

UNITED STATES CONGRESS
COMMITTEE ON
INTERIOR AND INSULAR AFFAIRS
HOUSE OF REPRESENTATIVES

March 22, 1984

TO: Tom Rehm/Darrell Eisenhut
FROM: Henry Myers

Attached hereto are preliminary comments
and questions derived from my review
of 83-37 and its draft.

I would welcome your comments.

Tom,
Copy sent to Eisenhut
per direction

6/1 3/83

After reading this -
nothing particular sticks
out.

Called Potter - He is in
a cage of data room - even
attends.

Generic Comments (GC-X)

GC-1. A statement to the following effect is made repeatedly with respect to the Region V method used to inquire into the NSC findings: "The inspector's approach to resolving this issue was to assess the validity of the NSC finding and Pullman response, and evaluate the NRC findings for conformance with the specified Pullman program." (E.g. 83-37, Item 24.) This implies that there is a documented Pullman response to the NSC finding. [E.g. "The licensee conducted an audit of Pullman, during the period of April 2 through June 1, 1978, in response to the NSC audit and the Pullman response." See Draft 83-37, p. 37. This statement does not appear in the Final 83-37.] Where is it? What interviews were conducted with PG&E, Pullman, and NSC past and present personnel in the course of preparing 83-37? How were such interviews documented? Where is the documentation?

GC-2. Inspection Report 83-37 refers to corrective actions taken in response to the NSC audit. It is unclear in certain instances as to whether the corrective actions were taken with respect to QA deficiencies that existed prior to the audit; e.g. to what extent did the corrective actions involve activity to insure that inadequate workmanship did not escape detection as a consequence of the QA deficiencies that existed prior to the NSC audit.

GC-3. Inspection Report 83-37 contains several references to the 90 day welders' log. Does the NRC have the log in its possession? If not, is it readily accessible? Where is it? What deficiencies exist in this log vis-a-vis the ASME code?

GC-4. Inspection Report 83-37 states in several places that Pullman practices were "consistent" with the ASME code. Does "consistent" mean "in compliance with"? Is it the NRC position that wherever "consistent" is used that it may be replaced by "in compliance with"?

GC-5. There is no indication of Region V having sought the views of NSC either to elaborate on the 1977 findings or to comment on the findings and conclusions of the Region V inquiry.

GC-6. Page 3 of the draft states a sample of 25 stainless steel welds were sampled for delta ferrite and that 100 radiographs were selected to verify field weld and inspection review adequacy. What is the basis for selecting these welds? On what dates were these welds produced? Did these welds represent an adequate statistical sample?

Criterion 1, NSC Audit Finding 3. (Final p.3, Draft, p.2-5.):

Did the fact of QA personnel writing and approving Engineering Specifications, performing welding engineering functions, and

approving welding engineering changes constitute a violation of Appendix B requirements?

Criterion II, NSC Audit Finding 4. (Final p.4-5, Draft, p.2-5.):

Is it the NRC conclusion that upper management performed scheduled reviews of nonconformance reports, personnel qualifications, and corrective actions as required by NRC regulations for the time periods addressed by the NSC audit? Note handwritten notation in draft report: "In conclusion, factual records do not support the NSC finding." The corresponding statement in the final report is: "The inspector concludes the historical records of corporate management audits do provide evidence that reviews of nonconformance reports, personnel qualifications and corrective actions were performed." Note comment in final report: "In addition, Pullman Power Products has since proved programmatic improvements ..." etc. What was the program prior to the improvements? What was it after the improvements were instituted?

Criterion V, NSC Audit Finding 1. (Final p. 5, Draft, p.39-40.):

NSC stated: "There is no requirement that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings." Region V states, apparently in reference to fabrication of piping assemblies and erection of pipe in the plant, that KFP-8 established appropriate instructions and procedures. Region V seems to imply that KFPS-7 established procedures for pipe supports. KFPS-7, however, was not issued until December 1973. Were the QA procedures for installation of pipe procedures prescribed by documented instruction, procedures etc. prior to December 1973? Moreover, the draft states that ESD-264, dated 9/15/76, provided a specific procedure "to implement precisely the QA program elements of KFP-8 and KFPS-7." The latter statement does not appear in the final report. In that the specific procedures for implementing "precisely the QA program elements of KFP-8 and KFPS-7" were apparently not promulgated until only September 15, 1978 what is the basis for assurance that KFP-8 and KFPS-7 were adequately implemented prior to September 1978.

Criterion V, NSC Audit Finding 2. (Final p. 5-6, Draft, p.40-41):

NSC states that hanger package review was not described in procedures. Region V states that hanger package review was described in KFPS-2 dated December 3, 1973 and that supplementary requirements were incorporated into ESD-254 dated December 30, 1977. What was the basis for reviews conducted prior to December 3, 1973? The draft, but not the final report, states that ESD-253 provided additional detailed information concerning hanger drawing controls. What is the date of ESD-253? Is it

NRC's position that hanger package review was described in a manner that complied with the Appendix B requirements for all periods covered by the NSC audit?

NSC states that other activities not described in procedures included preheating for welding, use of Note-O-Grams, use Rejection Notices, and maintenance of Field Quality Inspector Daily Logs. Is it the NRC's position that all such activities were described in procedures in a manner that complied with the Appendix B requirements for all periods covered by the NSC audit?

Criterion V, NSC Audit Finding 3. (Final p. 6-7, Draft, p.41-42):

NSC found that isometric package review was not sufficiently described. The draft of 83-37 states that "Field procedure ESD-254 (issued 5/6/75) appears to provide an adequate outline guide for review of isometric drawing packages." The final report adds that May 6, 1975 was the earliest date that could be found for ESD-254 and that while most piping installations had been completed prior to May 1975, the inspector found that the final complete document review of isometric drawing packages were performed after ESD-254 was in effect.

Criterion IX, NSC Audit Finding 10h,10i. (Final p.22-23, Draft p.13-16.):

The draft focuses on question as to whether auditors' observations need be recorded on the "process sheet or the inspectors' daily work sheet." The draft does not indicate that the inspector examined the welder audit sheets. The final does state that the inspector examined welder audit sheets but does not indicate the period covered by the examination. The final version of 83-37 states in 10h that the welder audits were "a Fullman program requirement in excess of the ASME code requirements" and twice in 10i that the program requirements "appeared" in excess of code requirements. The DRAFT did not mention that the code did not require a welder audit.

Draft 10i (p.15) says "...records of the 9/73 revision and 11/73 implemented procedure are not available." Final drops this part stating (p.23) "The November 1973 revision apparently was issued and implemented beginning in November 1973. ... welder audit sheets indicate that the required welder audits were performed beginning November 1, 1973." The following statement appears in the draft but not the final: "The welder audit sheets examined indicate the ferrite control measurements were performed on welds by the auditors." Why was this statement dropped? Is the statement accurate? Was there a requirement to make ferrite control measurements?

What is the significance of failing to adhere to ESD-219 if the ASME code does not require welder audits?

Note following statement in draft does not appear in final:

"Since the record of the 9/73 revision is not available, the inspector could not determine when the procedure was approved for implementation and, thus, was not able to corroborate the Pullman statement that the September 1973 revision was made to initiate the auditing of welders." The draft and final state that "the inspector was not able to corroborate the NSC statement that Pullman was in non-compliance with the procedure for about 23 months."

Is the staff's conclusion that neither Item 10h nor Item 10i were identifiable items of noncompliance or deviation rest on the assumption that welders' audits were not required by the ASME code?

Criterion IX, NSC Audit Finding 10j. (Final p.23-24, Draft p.16-18.):

Note change from draft which relied on the examination of 25 welds to find that "...there is a high probability that other stainless steel welds installed in the plant comply with delta-ferrite acceptance criteria." The final report cites a "random sample of 25 stainless steel welds" as "an additional check." Primary reliance for the final report's conclusion that "the inspector was not able to corroborate that Pullman was in noncompliance with this procedure requirement for 12 months" was based on the assumption that stainless steel welding did not begin until early 1973. If it is true that on-site stainless steel welding did not begin until 1973, what is the relevance of the examination of the 25 welds since the NSC finding applied to the pre 1973 period?

Is there a documented basis for the statement "Based on discussions with PG&E personnel it appears that stainless steel welding on site began in early 1973?"

Criterion IX, NSC Audit Finding 10k. (Final p.24-25, Draft p.120-121.):

The NSC finding that "Hangers are not welded in accordance with Pacific Gas & Electric Company requirements" was not confirmed. Did NSC err in observing that hangers were welded to structural steel on the wrong side of the bracket? What was Pullman's response to the NSC finding? Would NSC agree that an error of this kind would be made in the audit? Was an effort made to determine whether the hangers might have been modified following the audit?

Criterion IX, NSC Audit Finding 10n. (Final p.26-27, Draft p.20-21.)

NSC found that there was no procedure for preheating weld joints. The draft report (p.21) states that a series of weld procedure

specifications was examined and that each contained "an adequate definition of preheat, postweld heat treatment and interpass temperatures." The draft also states that "ESD-218 (Postweld Heat and Preheat Treatment Procedure) was revised 12/30/77 to prescribe preheat requirements and indicate preheat applicability." An adjacent handwritten comment (p.21) asks "How about b/f 12/30/77?" Does this mean that the procedures were or were not adequate prior to 12/30/77?

The final report (p.27) contains an additional statement to the effect that prior to early 1978, compliance with the preheat requirement was dependent upon the welder's knowledge etc. Did the procedure described in the second paragraph on p. 27 comply with Appendix B? What was the basis for the added language? Was there discussion with Pullman or PG&E on this point beyond that which occurred during the inspection that ended on December 9, 1983?

The penultimate paragraph on this item states "while no separate and specific procedure for preheating of weld joints existed prior to December 30, 1977, preheating requirements were adequately prescribed by the welding procedure specifications and documented by signature on the welding block of the process sheet, which specified the applicable welding procedure." Was this in compliance with Appendix B?

Criterion IX, NSC Audit Finding 10c. (Final p.27-30. Draft p.21-26.):

NSC stated that the initial results of welding auditing (from November 5, 1973 to February 1974) indicated the existence of 7 problems which, if they did exist, raised question about weld quality. NSC concluded on the basis of a review of these audits that "...there is no confidence that welding done prior to 1974 was performed in accordance with welding specification requirements."

The NRC inspector said he had "critically examined the records of welder audits performed between November 1, 1973 and April 1, 1974." On the basis of an examination of 183 audit records from this period, the NRC inspector concluded that the "aggregate of problem areas is not so pervasive such that support can be given to the NSC conclusion" that there is no confidence that pre-1974 welding had been performed in accord with requirements.

60-37 states that "It is important to recognize that none of these were NSC findings, but were instead findings of the Pullman welder audit program, which was designed to detect program weaknesses and provide prompt corrective action during the early phases of site welding activity." The problem is that the welder audits referred to by the Region V inspector (which were found by Region V under 10h and 10i above to be beyond what was required by the code) were not initiated until November 1973. In

In addition, the NSC audit states that its findings were based on a review of Pullman's audits conducted in the period "from November 5, 1973 to February, 1974). Therefore, how could the audit program, upon which Region V relies "detect welding program weaknesses and provide prompt corrective action during early phases of site welding" if the audit program was not initiated until November 1974?

In sum, the NSC finding, based on findings obtained from a review of audits conducted after November 1, 1973, was that "...there is no confidence that welding done prior to early 1974 was done in accordance with welding specifications." Region V, on the other hand, based on a review of audit reports prepared during essentially the same period as the reports reviewed by NSC (and ignoring the above noted finding (final, p. 23) that "the required welder audits were performed beginning November 1, 1973") concludes "no support can be given the [above quoted] NSC conclusion." Region V does not deal with neither (A) the fact of there having been no welder audits prior to November 1973 nor (B) the question of whether the types of deficiency discovered in the initial audits existed in prior years.

[At the March 19 Commission meeting, statements were apparently made to the effect that audits other than those that pursuant to the ESD-219 program were conducted prior to November 1973. If so, were the findings of such audits discussed in 83-377? Where? Why were these findings, rather than those in the post November 1973 period, used to refute the NSC findings?]

- Criterion IX, NSC Audit Finding 100, Item 1. (Final p.28. Draft p.23.):

- The draft, without citing documents, appears to rely on the gas flow being "near the 20 cfm requirement" for its conclusion that defective welds might have resulted from inadequate shielding and purging. The draft states that excessively low flow rates would have been manifest in unacceptable porosity which would have been detected by NDE; the draft does not indicate the extent to which unacceptable porosity was found. The final does not state that the flow was near the 20 cfm requirement; it does state that "The vast majority of safety related stainless steel welds were radiographically examined and the film was reviewed and accepted by a qualified interpreter for code compliance." How many welds were not radiographically examined? How many were examined? Of those that were examined, what percentage exhibited excessive porosity? What was done to determine whether shielding and purging deficiencies that might have existed prior to the first welder audit? What was done to correct for such deficiencies?

Criterion IX, NSC Audit Finding 100, Item 2. (Final p.28. Draft p.23-24.)

What is the significance of 14 out of 183 audits identifying that welders did not have tempil sticks? Region V states that in each case that a welder was found not to have a tempil stick, one was provided. What was done to determine the extent to which welders did not have tempil sticks prior to November 1973? Does the code allow interpass temperature requirements to be met by the a resumption of welding delayed until the welder "can touch the weld?" The draft, but not the final, states that "Tempil sticks were used by welders in the vast majority of cases." What constitutes a "vast majority?" What was done to determine whether there was a tempil stick problem prior to November 1973?

Criterion IX, NSC Audit Finding 100, Item 3. (Final p.28. Draft p.24.)

The draft states that in 4 out of 183 instances where amperages were not within the welding procedure specification limit, the welder corrected his amperage setting. The draft stopped there. The final adds statements to the effect that defects resulting from improper amperages would be found during inspections. The final also adds a statement that "...amperage is not an essential variable specified by the ASME code..." Does this mean that a welds produced with improper amperages could still be in compliance with the code? What about improper amperages that might have been used prior to November 1973?

Criterion IX, NSC Audit Finding 100, Item 4. (Final p.28-29. Draft p.24.)

57-57 states concludes the "vast majority" of welders used welding procedures and knew where to obtain them. Those that did not have them were told to get them. Those that did not know where they could be found were given "an explanation of the location from where they could be obtained." This finding was based on welder audits conducted after November 1973. What is Region V's position with regard to those not members of the "great majority?" What is Region V's position with regard to the availability of procedures and welders' knowledge of where procedures could be obtained in the period prior to November 1973?

Criterion IX, NSC Audit Finding 100, Item 5. (Final p.29. Draft p.24.)

NSC found that the oxygen analyzer was not available or not operative. Region V concludes that only one of the 183 audits reviewed "indicated a problem with the oxygen analyzer." What was done by Region V to determine the basis for the significant discrepancy between its finding and those of NSC? What documentation was examined?

Criterion IX, NSC Audit Finding 100, Item 6. (Final p.29. Draft p.25.)

NSC concluded that "Oven rod temperature was not monitored by the welders." 83-37 states that 14 of 183 audits identified instances where rod oven temperatures were lower than those which were required. A note on the draft states: "With this many audit findings the rod oven temperature must have been too low much of the time." The NRC concludes that "The NSC finding that rod oven temperature was not monitored by the welders is not supported by the audits, although isolated instances of ovens being below temperature were identified by the audits." Is it correct that 14 out of 183 constitutes "isolated instances?" What is the NRC position with regard to temperature control during the period prior to the initial welders' audit?

Criterion IX, NSC Audit Finding 100, Item 7. (Final p.29. Draft p.25.)

The NSC stated that "Many welders did not understand their duties and responsibilities." Region V states that "Of the 183 audits received, five welder audits indicated that the welder in question did not understand their (sic) duties and responsibilities." The final, but not the draft, contains a sentence: "The NRC considers that the reason these welder audits were done was to identify such instances and provide corrective action." The draft and final report state that "In each case the welder was reinstructed by the QA inspector auditing the welding..." 83-37 does not address the pre-November 1973 period during which audits were not conducted. What mechanism existed prior to November 1973 to identify situations where welders did not understand their duties and responsibilities? What is the basis for assurance that, prior to November 1973, welders understood their duties and responsibilities?

Criterion X, NSC Audit Finding 5.6. (Final p.30-31. Draft p.26-28.)

NSC found that the inspection process is generally inauditable on the ground that there were acceptance signatures that did not permit a determination of whether the individual inspection requirements were fulfilled. Region V stated that acceptance process sheets identified the procedures necessary to perform a particular inspection and the the acceptance signatures were sufficient documentation of these procedures having been followed. The final report, but not the draft, states that this practice was "in accordance with standard industry practice, and in compliance with ASME code requirements..." Was this practice employed at other plants under construction during this period? Did NSC consider this practice in compliance with the ASME code? What was Pullman's response?

Criterion X, NSC Audit Finding 7. (Final p.31. Draft p.28-29.)

NSC found that a "large number of welds were accepted for visual examination and thereafter accepted on surface NDE inspection ... Visual examination of those welds indicates that the surface is not acceptable for performance of surface NDE inspection." The final report, but not the draft, states "The inspector concludes that the NSC finding (that the surface of the welds was not acceptable for surface NDE inspection) was in error." What is the basis for these contradictory conclusions? Did NSC and NRC inspect the same surfaces? What evidence exists to demonstrate that remedial work was not carried out in the time between the NSC and NRC inspections?

Criterion X, NSC Audit Finding 9. (Final p.31-32. Draft p.28-29.)

The NRC disagreed with the NSC implied finding that inking "R1" onto a radiograph was not permitted by the code. NRC also disagreed with NSC that FW-63 contained a surface defect "that is questionable for acceptance under visual standards." Does NSC agree with NRC's findings?

Criterion X, NSC Audit Finding 10a. (Final p.32-33. Draft p.28-29.)

NSC found that "Records of welder qualification prior to 1972 are not available." Thus, the inspector was not able to verify the validity of the Pullman response to the NSC audit finding." Region V found that 20 welders were qualified prior to 1972. Region V also found that the 90 day qualified welders log was started "at the beginning of 1972." The draft report, but not the final, states: "The inspector was not able to determine when the first production welding was performed or on what system the first weld was accomplished." The final report, but not the draft states: "The inspector concludes that records of welder qualification prior to 1972 were available and in acceptable order."

Does Region V now know when the first production welding was performed and on what system? In light of NRC having found records for 20 welders, has NSC been asked why they found that records were not available? Does Region V believe that the welder qualification records for this period are complete? How many active welders are shown on the initial 90 day qualified welders log? Is this log consistent with Region V's findings regarding the 20 welders?

Criterion XIII, NSC Audit Finding 5. (Final p.35-36. Draft p.31-37.)

Note that last paragraph on Draft, p. 37 was dropped. The dropped

paragraph mentions a PG&E audit of Pullman which identified programmatic and hardware discrepancies? What is the nature of these discrepancies? Was there a requirement that they be reported to the NRC? Were they reported to the NRC? Does Region V have a basis for concluding that appropriate corrective actions were taken. Note the reference to the inspector having discussed this matter with Pullman and PG&E personnel. What was the nature of these discussions? Do written summaries of these discussions exist? Is it Region V's position that for the entire period covered by the NSC audit, Pullman was in compliance with applicable NRC requirements pertaining to handling procedures?

Criterion XIV, NSC Audit Finding 1. (Final p.38-39. Draft p. 59-60.)

3C-3. In several instances, the NSC report refers to documents that were deficient as a result of changes, postdating, etc. In some such instances Inspection Report 3C-37 states that the NRC inspectors did not find the documents to be out of order. What is the basis for the NRC inspectors having concluded that the documents, found by NSC to be deficient, were identical to the documents examined by NSC?

TAX TO TOM KEHM
FROM OCA

4/10/84

5 PAGES

NOTES RE BASIS FOR 63-37 FINDINGS ON NSC AUDIT ETC.

1. The NSC audit of Pullman appears to have been undertaken in response to concerns expressed by PG&E as to whether the Diablo reactors had been in constructed in a manner that complied with the Commission's regulations. PG&E Audit B0422 (p. 2) states: "Several apparently generic deficiencies in work performed by Pullman were previously identified by the General Construction Department."

What "generic deficiencies" had been identified by the General Construction Department?

Had these "generic deficiencies" been reported to The AEC/NRC?

2. The Scope Statement of the NSC audit encompassed "workmanship of the field-fabricated and installed items." The June 16, 1978 letter from Mr. Wischow to Mr. Bain, to which the PG&E review of the NSC audit and Pullman response thereto were attached, stated that the NSC audit "did not address itself to the verification of the adequacy of the installed hardware. The NSC audit was superficial with respect to the hardware...."

Did NSC fulfill its commitment to verify the adequacy of installed hardware? If not, what was the reason for its not having done so? What was done to satisfy PG&E's original concern that there be an audit to verify the adequacy of installed hardware?

3. PG&E undertook Audit B0422 to verify the adequacy of Pullman's QA program; to review the validity of the NSC findings and to determine the accuracy and appropriateness of Pullman's response; and to observe the as-installed condition of components and Pullman's adherence to applicable specifications, design drawings, and quality standards.

Audit B0422 evaluated a Pullman corporate audit conducted in February 1978. Audit B0422 found discrepancies in items that had been inspected by Pullman auditors who noted no discrepancies. Audit B0422 concluded that "In light of the number of discrepancies noted, it is apparent that the Pullman audit did not effectively evaluate the quality of their work."

What additional audits were conducted in light of the finding that Pullman's "audit did not effectively evaluate the quality of their work?" In light of this finding what hardware inspections were conducted to determine the adequacy of Pullman's work? How many discrepancies were noted as the result of additional audits and inspections conducted in the wake of Audit B0422? What was done to determine why the deficient conditions noted in M-3725 and M-3726 had not been discovered in the course of the original inspection process? What was the reason these deficient

conditions had not been noted during the course of the original inspection process? What was done to determine why the Pullman corporate audit had not noted the discrepancies noted by Audit 80422? Why did the Pullman corporate audit not discover the discrepancies? What was the basis for the 83-37 finding (stated on page 40) that Pullman had performed adequate corporate audits? What was the basis for the 83-37 finding (Id.) that Pullman's internal and corporate audits had indicated that no fundamental QA program breakdown had occurred? [E.g. see 1978-79 findings re pipe rupture restraints per NCR's DC1-7E-RM-008, DC1-7B-RM-009, DC1-79-RM-003, etc.]

4. To what extent did recommendations listed on page 11 - 12 of Audit 80422 correspond to deficiencies noted in the NSC audit?

5. A May 29, 1979 memorandum from K. Freed to E. Gerwin addresses pipe rupture restraint problems. Why had welder deficiencies not be detected and corrected at an earlier date by Pullman's QC/QA program? To what extent are the noted welding deficiencies similar to those specified by the NSC audit?

6. What audits and/or reinspections hangers were conducted to determine whether the types of defects found in the pipe rupture restraints existed with respect to pipe hangers? What is the basis for a determination that defects found in pipe rupture restraints did not exist with respect to pipe hangers?

INTEROFFICE CORRESPONDENCE

TO E. Gerwin

FROM K. Freed

DATE May 29, 1979

SUBJECT DIABLO CANYON RUPTURE RESTRAINTS

I. Problems outside Pullman's responsibility

A) JOINT DESIGN (Primary Cause)

- 1) Massive weldments, 5" deep x 4 5/8" wide, at 45° single bevel that would shrink unrestrained about 1/2" in a transverse direction are totally restrained by huge columns and beams. All potential shrinkage is transformed into residual stresses and/or cracks.
- 2) Lateral reinforcement plates (stiffeners) are welded exactly opposite, both pulling on webs as thin as 1/2" and 3/4".
- 3) PG&E Department of Engineering Research (D.E.R.) has acknowledged joint design as the major problem by developing their investigation around six (6) joints classified by degree of restraint.

B) BASE MATERIAL (Secondary Cause)

- 1) Almost all "cracks" originated at lamellar tears in base material.
- 2) Some material has excessive rolled laminations.
- 3) PG&E supplied base material was inadequately identified prior to implementation of QA verification of base material.
- 4) Low melting point alloys formed with copper (in A441) and sulfides triggered some tears.

C) INDISCRIMINATE MATERIAL REMOVAL

- 1) Large Destructive test samples have been removed.
- 2) Some sections have been essentially destroyed chasing cracks.
- 3) No Proposed repair/replacement.
- 4) No consideration is given to how removal stresses other joints in same structure.

TO: E. Gerwin
SUBJECT: DIABLO CANYON RUPTURE RESTRAINTS
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DATE May 29, 1979

(Cont'd)

D) CONCLUSION

- 1) Joint design can be improved by:
 - a) Smaller bevel angle.
 - b) Double bevel if possible
 - c) Bracing with gusset plates to distribute area contracted upon.
- 2) Before removal a complete repair/replacement plan should be developed with special attention given to other joints in the structure.

II. Problems within Pullman's Q.A./Fabrication responsibility

A) PREHEAT (Early Secondary Cause)

1) WELD PROCEDURE - 7/8

11/11/71 Spec. 8833XR requires AWS D1.0-69
Rev. 11/28/73 Preheat - 50°F. min., 175°F over 1" & carbon over .30"
Rev. 10/15/76 Preheat references ESD 243 for AWS Welding

2) Q.A. VERIFICATION

11/11/71 Spec. 8833XR requires detailed "Q.A. Inspection Plan"
Rev. 2/01/74 ESD 243 not address preheat
Rev. 5/06/75 ESD 243 preheat now Q.A. hold point
Rev. 6/10/76 ESD 243 details preheats meeting and exceeding D1.0-69

3) KNOWN DEVIATIONS

- a) PG&E audit observed welders not using correct preheat on 9/17/75 and on 9/19/75
- b) 8/3/77 Q.A. Inspector terminated after questionable documentation practices.
- c) 8/15/78 documented preheat of 150°F., required 225°F. (D.R. 3712).
- d) 9/25/78 documented preheat of 150°F., required 225°F. (D.R. 3798).

TO:

E. Gerwin

DATE May 29, 1979

SUBJECT:

DIABLO CANYON RUPTURE RESTRAINTS

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II. (Cont'd)

- B) Purported major welding and weld metal defects are not prevalent. One gross weld metal defect has been identified, that being a lack of fusion between two SMAW produced layers. Other defects exist but are inherent to the welding process (for example some porosity), are not detrimental and are well within acceptable limits. Confusion is occurring because PG&E NDE Technicians are calling lamellar tearing "lack of fusion" which it distinctly is not.

C) CONCLUSIONS

No documented control and inadequate control of required preheats were definite problems before 10/15/76. This likely contributed to cracking adjacent to fillet welds and may have contributed to cracks in heavy joints that originated in hardened heat affected zones. However, the major factor by far in heavy joints was poor joint design. The preheat situation is now under full Q.A. control, preheat hold points are being observed.

III. POINTS REQUIRING ACTION

- A) Stop indiscriminate material removal
- B) Change contract and/or specification to include the additional examinations (M.T. and re-U.T.) being imposed.
- C) Evaluate cracked joints and develop method of bracing the joint to replace the portion of the joint that examinations reveal to be cracked.
- 1) Brace, gusset or plate to web.
 - 2) Arrange gusset shrinkage to take load off cracked area or even to put cracks in compression.
- D) Hire Welding Engineer for Diablo Canyon to implement rupture restraint repair program, control installation of heavy stanchions in Unit 2 and maintain quality welding program.

cc: A. Eck

KRG:ad