Shiny Metal
Contrast of Particles to Base Metal Good
Method of Particle Application Powder Bulb
Method of Removing Excess Particles Blowing
Demagnetization None
Prod. Spacing and Amperage: 3 Coil Loops of 5 x Pipe Diameter with 1000 Amps.



Coil plugged ... Magnaflux Model P... Half-Wave Rectified DC Current. (110 Volt

Indications are induced mechanical defects made by a thru-wall cut of a band saw then compressed. Part of the thru wall cut was back-welded to produce sub-surface indications.

Evaluation of Procedure Good-Indicator and defect showed well.

Procedure: ☐ Approved ☐ Not Approved Test Conducted By M. MacCrae 11/9/82

M. S. MacCrae
MT Level III

PREPARED BY M. MacCrae DATE OF ISSUE 11/9/82 PAGE ___ OF ___
APPROVED BY ___ DATE OF REV. ___

CONST. [illegible]

THE [illegible] COMPANY
A DIVISION OF PULLMAN INCORPORATED

EXHIBIT 11 TO
ATTACHMENT I

PERSONNEL TESTING RECORD

NAME D. R. GESKE

SUBJECT	LEVEL	GRADE	DATE	EXAMINED BY	RE-EXAMINED BY	GRADE	DA
Radiography	III	92%	[illegible]	[illegible]			
Magnetic Particle	II	98%	8-23-[illegible]	[illegible]			
Liquid Penetrant	II	96.67	10-1-[illegible]	[illegible]			
Visual Inspection	II	95%	10-[illegible]	[illegible]			
Welding Inspection							
Radiation Safety							
Ultrasonics	II	94%	11-[illegible]	[illegible]			

EXAMINATION GRADES IN PERCENT

SUBJECT	GENERAL EXAM	SPECIFIC EXAM	PRACTICAL EXAM	COMPOSITE
Radiography	93.[illegible]	90.7[illegible]	[illegible]	92%
Magnetic Particle	[illegible]	[illegible]	[illegible]	98%
Liquid Penetrant	100%	97%	93.75	96
Visual Inspection	100%	80%	100%	93
Welding Inspection				
Radiation Safety				
Ultrasonics	90%	95%	100%	95%

PERCENTILE WEIGHT

SUBJECT	GENERAL EXAM	SPECIFIC EXAM	PRACTICAL EXAM	LEVEL
Radiography	.5	.3	.2	II
Magnetic Particle	.4	.3	.3	II
Liquid Penetrant	.4	.3	.3	II
Visual Inspection	.5	.4	.1	II
Welding Inspection				
Radiation Safety				
Ultrasonics	[illegible]	[illegible]	.2	II

ATTACHMENT
2

Affidavit

My name is Charles Stokes. I am submitting this affidavit to the Nuclear Regulatory Commission (NRC) to inform them of material false statements and other evidence of activities which could compromise the quality of the Diablo Canyon nuclear power plant, if it should be turned on. The misconduct involves welding, procedure qualification tests, and plant modifications during the hot functional tests. In my professional judgment, if these issues alone are confirmed as examples of general practices, the plant could not possibly be licensed to go critical under the NRC's legal requirements in 10 C.F.R.

In fact, the practices revealed below and others I have disclosed would even flunk Bechtel's own standards. I am enclosing as Exhibit 1 portions of Bechtel's "Field Engineer Pocket Hanger Reference," Diablo Canyon Project, Bechtel Power Corporation. Bechtel's booklet is not a bad document. Although there are a few minor errors, it describes a reasonable design control and quality assurance (QA) program.

Unfortunately it was not issued on-site before I left. I obtained a copy before distribution was stopped. I can understand why Bechtel didn't want the booklet released. The plant wasn't built at all like the system described in Bechtel's own handbook. The handbook will be discussed in more detail below.

(1) In reply to PG&E's letters no. DCL-84-067 and no. DCL-84-078 concerning welding of A-325 bolts. PG&E contends that "10 supports were identified which used welded A-325 bolt design." That is highly misleading. In reality, there are many more cases where bolts have been used.

Because of inadequate documentation, welded bolts have been used and it is impossible to say whether they are A-325 or A-307 or anything else. Even QA Personnel concedes not knowing. In two specific cases, for which I can provide the support numbers, undocumented bolts were used to connect support members to structural steel.

In my opinion, PG&E's reply is so far from complete that it does not provide accurate information to the NRC concerning the use of A-325, A-307 or other bolts. The two specific supports do not even have a weld symbol describing how they were welded on the drawings. The QA inspector was not able to visually inspect the connection.

(2) A second illustration of deficient documentation for welding bolts is inadequate material traceability. Material was not stamped for traceability back to the Certificates of Compliance as required. The significance of stamping for traceability is that without this traceability there existed no methodology to ensure that the material used in many hangers, or other seismic class one structures, complied with the requirements (e.g., proper metallurgical properties).

In ANSI B31.7 chapter 10723, entitled "Materials," it is stated that "all material shall be clearly identified" by "the applicable material specification and grade, heat number, or heat code of the material, and any additional markings required to facilitate traceability of the reports of the results of all tests and examinations performed on the material." ANSI B31.7 also states that "Certificant of Compliance with the material specifications may be provided in lieu of Certified Material Test Reports unless otherwise required by the design specification." (Emphasis added)

Material traceability is only one aspect of the required traceability. In ANSI B31.7 Para. 1-727.5.3 and Para. 1-727.6, weld traceability is also required. "The welder or welding operator shall identify it as his work by applying his assigned symbol for permanent record in a manner specified by his employer. As an alternative, the employer shall keep a record of the joints and of the welders working the joints." This is also true under ASME Section IX QW-301.3, entitled "Identification of Welders and Welding Operations," which states: "Eace qualified welder and welding operator shall be assigned an identifying number, letter, or symbol by the manufacturer or contractor, which shall be used to identify the work of that welder or welding operator."

In discussions with Pre-inspection Engineers, QC and QA inspectors, some of whom have worked for as long as ten years at Diablo, it is obvious that neither material nor welder traceability was maintained. All that was required was that the "Certificate of Compliance" be provided. This superficial attempt to comply with the requirements of ANSI B31.7 and ASME Section IX does not satisfy the code requirements. This is evidenced by past and present industry practice at other plants across the United States. The abuse of traceability destroys the foundation of a valid Quality Control Program -- accountability and traceability.

Since many of the pre-inspection engineers and QC, QA personnel have never before Diablo worked at a nuclear plant nor other heavy industry construction site nor read ANSI B31.1, B31.7 or ASME Section IX, they worked at Diablo under the false assumption that the work was being performed correctly, and that management was implementing all the necessary directives for them to do their work. Management did not train personnel, nor did they correct this misconception.

Having worked on other nuclear plants, I know the importance of these sections in ANSI B31.7 and ASME Section IX. At other plants almost everything in Class I systems was stamped and logged, and records were kept to insure that traceability was maintained. Per B31.7, "The marking or marking code shall be transferred to all pieces when material is cut to make more than one piece." In my experience at other plants, this was required for all Class I material except miscellaneous material, such as "gaskets, packing, seals, springs, bearings, retaining rings, washers, fluids for hangers, etc." This was not done at Diablo Canyon. The practice of using "non traceable" steel was widespread throughout the plant. At other plants shim stock was not required to be stamped, and I suppose shim stock was considered to be "etc."

B31.7 states in the case of miscellaneous items that "A list of such materials shall be furnished, and such materials do not require certified materials test reports or certificates of compliance as defined in 1-723.1.2." (Emphasis added) Management at Diablo Canyon have failed to provide the chain of documentation which is necessary under 10 C.F.R. 50 before the plant can be operational. Not only did they fail to provide an "up-to-date heat number log," but also failed to publish a list of material that did not have to meet the scrutiny of ANSI B31.7.

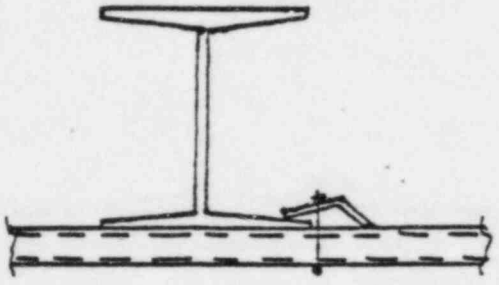
(3) Deficient training reinforced the problems, and perpetuated them. QA inspectors told me that their training consisted of reading ESD 223 for one week and being given a list of suggested reading. This list contained B31.7, B-31.1 and other codes. In one conversation, when I asked if the QC inspectors were required to read the suggested readings, his reply was "no, we only had to know what B31.7 was, not what it says." "I and others thought that these codes had been incorporated into ESD 223 by management." This was, and remains, a wrong assumption. The inspectors undoubtedly performed to the best of their

ability. However, the instruction, training, and practices necessary to adequately perform their functions were deficient. The inspectors only discovered their "wrong beliefs" through discussions with better trained, more experienced inspectors from companies other than PG&E.

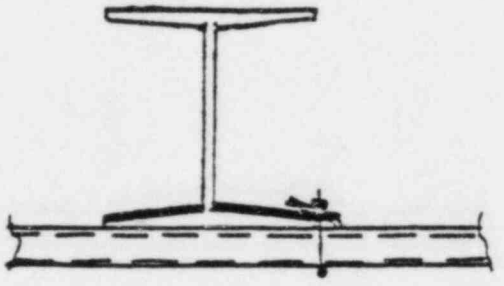
(4) In letter no. DCL-84-094, PG&E states, "Pipe support number 100-111, identified for NRC review by Mr. C. Stokes, resulted in a minor modification . . . This change was made for consistency with Project Standard Practices even though analysis showed the change was not necessary to meet acceptance criteria."

I don't know if PG&E reported other modifications performed during the hot functional testing to the NRC. I do know of at least one other support which was modified during hot functional testing. I can not give the support number here. My informant would be immediately on the "firing" line. I will supply the support number to NRC inspector Isa Yin, if the NRC supplies a list of supports to me for which they know modifications have been performed.

(5) In PG&E's answer to the intervenor's motion to reopen licensing issues on Construction Quality Assurance, "Affidavit of D.A. Rockwell, L.R. Wilson," Paragraph 3 states in part: "Since this contact is provided by the plate of the clamp to the Unistrut, the plate is not necessarily horizontal and may appear 'cockeyed.'" This statement is too incomplete to be meaningful. The use of the term "cockeyed" is not explained or supported nearly enough to support any conclusion that the clamping plates were correctly installed. If incorrectly installed, the clamp will tend to slip off the structural steel to which it is attached. See sketches below of correct installation compared to incorrect installation.



Correct. Notice Line contact at toe and heel of plate. When bolt is tongued properly, clamp should not be easily displaced.



Incorrect. Line contact but not at toe. When tongued, this tends to slip off the steel marker.

In both the examples above, the plate is "cockeyed." One is correct, and if installed correctly, should not be easily moved. On the other hand, the incorrect installation could slip easily. This fact can be checked by consulting engineering manuals from either Unistrut, Superstrut, or other brand names.

(6) In paragraph 5 as a remedy for possible slipping, PG&E states, "For support type S221, U-bolts were torqued and U-bolt nuts tack welded. For other support types, the Unistrut channel was directly welded to the beam flange." (Emphasis added) Based on my experience in the nuclear industry, the proposed fix by PG&E/Foley would do more damage than good. To my knowledge, there are no engineering documents presently available or in use that support the practice of welding Unistrut or similar material. In fact, the material type used in making "Superstrut" and similar products should not be welded In a phone call on 3/27/84 with a Superstrut Product Engineer, I was told that Superstrut is coated with an electro-plated galvanized chromate coating (an epoxy paint) which burns when welded, giving off toxic gases. Two problems result from welding it. (1) Air quality problems for the welder and (2) the joint corrodes. The Product Engineer said he would never

advise that Superstrut be welded when used as Class I supports in a nuclear plant near the ocean. He said that the material could be destroyed in one year if exposed to adverse conditions.

(7) In reply to intervenor's Petition to reopen Construction Quality Assurance, Affidavit of H.R. Arnold, F.C. Breismesiter and R.K. Rhodes Paragraph 6. "During a planned review of existing brazing procedures for copper and stainless steel by Foley QA Personnel in September 1981, it could not be verified that stainless steel tubing PBS number MD045 had been qualified in all braze flow positions (vertical-up, vertical-down, horizontal and flat) since the procedure qualitfication tests performed in 1977 did not include the vertical-up flow position. This variation was properly documented on Foley Non-Conformance Report (NCR) #8802-675 in accordance with approved procedures." (Emphasis added) The statement quoted above is in direct contradiction to the first line in Para. 1 and line, Page 1. "This allegation is completely false. The procedures in question were qualified prior to their use." (Emphasis added) To correct this problem, one worker was tested. Under ANSI B31.7 and ASME Section IX, each welder must be qualified to perform the work to which he is assigned. Foley's solution does not correct the use of the procedure from 1977 to 1981 for brazing a vertical-up joint as was originally stated in the procedure. Nor does it resolve the issue as to whether the brazers before 1977 were qualified to perform work. The test of one worker does not satisfy ASME requirements that each worker be qualified unless the worker tested was the only person on-site who was assigned the brazing work. Nor do the present tests qualify old work, since past work could be considered training thus not qualifying as acceptable work. ASME Section IX requires that the welder be qualified first before work is performed. There is a reason for this,

which is to ensure that the work is performed correctly.. The other point not sufficiently covered in Foley's reply is that "Neither the ASME Code nor Foley procedures require documentation of these inspections. Therefore none were documented." Nor in the statement that "ASME Section IX recognizes the function of independent mechanical test contractors such as Central Coast Lab, and does not requre them to witness the actual brazing." (Paragraph 3, page 6 and 7) This is an example of Management 's near-sightedness. Can they say that this documentation is not required in B31.1, B31.7, ASME Section IX, AWS D1.1-79 or 10 C.F.R? From my previous experience in the nuclear industry, it has been the practice to test and document results therefrom for welders. This would certify that the weld was made by the specific welder and that the test results were for the welds performed by that individual. These logs and records were controlled and monitored by the QA. The policies at Diablo by PG&E, Pullman, and Foley are at the opposite end of the scale from what has been typical industry practice. Where documentation was in question, other plant owners considered it good engineering practice and a good policy to go ahead and provide documentation to prevent the problem of a future question. At Diablo, just the opposite is true.

(8) In a discussion with a friend, I was shown a Discrepancy Report written against Unit #2. This document listed many anchor and smaller supports which did not have acceptable full penetration welds at the stantion to pipe and were to be reworked. The problem with this work was that there had been no process sheets issued for the removal nor had the pipe been ultrasonically tested to ensure that the minimum wall remained after grinding away the old material. The new stanchions were installed without an ultrasonic test (UT) being performed. The tests were performed seven months later. Per ASME Section IX and ANSI B31.7, the ultrasonic testing should have been conducted

at the time after removal and before new stanshions were welded in place. When ultrasonically testing this type of joint, incorrect readings are possible.

A worker who was familiar with this Discrepancy Report (DR) on Unit 2 realized the same problem might have occurred on Unit 1. I was shown a copy of a Preliminary Discrepancy Report listing about 15 supports in Unit 1 which the worker had determined had the same problem as the Unit 2 problem narrated above. I can supply the DR number on Unit 2 and the author of the Unit 1 DR. This will be suppled under similar conditions listed on a previous issue to Isa Yin.

(9) In closing and as the only exhibit to this affidavit, I have a copy of a document which was scheduled to be issued to all field engineers to aid them in their work at Diablo. It was prepared by Bechtel Power Corporation. The title of this document is Field Engineer Pocket Hanger Reference. This document was sent to the field for issuing, but was recalled under the excuse that it contained errors which needed to be corrected. I and other engineers at Diablo had copies of this document. It contains valuable information to which an engineer could refer and rely upon during his work. In truth, this document represents Bechtel policy at previous jobs. Much of it is in direct contradiction to the procedures used to build Diablo. Had it been issued many problems would have surfaced in a relatively short time. Why is this true? The document puts at finger tip location contradictory guides, providing typical industry practice in many areas, to the procedures and management directives issued at Diablo. There are minor errors in this document. However, I have reviewed it and have found it to be a valuable and handy document to have when working in the field. It should have been checked, corrected, issued and used.

Enclosed are pages 1-10 and 1-11, "Notes: Pipe Insulation Chart." In reading these two pages several points are evident which were not complied with at Diablo: (1) vapor barrier requirements; and (2) the application of a double layer of insulation on high thermal lines. In PG&E's answers to the staff concerning stress walkdown, they tried to explain away interferences by local crushing of calcium silicate. Note, this is not acceptable on Page 1-10.

Also enclosed is a copy of page 1-13, "Insulation Removal Request Flow Chart" and page 1-14, "Request for Insulation Removal." I am not aware of either of these procedures being followed at Diablo.

Also enclosed is a copy of Section 7, "Welding Instruction." On page 7-2, item 15, it is stated that there are no dihedral angle limitations for skewed T-joints. I feel this policy will cause problems by design personnel failing to consider welds shown as fillet as partial penetration groove welds unless a note specifically stated that it should be considered otherwise. I personally know many engineers will assume a fully effective throat for any weld indicated as a fillet. I suggest a test at site on this point before a decision is made on how to represent a skewed T-joint.

Also on page 7-5, see "attachment I." Either I don't understand this table or no allowance was added for the throat deduction for inadequage penetration. This last conclusion was also that of a pre-inspect engineer at Diablo Canyon.

Lastly, on pages 7-7 thru 7-10, I would like to point out the concise clarification of weld symbol terminology. Had this part of the book been in effect at Diablo, many questions would have been resolved (although many

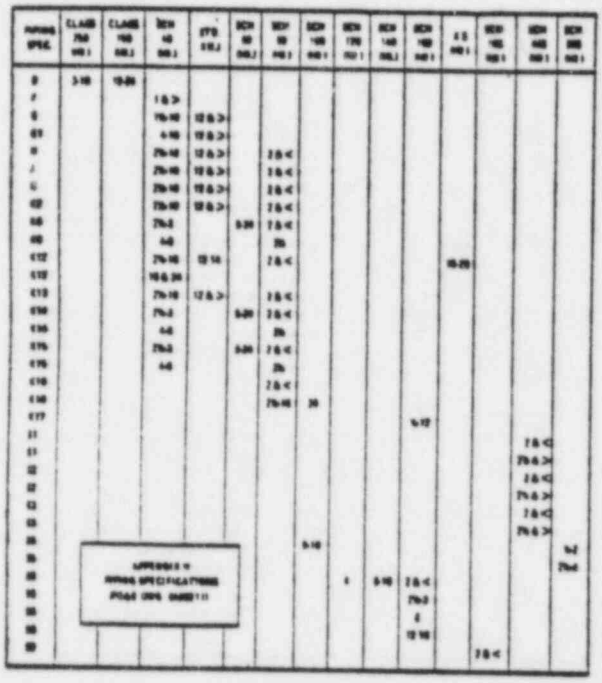
other questionable practices would have become evident to many field personnel).

I have read the above 11-page statement and it is true and correct to the best of my knowledge and belief.

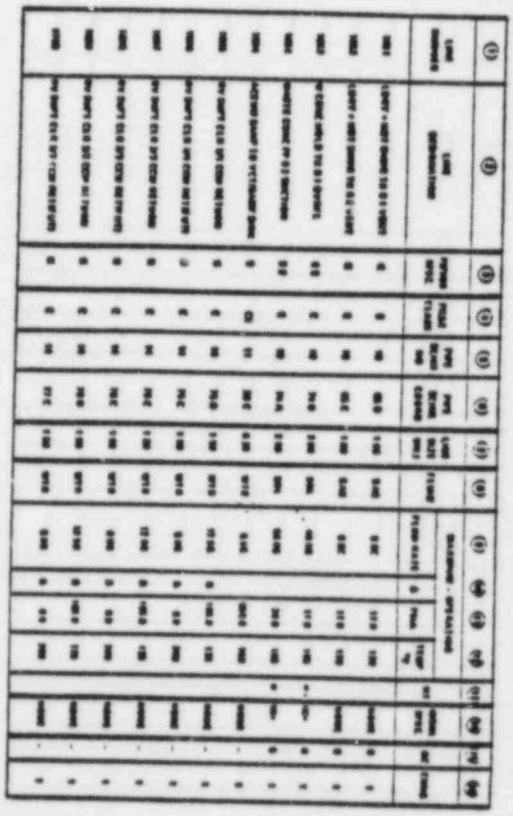
Charles C. Stokes 4/12/84

Charles Stokes

SPECIFICATION/PIPE SCHEDULE CONVERSION



EXAMPLE OF LINE DESIGNATION – UNITS 1 AND 2 (DWG. NO. 102040 – PAGE 38 – DATE 10/02/72)



PG&E DESIGN CLASS SYMBOLS

A – DESIGN TO ANSI B31.1-1967; MATERIAL, N.O.E., FABRICATION AND ERECTION TO ANSI B31.7 CLASS I-1969 EDITION PLUS 1970 ADD., PG&E DESIGN CLASS I

B – ANSI B31.7 CLASS II, 1969 EDITION PLUS 1970 ADD., PG&E DESIGN CLASS I

C – ANSI B31.7 CLASS III, 1969 EDITION PLUS 1970 ADD., PG&E DESIGN CLASS I

E – ANSI B31.1-1967, PG&E DESIGN CLASS II

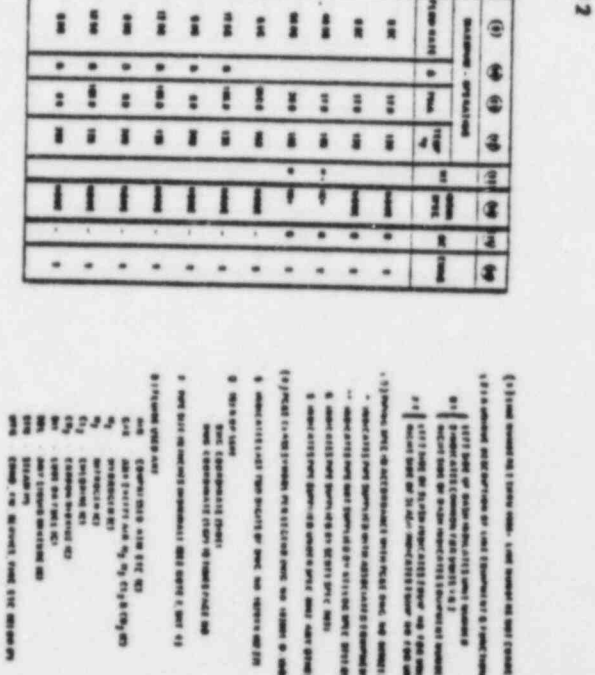
E1 – CLASS E, MODIFIED TO REQUIRE "FILE 44" – DESIGN EARTHQUAKE ANALYSIS

G – NFPA; ALSO COMPLIES WITH ANSI B31.1

G1 – NFPA STANDARDS, PG&E DESIGN CLASS II (10 CFR 50 APPENDIX B QUALITY ASSURANCE PROVISION APPLIES TO THIS PG&E DESIGN CLASS II SYSTEM)

● – DESIGN TO ANSI B31.1-1967, FABRICATION, ERECTION AND INSPECTION TO ASME BOILER AND PRESSURE VESSEL CODE SECTION 1, 1968 EDITION, PG&E DESIGN CLASS I. (EXCEPTION: LINES No. 1 THROUGH No. 12 AND No. 16 ARE DESIGNED TO THE 1955 EDITION OF ANSI B31.1 AND APPLICABLE NUCLEAR CODE CASES.)

LINE DESIGNATIONS (NOTES (1) THROUGH (16))



NOTES: PIPE INSULATION CHART

Fittings and valves are normally insulated with pre-formed sections of the same material as used on the pipe. However segmental blocks are sometimes used by wiring them on the fitting or valve and filling the gaps with asbestos cement.

Many and varied types of jackets for insulation are available. Some of these are: canvas, asphalt-saturated asbestos felt, plastic-impregnated asbestos felt, thin gage sections of galvanized steel, and integral or separate jackets of aluminum alloy or stainless steel.

The selection of the type of jacket to be used should be made with due consideration given to the following: amount of abrasion and mechanical abuse to be encountered. Weather protection for outdoor installations, fire proofing, vapor barrier requirements, cost of application, and last but not least the finished appearance.

Most insulation failures are caused by water entering through breaks in the finish, such as expansion cracks, or un-flashed openings, therefore, particular attention should be given to complete detailed specifications in regard to weatherproofing.

The usual insulating materials and jackets for heated piping and equipment allow the moisture to escape in the form of vapor. However in the medium temperature range, and where shut-downs are frequent, moisture in the insulation is not driven off and water damage is most likely to occur. For these conditions, the insulation should be thoroughly dry before applying the jacket, the surface of the pipe should be primed and painted, and corrosion-restraint wire or bands used for securing the insulation. If possible, insulation should be applied to high temperature piping while heated to insure the complete dryness of the completed installation.

The layout of insulated piping and equipment should provide adequate clearances for proper application of the insulation and also safeguard against mechanical damage during normal operation and maintenance.

Thicknesses, as shown are nominal. Actual thicknesses, which are based on "simplified thicknesses," will vary slightly from nominal in that the outer diameters of the insulation approximate the diameters of iron pipe sizes in order to obtain nesting of layers.

Weights, as shown, are for actual thicknesses and are based on densities of 11 pounds per cubic foot for 85% magnesia and calcium silicate, and 21 pounds per cubic foot for diatomaceous earth (calcined diatomaceous silica and asbestos fiber). Weights for materials with different densities may be proportioned accordingly.

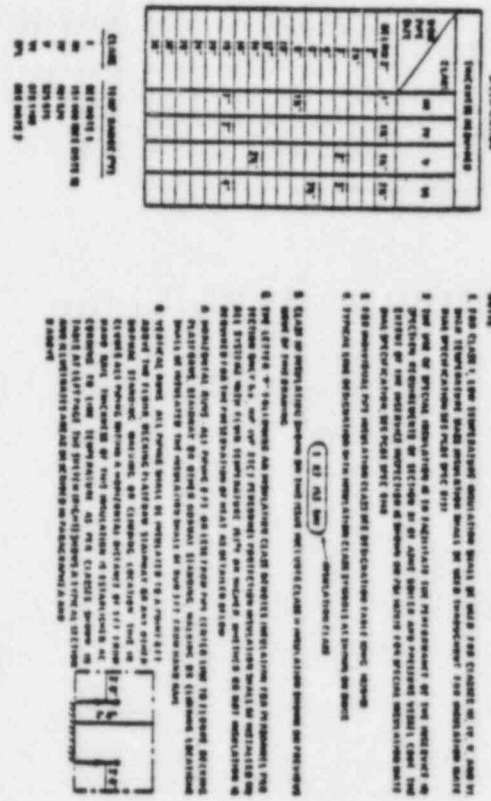
At temperatures above 600°F, pipe expansion is a significant factor. For best results pipe insulation should be applied in double layers with staggered joints for all operating temperatures above 600°F. This construction prevents excessive heat losses and surface temperatures at the joints, opened by pipe expansion, thus eliminating scorched or burned jackets. This construction also eliminates the potential fire hazard of exposing jackets to higher temperatures at the joint. Double-layer, staggered-joint construction also minimizes thermal stresses in the insulation by reducing the temperature differential across each layer.

The recommended thicknesses in the above table are calculated on an economic basis for heat conservation under average operating conditions for steam generation and process piping, and assure adequate temperature control. To determine the most economical thickness for any particular installation the cost of fuel, fixed charges, need for definite temperature control, or other special conditions must be considered. If necessary, insulation thickness can be increased.

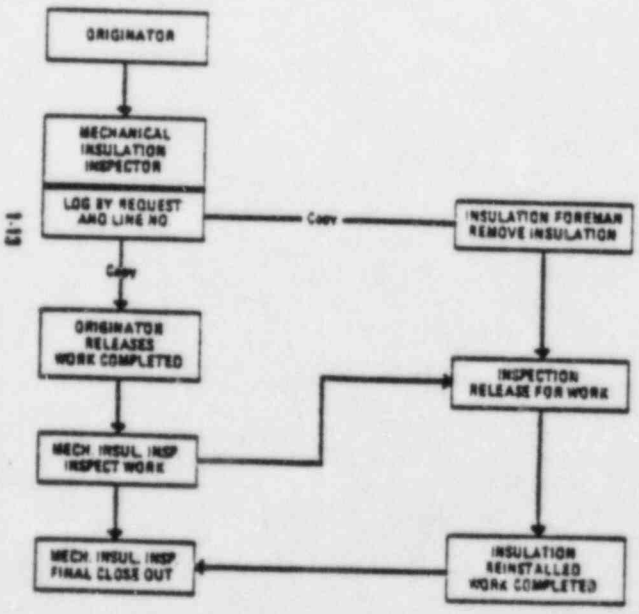
Generally, pipe insulation is furnished in 3-foot half sections for pipe sizes up to 24-inch in calcium silicate and up to 14-inch pipe size for 85 percent magnesia and diatomaceous earth. Insulation for pipe sizes larger than those mentioned is usually furnished in 3-foot long segments or curved blocks.

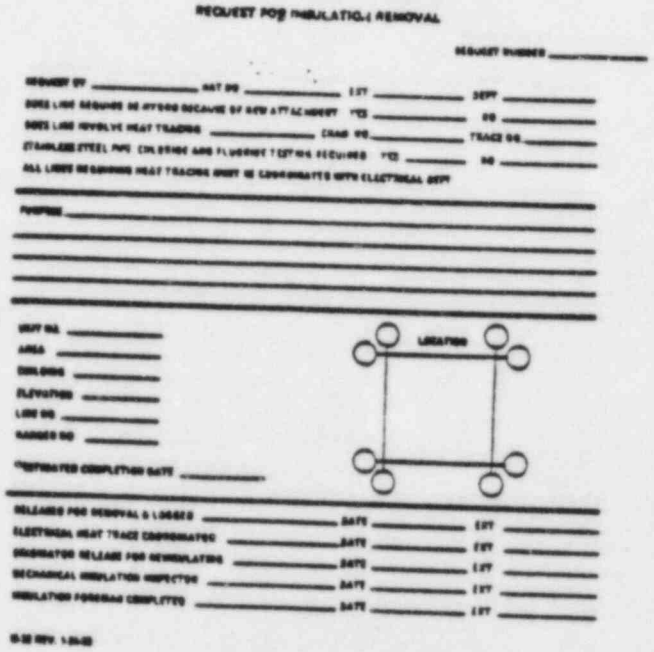
LINE DESIGNATIONS (NOTES 1 THROUGH 18)

LINE DESIGNATIONS (ADDITIONAL NOTES)



INSULATION REMOVAL REQUEST
FLOW CHART





WELDING INSTRUCTIONS
(EXCERPTED FROM ESD-223 REV. 7)

1 WELDS SHALL NOT BE PEENED.

2 FULL PENETRATION WELDS SHALL BE FIT IN ACCORDANCE WITH THE WELD PROCEDURES DESIGNATED BY THE FIELD ENGINEER. ROOT OPENINGS USING BACKING STRAPS SHOULD BE 1/4" PLUS OR MINUS 1/16". ROOT OPENING REQUIREMENTS FOR STAW WELD PROCEDURES ARE 1/8" PLUS OR MINUS 1/32".

3 PARTIAL PENETRATION GROOVE WELDS SHALL BE FIT IN ACCORDANCE WITH THE WELD PROCEDURE DESIGNATED BY THE FIELD ENGINEER. THE JOINT SHALL BE BROUGHT INTO AS CLOSE CONTACT AS POSSIBLE. THE GAP BETWEEN PARTS SHALL NOT EXCEED 3/16".

4 SQUARE GROOVE WELDS SHALL BE FIT IN ACCORDANCE WITH THE WELD PROCEDURE DESIGNATED BY THE FIELD ENGINEER. ROOT OPENING SHALL BE 3" TO 1/16" MAXIMUM.

5 FILLET WELDS SHALL BE FIT IN ACCORDANCE WITH THE WELD PROCEDURE DESIGNATED BY THE FIELD ENGINEER. PARTS TO BE JOINED SHALL BE BROUGHT INTO AS CLOSE CONTACT AS POSSIBLE. NO PACKING, SHIMMING, OR WELDING WILL BE PERMITTED TO CORRECT POOR FIT-UP OF JOINTS. IF THE SEPARATION IS 1/16" OR GREATER, THE LEG OF THE FILLET SHALL BE INCREASED BY THE AMOUNT OF THE SEPARATION. THE GAP SHALL NOT EXCEED 5/16".

6 ALL MEMBERS SHALL BE VISUALLY PLUMB, TRUE TO LINE, AND SUBSTANTIALLY FREE FROM BENDS, TWISTS, OR EXCESSIVE GAPS.

7 ALL WELD PREPARATION SURFACES SHALL BE FREE FROM FOUNDRY OR MILL SCALE, OIL, RUST, SAND, SLAG, PAINT, AND ANY TYPE OF SURFACE GRIDE OR DIRT.

8 WELD PREPARATION SHALL BE SMOOTH AND UNIFORM. IF WELD PREPARATIONS ARE FORMED BY FLAME CUTTING, THEY SHALL BE GROUND AND DRESSED BEFORE WELDING.

9 UNDERCUT, EXTENDING THE LENGTH OF THE WELD, SHALL NOT EXCEED 1/32" IN DEPTH. LOCAL UNDERCUT SHALL NOT EXCEED 1/16" WHEN THE LENGTH OF A LOCAL UNDERCUT AREA DOES NOT EXCEED 1/2" IN ANY 6" LENGTH OF WELD.

10 FOR GROOVE AND FILLET WELDS, THE SUM OF THE DIAMETERS OF POROSITY SHALL NOT EXCEED 1/8" IN ANY LINEAR INCH OF WELD AND SHALL NOT EXCEED 3/4" IN ANY 12" LENGTH OF WELD.

11 MINOR ARC STRIKES ON SUPPORT MEMBERS SHALL BE MINIMIZED. SERIOUS ARC STRIKES ON SUPPORT MEMBERS SHALL BE REMOVED AND/OR REPAIRED PRIOR TO QC ACCEPTANCE. NO ARC STRIKES ON PIPE SHALL BE PERMITTED. ARC STRIKES ON PIPE AND SEISMIC LIMITERS SHALL BE REPORTED ON A DEFICIENT CONDITION NOTICE FOR DISPOSITION PER ESD-268.

12 THE FILLET WELD SIZE SHALL BE AS SPECIFIED ON THE DRAWING. WHERE THE SIZE IS NOT SPECIFIED, THE FILLET SHALL BE OF THE SAME SIZE AS THE THICKNESS OF THE THINNER OF THE TWO MEMBERS BEING JOINED. AS-BUILT IS REQUIRED TO SHOW WELD SIZE.

13 OVERWELD: FOR EXISTING WELDS- ANY AMOUNT OF OVERWELD IS ACCEPTABLE, PROVIDED DISTORTION IS NOT EXCESSIVE. FOR NEW WELDS THE MAXIMUM OVERWELD SHALL BE 50 PERCENT OR 1/8", WHICHEVER IS GREATER, PROVIDED THAT DISTORTION IS NOT EXCESSIVE. (SEE PARAGRAPH 6.8.2.4.A.) AS-BUILT IS NOT REQUIRED.

14 UNDERWELD: FOR EXISTING WELDS, ANY UNDERWELD IS ACCEPTABLE PROVIDED THAT THE AISC RECOMMENDED MINIMUM WELD SIZE FOR THE MATERIAL BEING WELDED IS MET. A NEW FILLET WELD IN ANY SINGULAR CONTINUOUS WELD SHALL BE PERMITTED TO UNDERRUN THE NOMINAL FILLET WELD SIZE REQUIRED BY 1/16" WITHOUT CORRECTION, PROVIDED THAT THE UNDERSIZED PORTION OF THE WELD DOES NOT EXCEED 10% OF THE LENGTH OF THE WELD.

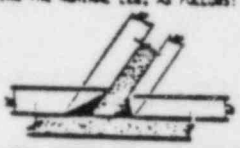
AS-BUILT IS REQUIRED TO SHOW EXISTING WELDS WHICH ARE MORE THAN 25 PERCENT UNDERSIZED AND/OR UNDERSIZE FOR MORE THAN 20 PERCENT OF THE TOTAL LENGTH OF THE WELD.

FILLET WELD SIZE TABLE

MATERIAL THICKNESS OF THICKER PART JOINED	MINIMUM SIZE OF FILLET WELD
UP TO AND INCLUDING 1/4	1/8
OVER 1/4 THROUGH 1/2	3/16
OVER 1/2 THROUGH 3/4	1/4
OVER 3/4 THROUGH 1-1/2	5/16
OVER 1-1/2 THROUGH 2-1/4	3/8
OVER 2-1/4 THROUGH 6	1/2
OVER 6	5/8

15 FILLET WELDS ON SKEWED T-JOINTS

- THERE ARE NO DIHEDRAL ANGLE LIMITATIONS
- THE SIZE OF FILLET WELDS ON SKEWED T-JOINTS SHALL BE DETERMINED BY MEASURING THE NOMINAL LEG, AS FOLLOWS:

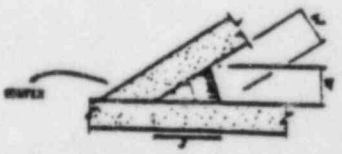


W = NOMINAL WELD LEG

NOTE: WELD SURFACES MUST BE FLAT OR CONVEX.

16 PARTIAL PENETRATION WELDS

- WHEN VERIFYING THE SIZE OF PARTIAL PENETRATION BEVEL WELDS, THE FACE MUST BE AT LEAST FLUSH WITH THE FACE OF THE BEVELED PIECE.
- QC FIT-UP INSPECTION IS REQUIRED ON PARTIAL PENETRATION GROOVE WELDS DESIGNED AT SKEWED T-JOINTS. THE SIZE OF PARTIAL PENETRATION GROOVE WELDS, WHICH HAVE BEEN DESIGNED TO BE INSTALLED AT SKEWED T-JOINTS, SHALL BE DETERMINED BY MEASURING THE FACE OF THE WELD, AS FOLLOWS:



W = NOMINAL WELD LEG

S = SPECIFIED SIZE

USE W MINIMUM IN DETERMINE WELD SIZE.

THE ACCEPTABILITY OF THE WELD SIZE SHALL BE DETERMINED BY USING THE CHART IN ATTACHMENT I.

17 FLARE-BEVEL WELDS WHICH ARE FORMED BY AT LEAST ONE PIECE OF TUBE STEEL SHALL HAVE THE SIZE DETERMINED AS FOLLOWS:

- WHEN NO SIZE IS SPECIFIED ON THE DRAWING, THE FACE OF THE WELD SHALL BE AT LEAST FLUSH WITH THE FACE OF THE TUBE STEEL BEING WELDED
- WHEN THE SIZE OF THE WELD IS SPECIFIED ON THE DRAWING, THE SIZE OF THE WELD SHALL BE DETERMINED BY MEASURING THE FACE OF THE WELD AS FOLLOWS:

W = NOMINAL WELD FACE

S = SPECIFIED SIZE

THE ACCEPTABILITY OF THE WELD SIZE SHALL BE DETERMINED BY USING THE CHART IN ATTACHMENT J.

10 PREHEAT AND INTERPASS

- THE FOLLOWING PREHEAT AND INTERPASS TEMPERATURES SHALL BE USED FOR THE WELDING OF CARBON STEEL SUPPORT MEMBERS TO EXISTING STRUCTURAL STEEL AND RUPTURE RESTRAINTS (EXCLUDING INSERTS):

MATERIAL THICKNESS (INCHES)	PREHEAT (MIN) (°F)	INTERPASS (MAX) (°F)
UP TO 3/4	50*	800
OVER 3/4 - 1-1/2	150	800
OVER 1-1/2 - 2-1/2	225	800

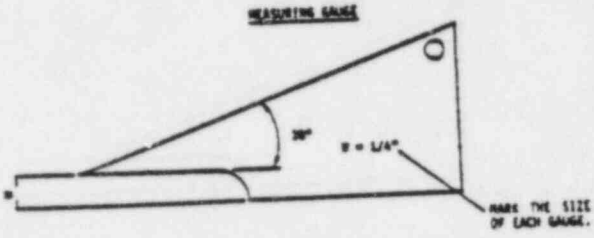
NOTE: FOR WELDING OF DISSIMILAR METALS, THE MINIMUM PREHEAT TEMPERATURE AND MAXIMUM INTERPASS TEMPERATURE SHALL BE IN ACCORDANCE WITH THE WELD PROCEDURE

*MATERIAL TO BE FLAME DRIED WHEN BELOW 70°F.

- PREHEAT REQUIREMENTS SHALL BE DETERMINED BY THE HANGER FIELD ENGINEER DURING INITIATION OF THE REQUIRED PROCESS SHEETS PRIOR TO RELEASE OF WORK. THE PREHEAT SHALL BE A QC HOLD POINT ON THE GENERAL FIELD PROCESS SHEET.

ATTACHMENT H

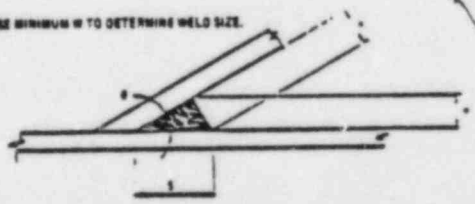
MEASURING GAUGE



w = 3/16"
1/4"
5/16"
3/8"
7/16"
1/2"
5/8"
3/4"
7/8"
- ONE SET

ATTACHMENT I

* USE MINIMUM w TO DETERMINE WELD SIZE.



IF MINIMUM w MEASURED IS GREATER THAN OR EQUAL TO S SPECIFIED, NO MORE SIZE CHECKING IS NEEDED.

IF MINIMUM w MEASURED IS LESS THAN S SPECIFIED, CONSULT THE TABLE BELOW TO VERIFY THAT w MEASURED IS GREATER THAN OR EQUAL TO w REQUIRED.

IF MINIMUM w MEASURED IS LESS THAN w REQUIRED, WELD IS UNDERSIZE.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

α \ S	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
15°	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	1/4	1/4	1/4	1/4
20°	3/16	3/16	3/16	3/16	3/16	3/16	3/16	1/4	1/4	1/4	5/16	5/16	5/16	5/8
25°	3/16	3/16	3/16	3/16	3/16	1/4	1/4	5/16	5/16	5/16	5/8	5/8	7/16	7/16
30°	3/16	3/16	3/16	3/16	1/4	1/4	5/16	5/16	5/8	5/8	7/16	7/16	1/2	1/2
35°	3/16	3/16	3/16	1/4	1/4	5/16	5/8	5/8	7/16	7/16	7/16	1/2	9/16	5/8
40°	3/16	3/16	1/4	1/4	5/16	5/16	5/8	7/16	7/16	1/2	9/16	9/16	5/8	11/16
45°	3/16	3/16	1/4	5/16	5/16	5/8	7/16	7/16	1/2	9/16	5/8	5/8	11/16	3/4
50°	3/16	3/16	1/4	5/16	5/8	5/8	7/16	1/2	9/16	5/8	5/8	11/16	3/4	13/16
55°	3/16	1/4	1/4	5/16	5/8	7/16	1/2	9/16	9/16	5/8	11/16	3/4	13/16	13/16
60°	3/16	1/4	5/16	5/16	5/8	7/16	1/2	9/16	5/8	11/16	3/4	3/4	13/16	7/8

EQUIVALENT WELD SIZE "w" FOR PARTIAL PENETRATION BEVEL WELDS (SEE PARAGRAPH 6.8.2.6.6(2)).

ATTACHMENT J

IF w MEASURED IS GREATER THAN OR EQUAL TO S SPECIFIED, NO MORE SIZE CHECKING IS NEEDED.

IF w MEASURED IS LESS THAN S SPECIFIED, CONSULT THE TABLES BELOW TO VERIFY THAT w MEASURED IS GREATER THAN OR EQUAL TO w REQUIRED.

IF w MEASURED IS LESS THAN w REQUIRED, WELD IS UNDERSIZE.

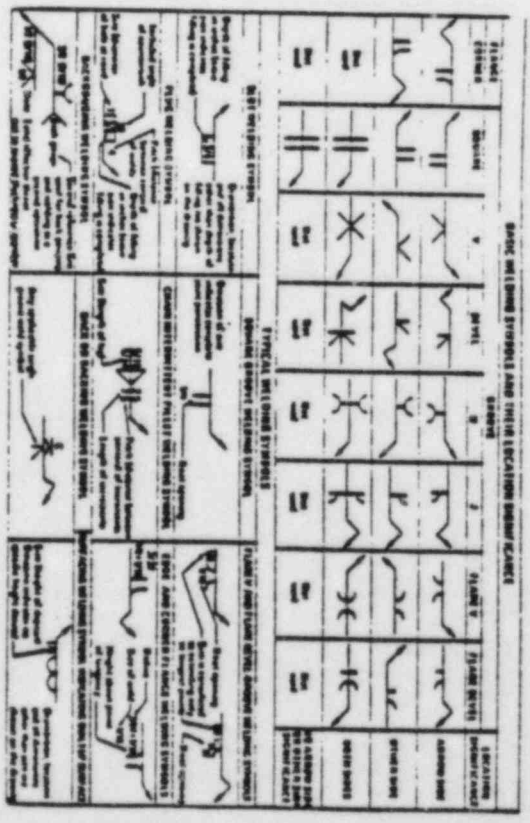
THOSE STEEL PENETRATIONS LESS THAN OR EQUAL TO 24 INCHES
(ALL DIMENSIONS ARE IN INCHES)

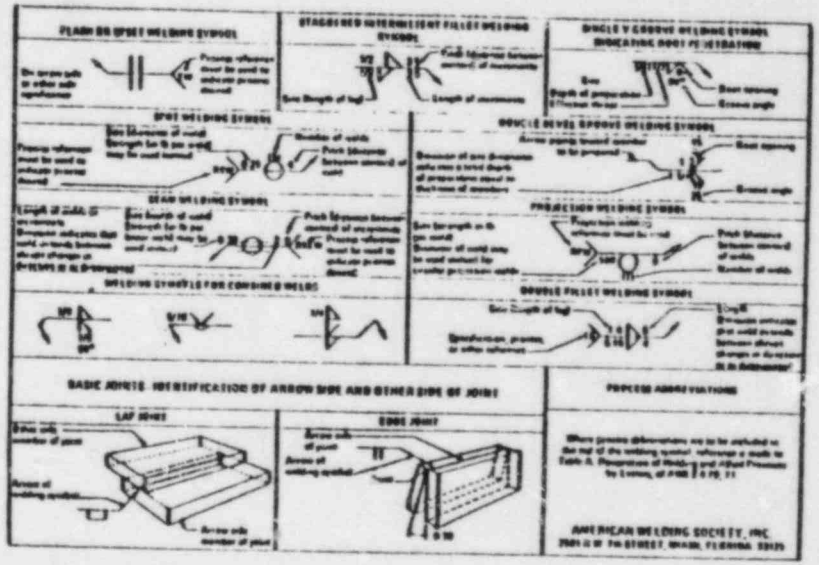
S / WALL THICKNESS	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
.188	3/16	3/16	3/16	3/8										
.188 < T ≤ .250	3/16	3/16	3/16	3/16	5/16	1/2								
.250 < T ≤ .312	3/16	3/16	3/16	3/16	3/16	1/4	3/8	5/8						
.312 < T ≤ .375	3/16	3/16	3/16	3/16	3/16	3/16	1/4	3/8	1/2	3/4				
.375 < T ≤ .500	3/16	3/16	3/16	3/16	3/16	3/16	3/16	1/4	5/16	3/8	7/16	9/16	11/16	1

THOSE STEEL PENETRATIONS GREATER THAN 24 INCHES
(ALL DIMENSIONS ARE IN INCHES)

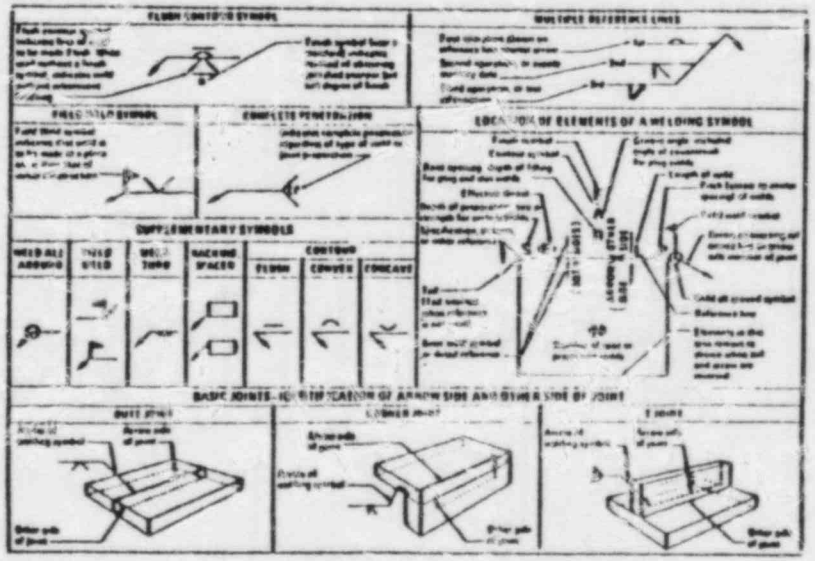
S / WALL THICKNESS	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
.188	3/16	3/16	3/16	3/16	5/16									
.188 < T ≤ .250	3/16	3/16	3/16	3/16	3/16	1/4	3/8	5/8						
.250 < T ≤ .312	3/16	3/16	3/16	3/16	3/16	3/16	5/16	3/8	7/16	5/16				
.312 < T ≤ .375	3/16	3/16	3/16	3/16	3/16	1/4	1/4	5/16	3/8	1/2	3/4			
.375 < T ≤ .500	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	1/4	1/8	5/8	5/8	7/16	1
.500 < T ≤ .625	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	1/4	5/16	5/16	5/16	3/8

EQUIVALENT WELD SIZE "w" FOR FLARE BEVEL WELDS (SEE PARAGRAPH 6.8.2.6.6(3)).

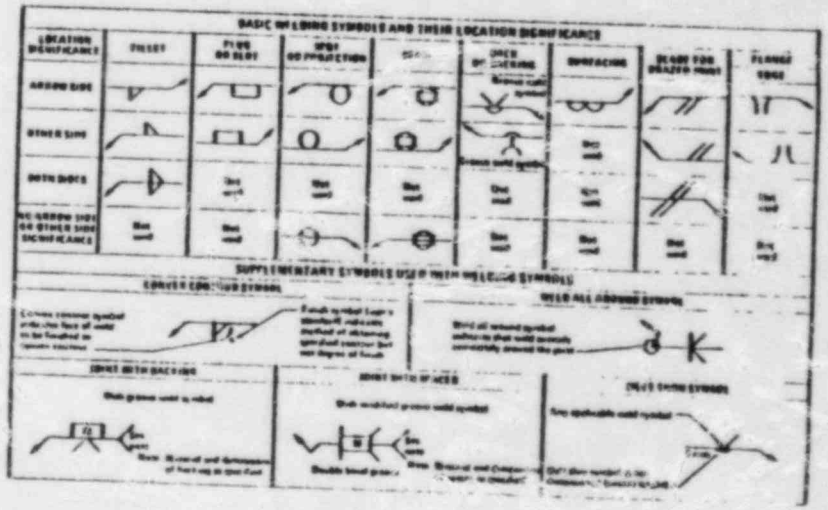




7-10



7-8



7-9

GOVERNMENT ACCOUNTABILITY PROJECT
Institute for Policy Studies
1901 Que Street, N.W., Washington, D.C. 20009
(202) 234-9382

ATTACHMENT 3

March 2, 1984

Mr. Thomas Bishop
Division Director
U.S. N.R.C.
Region Five
1450 Maria Lane, Ste 210
Walnut Creek California 94596

Re: PACIFIC GAS AND ELECTRIC (Diablo Canyon Nuclear Power Plant, Unit 1), Dkt. No. 50-275

Dear Mr. Bishop:

Enclosed with this letter is a copy of a petition filed with the Commission pursuant to 10 C.F.R. 2.206 on March 1, 1984, together with Attachments 1 through 17 thereto.

Also enclosed for your use, bound separately in this package, are three documents that were not included in the petition filed on February 2, 1984: Exhibit 4 to Attachment 2, and two Discrepancy Reports inadvertently omitted from Attachment 7.

Best wishes in your continuing investigation.

Sincerely yours,

John Clewett

Enclosures: A/S

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