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RUEGER, G.M. Pacific Gas & Electric Co. RECIP. NAME RECIPIENT AFFILIATION

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SUBJECT: Forwards itemization of NRC Insp Rept issues, corresponding util QA audit findings & action taken to resolve findings noted in Insp Rept 99900772/91-01 & discusses issues re generator identified in Insp Rept 50-323/91-202.

NOTES: See Reports, Volumes 1812

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Pacific Gas and Electric Company

77 Beale Street San Francisco, CA 94106 415/973-4684 Gregory M. Rueger Senior Vice President and General Manager Nuclear Power Generation

February 12, 1992

PG&E Letter No. DCL-92-034

U.S. Nuclear Regulatory Commission ATTN: Document Control Desk Washington, D.C. 20555

Re: Docket No. 50-323, OL-DPR-82

Diablo Canyon Unit 2

PG&E Comments Regarding NRC Inspection Report No. 99900772/91-01 Inspection of a Safety-Related Power Generator Supplied to Diablo Canyon Power Plant Unit 2

Gentlemen:

NRC Inspection Report No. 99900772/91-01, dated January 15, 1992, summarizes the findings and conclusions of an NRC inspection conducted at the facility of NEI Peebles - Electric Products, Inc. (P-EP) in Cleveland, Ohio. This inspection principally centered around P-EP's production of a power generator for PG&E, which is to be used as part of PG&E's program to add a sixth emergency diesel generator (EDG) at the Diablo Canyon Power Plant (DCPP) Unit 2. While the Inspection Report was directed to P-EP for response, PG&E would like to take the opportunity to provide the NRC with information regarding the NRC-identified issues and their relationship to the qualification of the generator purchased by PG&E.

As noted by the NRC in the Inspection Report, P-EP was contracted by PG&E to supply a generator in accordance with the requirements of 10 CFR 50, Appendix B. P-EP subcontracted the fabrication of the generator to Peebles Electrical Machines (PEM) in Scotland while retaining design control for the generator. PEM's quality assurance (QA) program is governed by the British Standard QA Program BS 5750, Part 2. It should be noted that the British Standard QA Program BS 5750, Part 2, has been reviewed by PG&E and found to be comparable to 10 CFR 50, Appendix B, exclusive of Criterion III (Design Control). PG&E conducted a number of activities in conjunction with the purchase of the generator, including several QA audits at the P-EP Cleveland facility and the PEM Scotland facility in 1989 and 1990. Compensatory actions were taken by PG&E as a result of those audits to provide assurance that the generator was acceptable for safety-related service. As described in the enclosure to this letter, the evaluations conducted by PG&E during audits of P-EP and PEM identified the same nonconformance issues discussed in the NRC Inspection Report.

The enclosure provides an itemization of those NRC Inspection Report issues applicable to PG&E, the corresponding PG&E QA audit findings, and the actions taken by PG&E to resolve the findings. It should be noted that all compensatory actions taken to resolve the findings against P-EP were directed to the one-time purchase of the generator, with no

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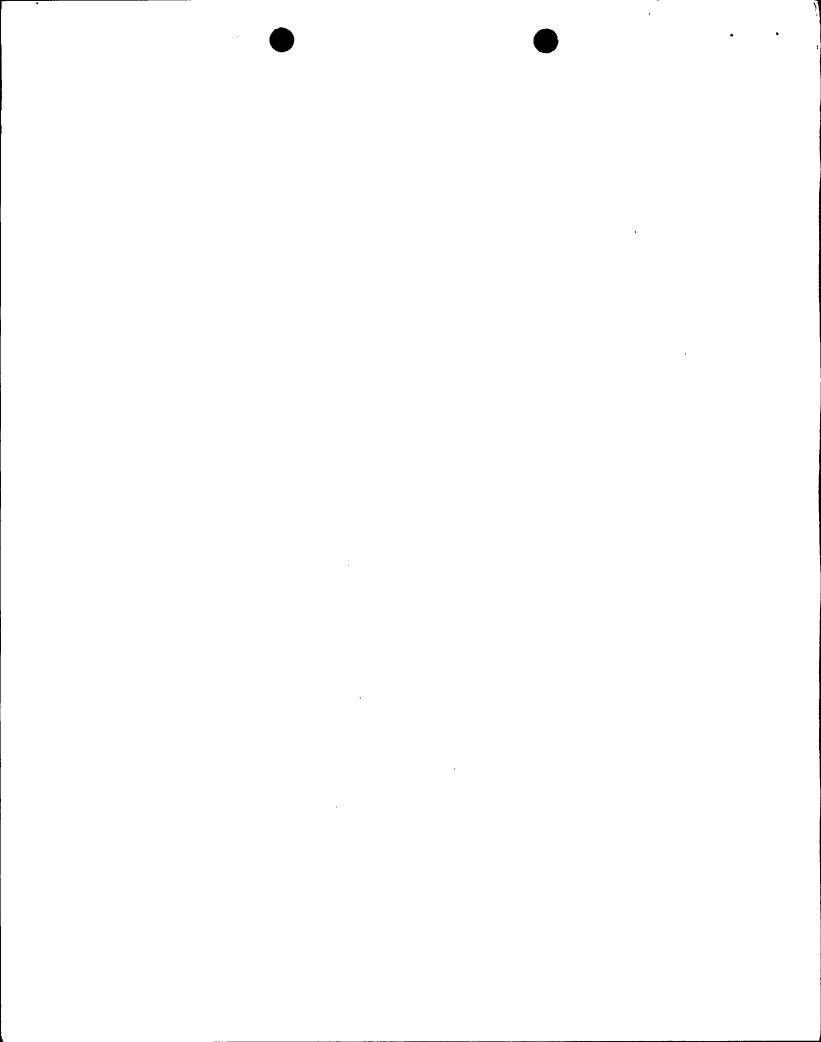
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PG&F Letter No. DCL-92-034

consideration toward a permanent resolution of the programmatic findings. In conjunction with P-EP, PG&E implemented an evaluation program that we believe addressed and resolved the PG&E QA audit findings. However, PG&E is formulating a plan, also in conjunction with P-EP, to address the NRC concerns relative to adequacy of documentation and completeness of P-EP specification and procedure equivalency and design change reviews performed to resolve PG&E concerns with respect to the lack of program requirements for the P-EP/PEM interface. Based on discussions with P-EP, PG&E does not believe that this documentation effort will result in any new areas of concern. PG&E will, however, ensure that proper actions are taken to assess and resolve concerns should they result from this review.

The Inspection Report also identified several issues with respect to PG&E's Engineering Material Memorandum (EMM) requirements, namely: (1) the issue that the generator be "like-for-like" to the five existing DCPP generators; (2) the relationship between PG&E's Revision 1 and Revision 3 EMMs; and (3) the failure modes and effects analysis available from P-EP.

There appears to be a misunderstanding on the part of the NRC with respect to the purpose of the lists of critical equipment provided in EMM, Revisions 1 and 3. The intent of the listing of critical components in Revision 1 of the EMM was to identify items supplied by P-EP to PEM (the generator fabricator), and to identify the associated critical characteristics of those items, in order to resolve a PG&E audit open item associated with the lack of control of sub-supplier material quality for items purchased by P-EP. This list of items was provided by P-EP, and the critical characteristics were developed by PG&E with input from P-EP. Therefore, this list was not intended to be an all-inclusive list of critical components, but was in fact limited to items purchased by P-EP. The list of critical components and characteristics provided in Revision 3 to the EMM was developed during the joint audit of PEM by P-EP and PG&E with input from PEM and P-EP. The intent of this list was to define the population of critical components for use in establishing a representative sample of components for evaluation of the PEM OA program. Incorporation of the list in the EMM was done to document the basis of the review conducted by PG&E, PEM, and P-EP, and was not to impose new requirements on P-EP. Therefore, the later issue date of this EMM with respect to the generator manufacturing schedule does not indicate a lack of control in the fabrication process. The EMM issues are further discussed in the enclosure.

The enclosure also discusses issues related to the generator that were identified in NRC Inspection Report No. 50-323/91-202, dated November 15, 1991, that documented the results of an earlier NRC inspection of the sixth EDG. PG&E believes that the issues identified in the two NRC Inspection Reports are enveloped by the findings identified in the August 1990 audit of P-EP and the joint October 1990 P-EP/PG&E audit of PEM. Details of the resolution of the PG&E QA audit findings are documented in Section V and Attachment 2 of the enclosure.



PG&E has been, and continues to be, committed to ensuring that the sixth diesel engine generator unit meets the quality standards required for the DCPP emergency onsite electrical power distribution system. We would be pleased to discuss the contents of this submittal with you at our scheduled meeting on February 20, 1992, in your Rockville, Maryland offices.

Sincerely,

Gregory M. Rueger/RCandum

Gregory M. Rueger

cc: Ann P. Hodgdon John B. Martin Philip J. Morrill Harry Rood

Harry Rood Howard J. Wong

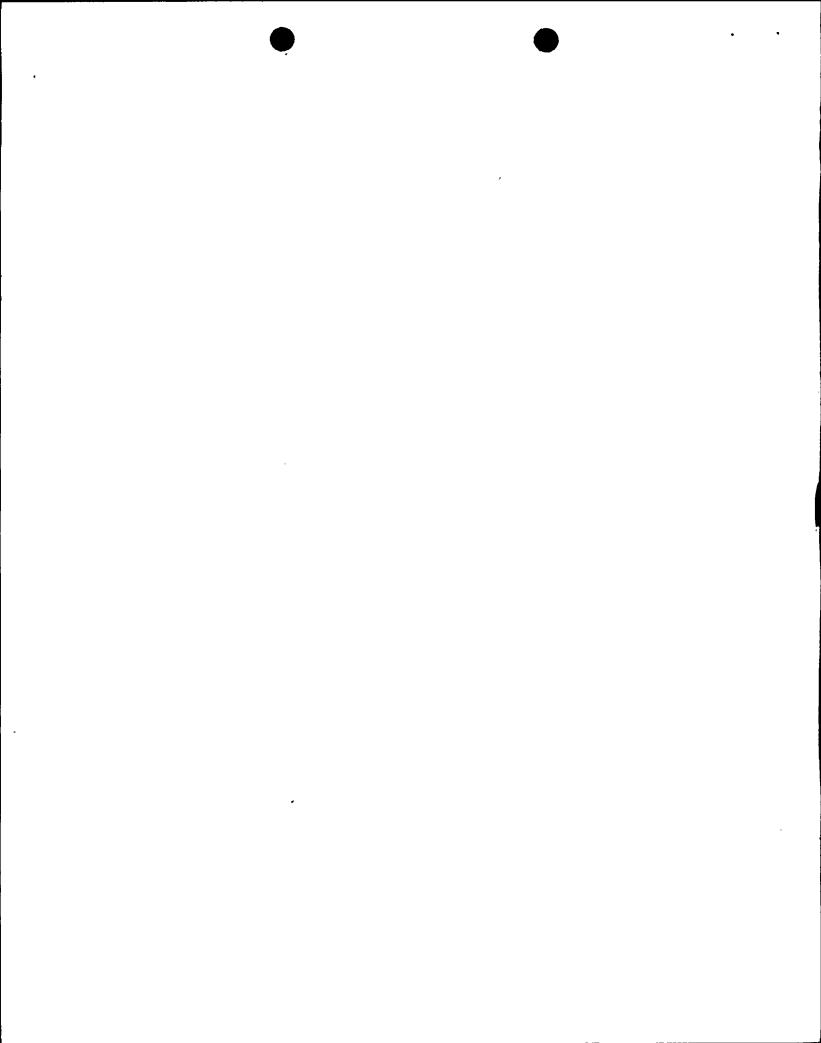
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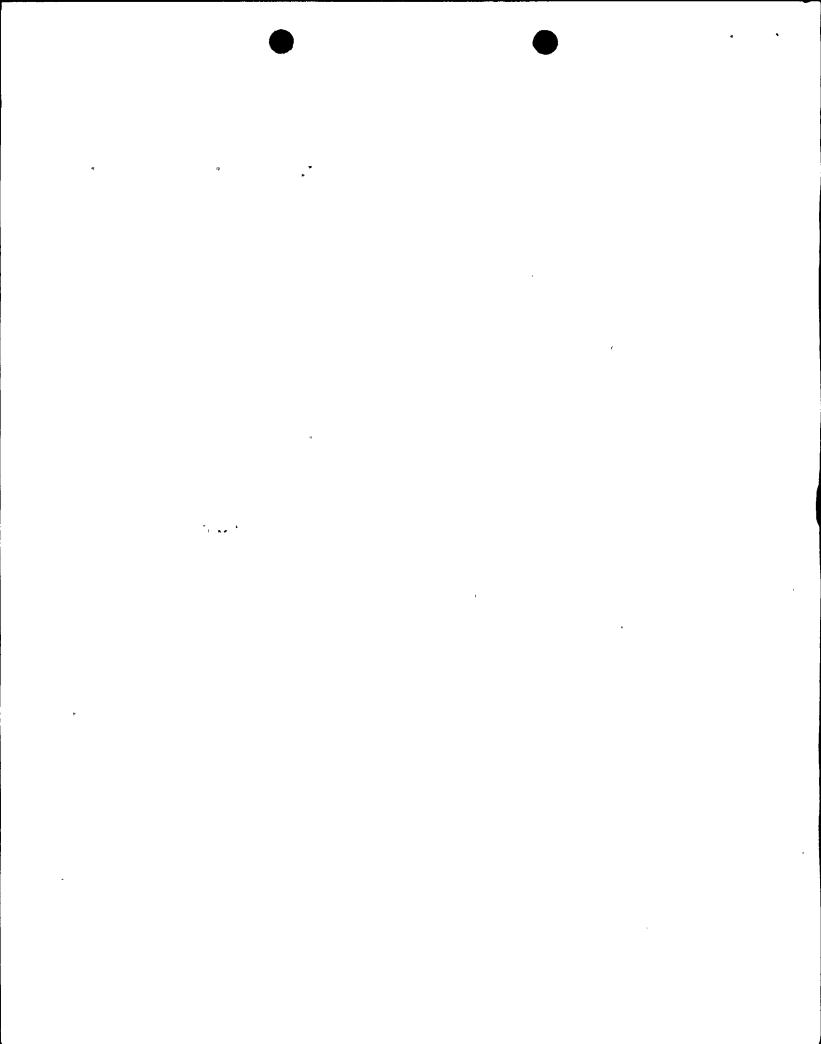
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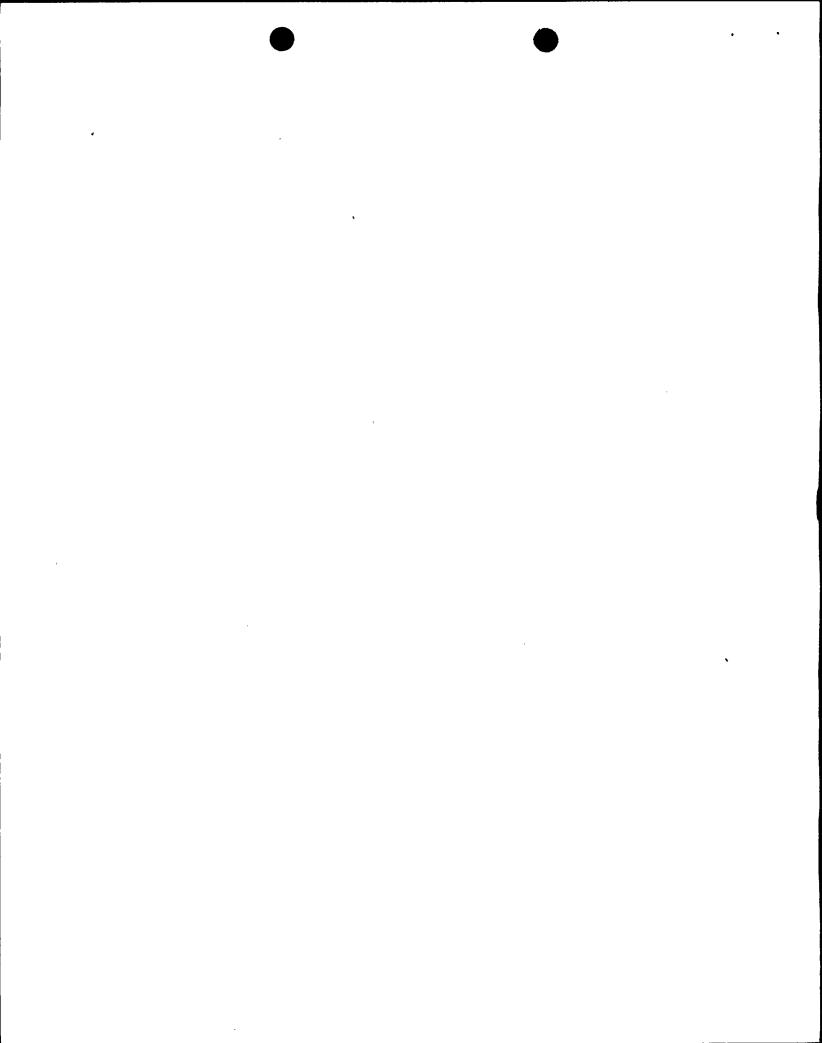
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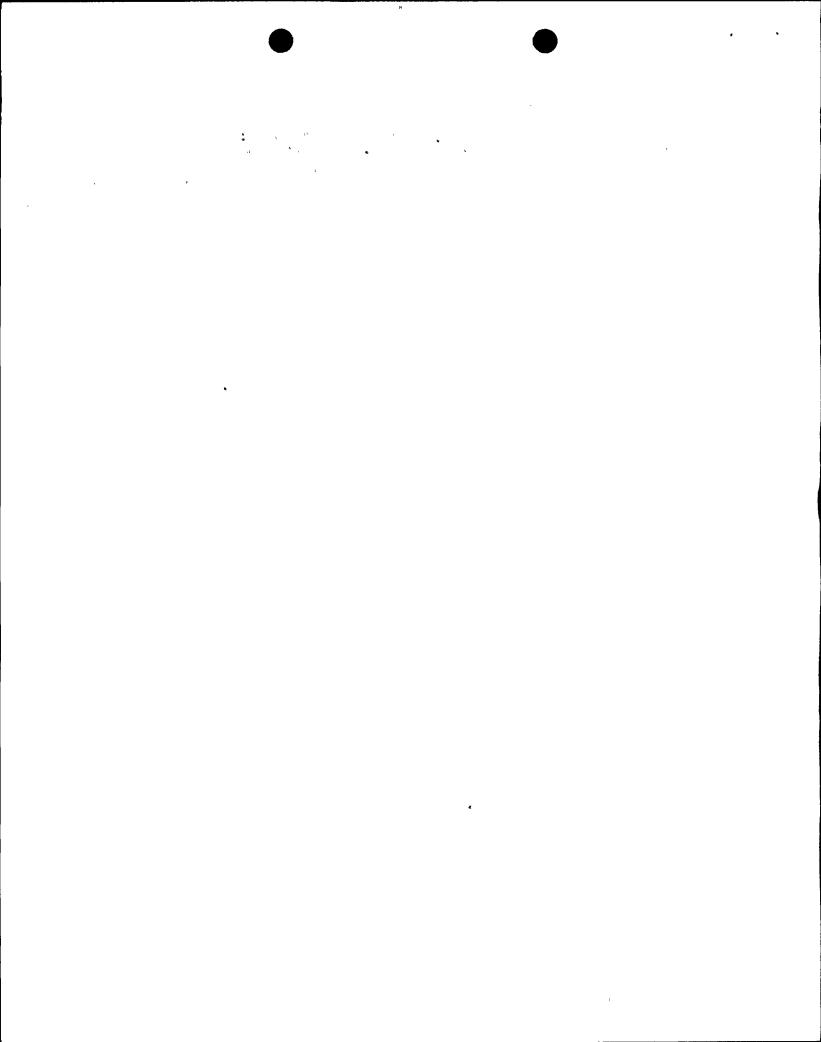
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- II. Background of PG&E Qualification of NEI Peebles Electric Products, Inc. (P-EP)
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 - D. Nonconformance 99900772/91-01-04, Instructions, Procedures and Drawings
 - E. Unresolved Item 99900772/91-01-05, P-EP Quality Assurance Manual
 - F. Specific References in Report 99900772/91-01 to PG&E Activities
- V. PG&E Engineering Evaluation of P-EP for Purchase of Sixth Generator



ATTACHMENTS

- 1. NEI Peebles-Electric Products, Inc. (P-EP) Letter to PG&E, dated January 17, 1992. Resolution of issues discussed in NRC Inspection Report No. 50-323/91-202.
- 2. PG&E Engineering Evaluation of P-EP, NEMP 12.4, Revision 1
- 3. Summary of PG&E Engineering and Quality Assurance Documents for Qualification of P-EP $\,$
- 4. Adequacy of P-EP Commercial Grade Dedication Activities for PG&E's Sixth Generator



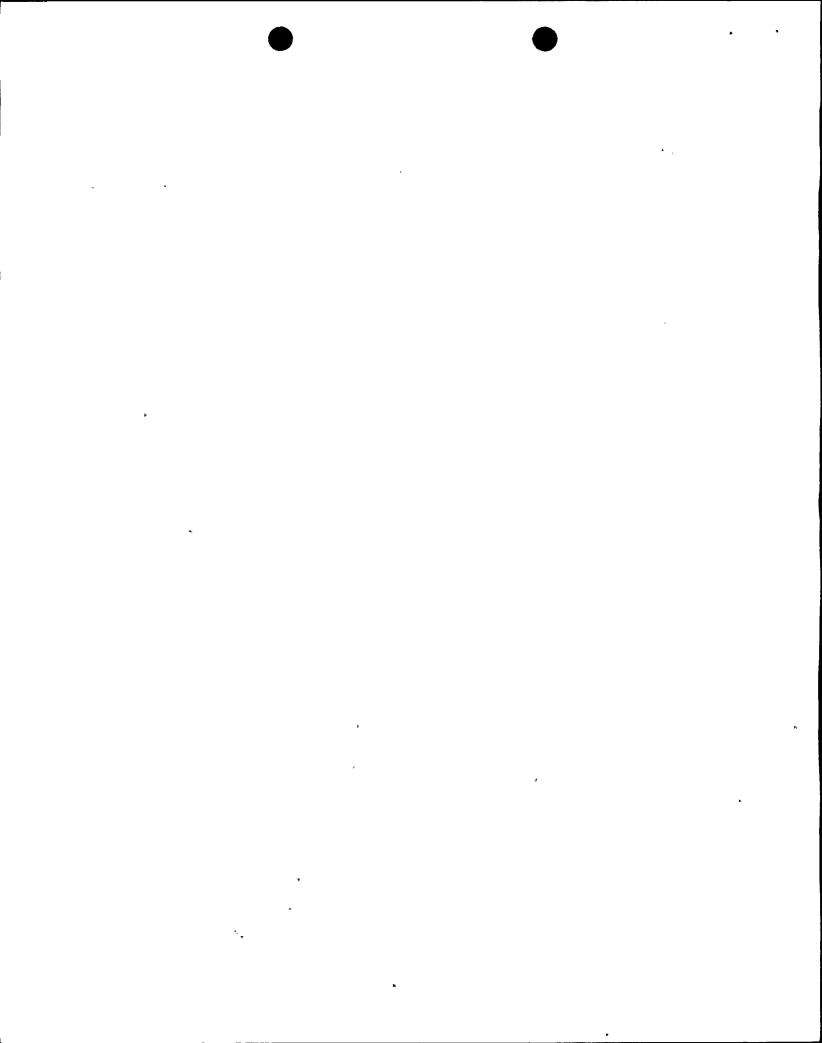
I. General Discussion

The purpose of this submittal is to provide additional information and PG&E's perspective on the issues related to procurement of the generator raised by NRC Inspection Report (IR) No. 99900772/91-01, issued to NEI Peebles - Electric Products, Inc. (P-EP) on January 15, 1991, and IR 50-323/91-202, issued to PG&E on November 15, 1991.

Section II provides background information on the development of the engineering specification and the qualification of P-EP by PG&E.

Sections III and IV provide PG&E responses to the specific issues raised by the IRs 50-323/91-202 and 99900772/91-01. The format used in these two sections is to first quote the open item from the applicable report, identify the corresponding PG&E quality assurance (QA) audit finding, and then state PG&E's position.

Section V gives an overview of the engineering evaluation performed by PG&E to qualify P-EP. This evaluation was required to address the deficiencies identified by PG&E QA audits.



II. Background of PG&E Qualification of NEI Peebles - Electric Products, Inc.

PG&E purchased a generator for the Sixth Diesel Installation Project from P-EP. P-EP subcontracted the fabrication of the generator to Peebles Electrical Machines (PEM) of Edinburgh, Scotland. The generator has been supplied as a safety-related item by P-EP with the requirements of 10 CFR 50, Appendix B, and 10 CFR 21 applicable to this purchase.

A brief history of the procurement of the existing generators at PG&E is appropriate to provide a clear picture of the activities conducted by PG&E in the purchase of the sixth generator. The original five generators associated with the Diablo Canyon Power Plant (DCPP) onsite emergency power distribution system were originally designed and manufactured by Electrical Products Incorporated (EPI) in Cleveland, Ohio, and supplied to PG&E in 1969. The purchase was via a subcontract from ALCO Engine Incorporated, which had been contracted by PG&E to supply the five emergency diesel engine generator units for DCPP. Northern Engineering Industries Parson Peebles (NEI Peebles) of Great Britain bought EPI in 1979 and renamed the company NEI Peebles – Electric Products, Inc. The manufacturing operations of P-EP transferred to Peebles Electrical Machines (PEM) of Edinburgh, Scotland, another subsidiary of NEI Peebles, in 1984.

In January of 1990, PG&E issued a purchase order to P-EP for procurement of the generator for installation in the DCPP sixth diesel engine generator unit. This generator was shipped to GEC Alsthom in Toronto, Canada, for assembly and testing for the sixth diesel engine generator unit in February of 1991. Testing of the engine generator unit was completed in August 1991. The unit arrived at DCPP in September of 1991. The sixth diesel skid (including the engine and generator) has been delivered onsite at DCPP and is undergoing installation and tie-in of its auxiliary systems. The unit is currently scheduled to complete final testing and installation by the DCPP Unit 2 fifth refueling outage in the spring of 1993.

Prior to the placement of a purchase order with P-EP, an audit was conducted in December of 1989 to assess P-EP's qualifications. This audit addressed the ability of P-EP to control items procured by P-EP which were to be shipped to PEM for use in the fabrication of the generator. To address P-EP's capabilities, a list of components potentially supplied by P-EP to PEM was obtained from P-EP. The list of components potentially supplied by P-EP was used as the basis for the December 1989 audit. The critical characteristics of the components on this list were identified to facilitate the review conducted during the audit. Subsequent to the completion of the December 1989 audit, P-EP was placed on PG&E's Qualified Suppliers List (QSL) and a purchase order was issued to P-EP. As a result of discussions between PG&E Engineering and QA personnel after the P-EP audit, PG&E determined that additional controls were necessary for equipment supplied by P-EP to PEM.

The list of 14 items potentially supplied by P-EP to PEM was then incorporated as Attachment F into Revision 1 of the Engineering Material Memorandum (EMM) DC2-3322-BRH-E, which required that the critical characteristics for the 14 components be verified by P-EP with PG&E review and approval. This additional control was implemented to clearly specify the actions required by P-EP with respect to items procured by P-EP and supplied to PEM. Another recommendation which resulted from the December 1989 P-EP audit was the need to conduct a

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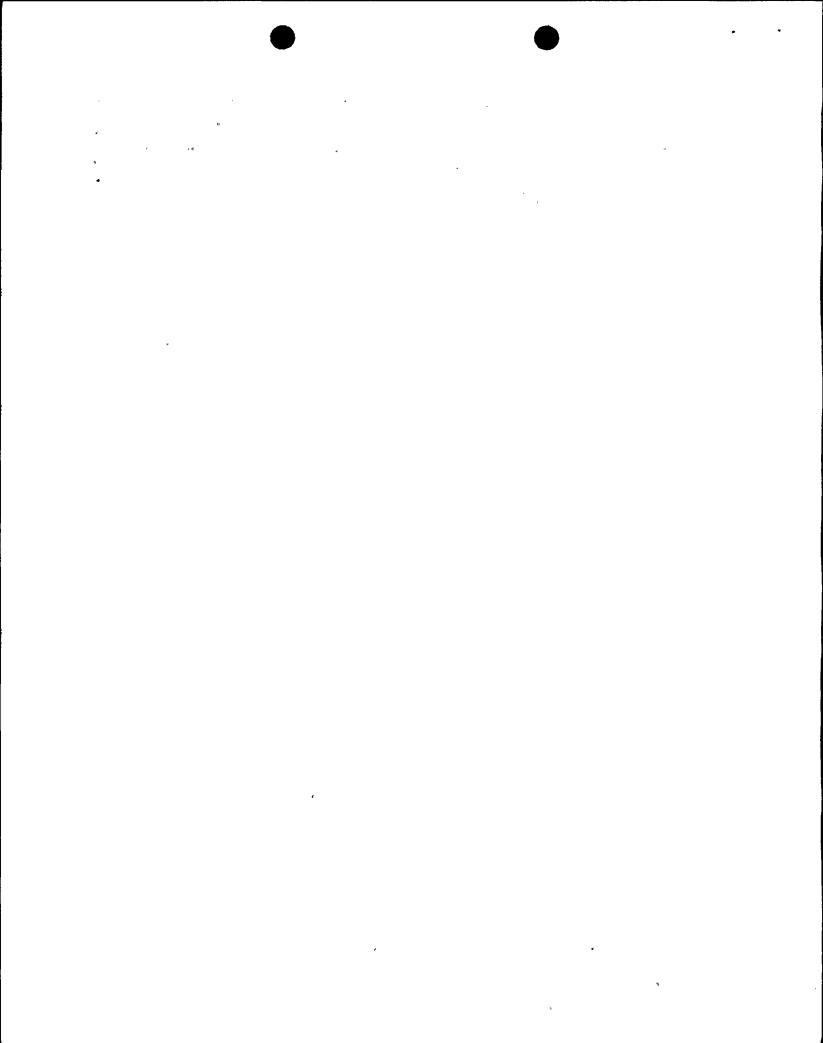
follow-up implementation audit of P-EP activities with respect to the controls used for the generator.

The implementation audit of P-EP was conducted by PG&E in August of 1990 to assess P-EP's QA program with respect to the PG&E generator. This audit was conducted utilizing Revision 4 of QA Specification SP-D-Peebles, which imposed additional requirements with respect to: (1) identification and control of materials; (2) testing to demonstrate that items will perform satisfactorily in service; (3) control of measuring and test equipment; and (4) critical material, parts or components that were procured as commercial grade (this last item, although not included in Revision 4 of SP-D-Peebles as a requirement, was evaluated during the subject audit and was incorporated in Revision 5 of SP-D-Peebles).

Deficiencies identified in the August 1990 audit were associated with: (1) procurement/commercial grade dedication; (2) test control; (3) audits; (4) measuring and test equipment; (5) design control; and (6) QA records. Based upon the results of this August audit, PG&E concluded that P-EP could only be listed on our QSL for this one-time purchase, and that measures would have to be put in place to compensate for P-EP's quality program not meeting PG&E's requirements. Resolution of these deficiencies and associated PG&E evaluations are discussed in detail in Section V and Attachment 2 of this enclosure.

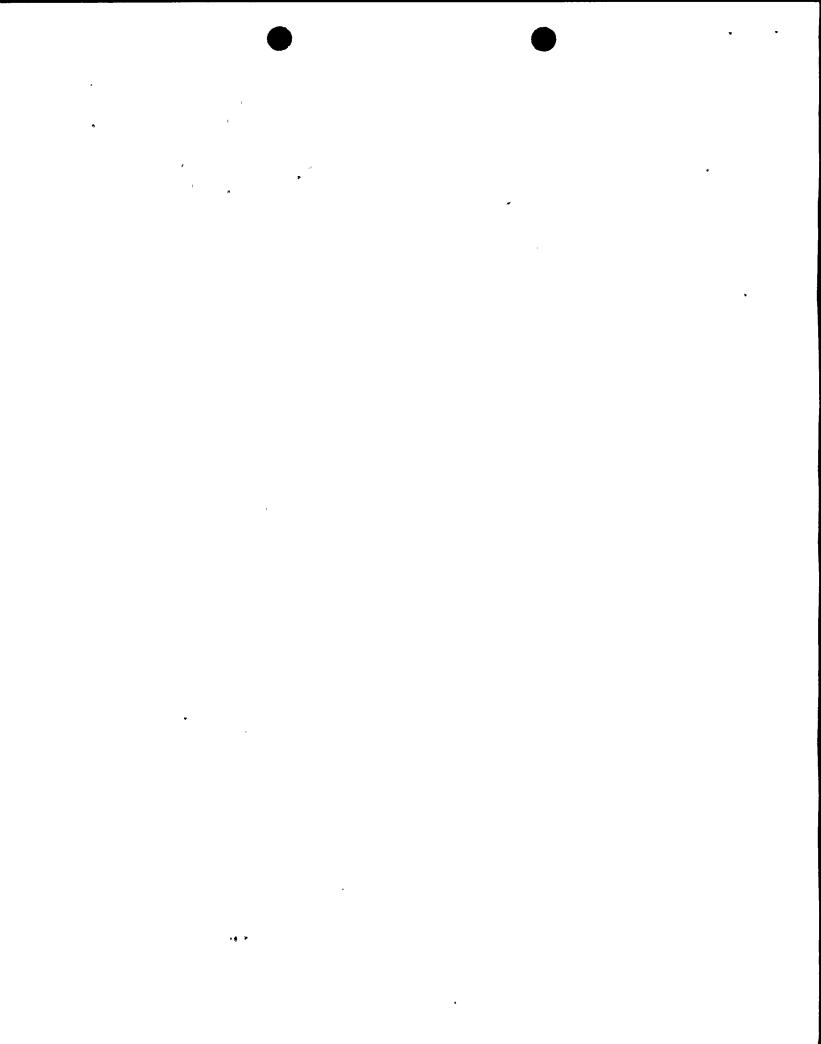
One of the concerns identified in the August 1990 PG&E audit of P-EP was the need for an audit of PEM. This audit was conducted by P-EP in October 1990 with direct joint participation by PG&E. In preparation for this joint audit, reviews with P-EP personnel were conducted to identify critical components and critical characteristics for evaluation during the audit. Preliminary listings of the critical components and characteristics were discussed with P-EP and PEM personnel during the audit in Scotland. These reviews resulted in a list of 27 components and their associated critical characteristics for use in identifying an appropriate sample of components for assessing the PEM program. The 27 items were divided into 6 categories based on the type and function of the item (e.g., mechanical, electro-mechanical). From these six categories, a total of 7 items were selected as the sample for the PEM evaluation (with at least one item from each category). The criteria for the audit was BS 5750, Part 2 (British QA program), as specified in the P-EP This BS 5750, Part 2, QA program was reviewed by PG&E and was purchase order. found to be comparable to a 10 CFR 50, Appendix B, program. The deficiencies identified in this audit included: (1) subsupplier control; (2) inspection, measuring and test equipment; (3) inspection documentation; (4) PEM/P-EP design interface and drawing control; (5) inadequate crimping procedure; and (6) a lack of documentation of equivalency evaluation of PEM/P-EP procedures and specifications. PG&E evaluated these areas of deficiencies and implemented controls and required evaluations by P-EP to address the concerns. Details of these deficiencies and their resolution is provided in Section V and Attachment 2 of this enclosure. Subsequent to the joint P-EP/PG&E audit of PEM, a new revision of the purchase order was issued to document the critical equipment lists generated during the audit. This was provided in Revision 3 to the EMM, which included Revision 5 of SP-D-Peebles.

PG&E believes that the issues identified in the NRC IRs are enveloped by the findings identified in the PG&E audits discussed above. The resolution of the audit open items is documented in an evaluation conducted by PG&E's



Engineering Department. Details of this evaluation are provided in Section V and Attachment 2 of this enclosure. A significant aspect of the audit finding resolution was associated with an evaluation conducted by P-EP to document the equivalency between the P-EP and PEM specifications and procedures. This P-EP equivalency evaluation also included an evaluation of all changes in the design of the generator since 1984. This time frame was used as a cut-off date because changes made prior to 1984 were not susceptible to the identified P-EP/PEM interface concerns due to P-EP having provided both design and manufacturing via a 10 CFR 50, Appendix B, QA Program through its Cleveland, Ohio, facility prior to 1984.

Concerns identified in the NRC IRs with respect to the adequacy of documentation and completeness of the P-EP equivalency/design change evaluation will, however, require further review by PG&E and P-EP. PG&E will establish, in conjunction with P-EP, a plan for resolution of this issue to ensure that this effort, which is a critical part of the PG&E evaluation of acceptability of the generator, is complete and properly documented.



III. Additional Information on P-EP Related Open Items Identified in NRC Inspection Report No. 50-323/91-202 (Alco Engine Inspection)

NRC IR No. 50-323/91-202, "Inspection of the Procurement and Commercial-Grade Dedication of the Sixth (2-3) Emergency Diesel Generator Set for Diablo Canyon Nuclear Power Plant Unit 2," was issued to PG&E on November 15, 1991. Although this report concentrated on dedication issues for the engine, the IR cover letter identified three concerns with the procurement of the generator from P-EP. These three concerns are discussed below.

A. Rotor Pole Magnet Wire

"These inspections raised additional specific technical concerns regarding the use of appropriate rotor pole magnet wire..."

PG&E Position: Per P-EP letter dated January 17, 1992 (Attachment 1 to this enclosure), the rotor pole magnet wire was specified to be unvarnished. The wire used in the sixth generator was lightly varnished. Per discussion with P-EP, this was not caught during PEM's incoming inspection and was an error on PEM's part, and was not the failure to identify a design change. The unvarnished wire was specified by P-EP in the purchase order. To ensure that varnished wire is acceptable, P-EP is performing additional testing of the lightly varnished wire. P-EP will forward the results to PG&E when the testing is completed.

B. Bakelite Electrical Separation Ring

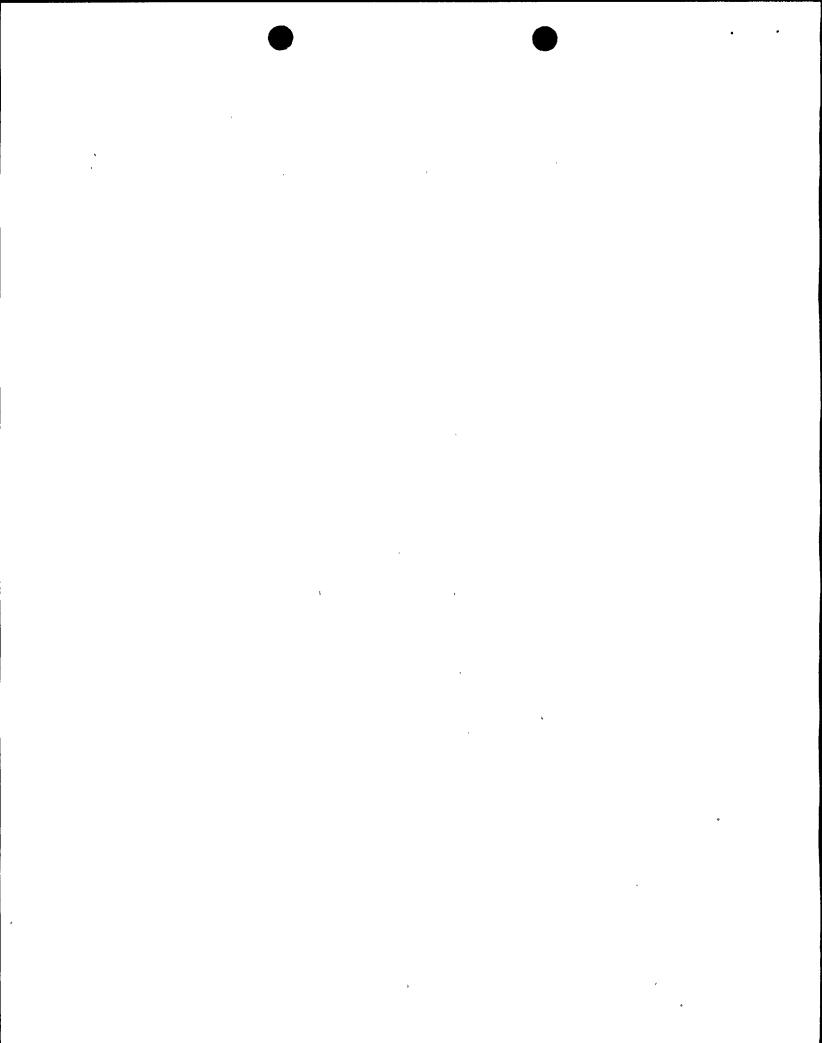
"These inspections raised additional specific technical concerns regarding the use of a Bakelite electrical separation ring as a potentially load bearing component-part of the rotor shaft support assembly."

<u>PG&E Position:</u> Per P-EP letter dated January 17, 1992 (Attachment 1 to this enclosure), "the bearing insulation ring's function is to insulate the bearing housing from the bearing bracket in order to prevent circulating currents which can pit the bearing surface and eventually lead to bearing failure. This function is verified by a bearing insulation test per IEEE 115-1983... The mechanical failure of the insulation has not been deemed a credible failure mode. While we would agree that the ring is part of the support system of the bearing housing, due to the sandwich design, and lack of any known failure of this design, the mechanical strength was not considered a critical design characteristic."

C. Specification of Critical Components

"PG&E's selection of critical components and characteristics, some of which were specified after the generator was assembled and shipped, were also of concern."

PG&E Position: Although the documentation of twenty-seven critical items was not signed off until January 28, 1991, these items were examined when



PG&E participated in P-EP Audit 9003 of PEM, which was conducted in October 1990.

Section IV.F(2) and Attachment 3 of this enclosure provide further information regarding the changes in critical item listings and critical characteristic identification.

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IV. Additional Information on Open Items Identified in NRC Inspection Report No. 99900772/91-01 (P-EP Inspection)

This section reviews each of the Nonconformances identified in IR 99900772/91-01. Each Nonconformance is summarized with the corresponding PG&E audit open item provided for reference. A summary is then provided for the basis of the resolution of the open item.

A. Nonconformance 99900772/91-01-01, Design Changes

"P-EP failed to (1) establish adequate measure to control changes to design, materials and manufacturing processes commensurate with those controls applied to the original design, (2) provide for performing design verifications for the changes in design, materials, and manufacturing processes, (3) demonstrate that the changes in the design were controlled commensurate with the design controls applied to the original design, and (4) demonstrate that the original design basis had been correctly translated into revised specifications, drawings, procedures, and instructions.

o P-EP's design-basis reconciliation of design changes for PG&E's generator was documented and verified only to 1984 when the Cleveland manufacturing facility closed. P-EP could not substantiate that the new generator was likefor-like to PG&E's five existing operating power generators."

<u>PG&E Position:</u> This Nonconformance corresponds to the previously identified PG&E Audit Finding Report (AFR) 90-067, "Design Control" (August 1990 PG&E audit of P-EP), summarized as follows:

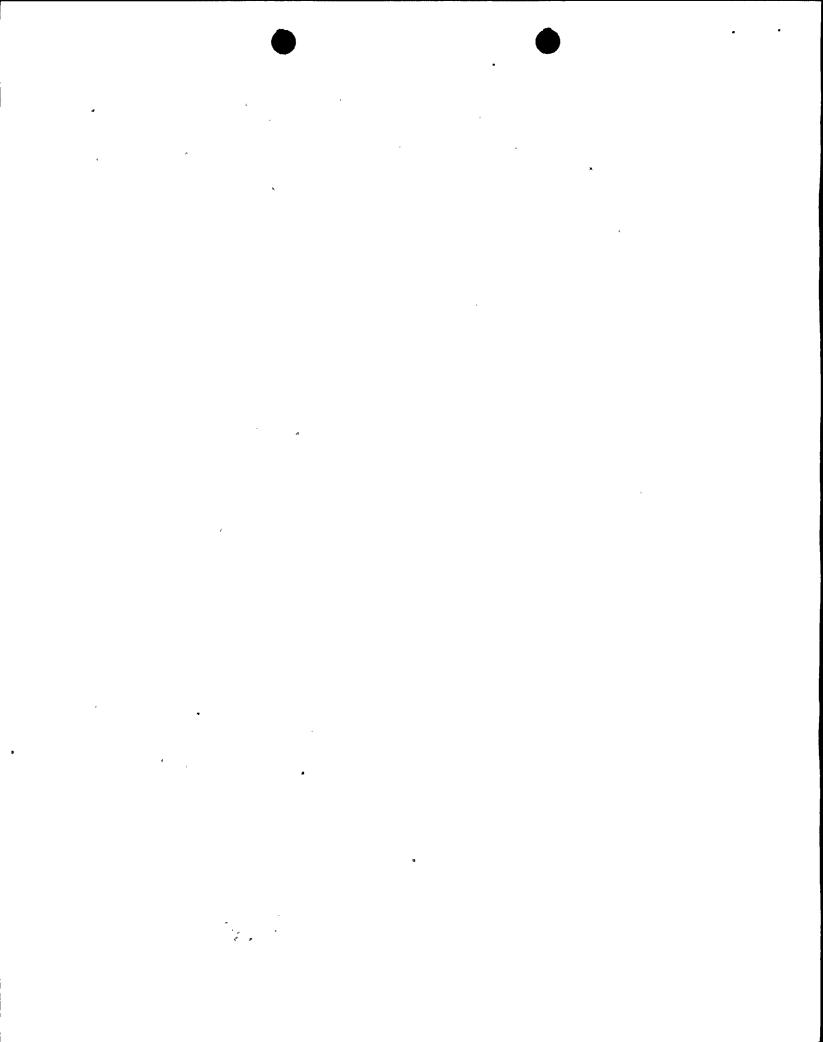
P-EP has not documented their Incoming Order Review for PG&E's Job No. S-1128 (generator for sixth diesel). Until this review is fully documented or performed, P-EP cannot assure that the design of the new generator is identical to the design of the spare generator, per purchase order requirements. Material substitutions were not submitted to PG&E nor were drawing changes.

This finding was closed based upon corrective action taken by P-EP, evaluations performed by PG&E's Engineering NEMP 12.4 evaluation, and verification visits to P-EP on March 12-13 and July 30-31, 1991.

PG&E EMM DC2-3322-BRH-E, page 3, states:

"The generator shall be identical in form, fit and function to the spare generator with serial number 38604851, outline drawing C-08991E, which was furnished by NEI Peebles in 1986/87. (Unit manufacturing #259132-1 and PG&E PO # 4R-71595.)

[Note this generator shall also be identical to the units 1-1, 1-2, 1-3, 2-1, and 2-2 bearing the serial numbers 16908022, 23, 24, 25, & 26 except that it will have the improved coil



insulation system furnished on the spare generator serial #38604851 and described in NEI Peebles Letter of 1-31-86..]"

Although PG&E's purchase order (the EMM) required the sixth generator to be "identical," it was recognized that there were differences from the original generators supplied by P-EP, and therefore the new generator was considered to be an "equivalent" verses "identical" item.

To address issues relative to P-EP design control, NEMP 12.4 Evaluation includes a review of all design changes, material changes, and discrepancy reports. This review is based on a submittal by P-EP of all changes made. This submittal of design changes was subsequently verified on a sample basis by PG&E QA. The submittal included three discrepancy reports and twenty-nine design changes. Engineering reviewed the change summary, and determined that the results of the design change review performed by the supplier were acceptable.

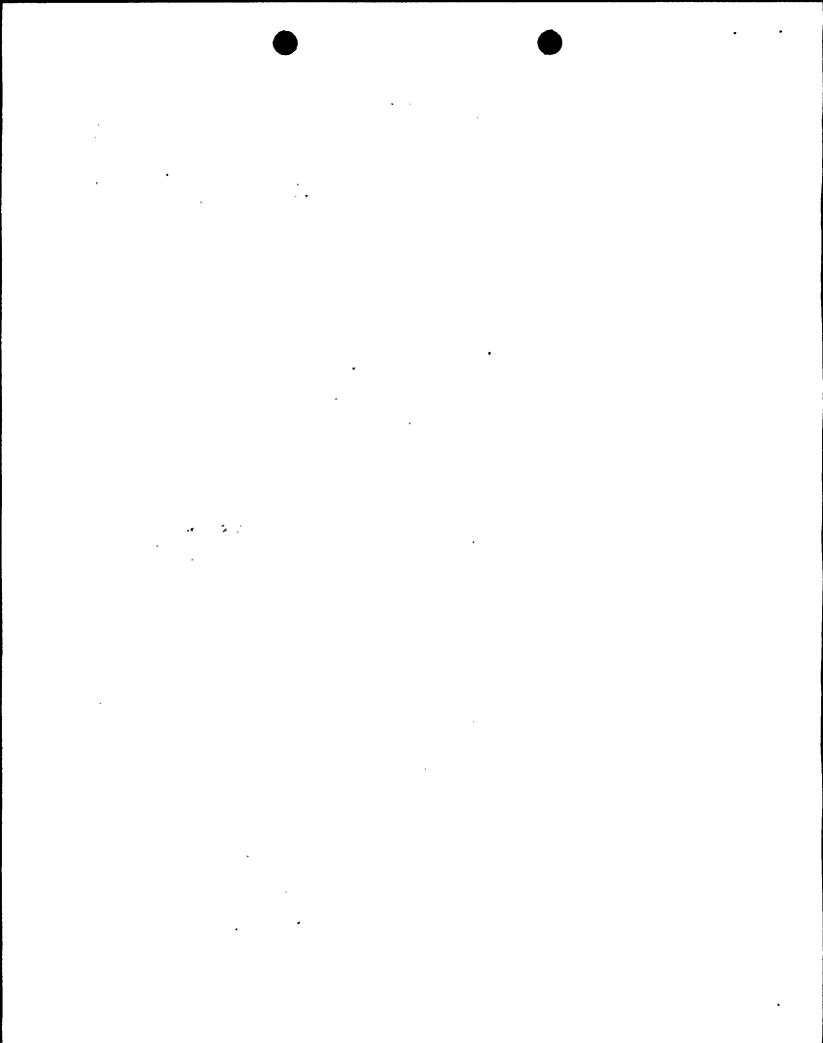
The evaluation of design changes and specification/procedure equivalency was not required prior to the 1984 time frame since the issues requiring this review were associated with a lack of formal interface between P-EP and PEM. This concern did not exist prior to 1984 since the design and manufacturing activities occurred in Cleveland and were directly controlled under a 10 CFR 50, Appendix B, QA program by P-EP prior to 1984.

PG&E feels that the corrective actions taken to resolve this finding address all the concerns identified by the NRC. This Nonconformance does not impact the quality of the sixth generator because the design change review performed by P-EP did not identify any changes that would impact the ability of the generator to perform its safety-related function.

B. Nonconformance 99900772/91-01-02, Design Interface/Equivalency Evaluation

"P-EP failed to (1) establish adequate measures to control the activities between it and its sister organization, Peebles Electric Machines (PEM) of Edinburgh, Scotland, that consisted of the review, approval, release, distribution, and revision of documents involving their respective design interface, (2) demonstrate that the results of PEM's design translation activities were equivalent to the design requirements specified by P-EP, (3) adequately document the critical requirements or acceptance criteria compared during the equivalency evaluation, and (4) adequately document the results of the equivalency evaluation or other bases to support P-EP's conclusion that PEM procedures and specification were equivalent.

The equivalency evaluations were not auditable because (1)
PEM's equivalent procedures or material specifications
were not always available for comparison to P-EP's
procedures or material specifications and (2) the
evaluations consisted of only a brief summary of the
procedures or materials specifications.
P-EP's equivalency evaluations failed to adequately
document (1) the critical requirements or acceptance



criteria compared during the evaluation and (2) the results of the evaluation or bases to support P-EP's conclusion that the documents were equivalent."

<u>PG&E Position:</u> This Nonconformance corresponds to the previously identified PG&E AFR 90-068, "Subsupplier Evaluation" (August 1990 PG&E audit of P-EP), and P-EP Audit Findings 9003-4 and 9003-6 (October 1990 joint P-EP/PG&E audit of PEM):

AFR 90-068 PART 1 - "P-EP's external audit/evaluation program used to substantiate the qualification of subsuppliers is not adequate to comply with PG&E's Specification and ANSI N45.2.13 requirements."

Audit Finding 9003-4: Cleveland and Scotland interface.

Audit Finding 9003-6: No documentation was available attesting to the equivalency of P-EP procedures and specifications.

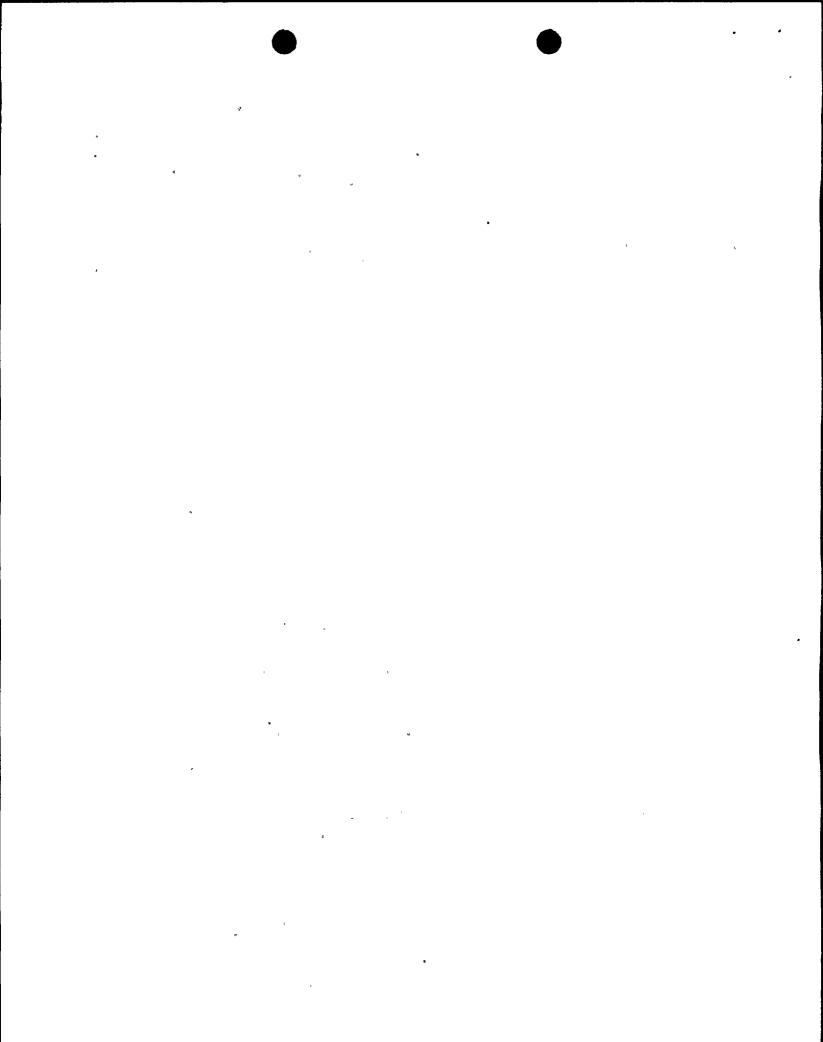
The issues were closed based on corrective actions for these findings, the NEMP 12.4 Evaluation, and visits to P-EP on March 12-13 and July 30-31. 1991.

As discussed earlier, P-EP is the responsible design organization for the generator, and the generator is manufactured by PEM in Scotland. As a result, it is important that PEM use specifications which are either the same as P-EP's, or which have been evaluated by P-EP to ensure their equivalency. In order to respond to this audit finding, at PG&E's request P-EP performed a review of differences between the material specifications and manufacturing procedures specified by P-EP and those specifications and procedures used by PEM.

P-EP's review examined seventy procedures and specifications for potential changes, and resulted in forty-two equivalency evaluations. PG&E Engineering reviewed the identified material and manufacturing specification differences and concluded that the bases for acceptability of the equivalency evaluations performed by the supplier were adequate.

PG&E believes that the corrective actions taken to resolve this finding address all the concerns identified by the NRC. This Nonconformance does not impact the quality of the sixth generator because the equivalency reviews performed by P-EP did not identify any deficiencies in PEM's material specifications or manufacturing procedures that would prevent the generator from performing its safety-related function.

However, to address the NRC concerns regarding completeness and adequacy of documentation of this review, PG&E in conjunction with P-EP is currently formulating a plan for identifying additional review and documentation requirements needed to ensure the adequate resolution of this Nonconformance. Based on discussion with P-EP, it is not expected that this effort will identify any significant new issues. Any items resulting from this review will be addressed by P-EP and PG&E to ensure complete resolution of the identified NRC concerns.



C. Nonconformance 99900772/91-01-03, Commercial Grade Dedication

"P-EP failed to (1) establish adequate measures to provide for the selection and review for suitability of the application for materials, parts and equipment that were procured as commercial grade items and were essential to the generator's ability to perform its intended design and safety-related function, (2) ensure the suitability of the stator coil's resistance temperature detectors, slip rings, adhesives, and mounting sleeve insulator for the slip rings, and (3) ensure the suitability of the materials, parts, and equipment PEM procured.

<u>PG&E Position:</u> This Nonconformance corresponds to the previously identified PG&E AFRs 90-068, "Subsupplier Evaluation," and 90-069, "Dedication Testing" (August 1990 PG&E audit of P-EP):

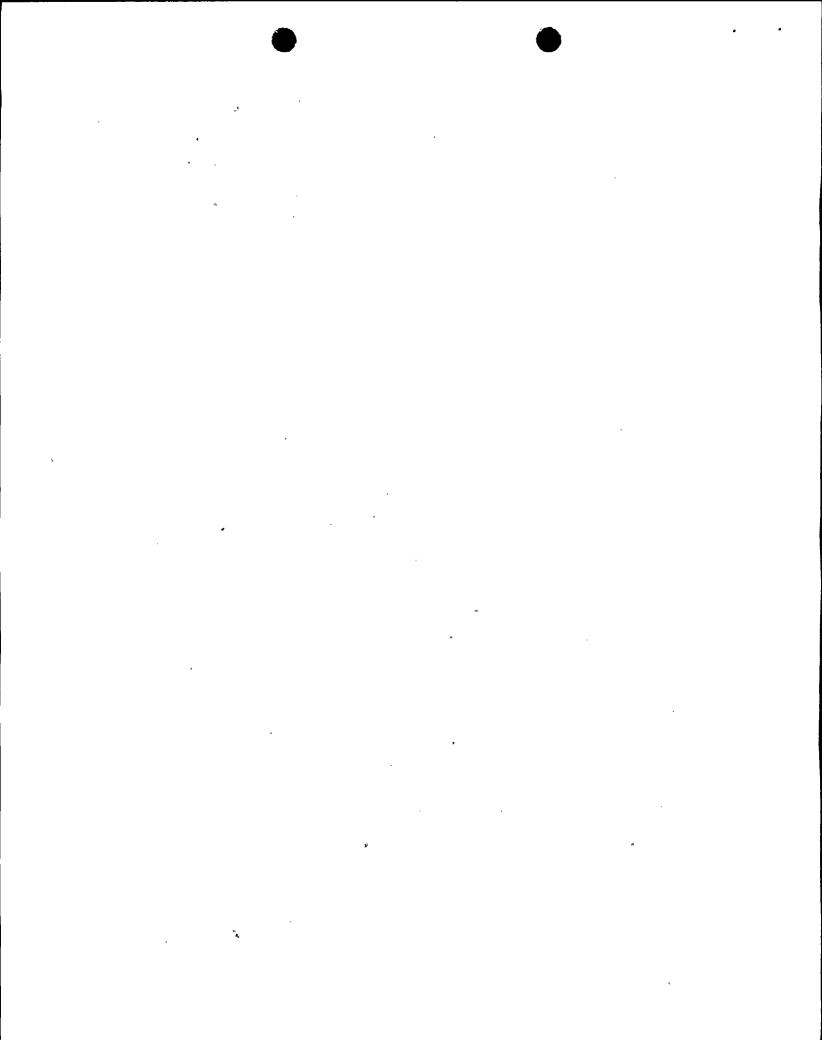
AFR 90-068 PART 1 - "P-EP's external audit/evaluation program used to substantiate the qualification of subsuppliers is not adequate to comply with PG&E's Specification and ANSI N45.2.13 requirements."

AFR 90-068 PART 2 - "P-EP's quality assurance program does not include provisions for the dedication of commercial grade parts (i.e., Identification of critical characteristics and providing a method to verify them). As a result, items supplied under Purchase Order No. 034525 for the generators were purchased and supplied as commercial grade with no dedication activities performed."

AFR 90-069 - "Testing, specified in PG&E purchase order ZS-1539-AB-9 was performed by P-EP without the use of approved test procedures/instructions."

Both the NRC Nonconformance and PG&E Audit Findings focus on the inadequate qualification of PEM by P-EP and the inadequate dedication program of P-EP. PG&E addressed both these concerns, relative to a one-time purchase of the generator for its sixth diesel generator, as follows:

- (a) To resolve the subsupplier (PEM) issues, PG&E auditors, technical specialists and management personnel participated in P-EP Audit 9003 of PEM in October 1990. Evaluation of the identified findings is documented in PG&E Engineering's NEMP 12.4 evaluation (Attachment 2 to this enclosure).
- (b) A review of P-EP's dedication testing was performed, including verification of the requirements for certification and calibration of measuring and test equipment. The issue of dedication testing performed by P-EP was closed based upon review of P-EP's dedication documentation by PG&E Engineering. The completed dedication evaluations are included in PG&E's NEMP 12.4 Engineering Evaluation. Attachment 3 provides the resolution of NRC concerns relative to specific dedication activities conducted by P-EP.



Regarding the suitability of specific items listed in the NRC Nonconformance, the following statements provide PG&E's rationale regarding the criticality of the items:

- The stator resistance temperature detectors were not included in the list of twenty-seven critical items because they do not perform a safety function in the generator assembly, nor will their failure adversely affect generator performance.
- The slip rings (supplied by PEM) were qualified based on the examination of the stampings (electro-mechanical equipment) during the joint P-EP/PG&E Audit 9003 of PEM.
- The adhesive (supplied by P-EP) was qualified by additional testing performed by PG&E.
- The mounting sleeve insulator for the slip rings was not identified as a critical item (see Section III.B.)

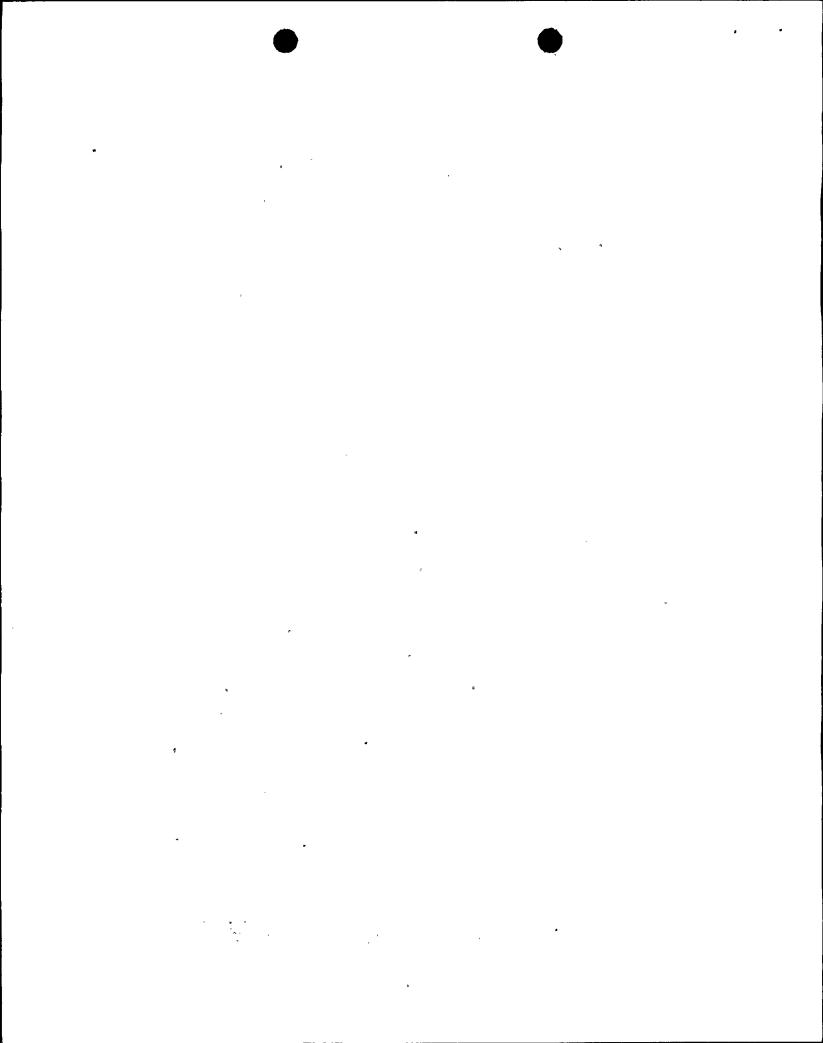
PG&E believes that the corrective actions taken to resolve this finding address all the concerns identified by the NRC. This Nonconformance does not impact the quality of the sixth generator because PG&E participated in the audit of PEM and performed reviews and additional testing as required. Also, all dedication evaluations performed by P-EP were reviewed and concurred with by PG&E.

D. Nonconformance 99900772/91-01-04, Instructions, Procedures, and Drawings

"P-EP failed to establish adequate measure to ensure (1) that activities affecting quality were prescribed by documented instructions, procedures, or drawings; (2) that activities affecting quality were accomplished in accordance with these instructions, procedures, or drawings; and (3) that instructions, procedures, or drawings include appropriate quantitative or qualitative acceptance criteria for determining that important activities were satisfactorily accomplished. P-EP also failed to demonstrate that the activities affecting quality (1) to fit the dovetail rotor pole assemblies to the rotor spider assembly, (2) to perform that brazing required to fabricate the rotor spider assembly, and (3) to perform brazed joint spliced-connections in the field coil winding were documented or accomplished in accordance with instructions, procedures, or drawings that contained quantitative or qualitative acceptance criteria and were equivalent to those specified by P-EP."

<u>PG&E Position:</u> This Nonconformance corresponds to the previously identified PG&E AFRs 90-068, "Subsupplier Evaluation," and 90-072, "Audit Program" (August 1990 PG&E audit of P-EP), and P-EP Audit Finding 9003-5 (October 1990 joint P-EP/PG&E audit of PEM):

AFR 90-068 PART 1 - "P-EP's external audit/evaluation program used to substantiate the qualification of subsuppliers is not



adequate to comply with PG&E's Specification and ANSI N45.2.13 requirements."

AFR 90-068 PART 2 - "P-EP's quality assurance program does not include provisions for the dedication of commercial grade parts (i.e., Identification of critical characteristics and providing a method to verify them). As a result, items supplied under Purchase Order No. 034525 for the generators were purchased and supplied as commercial grade with no dedication activities performed."

AFR 90-072 - P-EP's audit program is not sufficient to meet the requirements of the PG&E specification and ANSI N45.2.12.

Audit Finding 9003-5: Crimping inspection procedure was inadequate.

The PG&E audit team viewed these weaknesses identified in AFRs 90-068 and 90-072 as procurement control issues. The resolution of these procurement control issues is addressed in Section IV.C.

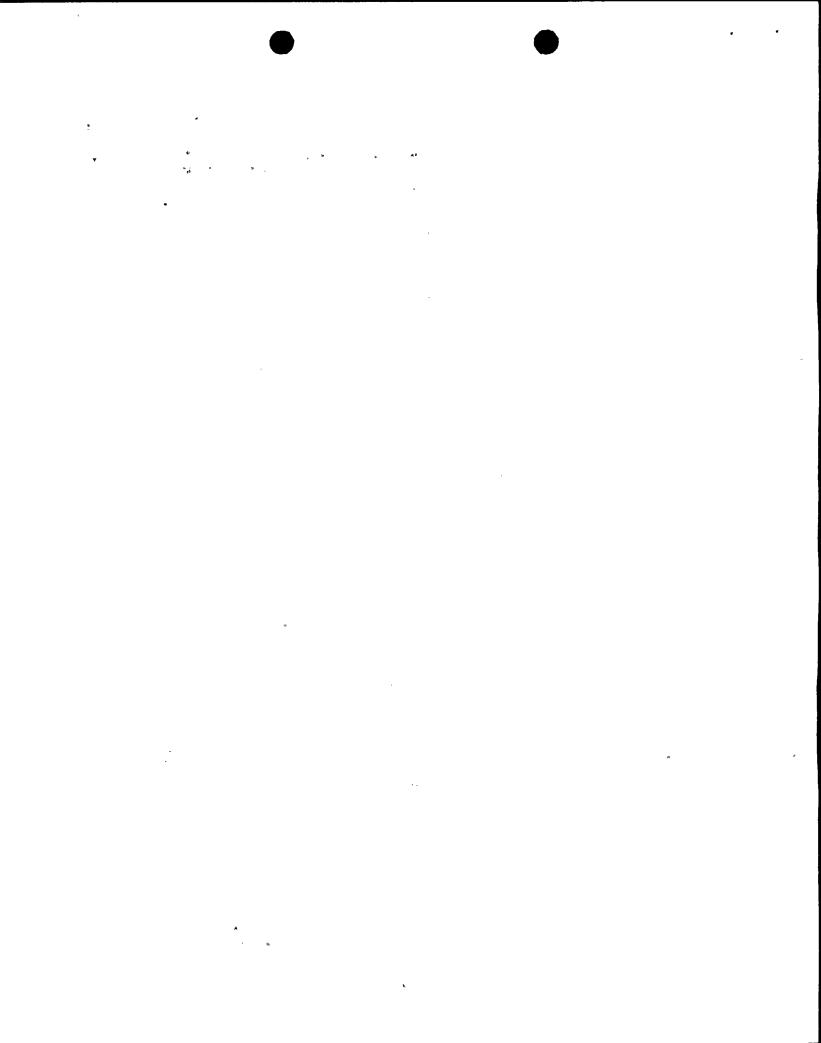
The only specific process procedure deficiency identified was the crimping procedure. This problem was addressed by P-EP Audit Finding 9003-5. The procedure was revised and was then reviewed by a representative of the DCPP Electrical Maintenance Department, who found the revised procedure to be acceptable. He also examined the actual crimping on the sixth generator. Any other procedure problems are addressed under P-EP Audit Finding 9003-6, which covers the equivalency of the P-EP and PEM procedures.

Per discussion with P-EP regarding procedures for the fabrication of the rotor pole spider assembly, these operations are part of normal shop practice and do not require a detailed procedure. If the rotor pole was not assembled correctly, the result would be excess vibration. P-EP stated that the functional testing of the generator, particularly the overspeed portion of the testing, verifies that these assembly operations were conducted correctly. Procedural concerns regarding welding of the rotor pole spider assembly studs have been addressed by the NEMP 12.4 evaluation (see Attachment 2). With respect to spliced connections, per P-EP there are no spliced connections in the field coil winding.

PG&E believes that the corrective actions taken to resolve these findings address all the concerns identified by the NRC. This NRC Nonconformance does not impact the quality of the sixth generator because any procedure deficiencies identified by PG&E were resolved by the supplier, either by revision and subsequent review, or by the fact that weaknesses in the actual manufacturing of the generator would have been identified during the functional testing of the assembly.

E. Unresolved Item 99900772/91-01-05, P-EP Quality Assurance Manual

"Although P-EP's second quality assurance manual (QAM-101) superseded QAM-100, it contained several weaknesses that required strengthening before its implementation. Because the team did not



evaluate the implementation of QAM-101, this concern will be evaluated in more detail during a future inspection."

<u>PG&E Position:</u> This Unresolved Item does not impact the quality of the sixth generator, since QAM-101 is not applicable to this purchase. Weaknesses in QAM-100 were recognized by PG&E during the August 1990 Audit 90197S, and resolution of the associated findings was developed with corrective actions directed to a one-time purchase of the generator with no consideration to the permanent resolution of P-EP programmatic issues.

- F. Specific References in IR 99900772/91-01 to PG&E Activities
 - (1) IR 99900772/91-01, PARAGRAPH 3.4.2, PAGE 9

"Equivalency evaluations of PEM's procedures and material...specifications...were completed by P-EP's engineering staff in July 1991...(the generator was completed by PEM in February 1991)."

<u>PG&E Position:</u> The additional equivalency evaluations were requested by PG&E as a follow-up action prior to final closure of the purchase order. Since no deficiencies were identified by the equivalency review, the fact that they were completed after generator shipment has no impact on the quality of the product.

(2) IR 99900772/91-01, PARAGRAPH 3.4.3, PAGES 10, 13

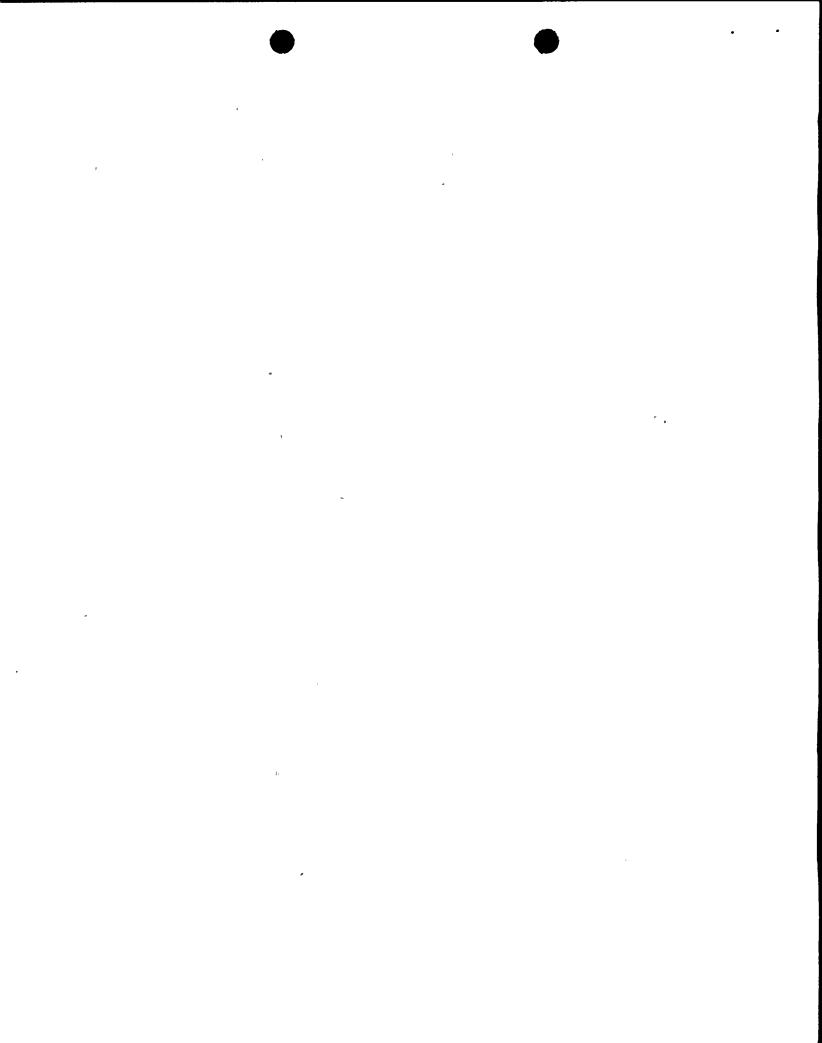
"Revision 3 to PG&E's PO, dated February 6, 1991, included significant revisions to PG&E's Engineers Material Memo (EMM); SP-D-Peebles, Attachment A; and the critical items list of Attachment F."

"Furthermore, P-EP had completed PG&E's generator when Revision 3 (of EMM) was issued; therefore, Revision 3 was not considered during the design, procurement, and manufacturing activities of the generator."

<u>PG&E Position:</u> The changes to Attachment A of the EMM, which is PG&E QA Specification SP-D-Peebles, will be addressed first. SP-D-Peebles, Revision 4, was written to incorporate the requirements audited during PG&E Audit 89295S in December 1989 and for the performance of the August 1990 PG&E Audit 90197S. The following paragraphs were added to Revision 4:

Section 4.2.8, the requirements for the identification and control of materials and items;

Section 4.2.9, the requirements for a test program to identify and document all testing required to demonstrate that items will perform satisfactorily in service;



Section 4.2.10, the requirements for the control of measuring and test equipment.

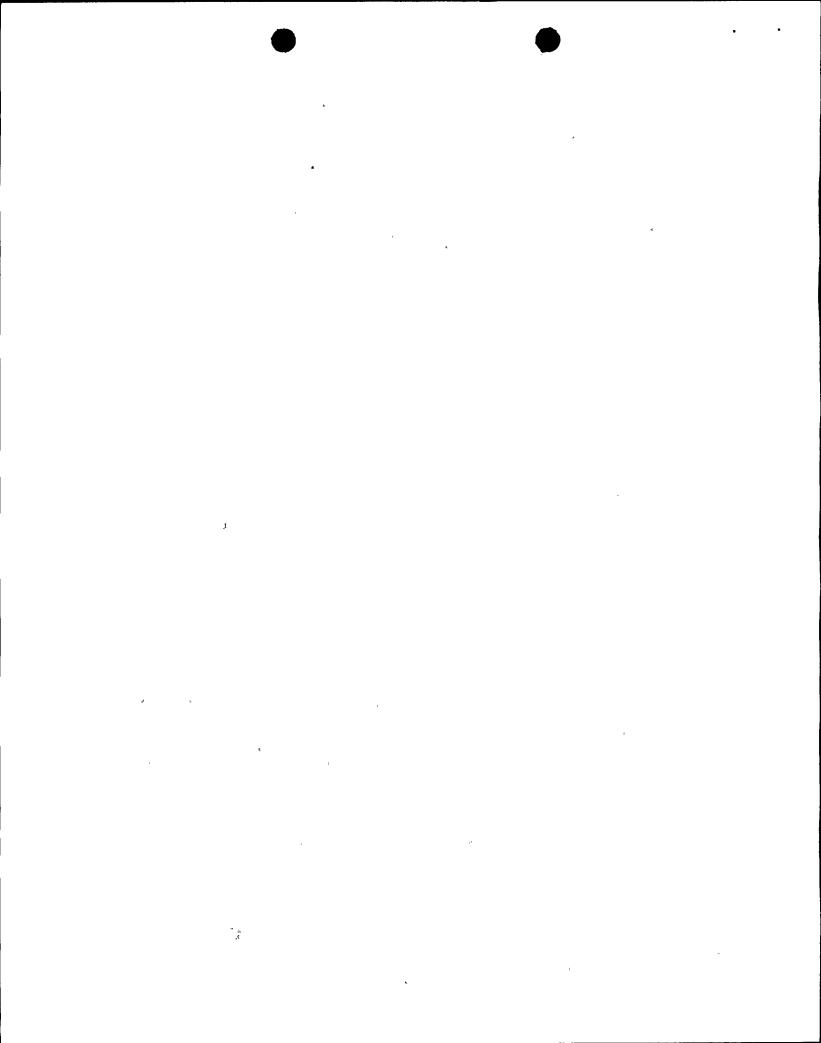
Revision 5 of SP-D-Peebles was issued on November 15, 1990. The specification was rewritten to clarify the organizations which had to comply with SP-D-Peebles (i.e., P-EP, PEM). Revision 4 included sections for both P-EP and PEM. However, PG&E's contract was only with P-EP. Also, Revision 5 added Section 4.2.6(1) for critical material, parts or components, which was inadvertently left out of Revision 4. However, this issue was addressed in PG&E's Audit 90197S of P-EP.

The remaining discussion of this response relates to the changes in EMM Attachment F, critical item listing, and the changes in the critical characteristics for these items (see Attachment 3 to this enclosure for a summary of the EMMs issued by PG&E for this purchase).

The fourteen items identified in EMM Revisions 1 (dated January 16, 1990) and 2 (dated February 12, 1990) were determined by PG&E Electrical Engineering and P-EP Engineering. This list was not intended to be all inclusive of the generator critical items, but rather was to encompass all items that could be procured as commercial grade by P-EP and consequently had to be verified by test. The items actually supplied by P-EP were the insulators, insulating bushings, insulating material, bearing seals, brushes and brush holders, current transformers, test switch, and adhesive. The adhesive was independently tested by PG&E and found to be in specification for tensile strength. For the remaining items, P-EP performed dedication evaluations that were reviewed and concurred with by PG&E.

Revision 3 of EMM DC2-3322-BRH-E (dated January 28, 1991) replaced the first Attachment F with a new listing of items and characteristics, which were used during the joint P-EP/PG&E audit of PEM. The list of twenty-seven critical items identified in the EMM, Revision 3, was developed by PG&E, P-EP, and PEM during the October 1990 joint P-EP/PG&E Audit 9003 of PEM in Scotland. This list was developed to facilitate a sampling of critical components to be used in the review conducted by Audit 9003 of PEM. Although the final documentation of the list of twenty-seven critical items did not occur until January 28, 1991, this list was used during the performance of the joint P-EP/PG&E Audit 9003.

In addition, between Revisions 1 and 3 of the EMM, changes in the description of the critical characteristics of seven items were made. This was done to identify commonalities in the critical characteristics with respect to their treatment by the PEM QA program. For example, critical characteristics of lead wires (Item 1) in Revision 1 included dielectric strength, number of strands, marking of cable and insulation thickness. In Revision 3, the word "configuration" was used for critical characteristics for lead wires (Item 16) to envelope these attributes. Similarly, one of the critical characteristics of the insulator (Item 2, Revision 1/Item 22, Revision 3) was changed to read "configuration" in place of "size and weight."



(3) IR 99900772/91-01, PARAGRAPH 3.4.3, PAGE 11

"According to P-EP, PG&E's PO did not impose qualification of the generator to the requirements of IEEE Standards 323 or 344, and PG&E did not procure P-EP's FMEA documentation for use in the selection of critical items or their critical characteristics."

<u>PG&E Position:</u> IEEE 323, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," describes the basic requirements for qualifying Class 1E equipment and interfaces that are to be used in nuclear generating stations. The requirements presented include the principles, procedures and methods of qualification. This standard was not imposed on P-EP for the sixth generator since it is not exposed to a harsh environment and does not require environmental qualification.

IEEE 344, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," was not imposed in the PG&E purchase order because the seismic evaluation of the sixth generator is being performed by PG&E, not P-EP.

The P-EP failure mode and effects analysis (FMEA) documentation was not purchased by PG&E since the FMEA was related to seismic qualification (which was to be done by PG&E) and equipment qualification (which is not applicable since the generator is not in a harsh environment). The selection criteria used in determining the list of critical components evaluated the effect of a component failure on the ability of the generator to fulfill its safety function. Although the FMEA documentation was not directly used in this process, the involvement of PG&E, P-EP, and PEM personnel provided the technical knowledge necessary to provide the appropriate evaluation of the generator components.

(4) IR 99900772/91-01, PARAGRAPH 3.4.3, PAGE 11

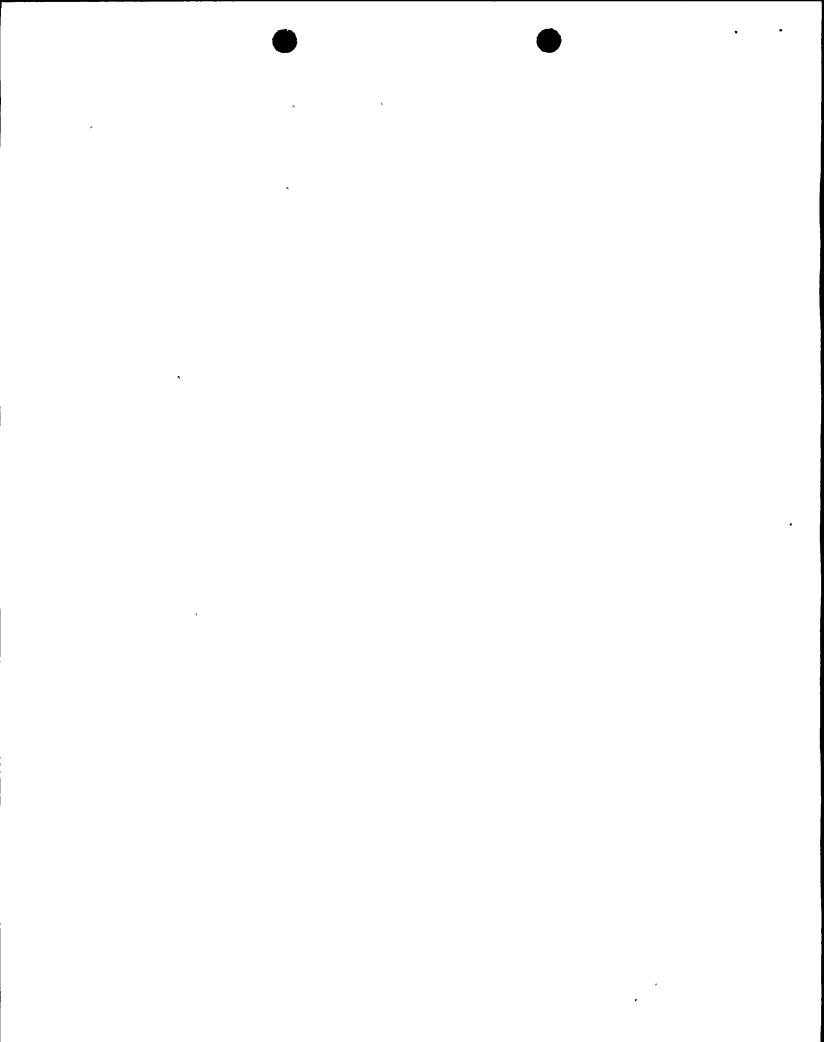
"P-EP reported that it had not been involved in PG&E's selection of the critical items, or their critical characteristics, listed in Revision 3 of PG&E's PO."

<u>PG&E Position:</u> Per discussion with PG&E personnel who participated in the joint P-EP/PG&E Audit 9003 of PEM and with P-EP personnel, P-EP and PEM representatives were involved in the determination of the list of twenty-seven critical items that was used as a basis for determination of the representative sample of items examined during this audit.

(5) IR 99900772/91-01, PARAGRAPH 3.4.3, PAGE 13

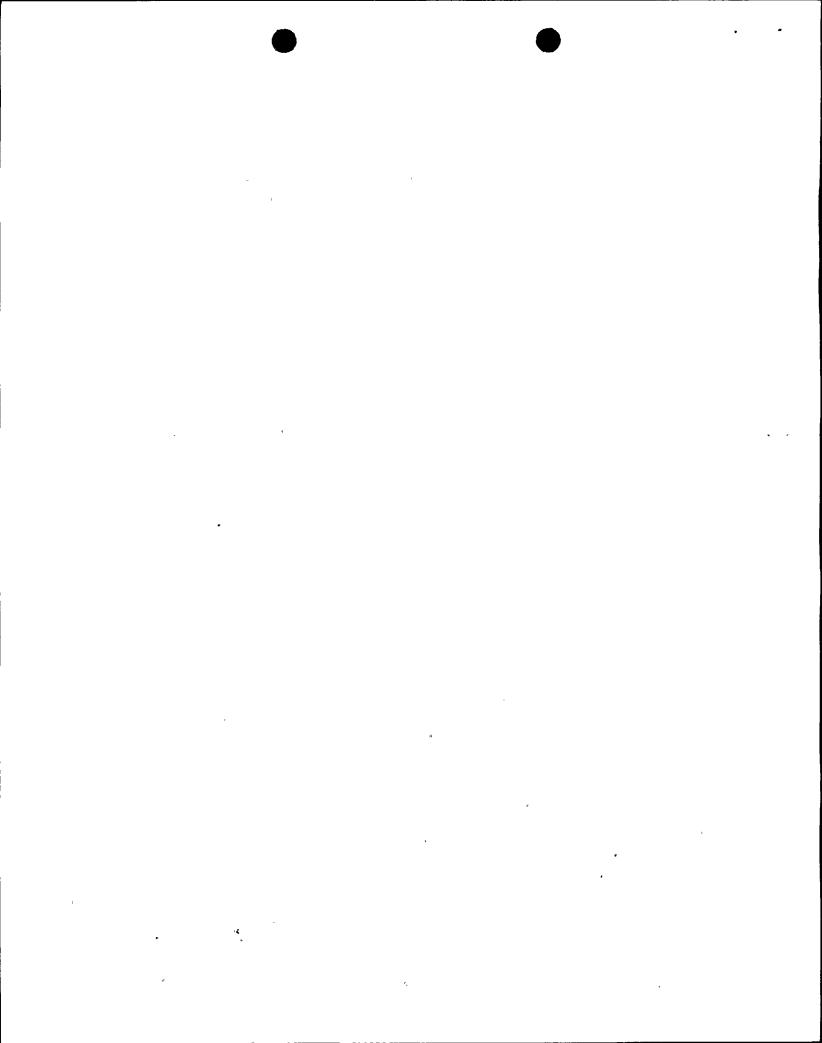
"Although the RTD's were included in PG&E's Revision 1 list of critical items, they were not included in the Revision 3 list of critical items...However, PG&E did not identify vibration indicating devices as critical items."

<u>PG&E Position:</u> The stator resistance temperature detectors were not included in the final list of twenty-seven critical items because they do not perform a safety function in the generator assembly. These



instruments provide information for use in trending the performance of the generator. They are not used as an interlock to any safety system, nor do they provide information that the operators can respond to during an emergency to preclude equipment failure.

Vibration monitors were not required by the PG&E purchase order for the generator. Vibration monitoring is conducted by portable vibration monitors during surveillance testing of the engine generator.



V. PG&E Engineering Evaluation of P-EP for Purchase of Sixth Generator

The purpose of this section of the enclosure is to provide an overview of the engineering evaluation performed by PG&E to qualify P-EP, and includes: (1) a description of PG&E's procedural requirements; (2) a summary of the P-EP NEMP 12.4 Evaluation, Revision 0; (3) a summary of the additional information incorporated into Revision 1 of NEMP 12.4.

A. PG&E's Procedural Requirements

PG&E Nuclear Engineering Procedure NEMP 12.4, "Technical Evaluation of Supplier Quality Programs," establishes the requirements for Engineering participation in QA Department audits of suppliers, technical evaluation of findings, and recommendations on supplier qualification status.

This procedure requires PG&E Engineering to perform a technical evaluation of audit findings by examining product performance and performing a review of the supplier qualification. The product performance portion of the evaluation includes a review of industry-wide data (i.e., Nuclear Plant Reliability Data System (NPRDS)), 10 CFR 21 Reports and NRC Information Notices and Bulletins) as well as DCPP-specific history. The supplier qualification portion of the evaluation requires an engineering evaluation of the impact of the audit-identified deficiencies on the acceptability of affected supplier products or services.

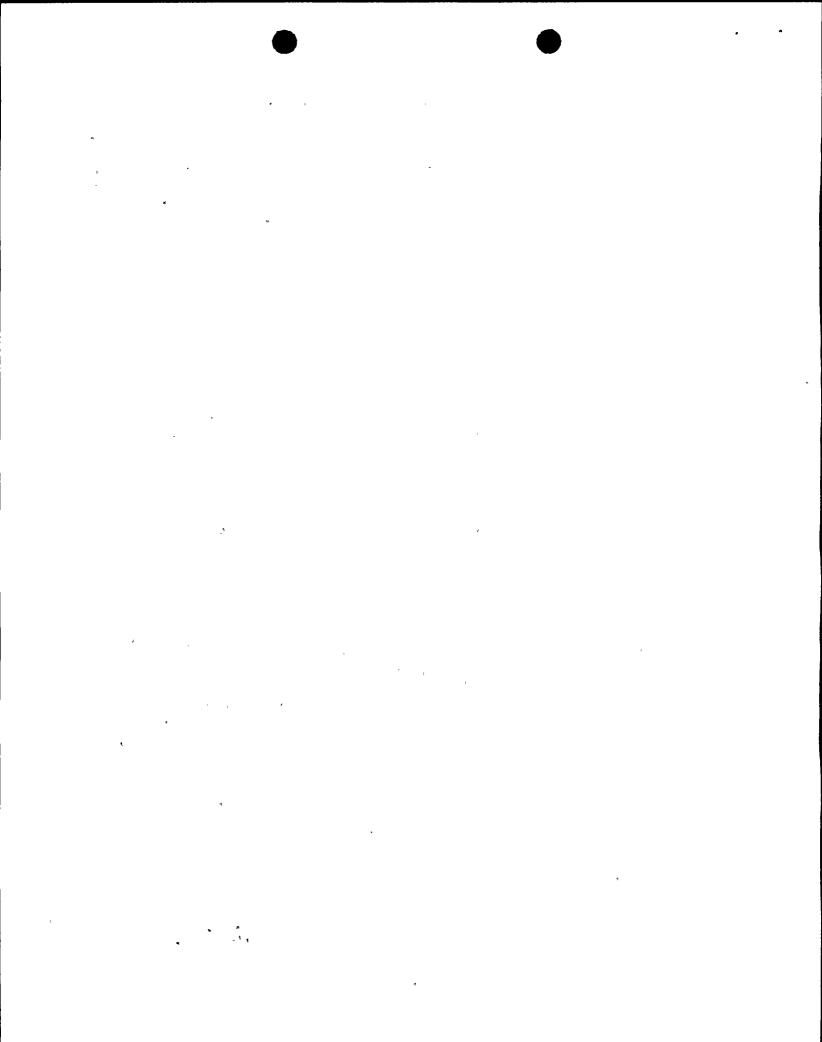
The final result of the NEMP 12.4 evaluation for a particular supplier is an Engineering recommendation to PG&E QA as to whether or not the supplier should be maintained on the QSL for the purchase of equipment or services.

B. Summary of the NEMP 12.4 Evaluation, Revision 0

The NEMP 12.4 Evaluation is divided into two sections: (1) product performance; and (2) supplier qualification. The product performance evaluates the history of the product in the nuclear industry, while the supplier qualification performs a technical evaluation of PG&E audit findings. The final conclusion of this 12.4 Engineering Evaluation was that P-EP, subject to the resolution of identified audit findings, was qualified to supply the sixth diesel generator for this one-time purchase only.

(1) Product Performance

To support the product performance conclusions, the following items were reviewed to determine whether they affected the quality of the sixth diesel generator: (1) seventy-four NPRDS Reports; (2) three 10 CFR 21 Reports; (3) seventy-nine Bulletins; (4) Information Notices and Letters; (5) INPO Significant Event Reports (SERs) and Significant Operating Event Reports (SOERs); (6) one Licensee Event Report (LER) (Washington Public Power Supply System 90-012-01); (7) PG&E's Restricted Equipment List; (8) three NRC Vendor IRs; and (9) the Government Industry Data Exchange Program.



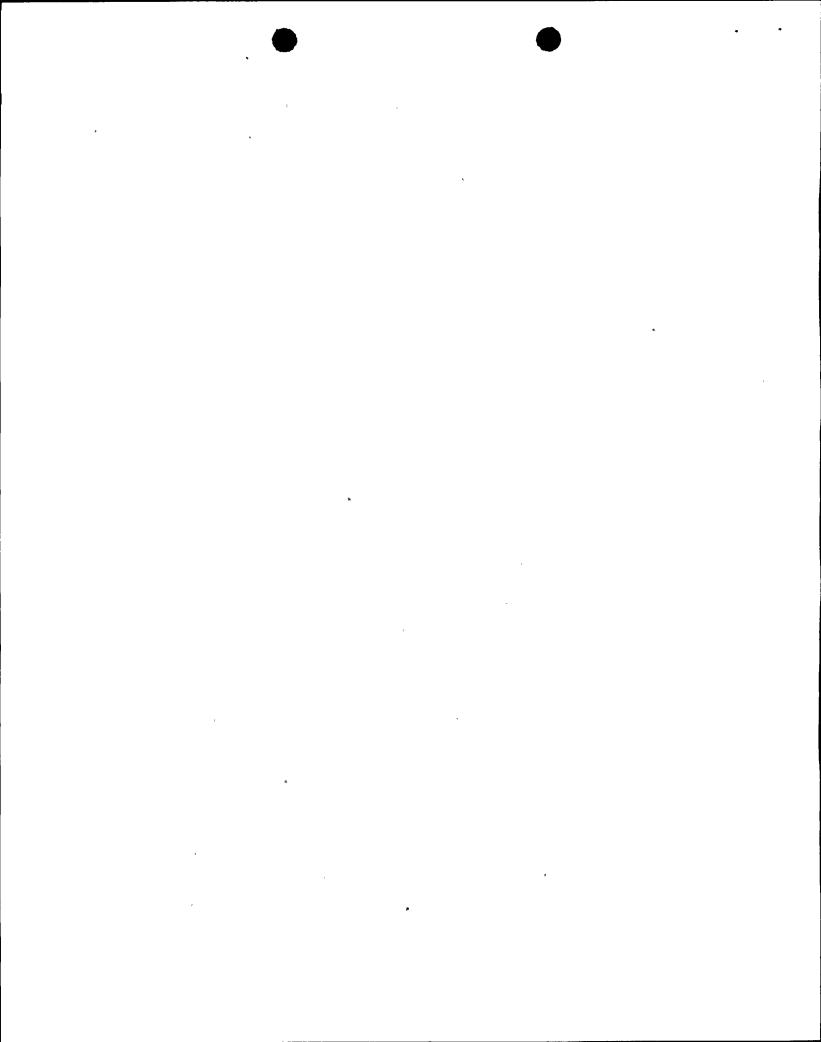
Out of the 162 items, twenty required further assessment and are addressed in the NEMP 12.4 evaluation. The criteria used to determine the impact of these documents is summarized below:

- Sixty-four of the identified NPRDS failures were not applicable to this evaluation because, for the sixth diesel installation, the generator control panel, excitation panel, and voltage regulator were not purchased from P-EP.
- The remaining ten NPRDS failures did not impact the sixth generator because: (1) they were not applicable to PG&E's design; (2) they were due to improper maintenance activities; (3) they were verified by the functional testing at supplier; or (4) they were attributed to normal wear (i.e. such as brushes).
- The three 10 CFR 21 reports had no impact because either the failed component was not used in PG&E's design, or additional testing and investigation performed by P-EP showed that the failure was not generic in nature.
- Of the Information Notices, Bulletins, SERs and SOERs reviewed, three were determined to have a potential impact on PG&E's model generator. Subsequent review showed that they did not impact the quality of the generator based on the fact that they did not apply to PG&E's design, or the performance and maintenance of the five generators at DCPP would preclude this type of problem.
- The problems identified in the above referenced LER did not impact the sixth generator due to design difference and the performance and maintenance of the five generators at DCPP that would preclude this type of problem.
- PG&E's Restricted Equipment List and the Government Industry Data Exchange Program did not identify problems with this generator.
- The NRC Vendor IRs for P-EP and PEM were reviewed to identify deficiencies noted by the NRC. PG&E verified that all identified deficiencies were covered in a more recent audit conducted by the PG&E QA Department.

In conclusion, based on review of these documents, Engineering concluded that there are no programmatic manufacturing or part failure concerns indicating that P-EP is not controlling the design or quality of parts.

(2) Supplier Qualification

To support the supplier qualification conclusions, all 12 audit findings from the August 1990 PG&E Audit 90197S of P-EP and the joint October 1990 P-EP/PG&E Audit 9003 of PEM have been evaluated.



Summaries of these evaluations follow. Additional investigations regarding subsupplier issues have been performed as required. Also, to provide added assurance, independent testing of the adhesive and rotor shaft has been performed.

- (a) PG&E Audit 90197S Findings
- PG&E AFR 90-067 Design Control: P-EP cannot assure that the design of the new generator is identical to the design of the spare.

To resolve this finding, P-EP re-examined all changes made for the sixth generator since 1984 and transmitted this information to PG&E. This transmittal identified three discrepancy reports and twenty-nine design changes. Based on a review of this information, PG&E determined that the identified changes were acceptable.

 PG&E AFR 90-068 - Subsupplier Evaluation: Part 1, P-EP's evaluation of their subsuppliers is not adequate, and Part 2, P-EP's program does not include provision for the dedication of commercial grade parts.

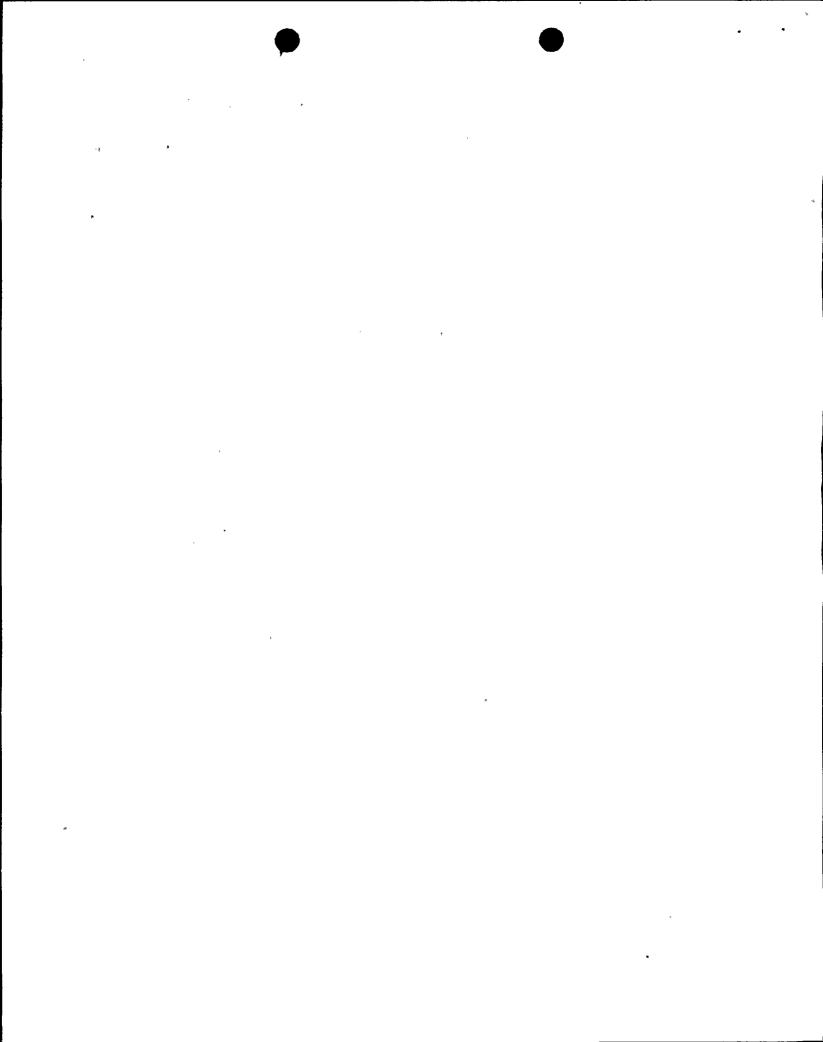
To resolve Part 1 of this finding, the joint P-EP/PG&E Audit 9003 of PEM was performed, the results of which are discussed later in this summary.

To resolve Part 2 of this finding, all dedication evaluations performed by PEP have been reviewed and approved by PG&E (see Attachment 4 to this enclosure).

 PG&E AFR 90-069 - Dedication Testing: P-EP did not have approved procedures or instructions for dedication testing.

To resolve this finding, PG&E Engineering reviewed the dedication activities for all generator parts purchased as commercial grade by P-EP. The results of this review confirmed the adequacy of the subject parts for use in the generator. Also, PG&E performed independent tensile testing on a sample of the adhesive used in the construction of the sixth generator. The result of this test confirmed the adequacy of the adhesive (see Attachment 4 to this enclosure).

PG&E AFR 90-070 - Outside Calibration Services: P-EP
has not verified the certification system of outside
calibration services by audit or evaluation. Measuring
and Test Equipment (M&TE) program does not meet the
requirements of the specification.



To resolve this finding, PG&E reviewed subsequent P-EP audits (9001 and 9002) and associated calibration records of M&TE calibration service suppliers. PG&E found these subsequent P-EP audits and records to be acceptable, and concluded that the applicable calibration suppliers were providing acceptable services.

 AFR 90-071 - QA Record Storage: P-EP's QA Record storage, handling and retrieval program is not sufficient to meet the requirements of PG&E specification and ANSI N45.2.9.

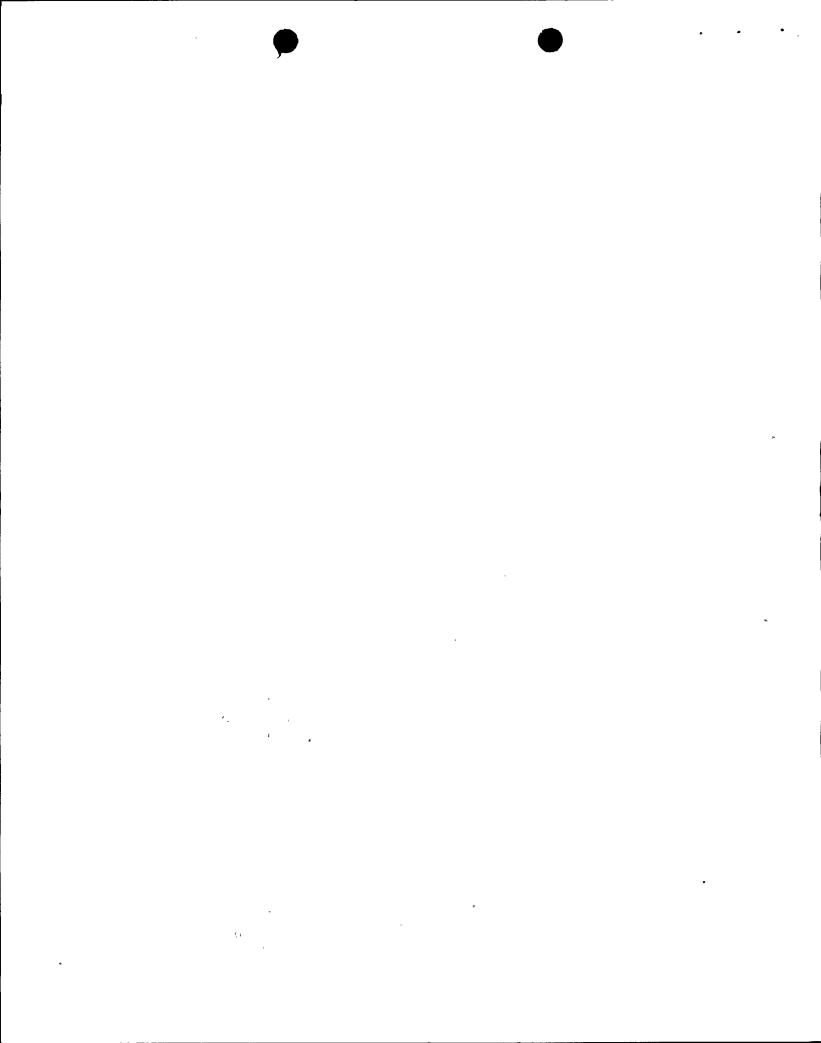
This issue was closed based on the fact that the finding is administrative in nature, and that no permanent fix was required for a one-time purchase. Also, PG&E has received all permanent records according to the purchase order requirements for the sixth diesel generator procurement.

 AFR 90-072 - Audit Program: P-EP's audit program is not sufficient to meet the requirements of the PG&E specification and ANSI N45.2.12.

This issue was closed based on a review of P-EP's audit procedure and satisfactory completion of the joint October 1990 P-EP/PG&E Audit 9003 of PEM, which included the resolution of Audit Findings 9003-1 to 9003-6, and the determination that a permanent resolution was not required for a one-time purchase.

(b) Joint P-EP/PG&E Audit 9003 Findings

Before examining the findings from this audit, it is appropriate to provide an explanation of how the specific critical items to be reviewed during the audit were determined. Attachment 3, Item D, shows the list of twenty-seven critical parts of the generator assembly which were used to identify the sampling of parts to be addressed during the PEM audit. Eighteen of these twenty-seven parts were purchased by PEM, with the balance purchased and provided to PEM by P-EP. In order to determine a representative sample for the performance of the audit, the eighteen parts were divided into categories based on their function in the generator assembly. The following shows these categories and the associated parts:



<u>CATEGORY</u> <u>PART</u>

Bearing Roller Bearing

Fastener Stud/Threaded Rod

Rivets

Electrical Magnet Wire

Stator Coils Lead Wires

Electro-Mechanical Stampings

Pole Head Slip Rings

Short Circuit Bars Insulating Washers

Mechanical Rotor Shaft

Tapered Keys Rotor Wedge

External Support Bearing Bracket

Structural Stator Frame

Spider End Rings Pole End Rings

One part was chosen from each category to form the representative sample that was examined during the joint audit of PEM:

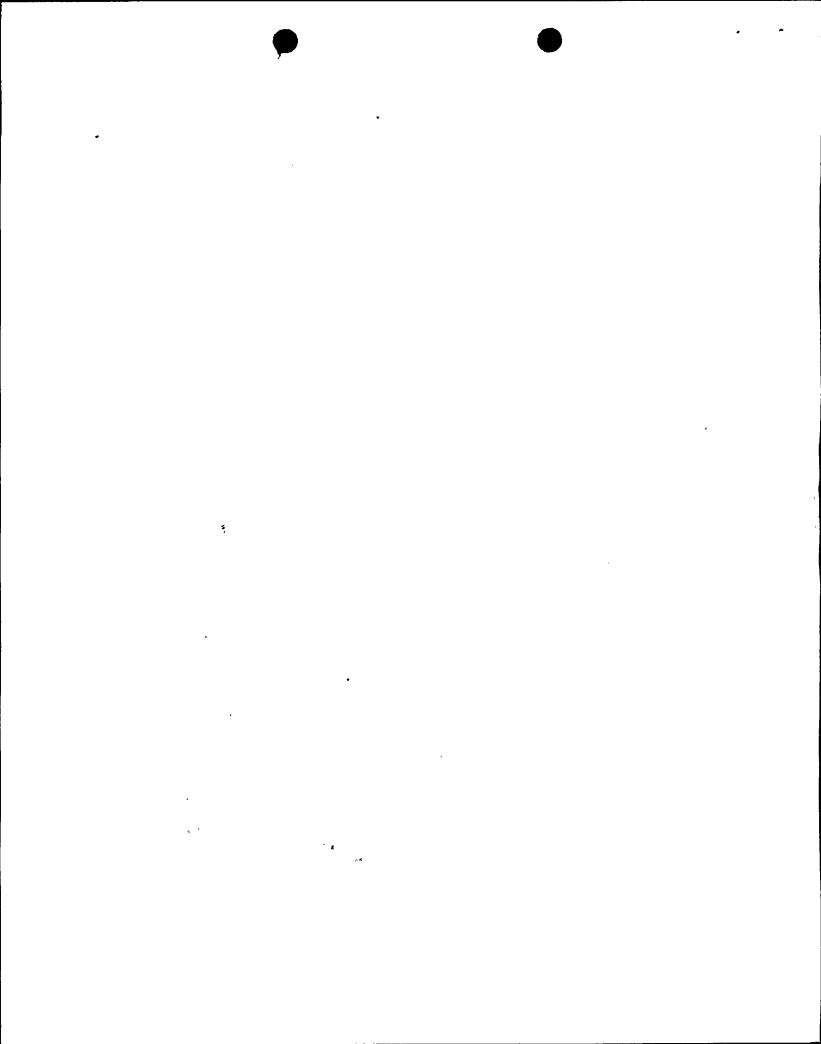
Roller Bearing, Stud/Threaded Rod, Magnet Wire, Stampings, Rotor Shaft, Bearing Bracket and Stator Frame.

As discussed above, part of the closure of PG&E AFR 90-068, "Subsupplier Evaluation," was PG&E participation in P-EP Audit 9003 of their subsupplier, PEM. The findings and their resolution identified by this audit are summarized below.

 P-EP Audit Finding 9003-1: Supplier evaluations were not adequate.

PEM has three methods for the qualification of their subsuppliers: (1) audit; (2) history - vendor assessment record; and (3) verification based on the British Registry.

The use of the British Registry of Qualified Supplier needs additional explanation. PG&E QA Specification SP-D-Peebles invokes British Standard BS 5750. This British quality standard recognizes the British Registry of Qualified



Suppliers. These suppliers are endorsed based on an audit performed by the British Government. These audits are similar to the NRC's NUREG-0040 Vendor Inspections. This document is used by the nuclear as well as other industries in the United Kingdom. The British Registry is similar to the following U.S. documents:

- DECAS list of suppliers used for Department of Defense contracts.
- ASME qualified suppliers and
- Quality Management Institute endorsed suppliers.

When PG&E initially reviewed these methods of supplier qualification, it was concluded that further evaluation would be needed. For that reason, an in depth review of the suppliers for those seven parts chosen as Audit 9003's representative sample was performed in the NEMP 12.4 evaluation. The results of this evaluation confirmed that PEM subsupplier qualification was consistent with the requirements of BS 5750.

• P-EP Audit Finding 9003-2: Calibration instructions and certification for the magnetic crack detector, interturn unit, and multimeter.

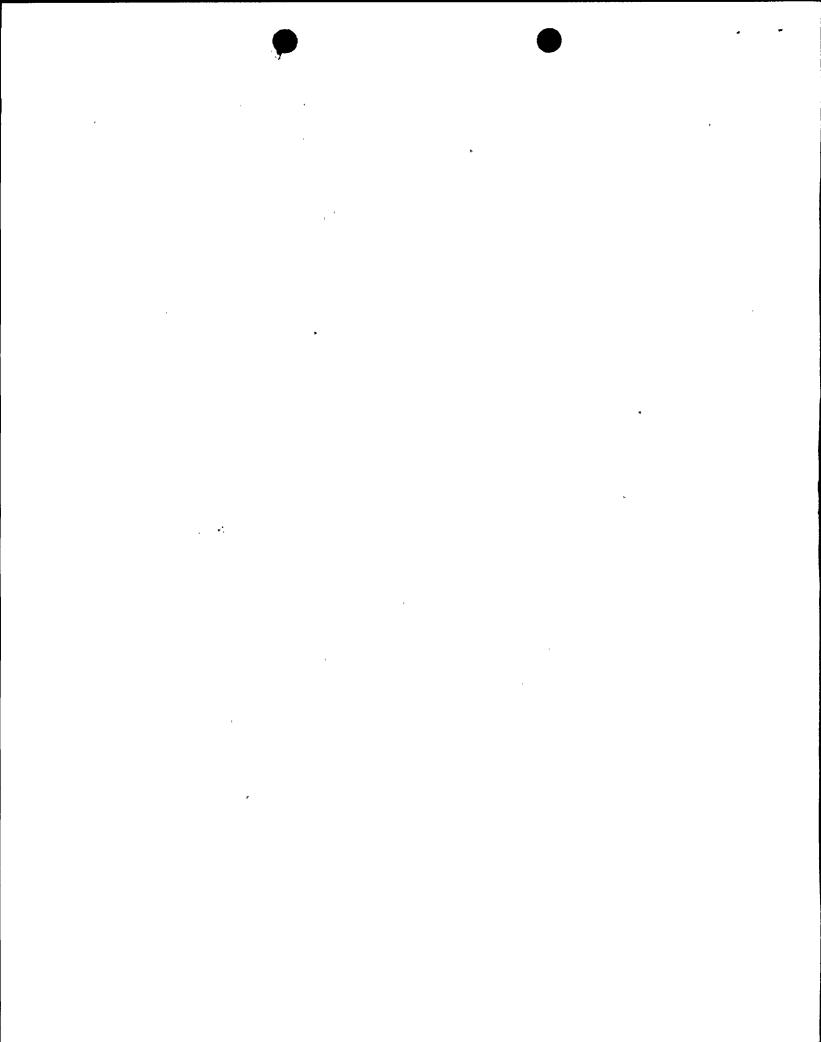
To resolve this finding, PG&E verified that the calibration procedure was revised, and reviewed the calibration certificates for the above listed instruments.

 P-EP Audit Finding 9003-3: Inadequate documentation of receipt inspection.

The source of this finding is that PEM did not document their receipt inspection, only stamped the packing slip. The inspections performed on non-complex items were considered adequate by the PG&E Audit Team. The inspections for complex items were acceptable based on the receiving inspection and testing activities for the shaft, stator frame, pole assemblies and stator coils, which were witnessed by a PG&E source inspector.

P-EP Audit Finding 9003-4: Cleveland and Scotland interface.

Per review with P-EP, the P-EP/PEM interface works as follows. When a purchase order is issued to PEM, P-EP calls out the drawings, specifications and most critical procedures. If for any reason PEM uses alternate verification methods or material, their engineering organization evaluates the acceptability and notifies P-EP. P-EP also then performs an engineering evaluation to verify the adequacy of the change.



In addition, P-EP reviews PEM's procedures and specifications as part of P-EP audits of PEM.

This finding was resolved based on the review of all design and procedure changes per AFR 90-067 (August 1990 PG&E audit of P-EP), and the review of equivalency evaluations per Audit Finding 9003-6 (joint October 1990 P-EP/PG&E audit of PEM). However, this conclusion is subject to the resolution of the review for adequacy of documentation and completeness as discussed in Section II above.

 P-EP Audit Finding 9003-5: Crimping inspection procedure was inadequate.

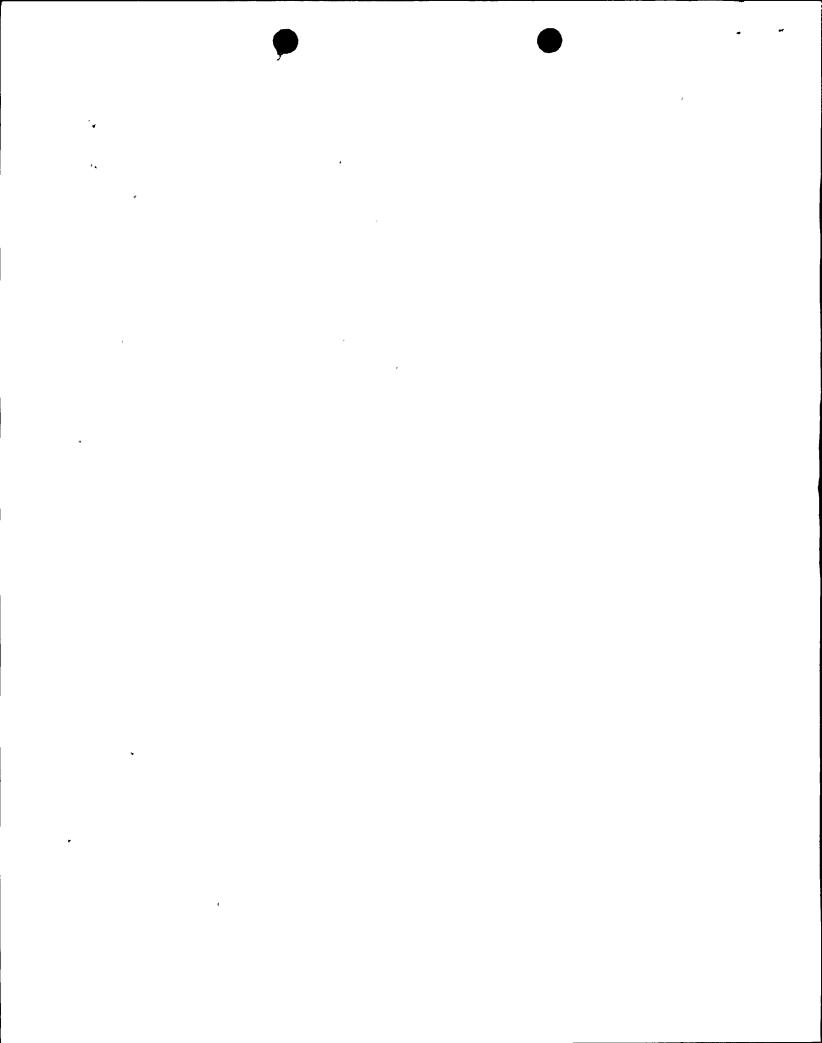
To resolve this finding, the crimping procedure was revised. A representative from the DCPP Electrical Maintenance Department reviewed the procedure and found it satisfactory.

 P-EP Audit Finding 9003-6: Inadequate evaluation of equivalency of procedures between P-EP and PEM.

As discussed earlier, P-EP is the responsible design organization for the generator although the generator is manufactured by PEM in Scotland. As a result, it is important that PEM use specifications that are either the same as P-EP's or that have been evaluated to ensure their equivalency. In order to respond to this audit finding, P-EP performed an initial review of differences between the material specifications and manufacturing procedures specified by P-EP and those specifications and procedures used by PEM.

Before requesting further action by P-EP, investigations were performed to determine the extent of review required to ensure that all changes applicable to the spare and new generator were addressed. It was concluded that the design change and equivalency reviews should cover a time frame of 1984 to the present. The basis for the selection of the 1984 cut-off was the fact that during this year, the manufacturing responsibility for the product was changed from P-EP to PEM. P-EP reverified their design change and equivalency reviews and transmitted a new summary to PG&E. Prior to 1984, the interface issues to be addressed in resolving this finding did not apply since all specifications and procedures and manufacturing activities were under P-EP control and were governed by a 10 CFR 50, Appendix B, program.

The final review examined seventy procedures and specifications for potential changes, and resulted in forty-two equivalency evaluations. PG&E Engineering reviewed these material and manufacturing specification differences between P-EP and PEM, and concluded that the equivalency evaluations performed by the supplier were adequate.



C. Summary of the additional information incorporated into NEMP 12.4, Revision 1.

Revision 1 of NEMP 12.4 was issued to incorporate the following: (1) recently identified 10 CFR 21 Reports for P-EP; (2) results of PG&E QA Audit 90197S follow-up; (3) results of PG&E independent testing of adhesive; and (4) results of the final design change and procedure equivalency review performed by P-EP.



PEM HARDNESS CERTIFICATE

REC'D W/LTR DTD 02/12/92....9202260197

PEEBLES NEMP 12.4. REV. 1 ATT. I

the And Charen product office with the off in the second THE STATE OF STATE OF

JAN 14 '91 BEISSAM NET PEEBLES-ELECT PROS CLEVELA 1045 Euclid Avenue

Cleveland, Ohio 44112 7

163594

| To: P.G. & E | Location: SAN FRANCISCO | | | | | |
|---|--------------------------|--|--|--|--|--|
| From: N, MONNOLLY | Location: NEI, CLEVELAND | | | | | |
| Copies to: BURT HEPPONS | STALL | | | | | |
| Date: 1-14-91 | • | | | | | |
| Number of pages including this: | | | | | | |
| Reply to Fax No: 216 . 481 8386 | • | | | | | |
| REF! P.G. FE P.O. Z SPARE ZGOOKW SHAFT HARDNE | 5-1539-AB-9 GEN. | | | | | |

REGARDING ARME TEST, WE SEND HEREWITH A COPY OF THE TIEST RESULTS.

REFARDS

N. Monnelly

PEEBLES NEMP 12.4 REV. 1 ATT. I by 2 of 30

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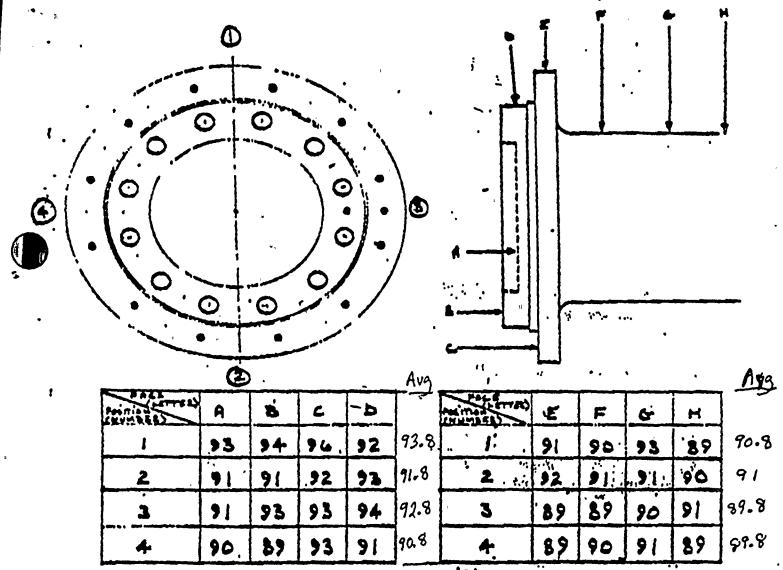
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NEI Peebles Ltd

163594



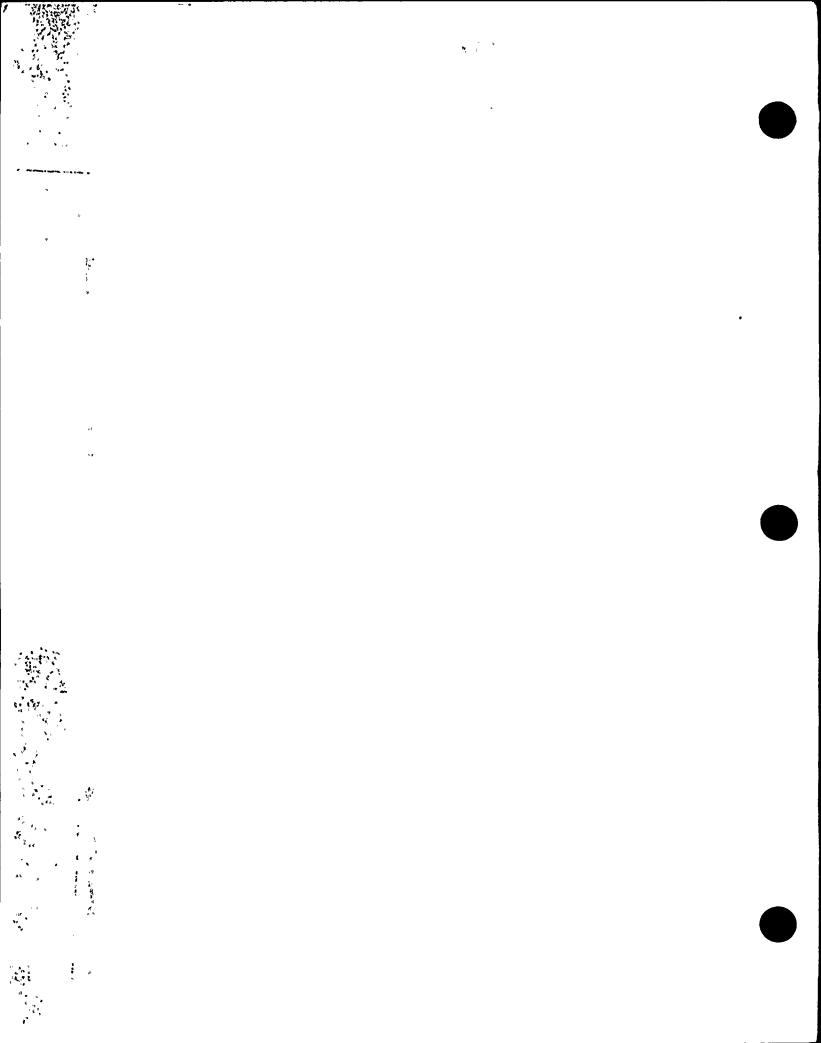
WEEKTION EXCORD



RALEMELL 'B' HARRIEL FIGURES.

OVERALL AVERAGE > 9/-3 ROCKWELL B

PEEBLES NEMP 12.4 REV. 1 ATT. I



JESION FACTORS

2 Pactors (Continued)

To Obtain NSITY (Contrased) gram (g) kilogram (kg) M'1071g kilogram (kg) 42728374 kilogram/metre3 (kg/m3) 96 01846 gram/centimetre3 (g/cm3) **27 6799**0 kilogram/metres (kg/ms) 179 **8**761 kilogram/metres (kg/m³) ३३ ग्रन्थ kilogram (kg) 24.59399 kilogram (kg) TIO OTOE kilogram (kg) 90; 184; kilogram (kg) kilogram (kg) & FORCE LENGTH newton (%) 0 00001 newson (%) 9 806650* newson (%) °266650° kilogram-force kilopond pound-force dyne poundal ounce-force 219716 19716 91716 920,000 100,000 100,000 100,000 pound/inch pound/loot o occionat newton (N) 0 2780139 newton (N) 4 438222 newton (N) o 1362550 newton/metre (N/m) 275 1766 newton/metre (N/m) G NOMENT of TORQUE newton-metre (N . m) E 0000001, newton-metre (N - m)

1 275318 the figure is exact.

9 Bobbso*

7,061552 0.007001552

o 3313031

0,1019716 341.6119

0.1416119

newton-metre (N - m)

newton-metre (N · m)

tool-baron

ounce-inch

dyne-centimetre lologram-metre ounce-inch

METRIC CONVERSION FACTORS

2421

Metric Conversion Factors (Continued)

| ٢ | Multiply | Ву | To Obtain | | | | | | |
|-------------------|---|------------------------|---|--|--|--|--|--|--|
| ľ | MOMENT OF INERTIA and SECTION MODULUS | | | | | | | | |
| Į. | | | | | | | | | |
| l | moment of inertia [kg · m ²] moment of inertia [kg · m ²] | 23.73036 3417,171 | sonuq-juchs | | | | | | |
| l | moment of inertia [1b - [12] | 0.04314013 | kilogram-metre? (kg + m²) | | | | | | |
| ۱ | moment of inertia [lb - inch2] | 0.0003936397 | kilogram-metre ² (kg · m ²) metre ⁴ (m ⁴) centimetre ⁴ foot ⁴ | | | | | | |
| ĺ | moment of section (foot*) | e.co8630975 | | | | | | | |
| J | moment of section [inch*] | 41 62314 | | | | | | | |
| l | moment of section (metre*) | £15 8 618 | | | | | | | |
| ١ | moment of section (centimetre*) | ⊕.∞ 4∞\$10 | inch4 | | | | | | |
| ١ | section modulus (foots) | 0,02631685 | metre ² (m ³) | | | | | | |
| l | section modulus [inch ²] | 0,00001638706 | metre ³ (m ³) | | | | | | |
| I. | section modulus [metre ³] section modulus [metre ³] | 51,023 76 61,023 76 | foot ³ inch ³ | | | | | | |
| | | MOMENTUM | | | | | | | |
| ľ | kilogram-metre/second kilogram-metre/second | 86 79614 | pound-inch/second | | | | | | |
| pound-fnot/second | | 0.1382550 | kilogram-metre/second (kg + m/s) | | | | | | |
| ١. | pound-inch second | 0.01152125 | kilogram-metre/second (kg + m/s) | | | | | | |
| ١ | PR | ESSURE and STRE | ss | | | | | | |
| ľ | atmosphere [14 60th Ihrineha] | 101.335 | pascal (Pa) | | | | | | |
| ı | bar | 100,000 ° | pascal (Pa) | | | | | | |
| ĺ | bar bar | 14 50377 100,000 * | pound/inch2 ncwton/metre2 (N/m2) | | | | | | |
| l | hectoliar | o 6111864 | ton [long]/inch² | | | | | | |
| | kilogram 'centimetre' | 14 22374 | pound/inch? | | | | | | |
| l | kilogram metre? | y \$0663¢* | newton/metre? (N/m²) | | | | | | |
| ١ | kilogram metre? | 9 806650* | poscal (Pa) | | | | | | |
| ١ | kilogram/metre? | 0.2018161 | pound/loot? | | | | | | |
| ١ | kilonewton/metre? | 0 1450377 | pound/inch ² pound/inch ² | | | | | | |
| l | newton/centimetre2 | 1.450377 0.00001* | bar | | | | | | |
| ١ | newton metre? | 1,0° | pascal (Pa) | | | | | | |
| ١ | newton/metre2 | 0 0001450377 | pound/inch2 | | | | | | |
| l | newton/metre? | 0.3019716 | pound/inch2 kilogram/metre2 | | | | | | |
| ł | newton/millimetre? | \$45.0377 | pound/inch ³ | | | | | | |
| l | pasca! | 0.00000986923 | atmosphere | | | | | | |
| ĺ | pascal | 0,00001 | bar | | | | | | |
| ı | pascal pascal | 0.1019716 1.0° | kilogram/metre ² newton/metre ² (N/m ²) | | | | | | |
| | | E)288000 0 | mound/loots | | | | | | |
| ì | pa.tcal | 0 0000011 | MOUTIU/IGOL* | | | | | | |

*Where an asteriak is shown, the figure is exact. 4 REV. 1 ATT. I PEEBLES NEMP 12.4 REV. 1 ATT. I

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14.1.2 The standard Brinell test using a 10-mm ball rileys a 3000-kgf load/for hard materials and a 1500 or 0-kgf load for thin sections or soft materials (see Supplement II on Steel Tubular Products, Section S 8). Other loads a different size indentors may be used when specified. In sorting hardness values, the diameter of the ball and the ad must be stated except when a 10-mm ball and 3000-kgf and are used.

16.1.3 A range of hardness can properly be specified of for quenched and tempered or normalized and tempered material. For annealed material a maximum figure of should be specified. For normalized material a minimum a maximum hardness may be specified by agreement general, no hardness requirements should be applied untreated material.

16.1.4 Brinell hardness may be required when ten

TABLE 28 Approximate Herdness Conversion Numbers for Nonsustantic Steels* (Rockwell 8 to other Herdness Numbers)

| | - Victors Hardness Number | Hardress, Hardr 3000-kgl Load, 800-gl | | Ord Load | Picotivel F Scale, 60-kg/ Load, Vie-In. (1.586-mm) Bell | Rockwell Superficial Hardness | | | |
|---|---------------------------------|--|---|---------------|---|---|---|---|---|
| Rectived B less, 100-trgf Lend We-th, (1.886-mm) Bull | | | Knoop Herdness, 800-gf Load and Over | | | 1ST Scale, 15-kgf Load, Vio-in. (1.588- mm) Bell | SOT Scale, SO-kpf Load, Vie-In. (1.548- mm) Ball | 45T Scale, 45-kgf Load, Vie-in. (1.588- mm) Ball | Approxim Tensis Strengt tal (MPs |
| 100 | 240 | 240 | 251 | 61.5 | ••• , | 93.1- | 83.1 | 72.9 | 116 (|
| 90 | 234 | 234 | 246 | ●0.9 | | \$2.8 | 62.5 | 71.9 | 114 (|
| H | 226 | 228 | 241 | ●0.2 | ••• | 92. 5 | 81.3 | 70.9 | 100 (|
| 97 | 222 | 222 | 236 | \$9. 5 | ••• | 92.1 | \$ 1.1 | ●0.9 | 104 (|
| 96 | 216 | . Z 10 | 231 | \$4.9 | ••• | \$1.8 | 80.4 | 68.9 | 102 |
| 96 | 210 | 210 | 226 | 54.3 | ••• | 9 1.5 | 79.8 | 67.9 | 100 |
| M | , 205 | 205 | 221 | 57.6 | ••• | \$1.2 | 79.1 | 6 6.9 | 98 (|
| \$ 3 | 200 | 200 | 216 | 57.0 ' | ••• | 8.00 | 78.4 | 6 5.9 | 94 |
| \$2 | 195 | 195 | 211 | 56.4 | *** | 90.5 | 77.8 | 64.8 | 92 |
| 9 1 | 190 | 190 | 206 | \$5.8 | | 90.2 | 77.1 | 63.8 | 90 |
| \$0 | 185 | 185 | 201 | 5 5.2 | ••• | 80.9 | 76.4 | 62.8 | |
| 80 | 180 176 | 180 | 196 | 54.6 54.0 | ••• | 89 .5 | 75.8 | 61.8 | |
| 86 87 | | 176 | 192 | \$4.0 | | 89.2 | 75.1 | 60.8 | 86 |
| | 172 1 69 | 172 | 188 | 53.4 | ••• | 86.9 | 74.4 | 59.8 | |
| 86 | | 169 | 184 | 52.8 | ••• | 86 .6 | 73.8 | 58.8 | 80 |
| # | 165 162 | 165 162 | 180 176 | 52.3 | ••• | 86.2 | 73.1 | 57.8 | 82 |
| 83 | 159 | 159 | 176 173 | 51.7 | ••• | 87.9 | 724 | \$6.8 | 81 |
| 2 2 | 156 | | | 51.1 | • ••• | 6 7.6 | 71.8 | 55.8 | 80 |
| 81 | 153 | 156 153 | 170 | \$ 0.6 | ••• | 87.3 | 71.1 | 54.8 | 77 |
| 80 | 150 | | 167 | 50.0 | *** | 8 6.9 | 70 4 | 53.8 | 73 |
| 79 | 150 147 | 150 147 | 164 | 49.5 | ••• | 8 6.6 | 60.7 | 52.8 | 72 |
| 78 | 144 | 144 | 161 158 | 48.9 | • • • | 9 6.3 | 69.1 | 51.8 | 70 |
| 77 | 141 | 141 | | 48.4 | ••• | 96 .0 | 66 4 | 50.8 | |
| 76 | 139 | 139 | 155 152 | 47.9 | ••• | 8 5.6 | 67.7 | 49.8 | |
| 75 | 137 | 137 | 150 | 47.3 46.8 | 99.6 | 96.3 9 6.0 | 67.1 66.4 | 48.8 47.8 | 67 |
| 74 | 135 | 136 | 147 | 46.3 | 99.1 | | | | |
| 73 | 132 | 132 | 145 | 45.8 | 96.5 | 84.7 84.3 | 6 5.7 6 5.1 | 46.8 45.8 | . 65 94 |
| 72 | 130 | 130 | 143 | 45.3 | 98. 0 | ₽ .0 | \$4.4 | 44.8 | . 8 |
| 71 | 127 | 127 | 141 | 44.8 | 97.4 | 83. 7 | 63.7 | 43.8 | . 55 |
| 70 | 125 | 125 | 139 | 44.3 | 96.8 | 834 | 63 .7 | 42.8 | Ğī |
| • | 123 | 123 | 137 | 43.8 | 96.2 | \$3.0 | €2.4 | 41.8 | - |
| • | 121 | 121 | 135 | 43.3 | 95.6 | 82 .7 | 61.7 | 40.8 | . 80 |
| 67 | 119 | 119 | 133 | 42.8 | 95.1 | 82.4 | 6 1.0 | 39.8 | |
| 96 | 117 | 117 | 131 | 42.3 | 94.5 | 82 .1 | 90.4 | 36.7 | 57 |
| 66 | 116 | 116 | 129 | 41.8 | 93 .9 | 81.8 | \$0.4 \$0.7 | 30 / 37.7 | # # # # # # # # # # # # # # # # # # # |
| ũ | 114 | 114 | 127 | 41.4 | \$3.4 ° | \$1.4 | 99 .0 | 36.7 | |
| 63 | 112 | 112 | 125 | 40.9 | \$2.8 | \$1,1 | 54 4 | 36.7 | ••• |
| Ē | 110 | 110 | 124 | 40.4 | 92.2 | 80.8 | \$7.7 | 34.7 | ••• |
| 61 | 106 | 106 | 122 | 40.0 | 91.7 | 80.5 | 5 7.0 | 33.7 | ••• |
| 80 | 107 | 107 | 120 | 30 .5 | \$ 1.1 | ² 80 .1 | 86 .4 | 32 .7 | ••• |
| 50 | 106 | 106 | 118 | 39.0 | 90.5 | 79.8 | \$8.7 | 31.7 | ••• |
| 56 | 104 | 104 | 117 | 26.6 | 90.0 | 79.5 | \$5.0 | 30.7 | ••• |
| \$7 | 103 | 103 | 115 | 36.1 | 80.4 | 79.2 | 64.4 | 29.7 | ••• |
| \$6 | 101 | 101 | 114 | \$7.7 | 96.5 | 78.8 | \$3.7 | 28.7 | ••• |
| \$6 | 100 | 100 | 112 | \$7.2 | 86.2 | 78.5 | \$3.0 | 27.7 | ••• |
| 84 | ••• | ••• | 111 | 36.8 | 87.7 , | 78.2 | \$2.4 | 26.7 | ••• |
| E3 | ••• | ••• | 110 | 36.3 | 86.5 | 77.9 | \$1.7 | 25.7 | ••• |
| \$2 | ••• | ••• | 109 | 3 5.9 | 786.0 | 77.5 | \$1.0 | 24.7 | ••• |
| 5 1 | *** | ••• | 106 | 35.5 | 85.4 | 77.2 | \$0.3 | 23.7 | ••• |
| 50 | ••• | • • • | 107 | 3 6.0 | 84.8 | 76.9 | 40.7 | 22.7 | ••• |
| 44 | ••• | ••• | 106 | 34.6 | 84.3 | 78.6 | 40.0 | 21.7 | ••• |
| 44 | ••• | ••• | 105 | 34.1 | 83.7 | 76.2 | 48.3 | 20.7 | ••• |
| 47 | ••• | *** | 104 | 3 3.7 | 83 .1 | 75.9 | 47.7 | 19.7 | ••• |
| 46 | | | 103 | · 23.3 | | 75.6 | 47.0 | 18.7 | ••• |

PEEBLES NEMP 12.4 REV. 1 205 ATT. I pg 5 of 30

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PEP
FAX
CONFIRMING
CONFIRMING
BAUER WITNESS

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TPEEBLES-ELECT PRDS CLEVEL RIPS Euclid Avenue

Cleveland, Ohio 44112 Telephone: (216) 481-1500

O Ed

| To: ?.G., \$ F | Location: SAN FRANCISCO |
|---------------------------------|--------------------------|
| | Location: NEI, CLEVELAND |
| Copies to: BURT HEPPENS | 541466 |
| Date: 1-9-90 | |
| Number of pages including this: | |
| Reply to Fax No: 216 · 481 8386 | • |

PEF: P.G. F.E P.D. ZS-1539-A8-9 SPARE 2400 FOW GEN.

WE CONFIRM THAT DON BAUER WENT OVER THE CRIMPING PROCEDURES AND WITNESSED THE SHAFT MARDHESS TEST. WHILE AT THE EDINBURGH PROTORY.
THIS IS FURTHER CONFIRMED BY FACTORY REPORT JENT MEREWITH.

REGARDS

M. Mountly

PEEBLES Namp 12.4 REV. 1 ATT. I pg 7 of 30



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PERBLES LTD

PEEBLES ELECTRICAL MACHINES

East Piton Edinburgh EHE 2XT Talephoner (031) 552 6261 Tales: 72125 (PP EDIN G) Sext (031) 552 7561

Generator for PGSE Yr O.X. 16271 8-1128 Our Ref BJF/260274

We your fax of 4th January we advise the following:

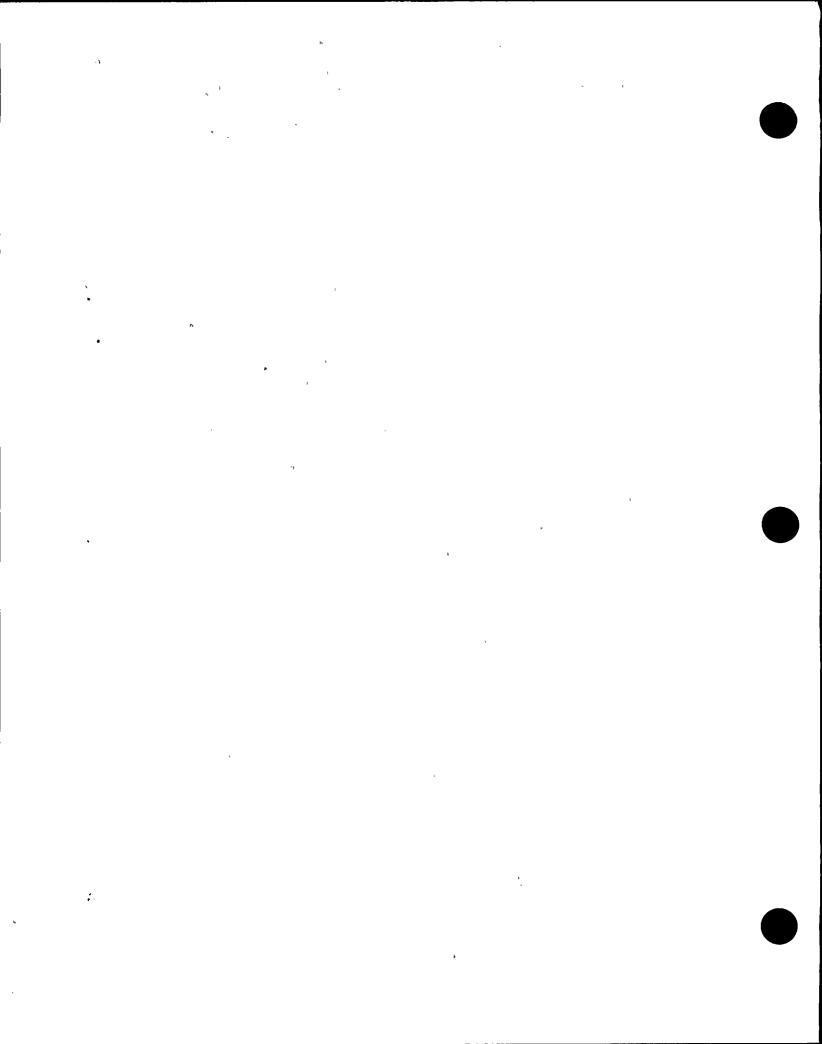
- 1. Don Bauer discussed in detail with our David Brunton our coil crimping procedures and these were found to be acceptable to him.
- 2. With regard to shaft hardness test this is a new requirement (it was not discussed during the Q.A. Audit) you are ewere that we required clarification of this and we contacted Burt Repponstall of PGEE Burt fexed details (copy of fex attached for your records).

A hardness test was carried out yesterday in the presence of Don Bauer - Test was carried out successfully and I believe a figure of 90 was obtained. I have requested our inspection to give us a test report - this will be submitted to you in due course.

As advised above this test was a new requirement and involved us in much time to dig out equipment and carry out test etc. Accordingly we intend to submit an extra cost for this - this was mentioned to Don and he appeared to accept this.

Bri Frank.

PEEBLES NEMP 12.4 REV. 1 ATT. I

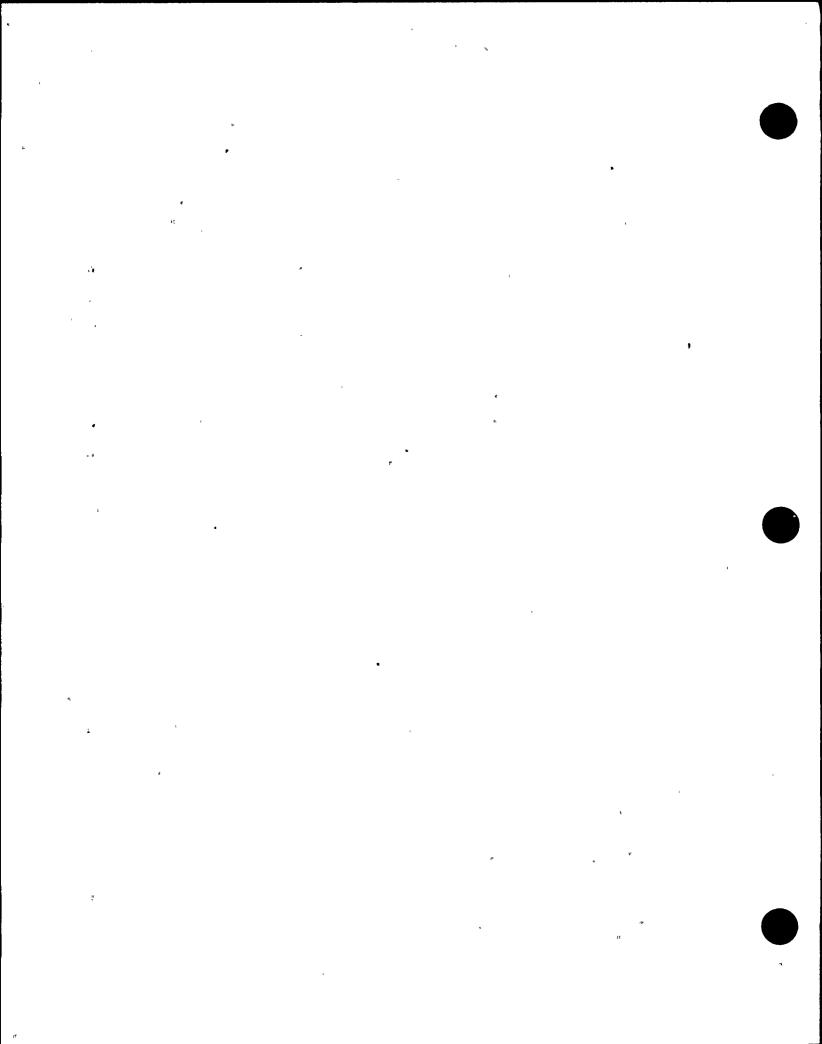


LA FORGIA

DI BOLLATE

CENTIFICATES

PEEBLES NEMP 12.4 REV. 1 ATT. I





Heaton Works Newcastle upon Tyne NE6 2YL Telephone: (091) 265 0411 Telex 53109 (CAP G) Fax (091) 276 5796

Our Ref DP/LM/1752A

17 August 1990

NEI Peebles Ltd Qualtiy Asssurance Dept East Pilton Edinburgh

For the attention of Mr J Miller

Dear Sirs

Approved Supplier La Forgia di Bollate Spa Milan, Italy

The above supplier is an approved source of carbon, alloy and stainless steel forgings.

They work to a formal quality system approved by TUV.

NDT approval CEGB level two - US cat KR - MP1 cat 2

Enclosed - Manufacturing References.

Yours faithfully for NEI PARSONS LIMITED

D Pattison - Senior Buyer Engineering Section

Procurement Department
PARSONS TURRINE GENERATORS

PARSONS TURBINE-GENERATORS

PEEBLES NEMP 12.4 REV. 1 ATT. I

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TELEPHONE RECORD

| Ву | Shan Bhattacharya | of | PG&E (NECS) |
|------|-------------------------|------|--|
| To | Mr. Lodahl | of | TUV |
| | | | Quality Assurances Dept. Munich, Germany 011-49-89-5791-1219 |
| Date | October 18 and 22, 1990 | Time | • |

Purpose:

I advised Mr. Lodahl that our diesel generator supplier (6th diesel) has procured the generator shaft from the subsupplier La Forgia di Bollate of Italy. Documentation shows that this subsupplier has been qualified by TUV as an approved supplier for forged material. The purpose of this call is to discuss how TUV qualifies the suppliers prior to including them in approved Suppliers List.

Discussions:

- 1. TUV is a quasi-government agency in Germany chartered to audit and qualify suppliers to support the government and major non-government procurement activities. (TUV is chartered to perform other activities, also, such as training, testing, etc.)
- 2. TUV uses their own checklist and audit standards to qualify suppliers. Document No. WO/TRD 100 (proprietary to TUV) is typically used as the basis for qualification.
 - o Audits are performed in two visits.

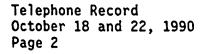
In the first visit, they familiarize themselves with the document control and the manufacturing process of the suppliers.

In the second visit, they perform the audit of the manufacturing process, which typically includes random checking of material control, shop control and testing control. TUV also performs independent testing of products.

- o Audits are typically performed every two years.
- 3. Mr. Lodahl advised that their audit checklist is developed from the Official Technical Rules of the German Steam Boiler Code. (He believes the German Code has requirements similar to those of the ASME Codes.)

PEEBLES NEMP 12.4 REV. 1 ATT. I 90102201.sb /g 1/ of 30

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- 4. Although Mr. Lodahl has not personally visited La Forgia di Bollate's (LFdB's) shop, he believes they are a good supplier of forged products.
 - o They are a small manufacturer with staffing level of 50. He also advised that LFdB is qualified as a nuclear supplier for forged products.
 - o LFdB generally purchases ingots or billets and heat-treats them in the shop. They perform post-heat-treatment inspection in the shop.
 - He wanted us to check if any material restriction is imposed on LFdB's certification document. Typically, this type of supplier is not qualified for forging of austenitic steel and high strength alloy steel.
- 5. TUV typically audits suppliers from outside Germany (such as Italy, Yugoslavia, etc.) to assure product quality of the German prime supplier's product.

SB: lat

cc: RBClark/UAFarradj 333/A7003 TFFetterman 333/A9042 ERKahler 333/A1404 MRTresler 333/A1409 JCYoung 1 Cal/F1876

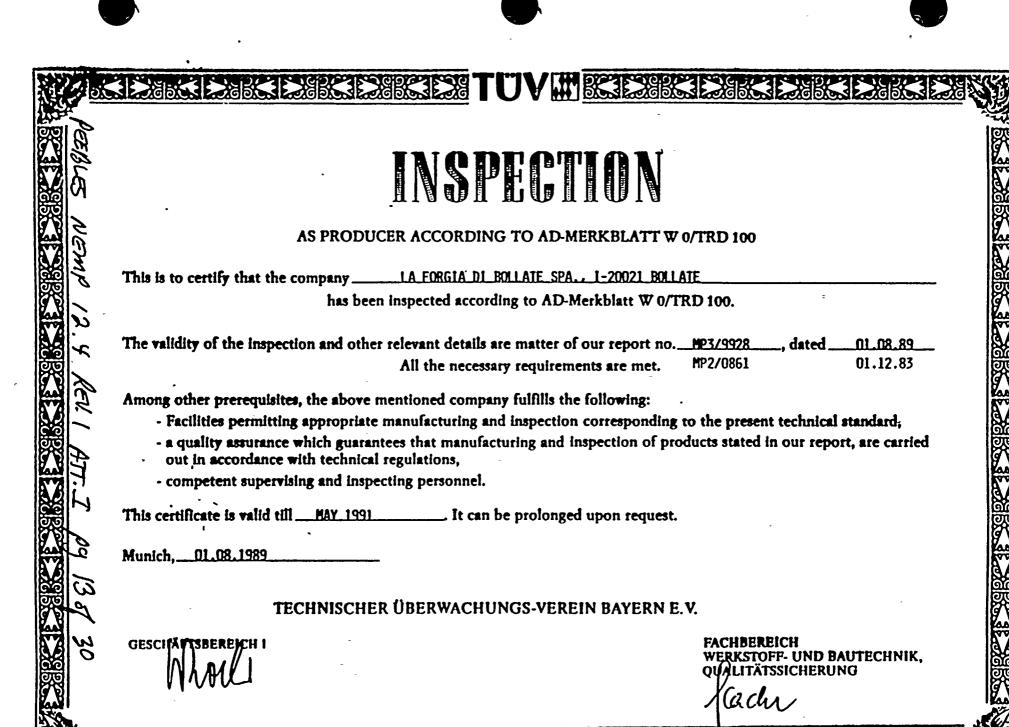
bcc: Mr. Lodahl

TUV, Dept. G-3 NPQ 10 West End Street 10099

Munich 21 GERMANY

PETBLES NEMP 12.4 REV.1 ATT. I

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INTERNAL MEMORANDUM

| ` | ************************************** |
|-------------|---|
| Date:_ | 11 October, 1990 -Our ref: <u>DCH/DO7M</u> |
| To: | Mr. H.D. Nicoll Location: |
| From:_ | D. HamerLocation: |
| Cubical | Quality Assurance Documentation for La Forgia di Bollate SpA., Milan |
| | * ** * * * * * * * * * * * * * * * * * |
| -Copies | to: |
| • | |
| findi | documents faxed to us 10 October 1990 by La Forgia di Bollate were a report of a repeat audit conducted by the Technical Inspection Association (TUEV) unich and its covering letter. |
| The | Essence of the report of findings is as follows: |
| 1. | Confirmation that the manufacturer's operating fulfils the demands of document WO/TRD100 (a TUEV originated document). |
| 2. | The original report of findings led to the issue of approval No. MP2/0861, 1 December 1983. This present report led to the issue of an extension approval No. MP3/9928 dated 1 August 1989. These approvals cover: |
| . | 2.1 Equipment 2.2 Quality Assurance 2.3 Supervisory & Test Personnel |
| 3. | The manufacturer is obliged to notify essential changes in his activities and apply for a supplementary audit. |
| 4. | The approval is valid until May 1991 subject to the requirements of WO/TRD100 being maintained. TUEV reserve the right to withdraw their approval. |
| · 5. | No fundamental changes have been noted as compared with the previous audit. The outcome of report MP2/0861, 1 December 1983 remains valid. The latest validity is to "Certified Clean Report of Pindings" Standard. |
| The : | report was issued by the department responsible for quality assurance of specialist rials and processes of TUEV, Munich. |
| D. H | 200 Rev. 1 ATT. I |

A Rolls-Royce Company

TUV

TOWNATION EV - POSTEMON SIBESO - E-BOUG MONOMER 21

- 1,5 - 1 494 (64 7.554 #**#skrtex 895** 564 1054 #**#skrter 08978791-15** 51

Margic di Lottett oph Via Villoreon 28/30

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SAL Mineria W.

ten: Manne

2419 - 44n.

Telefax 161

63-MPQ 10- In-kal

5/31-1219

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voz. 25.1.89 9928i

Uberprüfung als Hersteller nach AD-Herkblatt W O/TRD 100 Prüf-Kr.: HP3/9925

A-Nr.: 0208400

Schr gechrte Herren,

anliegend erhalten Sie unseren Untersuchungsbericht über die Überprüfung sowie das zugehörige Bestätigungsschreiben zu Ihrer Verwendung.

(2) Überprüfungsurkunden erhalten Sie mit separater Post.

Sollten sich zu den Unterlagen bzw. zur Auslegung von Verschriften Fragen argeben, stehen wir Ihnen jederzeit gerne zur Verfügung.

Für die froundliche Aufnahme unseres Sachverständigen und die Unterstützung bei der Durchführung der Überprüfung möchten wir uns herzlich bedanken.

Mil freundlichen Grüßen

Facilibereich Werkstoff- und Bautechnik, qualitätssicherung Institut für Qualitätssicherung

Anlage

PERSIES NEMP 12.4 REV. 1 ATT. I

and the transfer of the engine of the property of the first section of the engine of

43. 43. China

AD = Ausschuss Drucklehälter.

La Forgia di Bollate SpA _Via Villoresi, 28/30

I-20021 Bollate (MI)

Bestätigungsschreiben

≕360nchen, 91.08.89 3-4P0 10-In-kol

Hiederkehrende Überprüfung als Hersteller nach AD-Herkblatt W O/TRD 100 (Verlängerung der Zulassung vom 12.06.1987)

- Hiermit bestätigen wir ähnen, daß für den in der Anlage aufgeführten Seltungsbereich die Anforderungen an den Hersteller nach AD-Merkblatt -MO/TRD 100 weiterhin erfüllt sind.
- Sie verfügen gemäß unserer erstmaligen Überprüfung als Hersteller mach AD-Herkblatt W O/TRD 100, Bericht Nr. 4P2/0861 vom 01.12.83 und enserer wiederkehrenden Überprüfung, Bericht Prüf-Nr. 9P3/9928 vom 01.08.89 1ber:

- 2.1 Einrichtungen, die eine sachgemäße und dem Stand der Technik entsprechende Herstellung und Prüfung gestatten,
- 2.2 eine Qualitätssicherung, die die sachgemäße Verarbeitung der Werkstoffe zu den in der Anlage genannten Erzeugnisformen sowie die Einhaltung der hierfür maßgebenden technischen Regeln gewährleistet,
- 2.3 fachkundiges Aufsichts- und Prüfpersonal, insbesondere über Werks-sachverständige und eine Prüfaufsicht für zerstörungsfreie Prüfungen. Vor
- Sie sind verpflichtet, wesentliche Veränderungen oder Ergänzungen des 3. festgelegten Geltungsbereichs dem Sachverständigen mitzuteilen und ggf. eine ergänzende Überprüfung zu beantragen.
- valid Diese Bestätigung gilt bis zum Mai 1991 und setzt die Einhaltung der Anforderungen voraus. Die Geltungsdauer der Bestätigung kann auf Antrag veriängert serden.

Der Sachverständige ist zwischenzeitlich berechtigt, sich in begründeten Fällen von der Einhaltung der Anforderungen zu überzeugen.

Die Kosten für solche Überprüfungen gehen zu Ihren Lasten.

Bonerkungen: Es haben sich_gegenüber der letzten Überprüfung keine wesentlichen Anderungen ergeben. Die Festlegungen des Berichtes MP2/0851 vom 01.12.83 behalten weiterhin ihre Siltigkeit. Für den Bereich zerstörungsfreie Prüfungen ist de Beweils Aetztobitioe "Bestätigungsschreiben über die zerstörungsfreie Prüfung" maßgebend.

70V Bayern e.V. Facibereich Werkstoff- and Bautechnik. Quilititssicherung

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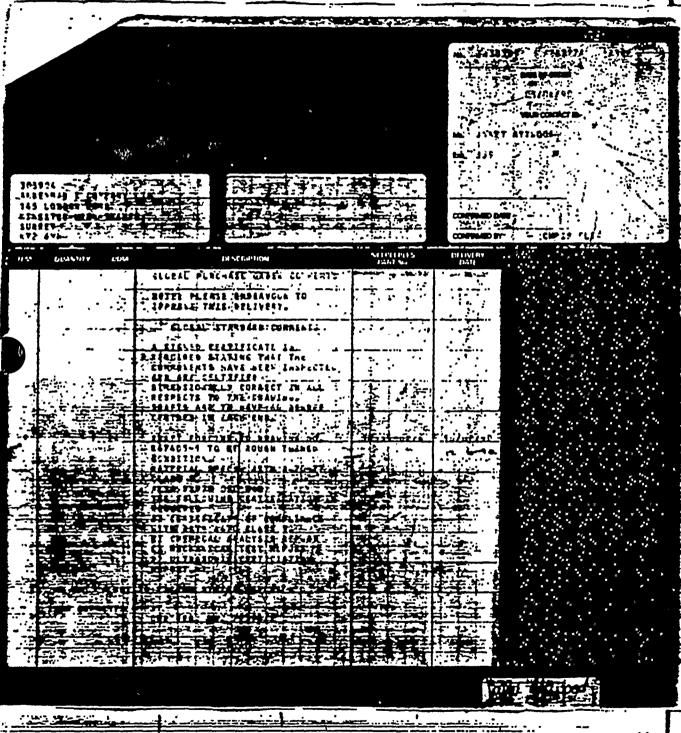
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DOGETTO:

ta Forgia di Bollate, estabilished in 1961, is part of a financial group in which there are two forging works.

Types of forgings

Disco, rings, balls, pinions, flanges, bars, tubesheets, shaped pieces, bored shafts with an 1.D. up to 600 mm and a length up to 12 meters.

Max weight of each piece: 30-40 Tons (10-12 Tons for Stainless steels)

Max length for shafts: 12-18 mt

Max 0.D. for rolled rings: 3,5 mt - max h. 900 mm

Max D.D. for discs: 3 mt

Our usual customers are the firms which produce: flanges, gears, valves, gear boxes, dies for plastic material or caoutchouc, wheels, rolls, shafts, tube-sheats, pressure vassals etc.

Main production equipments

1 ring mill (0.D. 3500 mm max th= 900 mm max)

] ring mill - (0.D. 2500 mm mex = h= 400 mm max)

1 ring mill (0.D. 1300 mm max h= 300 mm max)

3 menipulator of 40 fons

"A menipulator of -6 Tons

1 manipulator of -4 Tons

'2 menipulators of '3 Tons

2 manipulators of 1,6 Tons

1 press of 6000 Tonn

] press : 2500 Tons

2 presses of 2000 Tone

) press of 1200 Tons

3 presses of 900 Tons

1 hammer of 1000 Kilos

25 sawing mechines

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2 modern gan fired furneces In thest-treatment, the automatic control of temperature and a temperature rereorder (max weight 40 tons, -mex denght 12-mt.) ---- --- ---1 electric furnace for test-treatment which has the automatic montrol of temperature and a temperature recorder (max weight 10 tons, max lenght 7 mt.) 2 quenching tanks, one full of all and the other one full of water (disensions: lenght: 14mt. - width: 3 mt. - depth

l horizontal lathe (# 1000 x 8000mm) i horizontal iatha (# 1000 x 15000mm)

1 face lathe 1200 x 500 mm)

Quality control - We can work under quality assurance. The steelmokers from which we buy the ingots are: Accisioris di Rubicre, A.S.D., ALTA ACCIAI, Cogne, British Steel, Thysen,

Sandvik, Sets etc. The identification of material in done by marking type of steel and cost number on each ingot or billet. The mill certificate control is carried out by the quality control service, that can also carry out check analysis or other checks before or after the forging. Check analysis end metallographic tests are carried out by specialized firms: I.P.M., OM.CO, Breda. Forging, heat-treatment, destructive and non-destructive tests are carried out according to specifications: B5, AFNOR, ASTM, DIN, UNI or according to customers's specifications.

Mechanical properties tests:

2 mechanical testing rooms having:

- 2 tensile strenght meta

sets of room or low temperature (down to 195°C) 2 impact lest

3 portable herdress test-scts

- I extensometer for elevated temperature proof Lest atress tests. We are agreed by: T.E.G.B. - 1.S.P.E.S.L. (ANCC) - RINA -110yds Register - Burnou Verltes - Norske Verites - TÜV.

Non-destructive tests:

2 ultresonic test sats

2 magnetic particle test mets

2 penetrating liquid test metr

l micrographic test set.

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Hear Sirs.

Periodical inspection at your toric

We have the pleasure, in advising you that the name of your works continues to be reatined in List 3 "Approved Manufacturers of Steel Forgings", Part 2 of the Society's Rules and Regulations for teh Classification.

relating to the inspection fees and we should be please to receive the settlement at your earliest convenience.

Yours faithfully,

Man CAMPORTS

for the oursewer

e.e. L.K. GENGA

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APPROVAL OF MANUFACTURES

This is to certify that

LA FORGIA DI BOLLATE S.P.A., BOLLATE (MILANO)

is approved for the manufacture of

STEEL FORGINGS FOR SHIPS AND MOBILE OFFSHORE UNITS

Steel types: Carbon, carbon-manganese and low alloy steels.

March States

The approval is granted on condition that the Rules and requirements of the Society are complied with in all respects.

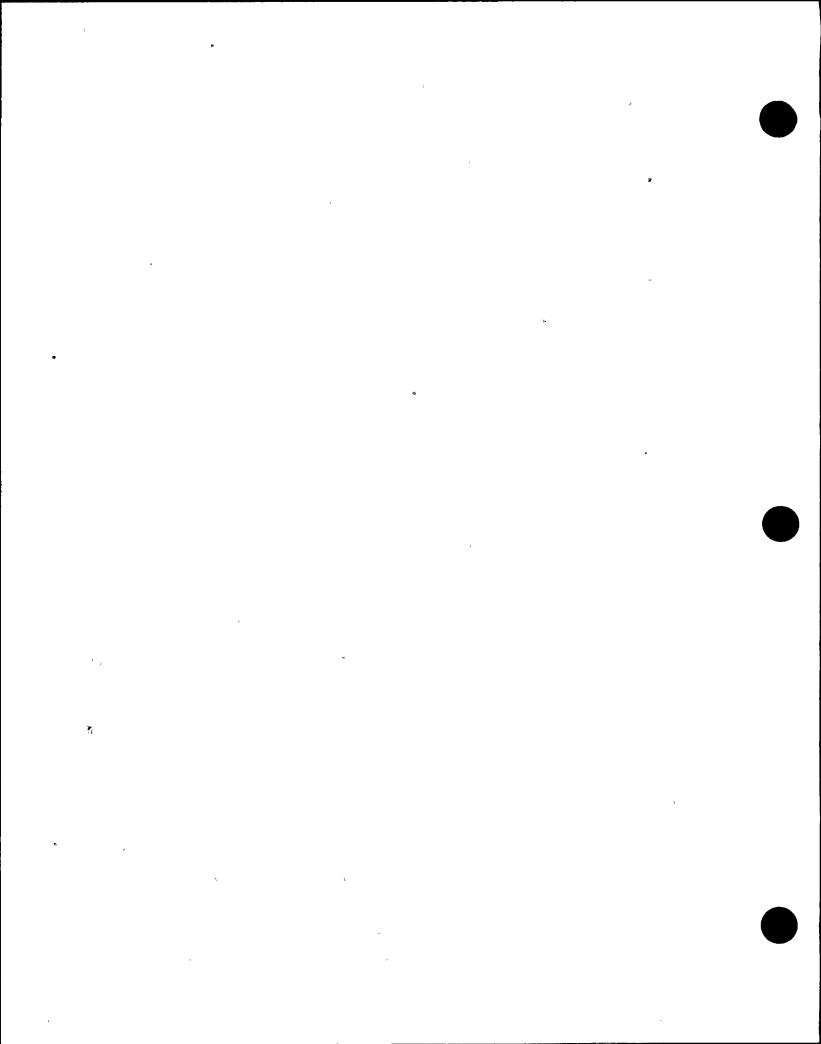
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Actorials for Pressure Vessels

General principles for materials

AD-Morkblatt Wo

The AD-Merkblätter are compiled by the seven trade associations apecilled below who together form the "Arbeitsgemeinschaft Druckbehälter" (AD), AD-Merkblett G 1 povers the composition and application of the AD-Regulations and also the procedural rules.

The AD-Merkbister cover safety requirements which must be adopted for normal conditions of operation, in the event of stresses over and above the normal level being anticipated during the operation of prassure vessels, allowance must be made for such strasses by meeting apecial requirements.

Should there be any departures from the provisions of this AD-Merkblett, it must be possible to demonstrate that the selety standards embodied in these regulations have been observed by means of alternative approaches, e.g. teating of materials, tests, stress analysis, operating experience.

> Factiverband Dempitiassel-, Behälter- und Robrietungebau e.V. (FDSR), Dösseldorf Hauptverband der gewerblichen Berufegencesenschaften s.V., Rankt Augustin

Verband der Chemischen Industrie a.V. (VCI), FrankfurtMain Verband Deutscher Maschinen- und Anlagenbau e.V. (VDMA), Fachgemeinschaft Verfahrenstechnische Maschinen end Apparate, Frankfurtiklain

Versin Deutscher Eisenhöttenleute (VDEh), Düsseldorf

VGB Technische Vereinigung der Großkraftwarksbetreiber a.V., Essen Vereinigung der Technischen Überwachunge-Vereine e.V. (VdTDV), Essen.

The AD-Merkblätter are amended continuously by the trade associations in fisaping with technical progress. Relevant proposals should be addressed to the publisher:

Versinigung der Technischen Überwechunge-Vereine 8. V., Peetlech 1838 M. D-4360 Essen 1.

Contents

- 1 8cope
- 2 General
- Materials for pressure vessels -Teeting Groups III, IV, VI and VII
- 4 Materials for pressure vessels "Testing Groups'I, N and V
- 5 Filler metals and consumables

1 Scope

The AD-Markblätter in Series W apply to metals for use in different product forms for the manufacture of stressed components of pressure vessels.

The AD-Merkblatt lays down general principles for the quality of the products, their manufacture and testing.

The AD-Merkblätter in Series W regulate the application and the requirements of various product forms, e.g. plate, strip, tubes.

This AD-Merkblatt does not cover materials for

- peskets.
- attachment and installation parts,
- velve ceeings
- and other accessories.

AD-Merkblatt A 4 covers valve casings, provided they represent accessorios of preseurs vessels as defined in Paragraph 3, Section 2 Druckbehälterverordnung.

The AD-Merichatter in the N-Series cover non-metallic meterials.

2 General

2.1 The meterials shall attain the required mechanical properties on the finished structural part.

Materials in contact with the vassel content should suffer neither serious corrosion attack nor form dangerous compounds with the same,

- 2.2 The operator or the manufacture of the pressure vessel shall select only materials which, when correctly proceeded, will attain the properties fully compatible with the service conditions of the pressure vessels.
- 2.3 The quality characteristics of materials in the delivery condition, essential for satisfying the conditions of Sections 2.1 and 2.2, and the quality-affecting measures to be adopted during processing shall be stated in a material specification. Preferably this document should refer either wholly or partiefly to standards or other technical delivery conditions.
- 2.4 The products are normally tested in the manufacturers works.

The relevant Diff-standards and Stahl-Eisen-Probletter (Test Sheets) apply to the toeting procedures, unless otherwise stated in the material specification (see Section 3.4.1).

- 3 Materials for pressure vecsels Teeting Groupe III, VI and VII
- **3.1 Special regulrements**
- 3.1.1 The material specification forms the basis for the assessment of the suitability of the material for pressure

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Carl Haymanna Verlag KG Luxamburger Strade 448, 5000 Kein 41 Outerburgetrade 3, 1000 Berlin 10

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vessels. For meeting the general conditions in accordance with Soction 2 the minimum requirements laid down in this document are:

- the demands made on the chemical composition and the mechanical/technological properties,
- the conditions regarding processing and heat treatment methods and practices.
- the material testing conditions together with the type and the content of the test certificate.
- the marking requirements,
- the conditions governing the design characteristics.

3.1.2 The manufacturer of the materials shall

- employ equipment ensuring the proper manufacture and testing of the products.
- employ compotent personnel for the manufacture and testing of the products as well as an inspection authority for non-destructive tests provided such have been stipulated in the materials specification and
- guaranton by means of quality control and suitable records, the appropriate manufacture and processing of the products as well as the fulfilment of the conditions laid down in the material specification.

The same holds for the manufacture of the initial material.

The works inspector issuing Test Certificate B for the manufacturer shall fulfil the conditions of DIN 50049. The name and the test stemp of the works inspector must be known to the expert1) in accordance with Paragraph 31 Druckbehällerverordnung.

3.2 Establishment of the sultability of the meterial

3.2.1 The sullability of the materials shall be astablished by the expert on the basis of the material specification in secondence with Section 3.1.1. If the sultability of the material cannot be established on the basis of the material specification. the expert shall impose additional essential safety conditions and appropriate tests for the product.

The expert shall express the result of the suitability check in writing.

in cases where the suitability check is intended for wider application, this can be done in the form of a VaTÜV-Werkstoffblatt?) drawn up in accordance with a procedure set out. In Werksloffbillter 1255-12643).

If a sultability check for general usage is not available, the expert may lesue a single certificate valid for a specific, respectively identical case of application.

- 3.2.2 The materials listed in the W-Series of the AD-Merkbilitter are suitable for use within the limits quoted in the relevant AD-Merkblatt. Other application limits are permissible once sulfability in conformity with Section 3.2.1 has been established.
- 3.3 Certificate confirming the fulfilment of the conditions laid down for the manufacturer
- 3.3.1 The manufacturer of the materials shall prove to the expert that the requirements according to Section 3.1.2 have been satisfied. This is generally done before the first delivery.

Unless previously performed during routine material acceptance tests by the expert, the expert shall reassure himself at 1 to 2 year intervals that the conditions are still satisfied.

3.3.2 The proof according to Section 3.3.1 can be replaced in an individual case by an appropriate enlargement of the scope of the tests performed on the delivery, e.g. by a check of the chemical composition on the piece, a heat treatment check, additional sampling to confirm the uniformity of the state. The necessary supplementary tests shall be imposed by the expert."

S.A. Testing, warking and quality certificates

- 8.4.1 (1) The conditions governing the suitability check in accordance with Section 3.2 are decisive for the testing and marking of the meterial as also for the quality certificate; the merking shall include at least the specifications imposed for a comperable product in accordance with the corresponding AD-Merkblatt of the W-Series.
- (2) The quality certificate shall quote the quantitly delivered, the typical dimensions and the full wording of the marking.
- (3) If the manufacturer uses, for a given product-form, materiels not refined by him, he must be in possession of certilicates supplied by the manufacturer of the Initial material stating the chemical composition, the material designation, the marking, the relevant dimensions and the quantity delivered.
- 3.4.2 If a certificate A or C according to DIN 50049 Section 3 is required as evidence of the quality characteristics, the tests shall be carried out by the expert. In cases such as these the chemical composition of the cast, the steelmaking method and the method employed for the manufacture of the product shall be made known, unless otherwise specified in the material specification on the basis of the suitability check In accordance with Section 3.2.

The expert has the right to attend the manufacturing process. but not to interfere with it.

In circumstances according to Section 3.4.1 pera (3), the authorized inspectors shall be in possession of the certificates from the manufacturer of the initial material.

3.4.3 In cases where nondestructive tests have been prescribed a test certificate B to DIN 50049 is generally issued.

3.5 Repairs and repair (final) welds

Material defects may be repaired in conformity with the conditions laid down in the material specification, if the question of rapair (final) welds is not covered in the material specification, repair (final) welding (with the exception the repair welding of steel cestings) may only be carried out in agreement with the oustomer and - whenever the expert is required to test the product - in the presence of the expert.

in cases of repairs by means of wolding, the nature and the extent of the repairs, as well as the type and the results of the tests performed on the required area shall be described in a certificate.

The conditions laid down in DIN 18990, Part 1 apply for repair welds on steel costings, unless otherwise stated in the material specification. A process approval test in accordance with Stahl-Elsen-Werkstoffblatt 110 is required for repair welds on steel castings.

3.6 Design characteristics

The characteristic values stipulated in the material specificstion are valid for deelgn purposes unless other values are laid down in the suitability check in accordance with Section 3.2.

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¹⁾ Consult Paragraph 31 Druckbal-Minnerstatung for a definition of the term

⁹ Observable from Verteg TÜV Rheinsend Gwishl, Peaklach 181780, 8000 Delogne

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4 Materials for pressure vessels - Testing Groups I. II and V.

4.1 Special requirements

The material specification according to Section 2.3 forms the basis for the assessment of the suitability of the material for the intended pressure vessel. For meeting the general requirements in accordance with Section 2 this document shall contain the following information unless otherwise stipulated for a particular application:

- the demands made on the phemical composition and the mechanical-technological properties;
- the conditions regarding the processing and heat treatment methods and practices,
- the material testing conditions as well as the type and the content of the test certificate (certificate according to DIN 50049 or stamp),
- the marking requirements and
- the requirements relative to the design characteristics.

4.2 Establishment of the suitability of the material

The suitability check and the selection of the material are the responsibility of the manufacturer of the pressure vessel. He may rely in this case on the suitability check in accordance with Section 3.2, provided such a check has alreedy been carried out.

The material with proven performance in service shall be regarded as suitable when it is intended for similar applications.

4.3 Testing, marking and certification of quality characteristics

The testing and marking practice shall comply with the conditions of the material specification, it shall be confirmed that these conditions have been strictly observed.

4.4 Repairs and repair (final) welds

Material defects may be repaired in conformity with the requivements of the material specifications, if the question of repair welds is not covered in the material specification, repair welding (except repair welding of steel castings) may be carried out in agreement with the customer.

Page 3 AD-Merkbian W 0, Edgeon 6 86

in cases of repairs by means of welding, the nature and the extent of the repair, as well as the type and the results of tests performed on the repaired area shall be described in a certificate.

The conditions iaid down in DIN 1690, Part 1 apply for repair welds on steel castings, unless otherwise stated in the material specification. A process approval test in accordance with Stahl-Eigen-Warkstoffblatt 110 is required for repair welds on steel cestings.

4.5 Design characteristics

The characteristic values stipulated in the material specification are valid for design purposes.

5 Filler metals and other consumables

- 8.1 The filer metals, if required in combination with consumables, shall be suitable for the fabrication of pressure vessels, i.e. the weld metal must be adapted to the base metals and to the relevant quality characteristics given in a "filter metal specification".
- 5.2 The suitability of solder and adhesives can be established in a process approval test.
- \$.3 The autability for pressure vessels of Groups III, IV, VI and VII shall be established by an expert's report on the basis of the filler metal specification³). In cases where a suitability check for general usage has not been carried out, a suitability for a specific, respectively similar application may be established during an extended process approval test.

The sultability of the filler metals quoted in VdTÜV-Kennbistt 1000 shalf be established within the scope fald down in that standard.

8.4 The suitability for pressure vescels of Testing Groups i, il and V shall be established by the manufacturer. He may rely in this case on the suitability check in accordance with Section 5.3, provided such has been carried out.

Filler metals and other consumables with proven performance in service shall be regarded as suitable, when intended for similar applications,

9) See VoTCV-Markblatt 1153 - Directions for the pullstutty being of blier metals

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Edition April 1975

| Technical Rules for Steam Boilers (TRD) | General principles for materials | TRD 100 Materials |
|--|----------------------------------|----------------------|
|--|----------------------------------|----------------------|

The Technical Rules for Steam Bollers (TRD) reflect the present state of the safety requirements for the materials, menufacture, design, equipment, eraction and testing as well as the operation of steam bollers. They are prepared and updated according to the most recent technical developments by

Doutscher Demofksssel-Aussahuß (DDA).

The TRD sheets are published on behalf of "Deutscher, Dampfkesselausschuß" by Vereinigung der Teelmischen Überweckungs-Vereine e.V., Essen

Translated by:

Fachverband Dempfkessel, Sehälter- und Rehrieftungsbau a.V. Düsseldorf

If there is any doubt reporting the interpretation of this sheet, the German wording shall govern,

Contents

- 1. Scope
- 2. Manufacturer
- 3. Materials

🕽 1. Scope

This sheet applies to metallic materials? which are used in the construction of pressure retaining walls and perts of hollers, superheaters, reheaters, feedwater heaters and the like it is the basis for the other TRD-sheets of Series 100, which cover the requirements for the materials to be used for the various types of products such as pietes, pipes and tubes, fittings, forgings, rough-forged and rolled rings and flances as well as cestings.

2. Manufacturer

- 2.1. For the purpose of this TRD-sheet manufacturers are both the manufacturer of the material and the manufacturer²¹ of the product forms as given in Section 1 as well as the manufacturer of filler metals.
- 2.2. The manufacturer shall have facilities³¹, which permit an appropriate manufacture and testing of materials according to the recent state of engineering practice.
- 2.3. The testing machines shall be in accordance with DIN 51 220, Class 1 and shall be verified by an authorized testing laboratory, according to DIN 51 300. The test reports shall be submitted to the inspector on request. The facilities for non-destructive examination, if any, shall be subjected to a judgement by the inspector.
- ₹ 2.4. The manufacturar shall have personnel with it experienced in carrying our appropriate materials tests.
 - 2.5. The manufacturer shall ensure an appropriate menufacture of the materials and the processing thereof to product forms as indicated in Section 1 by quality supervision with corresponding records, whereby the persinent technical rules are to be met.

- 4. Filler metals and auxiliary materials
- 5. Testing of materials and certification of quality
- 6. Design strength values
- 2.6. If the manufacturer intends to issue acceptance test certificates 8 to DIN 50 049 in accordance with the statements of the other TRD-sheets concerning materials, he shall have a works expert satisfying the conditions of DIN 50 049. Name and test stamp of the works expert shall be notified to the inspector locally competent. This applies also to the supervision responsible for the non-destructive examinations.
- 2.7. Prior to any commencement of the production, the inspector competent for the place of menufacture exemines, if the requirements of 2.2, through 2.5, here been met. The examination shall be repeated at time intervals of approximately one to two years unless the inspector can satisfy himself in another way that the requirements are still compiled with.

3. Materials

3.1. The materials shall be selected conforming to their intended purpose taking the mechanical and thermal loadings into consideration.

The materials shall have properties as to withstand the operating loads after being suitably processed. As a rule, the material shall be selected by the manufacturer of the components mentioned in Section 1 or the manufacturer of the materials as agreed upon,

- 2.2. The examination of the materials with respect to their machanical and tachnological properties shall be cerried out by the impactor. Materials shall be weldeble when intended for wielding. Where welding is only possible under observance of special conditions, these conditions shall be said down in the certificate of the impactor. Due to their eroof the materials to DIN-standards permitted in the TRD sheets of Series 100 shall be considered certified.
- 3.3. For other meterials, the certificate of the inspector is required for the first time. In this certificate the properties characterizing the meterial shell be determined taking the minimum requirements of TRD-Series 100 into consideration. As a rule, the first certificate will be summarized in the form of a VdTDV-Material Sheet. The manufacturers

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PEEBLES NEMP 12.4 REV. 1 ATT. I B 29 of 30

¹⁾ The term "meterial" covers the materials and their preduct forms.

²¹ Where the manufacturers of product forms have already met the requirements of this TRD by the use of the TRD-shorts of Series 200, then the appropriets provisions on the bests of Series 100 may be amitted.

³⁾ Where shaping and heat traument work is entrusted to other organizations or where testing facilities of other organizations are used, then the requirements shall apply accordingly.

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Page 2 TRD 100

current production.

of the materials being examined are indicated therein. The type and extent of the tests required for this sheet shell be established by the inspector as to represent in conjunction with the submitted works documents an adequate basis for the examination of the material. The proof of an adequate safety for the observance of the quarenteed quality shall be supported by a mathematical-statistical evaluation of existing test results as far as possible. Where several works are concerned with the manufacture, this shall be taken into account for the examination. The steel making process as well as chemical composition, product form, dimensional limits, delivery conditions, mechanical and technological properties, processing, range of application, type and extent of testing, test certification and designation shall be evaluated and determined within the scope of the exami-

3.4. Where a material is to be used beyond the scope of a Standard, a Steel-Iron-Sheet or a VdTÜV-Material Sheet, a certificate of the inspector is required. The same applies to another material to be used in any individual case. A separate certificate for the extended range of application may be issued in any individual case. A separate material certificate shall be referred to the examined manufacturer and to similar cases of application. The separate certificate shall be mentioned in the acceptance test certificate.

nation which may also be performed in the course of the

3.5. Where new manufacturing processes not covered by the first examination are used (e.g. steel making, casting or rolling processes) their equivalence shall be proved by a supplementary cartificate. In so far as steels have not been made according to the open-hearth, electric furnace, or basic exygen process⁴) the proof of the equivalence of the steel making process shall be submitted once to the impactor, Works documents covering tests carried out may be accepted hereby.

4. Filler metals and auxiliary materials

The suitability of filler metals and auxiliary materials shall be proved to the inspector for the first time, the suitability

4) The equivalence of basic oxygen steel and open hearth steel with respect to the properties at room temperature (and also with respect to the elevated temperature properties) is currently examined. of filler metals also by current supervision of the manufacture.

5. Testing of materials and certification of quality

\$.1. The testing and certification of quality are covered by the TRD-sheets of Series 100 which shall be staad in the order for the information of the manufacturer. The quality of the materials are determined by tests in accordance with the other TRD-sheets covering materials and proved by means of the certifications provided therein according to DIN \$0.049. The certifications shall contain the results of the tests as well as the indication of the steel making process.

5.2. As a rule, the materials shall be tested at the manufacturer's works. The inspector shall be informed with regard to the chemical composition of the melt and the manufacturing procedure of the product. The inspector shall have the right to witness the course of production. The course of production shall not be impaired thereby.

8.3. Materials shall be inspected for possible defects. Material defects may only be repaired by welding when agreed by the inspector and the purchaser.

5.4. Products made from alloy materies shall be subjected by the manufacturer to a suitable examination for material confusions.

8.5. As a rule, non-destructive examinations are certified by acceptance test certificate B according to DIN 50 049 as far as provided in the TRD-sheets of Seriat 100. Where no data concerning the performance and evaluating criteria of non-destructive examinations are given in the TRD-sheets, Standards or Steel-fron-Conditions of Dalivery, these shall be agreed with the inspector.

5.6. The material shall be marked in accordance with the other TRD-sheet covering materials. The complete text of the stamping shall be included in the certificate according to DIN 10 049.

6. Design strength values

For the design strength values the values determined in the TRD-sheets of Series 100 shall apply. For other materials the design strength values are determined in the certificate of the inspector;

PEEBLES NEMP 12.4 REV. 1 ATT. I pg 30 of 30

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RECORD OF CONVERSATION

DATE: 10/19/90

CONTACT: Hr. Buchanan

Weir Pumps

Glascow, Scotland

Phone 01-8-44-0259-72-2100 (Alloa phone)

BY: Hark Freund

SUMMARY: A followup was performed to collect additional data regarding the use of Weir Pumps of Alloa, Scotland by NEI Peebles Ltd to supply the generator bearing bracket. In contacting the Alloa facility I was informed that Alloa had no onsite QA Dept and that quality activities were controlled by the Glasgow, Scotland facility. I was then subsequently refered to Mr. Buchanan, QA Manager for Weir Pumps of Glasgow from whom I obtained the following data:

Weir Pumps does have a commercial QA program that meets the requirements of BS 5750 for the Alloa facility. However they have not been qualified for the Alloa facility by an outside organization.

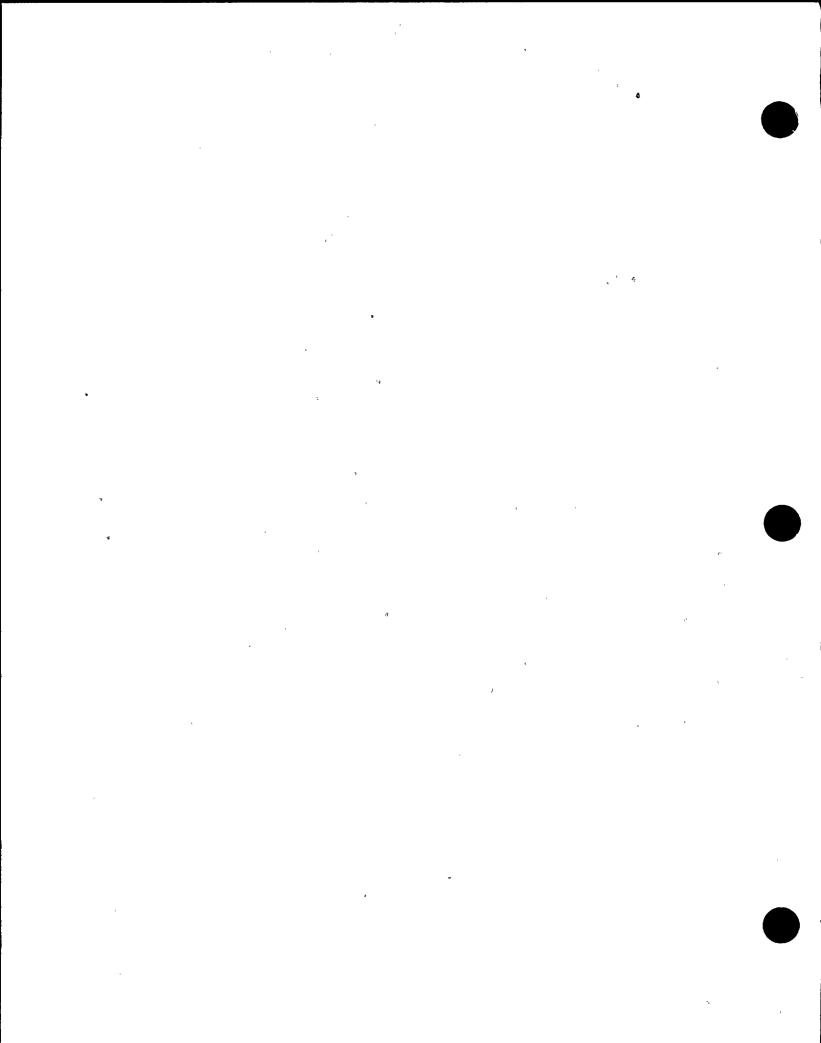
Weir Pumps of Glascow does have a QA program that has been audited and approved by ASME, Loyods, and is listed for Parts 1 & 2 of BS 5750 in the British Registry.

The generator bracket was probably produced in one of Weir's foundrys. With Purchase Order information the material could be traced to its origin.

All Suppliers utilized by Weir pumps are selected from the British registry or are audited prior to use.

Orders placed upon Weir are completed under the guidelines of the Weir Commercial BS 5750 program. However Weir will not certify that the program was applied unles the PO imposes BS 5750 and the customer has agreed that the Weir Pumps program meets the interpretation placed on the Standard by the customer for the product. (This is stated in Weir's QA Hanual).

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WEIR PUMPS LIMITED DIGEST OF QUALITY MANUAL

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There are three Quality Programmes described by Manuals and Supplementary Programmes operating within Weir Pumps Limited.

(1) Commercial (2) Nuclear (to ASME Code) (3) Nuclear (to BS5882)

This Digest consists of abridged extracts from the Programme used on Commercial work which, in addition to meeting Weir Pumps Limited Quality Assurance requirements, covers the provisions of the following Quality Standards as applicable to our type of manufacture:-

British Standards 855750 Parts 1, 2 & 3° Canadian Standards CAN 3-2299.1, .2, .3 & .4 South African Standards SABS 0157 Parts 1, 2 & 3 °

The Commercial Programme uses four "GRADES" to provide cover appropriate to the variations in Quality Assurance Standards invoked by customers and type of unit - "stock" or "special" - supplied by the Company.

• NOTE: Where BS 5750 has been specified, Veir Pumps Limited will only undertake the contract when it is agreed that the Veir Pumps Limited Quality Assurance Programme described meets the interpretation placed on the Stundard by the Customer (and his Representative) for the product.

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VVEIH PUMPS LIMITED

QUALITY ÀSSURANCE MANUAL

COMMERCIAL

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|-------|----|---------|
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| 2.0 | Scope | | |
| 3.0 | Definition of Terms | | |
| 4.0 | Manual Control | • | • |
| 5.0 | Organization | | |
| 6.0 | Tender and Order Review | • | |
| 7.0 | Contracts Division | | |
| 8.0 | Engineering - Technical Divi | lsion | |
| 8.8 | Spares and Service | | |
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WEIR PUMPS LIMITED

CATHCART - GLASGOW G44 4EX - SCOTLAND

Telephone, 041 - 637 7141 Total 13181 WFLCAT Q

FAX Tel. No. 041 - 633 2300 IGR3 AUTOL IRANK MEROX 2001

QUALITY ASSURANCE MANUAL

VOUS SEE

WAB/KSR OUR REP

DATE 1 September 1987

Section: 1.0 Pagel 1 of 1 Revi 5

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To all persons concerned

STATEMENT OF POLICY AND AUTHORITY

This Manual documents the Quality Assurance Programme for Commercial and NOO (N) Work of Weir Pumps Limited, Cathcart Works, located in Cathcart, Glasgow, Scotland and for Commercial Work of Weir Pumps Limited, Allos Works, located in Allos, Scotland.

Each person identified in this Manual by job title shall be responsible for implementing the requirements of this Manual in the area of his responsibility.

The Quality Assurance Manager has the authority and responsibility for assuring implementation of this Manual. The Sales and Marketing Division Director, Contracts Division Director, the Technical Division Director, the Production Division Director and the Purchasing Division Director shall be responsible for enforcing full implementation of this Manual in their Divisions. Implementation problems which are found unresolved upon follow-up Audit and differences of opinion. which cannot be resolved through the channels described in this Manual, shall be brought by the Quality Assurance Manager to me for resolution.

The Quality Assurance Henager has absolute overall authority on Quality matters and may require such revisions, reviews, changes in procedure, or process, additional work, verification or testing to be carried out on any aspect which he deems necessary for the satisfactory execution of a Contract, and may stop work in progress until any deficiency is corrected.

The Quality Assurance Menager shell, every 12 months, report to the Managing Director and the other Directors on the status and adequacy of this Quality Assurance Programme and shall include recommendations for corrective action he deems necessary. The Quality Assurance Manager may at any time call a meeting of the Managing Director and concerned Directors to discuss serious conditions requiring corrective action. The Quality Assurance Manager shall be responsible for the contents. distribution and changes to this Manual. The Quality Assurance Programme shall be applied to all new Contracts.

Managing Director Veir Pumps Limited

Page 2 of 22 Innie G

SCOPE



QUALITY ASSURANCE NANUAL This Programme of Quality Assurance Procedures has been compiled to meet the Quality Requirements of Major United Kingdom and Oversess Customers in the Chemical, Gas, Oil, Power Generation etc. Industries and to satisfy their various requirements with regard to Quality Assurance and Control. For specific requirements which are not met by the Programme described in the Manual, a "Customer Supplementary Quality Programme" may be issued.

PROCEDURES are described which meet the requirements of the various etandards. In their complete form they are used for units allocated a high Grade number. Lower Grade numbers recognise that in the case of a simple unit, requirements can adequately be set by simplified means. Procedures may not apply at all if not required by the Quality Standard specified by the Customer or in lew Grade units.

DEPARTMENT PROCEDURES The Quality Assurance Manual describes the overall Weir Pumps Limited Programme. Each affected department has its own written and QA approved operating procedures which do not form part of the Manual but which provide the required output. These Departmental Procedures may be of simple form where appropriate and so the output will not vary. may be revised without necessitating changes in the Manual.

GRADES Units are located into a Grade at the pre-contract stage which, whilst linked with the various Quelity Standards requirements, is primarily related to the duty and the degree of engineering involvement in the unit concerned. Because of the costs and menpower requirements the higher Grades are strictly reserved for units performing arduous or critical duties. Thus, selection of the Grade appropriate to the unit could result in the allocation of a Grade lower than that which would have been selected had the Customer's Quality Standard been the sole criterion.

GRADE DESCRIPTION

- Grade 1 New, onerous or critical duty unit specially engineered for a contract with high QA requirement.
- Grade 2 Repeat of a Grade 1 with modest engineering content.
- Grade 3 Low duty special unit which may require new design or a standard unit manufactured to special requirements.
- Grade 4 Standard or standard variant unit in regular production.

PRIME PARTS On higher grade units only specific items need be, or are, the subject of special Quality Control. A list of Stressed, Safety Related or otherwise critical items in the unit is made and Prime Parts Specifications are compiled for these detailing the WPL requirements and any customer or referred standards.

These Prime Parts Specifications may be newly created for a unit but in large part are existing specifications modified to suit the particular contract. Thus a complex onerous duty unit may be expected to have a large number of Prime Parts Specifications whereas a light duty unit would have correspondingly few.

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Standard and Standard Variant Units use Prime Ports Specifications only for the first production for WPL stock but not for contract supply.

INSPECTION SCHEDULES are prepared at the tender stage for Grade 1, 2 & 3 Units. They list the Prime Parts and the toots which will be applied to then using the information known at that stace.

They provide the means of communicating WPL preposals to the customer and provide the besin for the customer's request for any extra tests which he may require at his charge and to nominate these tests which he or his representative may wish to witness.

The Inspection Schedules are revised at the Contract stage and are then used to finalise the Prime Parta Specifications and for Grade 1, 2 and 3 Units if required, for the compilation of Quality Plane. Thesever possible existing basis Inspection Schedules are used.

QUALITY PLANS are normally drawn up for Grade 1 and 2 Units and for Prime Parts list the agreed tests, the Precess Seccifications and the Standards to be used and provide a list of the certifications which will be generated.

The Quality Plan is used to incorporate the required events into the shop control documents.

SPARES AND SERVICE On conclusion of a contract, Imspection Schedules, Quality Flane and Prime Parts Specifications, together with the original material ordering and manufacturing information are all included in the data on file and evailable to Spares and Service organisations and thus original requirements are incorporated in Sparce and Service work where ecorcoriste.

DEFINITION OF TERMS

Because of the varied interpretations encountered and to permit abbreviations to be used, a section on definition of terms is included in the GA Manual.

4. KANUAL CONTROL

Changes Each section of the Menual has its own revision number and the whole is controlled as an issue by the Table of Contents page.

<u>Distribution</u> Controlled numbered copies of the Manual are issued to a Distribution List and receipt recorded on a Distribution Log. Change distributions are accompanied by a revised approved Table of Contents. Uncontrolled Menuels may be issued to organisations outwith MPL. Such Manuals are suitably marked and are not undated.

Review The Menual is subject to periodic review by the Quality Assurance Henseer.

5. ORGANISATION

Weir Pumps Limited is organised in Divisions concerned with:-

Sales & Marketing Marketing, applications engineering, estimating and . tenderine.



Design of new pump units and ranges, major and minor modifications to existing designs, all Hydraulic

Design, Ancillaries, Quality Assurance and Laboratory.

Contracts

Tendering Support, Contract Services, Contract Control

and Commissioning of Units.

Purchase

Procurement of Bought-in Finished and New Materials

and Services.

Production

Hanufacture, Accombly and Took of complete new units and manufacture and supply of Sparce and Hefurbish

Services.

Weir Engineering Services

Marketing, estimating and tendering for the supply of spares and refurbish services and for the erection of unite at site if required under terms of the contract.

This section details the major responsibilities of the personnel appearing

6. TENDER AND ORDER REVIEW

Tender Review The Flow Chart (Fig 1) shows the path of a tender under which the Customer's Specification to studied to produce a Tender, including an Inspection Schedule, and to allocate a "Grade".

Order Review On receipt of an order the Contract Engineer ensures the review of Grade 1 & 2 Units by (a) the Quality Assurance Manager to secertain that the Customer's requirements (except Seeign) are adequately specified and can be not and (b) the Chief Engineer Technical Bivision to ensure Design Requirements are clearly defined and can be met. On satisfactory completion of the review, the centract will be accepted. For Grade 3 & 4 Units the Contract Engineer carries out the review.

·7 4 8 TECHNICAL AND CONTRACTS DIVISION

Prime Parts are selected by the Designer in conjunction with the Quality Assurance Department se parts requiring special attention by virtue of stress, safety, or other critical feature.

For all Grade 1, 2 & 3 Units the Contract Engineer ensures that Prime Parts Meetings are convened where required and that Prime Parts Specifications

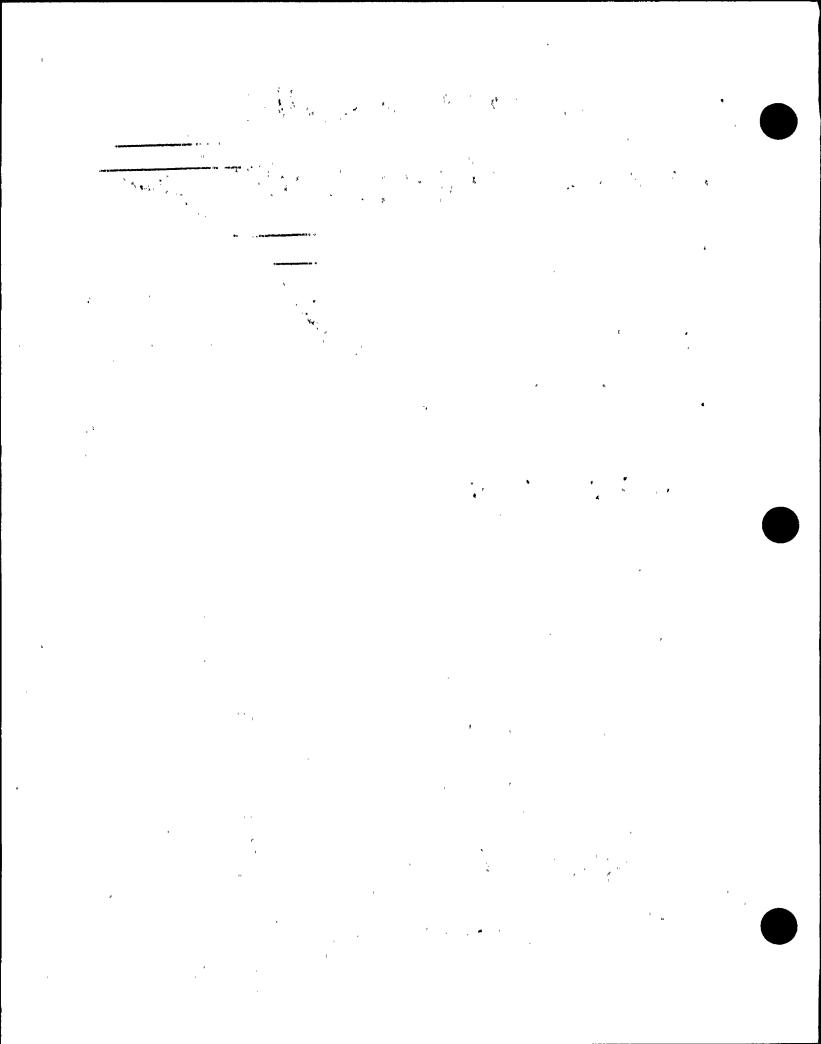
For Grade 4 Units the Prime Parts System does not apply save on the initiation of a new Product Range.

In Grade 2 & 3 Units as most of the material should be a repeat, existing Prime Parts Specifications are utilised or modified to meet any special requirements. The number of items to be covered in strictly limited in

Prime Parts Specifications are used by Quality Assurance to determine a a new or revised procedure is required.

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Design output is documented and expressed in terms of requirements, calculations and analyses and verification is performed by qualified personnel other than those who performed the design activity in the first implance.

Drawings provide all menufacturing details - material, dimensions and tolerances - but only those relevant accepted standards for NDE, Welding, Heat Treating and Quality Control operations which are a standard minimum for WE, requirements.

Process Specifications and Standards which are special to Customer Bequirements are not listed on Drawings but are identified on the Prime Parts Specifications and on the Quality Plans and by instruction in Parts List Information Shoots.

Changes there changes are made, a Drawing Alteration Note together with a print of the revised drawing is sent to Production Engineering to allow them to change their Process Naster and arrange changes to patterns and Jigs where affected.

Where the drawing change is considered by Deeign to require to be implemented in some or all of current menufacture, the Drawing Office issue a Parts List Associated Sheet for each of the affected Job Items as an instruction to Production Engineering to retrieve and change the necessary shop documentation and to Purchasing if a Purchase Order Associated is required.

then additional shop prints are required during production due for example, to loss or damage, the request for a replacement can only be fulfilled by the latest issue. Drawing changes affecting interchangeability require a drawing number change as distinct from an issue number change.

As Built Sketches where required by the Customer Specification are provided by the Drawing Office Manager for compilation by QC Welding, Inspection or Production. The Parts List identifies "as built aketches".

Part Identification therever necessary, the Parts List Items number is used to identify a part.

6 .A SPARES AND SERVICE

General The Spares Department and Service Centres have full access to the information relating to the specifications, drawings etc. of the original supply and use this plus any further instructions to procure, menufacture and supply spares and refurbish services.

<u>Erection of Unita</u> The Technical Field Services Division of Veir Engineering Services is responsible for erection of units at site if this is required under the terms of the centract.

9. QUALITY ENGINEERING

Quality Plans for Grade 1 & 2 Units (and Grade 3 Units when required by the Contract) are prepared by the Quality Engineer on request from Contracts and identify all the test, inspection, hold and witness points required during procurement, menufacture, assembly, performance test, cleaning and despetch of components and thus the records which will be held.

<u>Procedures and Specifications</u> Quality Assurance is responsible for sesigning the preparation of certain procedures and specifications for compliance with special customer requirements such as Welding, MME, Heat Treating, Hydrestatic Test, Cleaning, Handling and Packaging.

For all units with Quality Flans the Quality Engineer prepares and ratains a list of precedures with their appropriate issue and/or revision number that are used on the Frine Forta for the contract.

10. DOCUMENT CONTROL

General The Quality Assurance Requirements and Instructions are contained in and controlled by the issue of the following decuments:-

- (a) Contract Documents issued by the Contract Hanager. Includes Customer Purchase Order Specifications, ISO etc.
- (b) Engineering Documents issued by the Chief Engineers. Includes Drawings, Frime Parts Specifications, Parts List, Purchase Seguisitions.
- (c) Quality Documents issued by the Quality Assurance Hanager. Includes Inspection Schedule and Quality Plane.
- (4) <u>Purchase Documents</u> Issued by the Purchasing Hanagers. Includes Furchase Orders.
- (e) WPL Standardo Monuele which centain WPL Procedures and Specifications.

Distribution and Changes Each person responsible for the distribution of documents as defined in the above sub-sections is responsible for the issue of any changes and for the central and eafe-beeping of originals.

Each Department Manager has written and maintained Precedures which describe the administrative work within that Bepartment and those are reviewed and approved by the Quality Assurance Manager to ensure that they conform to the requirements of the Manual.

11. PUNCHASING

<u>Furchase Requisitions for Meterial</u> The Senior Draughtsman on a Contract is responsible for the preparation of Furchase Requisitions for all materials for the Contract except for prise movers and complete ancilliaries which are prepared by the Contract Engineer, contings which are compiled by Furchasing Division and for stack materials or welding materials which are procured under separate arrangements.

Purchase Requisitions for Services and Fabrications Purchase Requisitions for any outside Quality Services which the Quality Assurance Separtment may require, are prepared by the Quality Control Manager.

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Purchase Requisitions for sub-contracted mechining production operations are prepared by the Production Engineering Hanager. Requisitions for Heat Treatment operations on Prime Parts shall be approved by Quality Assurance before release. Purchase Requisitions for the Fabrication of Prime Parts such as Pressure Vessels and stressed items are issued by the Senior Draughtaman in conjunction with the Welding Shop when a make or buy decision is involved. Purchase Requisitions for Pabrications for Orade 1, 2 & 3 Units include Access and Inspection and are reviewed by the Contract Engineer and by Quality Assurance.

<u>Purchase Orders</u> are prepared by the Buyer strictly in ecoordence with the information on the Purchase Requisition.

Approved Vendors List The Purchasing Managers ensure that all buyers have access to the current Approved Vendors List. Prime Parts Orders are only placed on suppliers appearing on the list or a weiver obtained from Quality Assurance persitting the use of a mon-listed supplier.

Release of Purchase Order Purchase Orders for Prime Parts for Grade 1 & 2 and for selected Grade 3 Units are checked by the Quality Engineer to assure that they are in accordance with the Purchase Requisitions, which are forwarded along with the Purchase Orders to the Quality Engineer, and with the Prime Parts Specifications which are in his possession.

<u>Material Certification</u> The Purchasing Managers are responsible for ensuring that all Material Certification and Procedures detailed on the Purchase Order are received and controlled.

The Purchesing Department is informed of the delivery of material by the Goods Inward Department through a computerised records system and is responsible for ensuring that all certification is available so that Prime Part Material can be cleared.

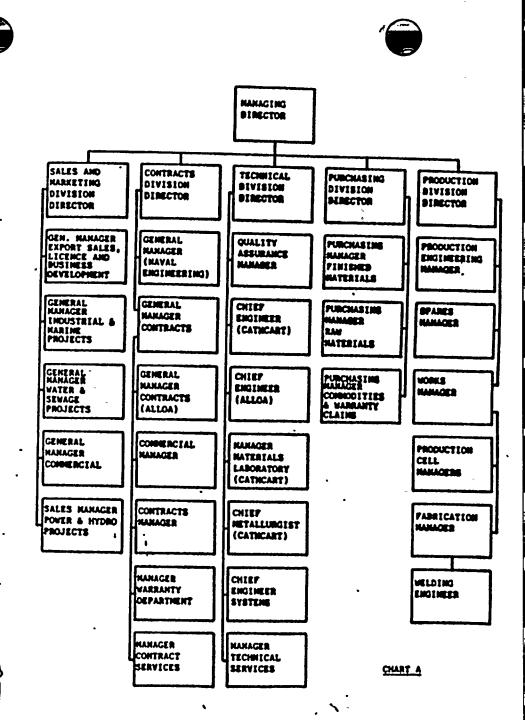
Certification is sent to the Inspection Records Department to be checked for compliance. The Inspection Department refers all certification with values outwith specification to the Laboratory for comment.

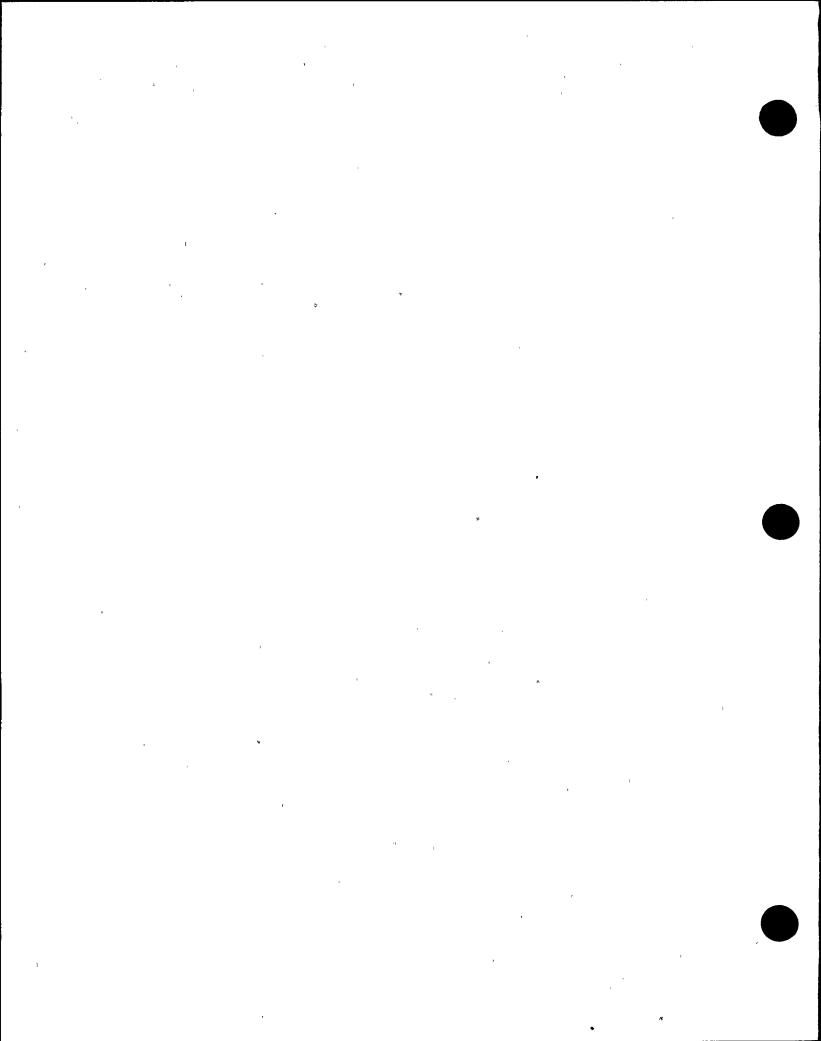
12. VENDOR APPROVAL

Survey and Approval The Quality Assurance Manager is responsible for surveying and approving Vendors and Sub-Contractors.

Surveys of the National Physical Laboratories and those Laboratories under their control which are surveyed by them at regular intervals are not required. The Quality Assurance Manager may, at his discretion, accept evidence of supplier acceptability (such as NCO(N) Registration) and approve this addition to the Approved Vendors List without survey by MPL.

Approved Vendore List An Approved Vendors List is compiled and maintained by the Quality Assurance Hanager.





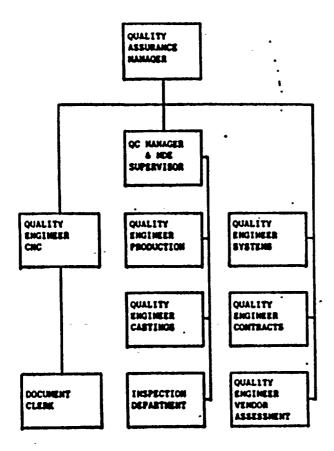


CHART S

WEIR ENGINEERING SERVICES

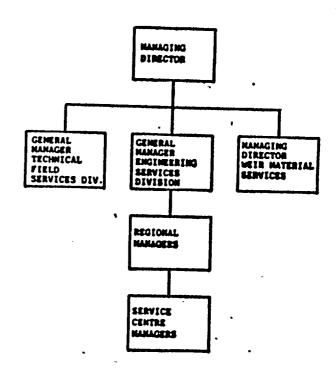
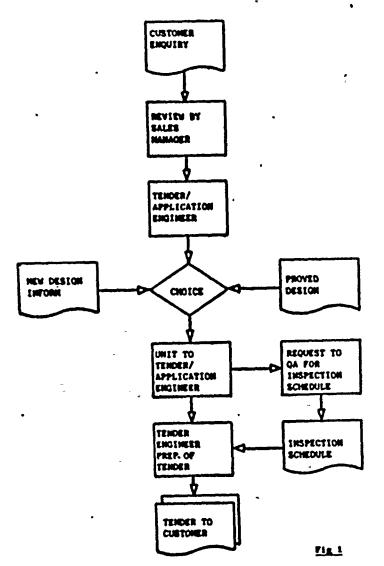


CHART C

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13. MATERIAL CONTROL

identification Delivered Prime Parts Forgings and Steel Castings are identified by Heat Humber. Stock bar material used for Prime Parts is identified by colour code and Stock Order Humber entry on the accompanying Route Card (material Certificates are held against Stock Order Humber) and by marking on the bar for material associally bought in for a contract.

Allocated "In House" Test Bor Mumbers are added to ber or forgings when in-process Nest Treatments require mechanical testing.

Stock Material Material taken from Meir Pumps Limited stock for manufacture of Prime Parts is only used if the Quality Assurance Manager approves its use when Material Certificates are available or Meir Pumps Limited have made an analysis to verify chemical composition of each identified lot of stock material. The Order Mamber of Stock Material used in marked on the Boute Card.

Release of Material and Parts is controlled by the Goods Received Note system and for Frime Parts, the yellow Quarantine Label has the word "Quarantine" masked off before release.

Items to be manufactured from castings, forgings and job ordered har are released by the Stores Manager when a Route Card Pacalge is tendered at the Stores with a signed off GRM attached.

Electrode and Weld Materials All welding electrodes are identified and held in the welding material stores identified by the Order Number.

"For Use" Electrodes are held in the required heated even condition.

Storage and Shipping The shelf life of material such as insulation is recorded and maintained. All other materials, especially finished parts, are stored in accordance with the item requirements to protect it against damage and deterioration.

Completed units and spares are pretected for shipping in accordance with any special contract requirements. Should the contract have no such requirements, the minimum "Trade Pack" will be applied.

Customer Supplied Items contract Engineer supplies the Customer with contract identification to be attached to the items to be supplied; informs the appropriate Stores Department of the supply; requests a Goods Inspection Report through the Quality Engineer Contracts and reports any loss or damage promptly to the Customer. The material is stored and handled as for goods received and incorporated in the unit. If the items are supplied for test purposes only the Contract Engineer is responsible for the return of the items after use and the arranging of any refurbishment or replacement required.



Route Carde Route Carde control menufacture and -

- (a) List the required sequence of individual operations.
- (b) Describe the operations and, as applicable, indicate the procedures, technique sheets and any other instructions required for manufacture, assembly, test and fabrication.

As operations are completed on Prime Part Boute Cards these are 'signed off by the Department Foresen or Inspector. Inspection and Test Operations are 'signed off' by the Inspector who ensures that any 'Hold' or 'Witness' requirements listed are adversed to.

IN. PROCEDURES AND EPECIFICATIONS

General Procedures or Process Specifications are instructions for carrying out processes, examinations and tests such as welding, heat treating, forming and MS.

The need for a new or revised procedure and/or its secociated technique sheets is identified before or during final review of the Prime Parta Specification and is requested by the Quality Assurance Department from the recognised specialist who is advised of the applicable standards and specification requirements.

<u>Welding Procedures</u> Welding Procedure Specifications are generally in accordance with ASME IX but are produced to Customer requirements. Customer approve) is obtained if required by the Contract.

welder and Welding Operator Qualifications The Welding Engineer is responsible for arranging the Qualification of Welding Procedure Specifications, Welders and Welding Operators and for preparing and maintaining the Qualified Welders List.

MDE Procedures All Procedures are developed and qualified by a qualified MDE Examiner, and approved by the Quality Assurance Hanager.

*MOE Training and Certification A qualified MOE Supervisor is responsible for the training and grading of all MDE personnel.

16. INSPECTION

General From receipt of materials, castings or vendor items, inspection have control over their passage between goods-in, manufacture, store, assembly, test, final inspection and despatch.

Inspection - During Manufacture Manufacturing Instructions are issued on Boute Cards for all Prime Parts which identify the 'Hold', 'Mitness' and any particular Inspection points. Manufacturing are instructed not to pass any operation calling for Inspection without the Quality Control Manager's approval or pass 'Mitness' or 'Hold' points without approval by the Castomer's Inspection Authority. The Inspector signs off for clearance of these points on the Route Card and this is the authority to move to the next operation. Any resulting certification is signed by the Customer's Inspection Authority if witnessed and passed to Inspection Documentation to be filed.

Page 14 of 22 Issue 6

When the LRS Scheme is applicable, the Performance Test Engineer will eign the Test Certificate. Quality Control prepares the Lloyd's Segister Certificate for Pumps (Quality Assurance) and submits it to the Lloyd's Surveyor for signature before sending it to Centract Services.

17. CALIBRATION

All gauges, instruments and other examination, measuring and testing equipment and devices used for final and in-process inspection, checking or examination are calibrated to a Calibration Policy Instruction and Calibration Instruction against certified measurement standards which have a known relationship to Meticani Standards where such standards exist. Secondary standards may be used for periodic shecking, provided those are verified on a regular basis against certified measurement standards. Where Mational Standards do not exist, industrial standards or standards developed by MPL shall be used.

full records are maintained.

Only company-owned dimensional instruments and pressure gauges are used for final acceptance inspection and test.

Pressure gauges and pressure recorders, where used for Hydrostatic (or Fnounatic) testing, must have valid calibration data stores.

18. MON-CONFORMANCE

A non-conformance is a deficiency is a characteristic or a deviation from an agreed requirement which renders an item or activity unacceptable.

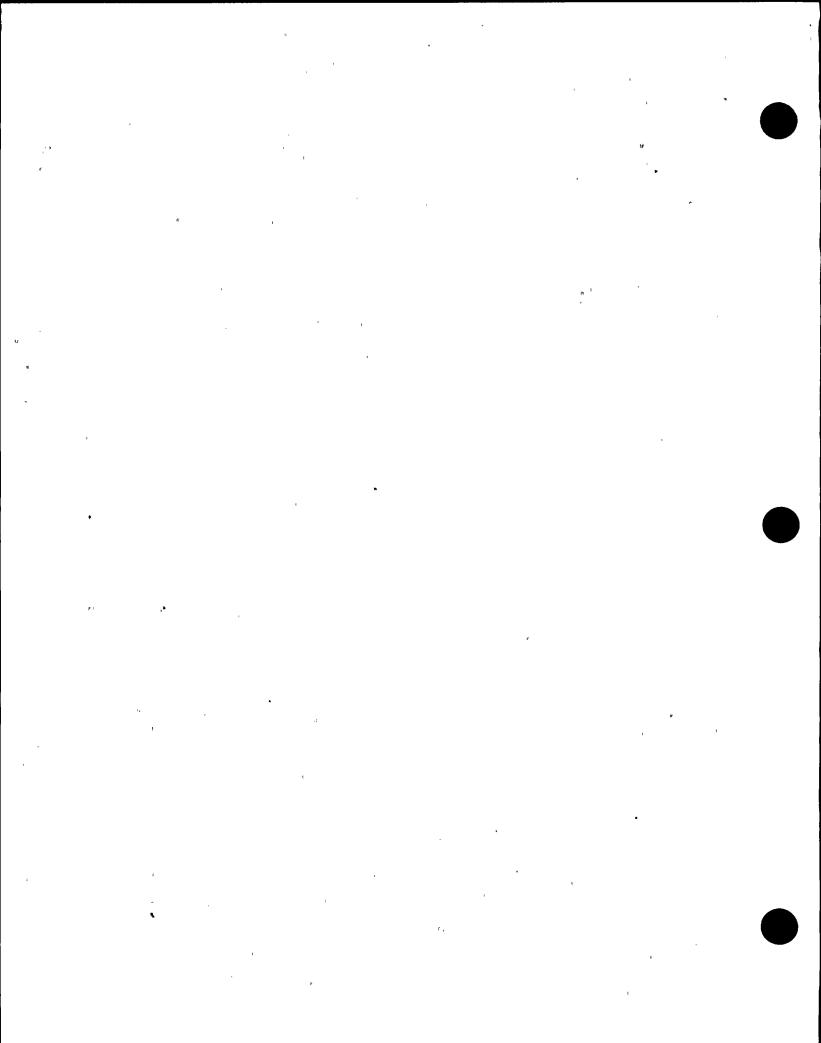
If the non-conformance is related to a Prime Part, it shall be the subject of a Mon-Conformance Besert.

If the non-conformance is related to an item or part other than a Prime Part and is considered by the Quality Control Hanager to be eignificant, he actions an Inspector or NDE Operator to raise a Salvage Approval Form.

Mon-Conformance Report The QC Hanager, Inspectors, Quality Engineers or the HDE Supervisor are responsible for initiating Non-Conformance Reports and Hold Labels for all types of son-conformance detected during -

- (a) Receiving Inspection, Sterage or Handling,
- (b) Certification Review for CRM's.
- (c) Non-Destructive Exemination.
- (d) Inspection during manufacture.

Salvage Approval Form An Inspector or HDE Operator makes out a Estvage Approval Form and Hold Labels on instructions from the Quality Control Manager.



Besolows The Quality Centrel Hanager may call on any of the company apecialists for advise on the technical aspect of a proposed resolution. Where a major repair is contemplated, the Quality Centrol Hanager raises a Concession Application for Customer approval of the resolution through the Contract Engineer if this is required by the Contract.

Varranty Claims and Customer Complaints are processed by the Marranty Department of Contracts Division and a copy of the final action report is sent to the Quality Assurance Manager for assessment.

19. AUDITS

Audits are conducted to assure compliance with the Manuel. The Quality Assurance Manager directs and arranges a system of periodic Audits by -

- (a) Assigning Qualified Auditors who do not have direct responsibility in the areas they are suditing.
- (b) Providing a Check List and Instructions to the Auditors.

Each phase of the Manuel is Audited at least ence every 12 months.

Honogers review their Departmental Procedures to ensure their continued effectiveness as part of their Assuel Implementation and Systems Audit of their Resertmental Operations.

Reports Several periodic quality reports are reviewed by the QA Manager for severae transp and are presented to the Soard of Directors.

- (a) QA Manager's annual report of the adequacy of the appropriate Quality Programme.
- (b) Independent review of the appropriate Quality Programme by WTL qualified auditors.
- (c) Defect Summery Report prepared from the Rework Report which is used to report Supplier Performance and WFL Departmental proficiency.
- (d) Managers Annual Implementation and Systems Audit Reports on their Teperimental Operations.

Management Review

The Quality Assurance Programme is reviewed at least every 12 months by the Managing Director and other concerned Directors to ensure its continued effectiveness and adequacy and, as a minimum, address the fellowings:-

- (a) A review of the Quality Assurance Manual to confirm continued conformance with RS5750 Part 1.
- (b) Confirmation that the Statement of Policy and Authority is valid and requires no change.
- (c) The identification of any conditions adverse to quality in the Quality Assurance Programme including those identified as a result of sudits.



(d) Verification that corrective action procedures are effective.

20. TRAINING

Scope Management and Supervisory personnel having responsibilities defined in this Manual are responsible for ensuring that personnel under their control are trained to conduct the duties required by them by this Manual.

They are also responsible for the review of the Job Specifications of their staff to determine certification and training requirements; to check these against the records of their existing staff and to arrange fulfillment of any certification or training found necessary. This activity is formally recorded and is repeated on any changes of Job Specification or aquisition or transfer of staff or manner of working requiring further training.

Quality Training The Departmental Hanager is responsible for his Quality Training Programme which shall include courses covering the requirements of this Hanual, applicable Departmental Procedures and Standards and a general introduction to the Quality Assurance Programme for Supervisory personnel having responsibility in the Quality Assurance Programme.

Copies of completed Attendance Seconds are sent to the QA Manager and the Manager of the Training Department.

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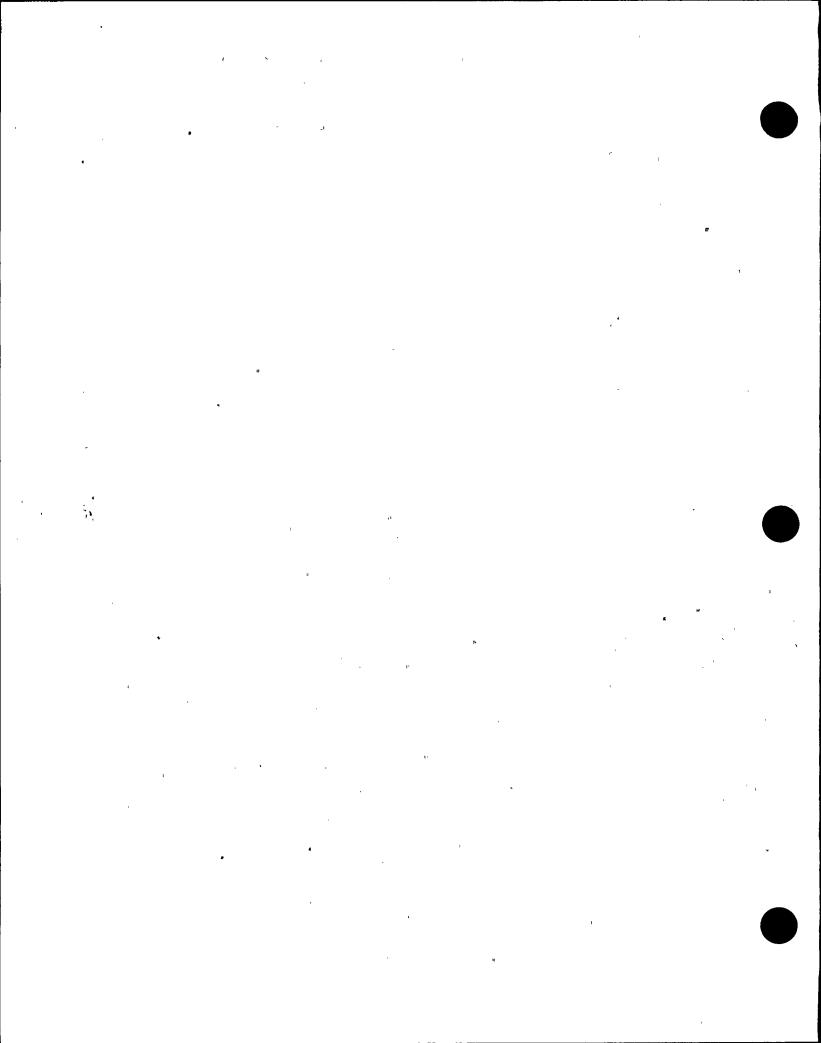
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| 100 Ms. | | tooks . |
| CUSTOMER | TYPICAL | |
| CUSTOMER IDENTITY | | · · |

MAIN PERPUATED PROPERTA SECTION & = APPROVED PROCEDURE LINE

| TYPE of PROCEDURE | PROCESSIE No. | 1974 | APPROVAL BATE |
|--|----------------------------|----------|---|
| - Radiography | WPS 868/300 | , | 29.1.00 |
| Acceptance Standard | ASTM E446/186 for | 1 : | • |
| • | Cats. A.B & C (D. | | |
| Radiography | *8 6 7 not allowed) | 1 | 1 |
| Acceptance Standard | CE69 EST 62-1 | • | 1 |
| Acceptance Standard | ASME VIII DUST | 5 | |
| - Ultrasonio | WPS 503/002 | | |
| Witrasonio | WPS 868/809 | | 29.1.48 |
| Acceptance Standard | WPB 868/829 | | 29.1.88 02.3.88 |
| - Magaetie Partiele | WPB 868/100 | | 29.1.40 |
| Acceptance Standard | STD 002 | 3 | 29.1.00 |
| Acceptance Standard | WPB 868/812 " | | •••• |
| Acceptance Standard | WPD 868/819 | 1 1 | |
| Acceptance Standard - Liquid Penetrant | 88 5500 | ; | |
| Acceptance Standard | WPS 503/203 | 5 | 29.1.88 |
| Acceptance Standard | 370 005 370 006 | | 29.1.44 |
| Acceptance Standard | UPS 868/821 | !!! | |
| Liquid Ponetrant | CE49 EST 42-1 | • | 29.1.88 |
| Acceptance Standard | 879 008 | 1 | 29.1.88 |
| Acceptance Standard | WP8 868/845 | | 29.1.88 |
| - Visual Examination | MS\$ 8755 | | -50.000 |
| - Volding Volding | W78 091/603 | | 29.1,48 |
| Volding | WPS 091/618 | | 29.1.48 |
| Volding | W78 091/628 | • | 29.1.48 |
| Welding | WP8 091/617 | •1 | 26.2.88 |
| Volding | WPS 091/039 | •3 | 26.2.68 |
| - Meat Treatment | WPS 516/205 . | 1 | 26.2.88 |
| Heat Treatment | UPS 516/100 | انتا | 29.1.88 |
| Heat Treatment | W78 516/138 | - i l | 26.2.88 |
| - Balaneing | CBD 1033 | 1 | |
| Balancias - Hydrostatio | CBD 1050 . | 1 | |
| Mydrostatie | WP8 503/313 | 3 | |
| - Chrome Plating | WPS 503/301 WPS 515/001 | 2 1 | |
| - Cleaning | WP8 850/035 | 3 | |
| Cleaning | W78 850/009 | - 1 | |
| - Painting - | WP8 860/013 | <u>i</u> | |
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SECTION & - SECTION STARS PERC / TIPE SELECTS

THREE RESERVED SHEETS

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| 2 | Pump Barrol (cent'd) | 0 |
| 3 | DE COVOP | 0 |
| i i | DE Cover (cost'd) | • |
| 5 | HDE Cover | 0 |
| 6 | HDE Cover (seat'd) | 0 |
| 7 | Impoller , | 0 |
| İ | Impollar (cont'd) | • |
| 9 | Shaft | • |
| 10 | Cooling Water Jacket | 1 |
| 11 | Cooling Vator Jacket (cont'd) | 2 |
| 18 | fuep Assembly | 1 |

- MOTES: 1) HDE Operators must be qualified in accordance with CEON Standard 989904
 - 2) All presetures referenced in this document must be approved by existency prior to use
 - 3) The following elegalizes procedures are applicable to those units:

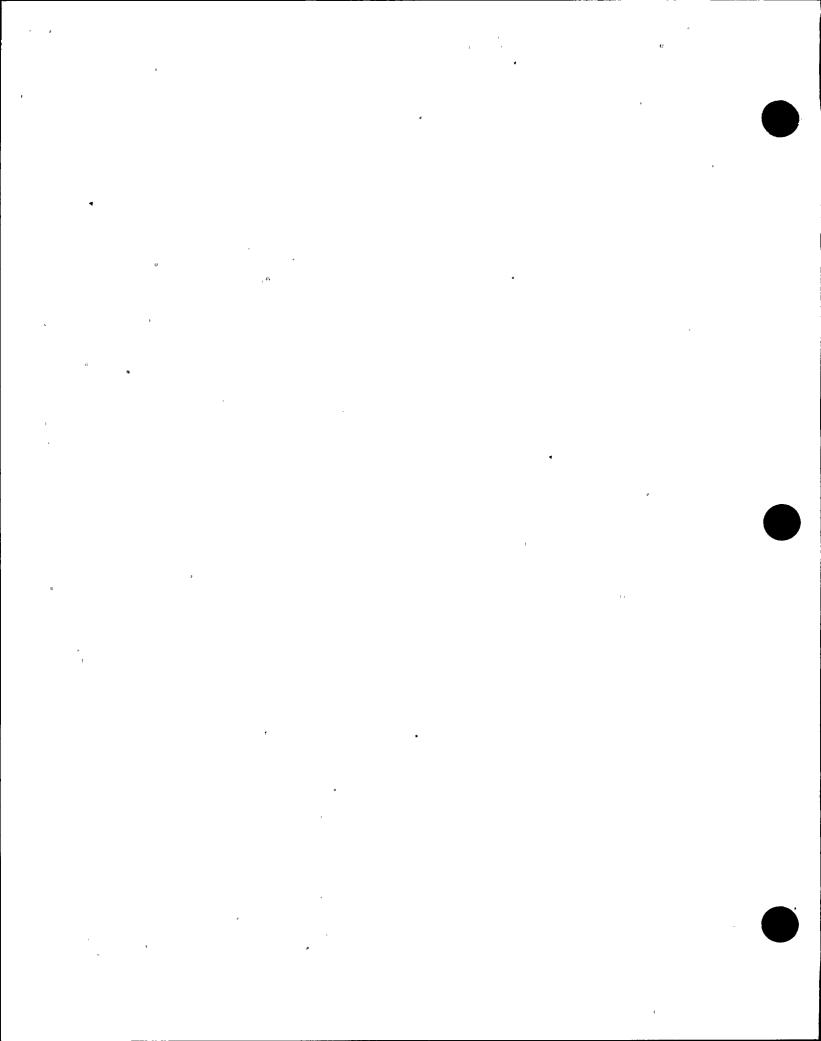
 $\frac{459/035}{6}$ - Cleaning of components, itoms or material during manufacture or prior to welding or heat treatment

<u> WP3#59/009</u> - Acid fickling of earbon stool eastings, fabrications and pipework

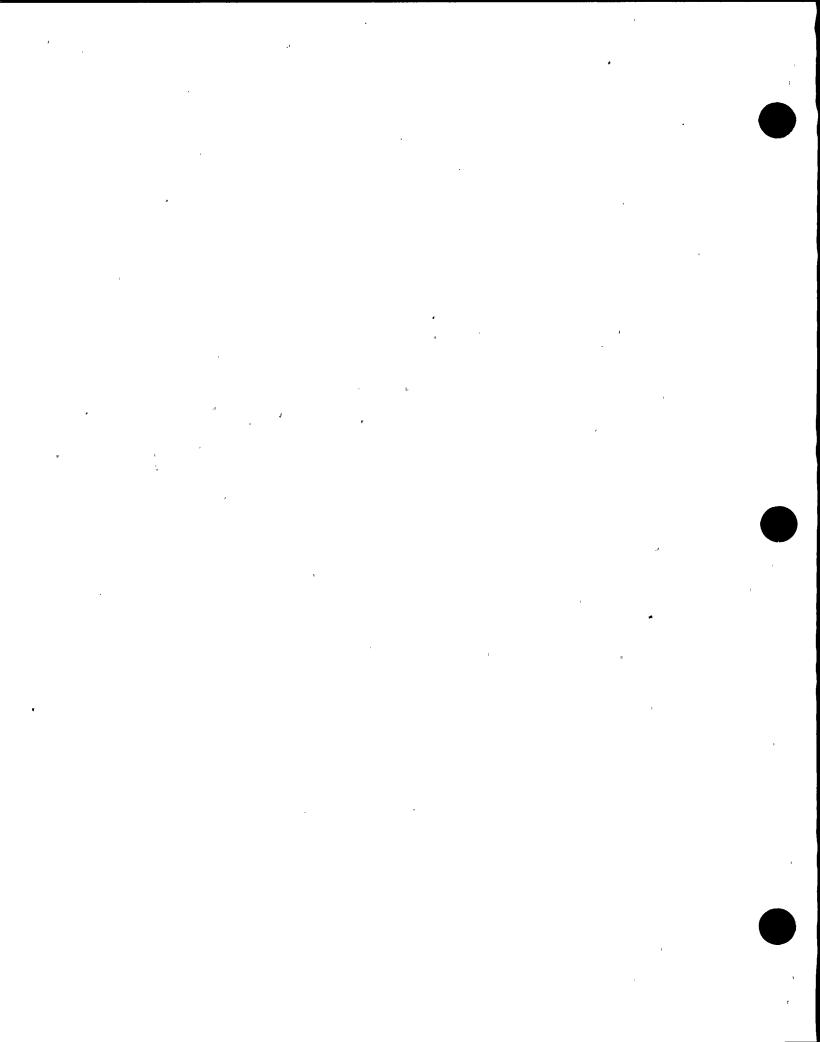
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| ė | . ACTIVITY | | PROCESSEL | Accordance | 1 | 2 | | E |
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| 7: | | 98 | ı | Material Spec's | • | | • | |
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| 9. | Plannelonal Check on lat off marting | | i | | | | • | • |
| Ž , | Ultrasouic Examination local to send mices (Certificate required) | | WS 848/809 or Approved Equi- | | • | | . * | 1 1 |
| : | Nagmetic Partitle Examination on major changes of 1775 \$62/100 or coction (Cartificate required) | 3 | 475 842/100 or 450 reset Equi- | . 8 | • | | × | • |
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| era Ed. | ACTIVITI | PARTIES | ACCEPTANCE STREET | SPIL. | 7 37 T | MAT. | H 37 |
| 3. 1 | Goods Inverd Inspection | • | Perchase Order | | | • | - |
| 3.1 | Viewel Exemination | - | MES 8755 | 1.1 | - } | - | - |
| 3.2 | Ultrasonic Exemination local to otud nices (Cortificate required) | WES 848/009 | WES 868/829 | • | 1 | - | |
| 3.3 | Magnetic Perticle Examination on major changes of section (Certificate required) | W75 848/100 | STD 902 | • | 1 | - | • 1 |
| 3.4 | Liquid Ponetrant Examination on visually suspect areas (Certificate required) | WPS 303/203 | ST9 005 | • | } | - | |
| 3.5 | Miner Weld Repairs | W75 091/618 | - | • | | - | • |
| 3.6 | Liquid Penetrant Examination on minor repairs (Cortificate required) | W75 303/203 | 223 CO2 | • | | - | |
| 3.7 | Bydroulic Test (for test pressure coe Parts List) (Certificate required) | WPS 303/313 | Look-free at test pressure | • | } | - | |
| 3.8 | Final Inspection | - | Braving | 1. | . 1 | - | - |



DOOUMENTATION FOR STOCKIST QUESTION

DITI DA REGISTRA

Integrated Telecommunications Ltd

Amested Product Range: 22 5618 Specification for the thermal insultation of certty walls by filling with DF form mterne.

mistion Systems & Machines IAC Wherfedale Road, Euroway Betate. Bradford, W Yorkshire, 204 66G, UK. TEL 8214 802775

The Siries Amountant Stanfard STOCKST Assessment Body: B& Quality Assessment Assessed Product Range: Varnish and stains for electrical impregnation and cattings. Electrical lectiontes including copper cisd, weapped and Mament wound tubes, muchland parts. Resible insulation and tape siceving. Enamelled and wrapped flexible winding wires. Cables for low and high application. Recognised specification and in the condition received except for cutting to apecific sine (Part 1).

Insulation Techniques & Services 22A Merry Hill, Quarry Bank, W. Midlands, DYS 15B, UK. TEL #334 378971 Amesament Standard: NS\$750 Pt2 (EXIZO02,

Assessment Body: RSI Quality Assurance Assessed Product Eanger Themal innilation of cavity walls.

Insulation Techniques and Services Bordenix House, Poster Street, Stourbridge, West Midlands, DYS 1EL, TEL DIA MALLA FE: 0384 379383 Assessment Standard: RS\$150 Fr2 (EH29002.

Assessment Body: BSI Quality Assurance Assessed Product Range: Insulation of UF foam, cavity wall insulation to \$5

Instruct Ltd Mucclecote, Gloucester, Gloucestershire, GL3 4AA, UK. TEL 0452 371331 TX: 437417 DESUMO G PK: 0452 611333 Assessment Standard: AQA1) Assessment Body: Ministry of Defence Assessment Standard: \$55754 Pt2 \$2129002. Amentment Body: British Rail

Assemed Product Range: Thermal and acoustic insulation, flame shields, seals, composite materials, hot forming. pressing & welding of theaten and other alloys for aviation systems, gas turbines and saissiles, kind based and marine gas

turbines and diesels and other aeromuce, marine, macleur, public utility and general engineering products.

Intech Teres Lai intech House, Junction Road. Eurgest MIL West Summer. RH15 ON, UK. TEL: 8444 4341 FX: 8444 870662 Ameriment Standard STOCKIST Assessment Body: BSI Quality Assurance Amende Product Range: Pressure sensitive adhesive tape (Part 1).

Integrated Electronics Ltd Unit 13, Statues Central Trading Estate. Staines, Middlesex, TW18 4UZ, UK. TEL: 6784 437261 TZ: 84001 SEARET G PX: 0724 461252 Assessment Standard: AQAM Assessment Body: Ministry of Defence Amened Product Range: Manufacture & repair, wiring assembly & test of electromechanical and electronic equipment, instrument modules, data loggers, control and micro-processor equipment interface units, simulator equipment for test and training Replacement devices for interchangeability with obsolescent equipment.

Integrated Hydraulics Ltd. Collins Road, Heathcote Industrial Estate, Warwick, CV34 6TF, UK. TEL DIX MIN Assessment Standard: \$55750 Pt2 (EH2000), E\$C000021 Assessment Body. Lloyds Register Quality Assurance Ltd Assessed Product Eange: Hydraulic valves and associated equipment.

Integrated Photometriz Ltd The Grove Trading Estate, Dorchester, Domet, DTi 157, UK. TEL: 8305 63673 TÁ: 411K MATRIX G FE: 0305 63679 Assessment Standard: AQAPI Assessment Body: Ministry of Defence Assessed Product Range: Circuits (particularly electro-optical circuits) and amociated electronic equipment. systems and test equipment.

Integrated Telecommunications Ltd Demisphy industrial Park. Dommuny. Belfact, ST18 SEIN, DK. TEL: 8232 602721/3 Assessment Standard: NS5750 Pt2 (EN29002. ##C9002* Assessment Body: BSI Quality Assertance

M 5 Instruments Ltd Mectron Mouse, 33-49 Farwig Lane, Brossley, Kent, BRI 3RK, UK. Assessment Standard AQAPI Assessment Body: Ministry of Defence Assessed Product Bange: Design. development, assoufacture and supply of believic measuring systems including automatic targets, telephone tracemission equipment including actomatic targets, telephone promission equipment including More-optic communication, special purpose computer systems, tocinding athome applications, electro-optical systems and night vision goggles.

Inculating Components and Materials ud Abbey Works Swan Street, West Malling Kent. MEID GLA. UK. Amened Product Range: High technology injection compression and tunsfer monlders. Specialist in high temperature high heat and ablative resistant materials. Spirally wound correponents in latest engineering plantics. Research design and development division. Ancillary facilities include machining, paint-spraying and toolmaking

insulation Equipment Ltd Salop Road. Orwestry, Shropshire. SYII ZRR. UK. Assessed Product Earner: Laminated metallic and plastic sheets and fabrications, phenolic based glass reinforced plastic mouldings for powenger transport, buildings, marine and decorative applications, which includes our proprietary range Melaminium, Melasteel, Melalite and Melaform

Sasulation Preservation Services Ltd Springwood Gardens, Leeds, 158 2QA. 1m 711. 0531 653034459033

Amesiment Standard: 255750 212 (2012)001,

Amesiment Body: 231 Quality Assurance Amossed Product Range: Chemical damp proofing.

Invelotion Service Ltd

ISL House, Portsmouth Ed. Burlesdon, Southempton, Hants, 803 SET, UK. TEL: 641-121 6222 Assessment Standard: \$55758 Pct (\$512900). 110000A Amessment Body: BSI Quality Amurance

Read "Mecentary Further Checks" on page ix

PEEBLES NEMP 12.4 REV. 1 ATT. K pg 1 of 4

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Foreword by the Secretary of State

Discerning customers have always looked for keen prices but increasingly now it is the quality of the product or service that has most influence on their decision to buy.

Any business hoping to compete effectively in today's markets, whether at home or abroad, must get its quality right. This is why as part of DTI's Enterprise Initiative we include a professional consultancy scheme designed to help firms establish and maintain effective quality management.

But many customers, especially new ones, demand more: they demand an assurance of that quality—an assurance based on the supplier's quality management system.

Here Britain has shown the way. First we drew up a standard, \$55750, against which to assess a quality system. This standard formed the basis for, and is now identical to, the international standard ISO 9000 now adopted in Europe as EN29000.

As further evidence of Britain's commitment to quality, the Department of Trade and industry provides funds to assist certification bodies to set up and operate new schemes for assessing suppliers' quality systems. These assessments now cover suppliers of a wide range of goods and services as the Register shows.

To complete the system we set up the National Accreditation Council for Certification Bodies to which such bodies can apply for accreditation. Only after the Council's rigorous scrutiny of the applicant's independence, competence and integrity, is a recommendation put forward to me for the accreditation of a particular certification body in a particular field of activity. Naturally, this Register gives prominence to certifications by such bodies.

And when it comes to this Register, we have ounselves been looking at the question of improved quality. Not only have we made it easier to use, we also intend to ensure that it is regularly up-dated.



I hope that in its new form the DTI QA Register will be of even greater value to suppliers and buyers alike. For the demand for quality, and an assurance of it, will continue to increase, especially with the advent of the single European market and the growing opportunities it is creating for those who meet, and demonstrate that they consistently meet, today's quality requirements.

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Nicholas Ridley

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(Page 3)



BSI Quality Assurance

In addition to being the United Kingdom National Standards Body, BSI has operated product certification schemes for over 60 years identified by the well-known Kitemark logo. A more recent development in BSI services, but still one that has operated for over 10 years, is the Registration Scheme for company capability assessment against the requirements of BS5750/EN29000/ISC9000.

The Certification and Registration systems operated by RSI QA are as follows:

- .1. Kitemark Product Certification
- 2. Safety Mark Product Certification
- 3. The Registration of Firms of Assessed Capability
- 4. System for the Assessment and Registration of Call Routing Apparatus Maintainers (CRAM)

All the above schemes are based on assessments against \$55750/KN29000/ISO9000.

5. System for the Registration of Stockists of Amessed Capability—covering the distribution of quality assured materiel from BS5750 or equivalent assessed and registered sources.

BSI Product Certification Schemes

Although any manufacturer can claim compliance with a British Standard, only manufacturers licensed by BSI may feature the Kiremark or Safety Mark on their products. The appearance of these marks on a product (BS***) provides customers with an independent assurance that the product complies with the Standard and that it has been produced under a quality system complying with BS\$750.

An emential requirement is that the manufacturer's documented quality system prescribes how he ensures that production complies with the product standard. Assessors select samples of the product for independent testing. BSI fully supports the work of NAMAS in laboratory registration and, when possible, utilises NAMAS recognised laboratories and calibration facilities within its product certification systems.

When all the above requirements have been met, the manufacturer is licensed to feature the appropriate certification mark on his product together with his licence number and any other information relevant to the standard.

Following the issue of a licence. BSI performs surveilisnce visits to the factory to ensure that the manufacturer continues to comply with B\$5750. During these

visits, the assessor selects at random from production, a sample of the product for independent testing to the appropriate Beltish standard to ensure that it continues to comply.

The appearance of the Kitemark on a product indicates that BSI has independently tested samples of the product against the appropriate British Standard and confirmed that it has been compiled with in every respect.

The Safety Mark appears on a number of products which conform to British Standards specifically concerned with safety or to the safety requirements of standards which cover other product characteristics as well.

BSI System For the Registration of Firms of Assessed Capability

The objective of the System is to provide, by means of assessment and subsequent surveillance, an

independent assurance of a firm's capability of working to specification. The specification may be a national or international Standard, the customer's specification or the firm's own specification.

For Individual Firm Registration, the scope of the assessment is determined by the firm's declared range of products or services. Each assessment is individually planned to facilitate the evaluation of the quality system as related to specific technologies. In addition, for industry Sector Schemes, in conjunction with BS5750. a Quality Assessment Schedule is prepared, defining in practice terms the scope and special requirements relating to a specific group of products, processes or services. Quality Assessment Schedules are developed by BSI in cooperation with the particular and services and in consultation with purchasing and associated interests.

Registration entitles the firm to use the BSI Registered Firm Symbol on letter headings, in advertisements and for other promotional purposes, other than product marking.









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Registration of Call Routing Apparatus Maintainers

The system has been introduced in response to sequirements for the liberalisation of the maintenance of call routing apparatus and the further requirement that firms undertaking maintenance within the scope defined in the general technical requirements and the Quality Assessment Schedule associated with the scheme shall be registered as firms of assessed capability by \$51.

Subsequent approval under Section 20 of the Telecommunications. Act is also required before a maintainer may maintain apparatus connected to a public switched telephone network, when the maintainer is not also the operator of the public switched telephone network concerned.

Registered maintainers are required to have a documented quality system which complies with the BSI System for the Registration of Call Routing Apparatus Maintainers

Registration entitles the maintainer to use the BSI Registered Firm symbol on letter headings, in advertisements and for promotional purposes other than product marking.

The maintainer is recommended to make application to OFTEL at the same time as his application to BSI as OFTEL require to look into matters not covered by the BSI Registration.

Registration of Stockists of Assessed Capability

The BSI Registered Stockist System provides purchasers with a list of stockists who can, when requested, provide a service of supplying material which has been manufactured by a quality assured source, that is a manufacturer who has a quality management system in accordance with BS5750. Stockists registered to Part 1 of the System are able to supply quality assured material which is lot or batch traceable and covered by the manufacturer's certificate of conformity whereas stockists registered to Part 2 can supply quality assured material which is not lot or batch traceable. Registered stockists are sequired to have a documented quality system which complies with the BSI Registration of Stockists of Assessed Capability System Requirements.

Assessment covers a stockist's documented procedures and their practical application. Where registration is granted, a Certificate of Registration is issued to which is attached an Appendix stating the scope of registration.

Registration entitles the stockist to use the BSI Registered Stockist Symbol on letter headings, in advertisements and for promotional purposes other than product marking.

The Pascal Compiler Validation Service

The BSI Pascal Compiler Validation Service has been established for five years and more than sixty compilers have been validated. Pascal is one of the more widely used computer languages and Pascal compilers are used on all types and sixes of computers.

Pascal compilers (programs which translate user programs into machine code) are validated against \$35192 'Specification for computer language Pascal' using the Pascal Validation Suite (PVS). The PVS consists of 780 tast programs (in vention 5.1) which provide a searching examination of a compiler's conformance to standard. The PVS also checks the error-bandling claims made by the compiler implementor and many aspects of implementation defined behaviour.

The FVS was jointly developed by the UK National Physical Laboratory and the University of Tasmania and is now distributed worldwide by BSI and its agents. Validation consists of independent witness testing of compiler performance using the PVS. The BSI evaluator then prepares a full objective test report and a Certificate is issued indicating the degree of conformance achieved.

Pascal compiler validation cartificates are recognised throughout the world, as the International Standard for Pascal (ISO7185) is a direct reference to BS6192. BSI has licensed authorities in France. West Germany, USA, Japan, Italy and China to operate the validation service in their country—these licences guarantee mutual recognition of validation certificates.

Further Information

Details of companies' registrations (or de-registrations) are updated on a monthly basis in the BSI publication BSI News which is distributed to all subscribing members of BSI. The details of each company's scope of registration are published annually in the BSI Buyers Guide which is widely circulated to members of the Institute of Purchasing together with major purchasers, specifiers, Central and Local Government.

Contact

All enquiries relating to product certification, assertinent and registration systems operated by BSI should be addressed to:

Business Development BSI Quality Assezs PO Box 375, Milton Keynes, MK14 6LL Tel: (0908) 220908 Telex: 827682 BSIMKQA G Fax: (0908) 220671

For accredited scope see page lxxv

IN PEEBLES NEMP 12.4 REV. 1 ATT. K Pg 444

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PEP EXPLANATION ADHESIVE CRITICALITY

PEEBLES NEMP 12.4 REV. 1 ATT. L
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NET PEERLES - ELECTRIC PRINCES, 17045 Fuclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

179824

| To: P.G.EE. | Location: San Francisco |
|---------------------------------|--|
| From: Ron B. Politi | Location: Cleveland |
| Copies to: Mr. · Ed Connell, | , Mr. Burt Hepponstall & Mr. Usama Farradj |
| Date: 12/3/90 | 2:50 |
| Number of pages including this: | |
| Reply to Fax No: 216-48 | 31-8386 |
| GENERATOR FO | OR DIABLO CANYON 74 OUR 51128 |

Re our telcon of Thursday, 29th. November. Attached is a more detailed delivery schedule from Edinburgh. Our larger problem is completing all the paperwork which has arisen as a result of the Edinburgh Audit. We attach the revised welding procedure. You will also have a paperwork schedule faxed to you by December 6th.

P.G.&E. POS ZS-1539-AB-9

We are attaching all we have on the Armstrong A701 Epoxy Adhesive but we still do not accept that this is necessary. We are of the opinion that the duty and testing are not fully understood.

- Point (1) There are clamps between the poles to ensure that the copper rotor winding is held in position. Even if the rotor winding did delaminate it would not result in an immediate failure.
- Point (2) When the pole is attached to the rotor and final running tests are carried out, the rotor is run at 25% overspeed. This stresses the adhesive used, to forces well above any that it will experience in its designed duty and gives a significant safety margin.
- Point (3) Taking the above 2 points into consideration, we do not consider the chemical composition critical.

PEEBLES NEMP 12.4 REV. 1 ATT. L

B 2 of 60



Regards

Ron B. Politi

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Report Issued: March 21, 1991

Revision 1



LABORATORY TEST REPORT

Ероху

Bonding

Acceptance

Test

Tested by:

Approved by:

Distribution:

GPDorighi/CM File

Usama Farradj Ed Kahler Brian Love

JKMcRee - Nuclear Indexer

Ed Walters

Report 500-91.65

(0365/9251)

Pacific Gas and Electric Company **Technical and Ecological Services** 3400 Crow Canyon Road, San Ramon, California 94583



INTRODUCTION

The Technical and Ecological Services has performed an acceptance test on an epoxy, A-701, batch number GA0309, marketed by Armstrong Products Company and manufactured by Morton Thiokol Inc. This testing has been performed at the request of Mr. Ed Walters, of Electric Engineering. See Appendix A for test request documents. See Appendix B for a copy of the receipt inspection and material certification of the epoxy.

OBJECTIVE

The objective of this testing was to determine if this epoxy could meet certain criteria established by Armstrong Products Company/Morton Thiokol Inc., i.e., the bond tensile shear strength and the color of the epoxy: This criteria is published in a product data sheet entitled: Armstrong A-701 and A-702 Epoxy Adhesives. See Appendix C for a copy of this data sheet.

TEST PROCEDURE



The testing of this epoxy was performed in adherence to ASTM D 1002-72 (reapproved 1983) and Morton Thiokol Inc. test procedure APTM Number 40-1285. See Appendix D for copies of these test procedures.

See Figure 1 and 2 for visual details of the tensile shear test in progress.

The color inspection of the epoxy was performed by visual examination upon arrival of the material.

The thickness of the epoxy in the bond zone was controlled by use the use of a special fixture. The metal blanks were inserted in this fixture when they were laminated together. The laminated blanks remained in this fixture until the heat curing process was completed. See Figures 3 and 4 for visuals and specific details of the lamination fixture. See Figure 5 for visual details of the metal blanks laminated together in the fixture.

See Appendix E for copies of the receipt inspections and material certification of the aluminum material used in the testing.

See Appendix F for the receipt inspection of the lamination fixture used in the testing.

See Appendix G for copies of the instrument calibrations used to perform the test.



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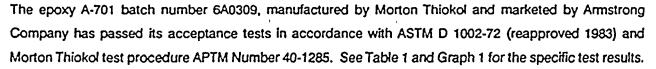
TEST RESULTS

All of the test samples passed both the tensile shear strength test and the visual color inspection. See Table 1 and Graph 1 for tensile shear test results. Also, see Figures 6 through 14 for visual details of the test samples before and after testing.

TEST RESULTS DISCUSSION, GRAPH 1

Graph 1 includes only samples that meet the ASTM/Morton Thiokol thickness specification of .005 inches \pm .001 inch. A mean average and a standard deviation were calculated from these fourteen samples. Nine of the fourteen samples fall within the high and low standard deviation points, which are depicted by vertical red hashed bars and solid red horizontal lines. Do not try to draw any conclusions from the horizontal spacing of the test specimens bars. This spacing has no relation to the values at which the specimens broke. The test specimen bars are however, place on the graph in order of their failure loads lowest to highest from left to right.

CONCLUSION





PEEBLES NEMP 12.4 REV. 1 ATT. L Pg 5 of 66

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Table 1
EPOXY BONDING TEST RESULTS

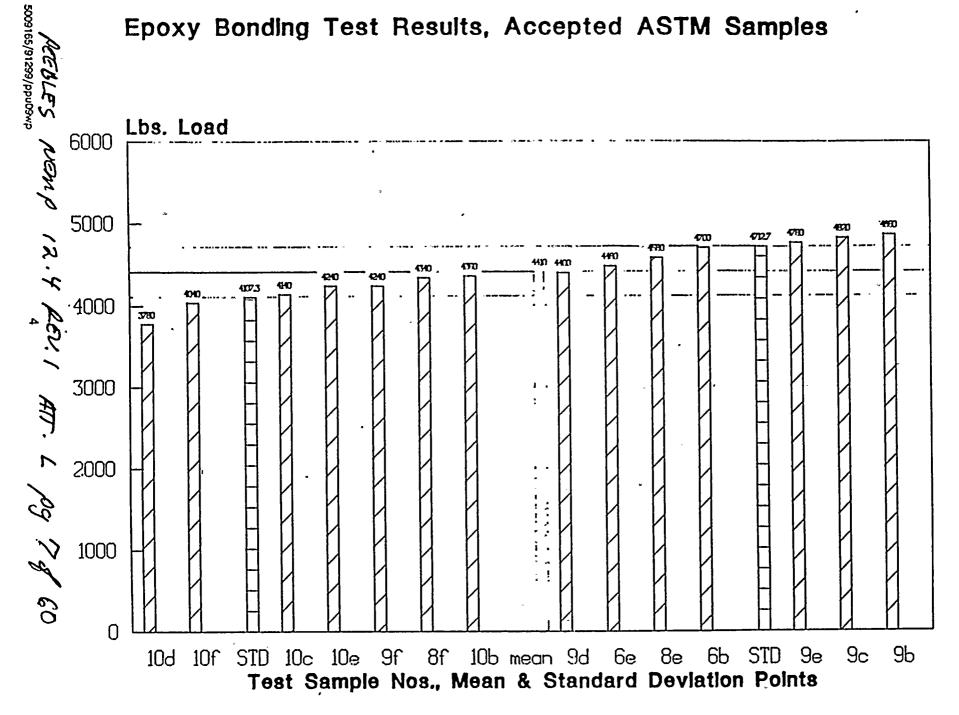
| Test Specimen | Sq. In. Area | #T.O. Failure Load (psi) | Calculated Failure For One Square Inch | Epoxy Thickness | *Meets ASTM Dim. Spec. |
|------------------|-----------------|-----------------------------|---|--------------------|---------------------------|
| 6b | .501 | 2,350 | 4,700 psi | .004 in | yes |
| 6c · | .501 | 2,190 | 4,380 psi | .0029 in | no • |
| . 6d | .504 | 2,250 | 4,500 psi | .0028 in | , no |
| 6e | .500 | 2,240 | 4,480 psi | .004 in | yes |
| 6 f | .500 | 2,270 | 4,540 psi | .0039 in | no |
| 7b | .500 | 2,380 | 4,760 psi | .0024 in | · no |
| 7c , | .515 | 2,600 | 5,200 psi | .0026 in | no |
| - 7d | .503 | 2,580 | 5,160 psi | .0025 in | no |
| 7e | .500 | 2,550 | 5,100 psi | .0021 in | no |
| 7f | .505 | 2,580 | 5,160 psi | .002 in | no |
| 8b | .499 | 2,300 | 4,600 psi | .0031 in | no |
| 8c | .503 | 2,270 | 4,540 psi | .0012 in | no . |
| 8d | .503 | 2,230 | 4,460 psi | .0029 in | no |
| 8e | .502 | 2,290 | 4,580 psi | .0 047 in | yes |
| 8f | .502 | 2,170 | 4,340 psi | .0053 in | yes |
| 9b | .501 | 2,430 | 4,860 psi | .0058 in | yes |
| 9c | .503 | 2,410 | 4,820 psi | .0051 in | yes |
| 9 d | .501 | 2,200 | 4,400 psi | .0044 in | yes |
| 9 e | .502 | 2,380 | 4,760 psi | .0052 in | yes |
| 9 f | .499 | 2,120 | 4,240 psi | .0057 in | yes |
| 10b | .505 | 2,180 | 4,360 psl | .0053 in | yes |
| 10c | .505 | 2,070 | 4,140 psi | .005 in | yes |
| 10d | .502 | 1,890 | 3,780 psi | .0053 in | yes |
| 10e | .504 | 2,120 | 4,240 psi | .0056 in | yes |
| 10f | .502 | 2,020 | 4,040 psi | .0052 in | yes |

The epoxy thickness specification is .005 in. ± .001 in.

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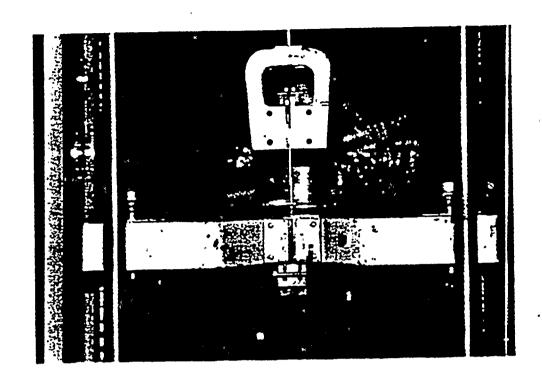
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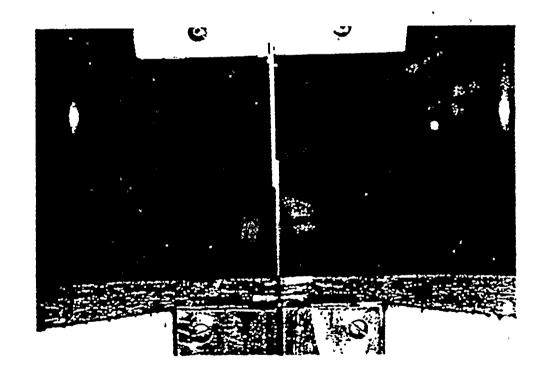


Figure 1
Tensile shear test in progress.

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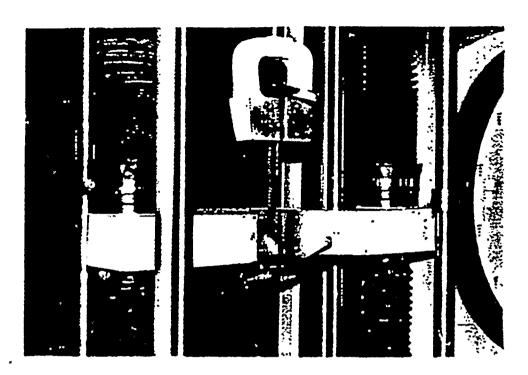
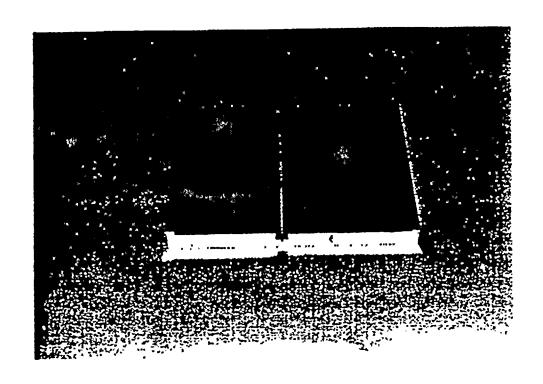




Figure 2
Tensile shear test in progress.

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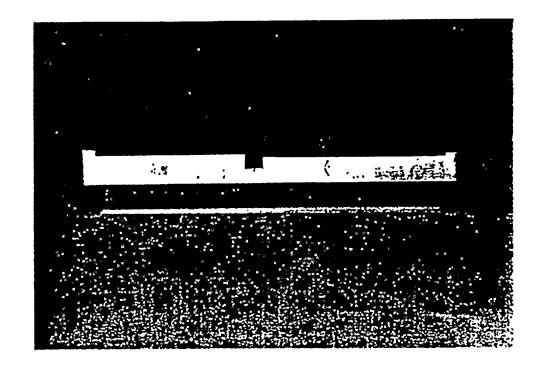


Figure 3
Metal blank lamination fixture.

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Orawing Not To Scale

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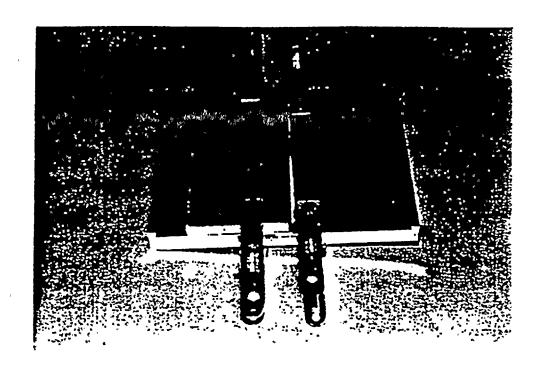
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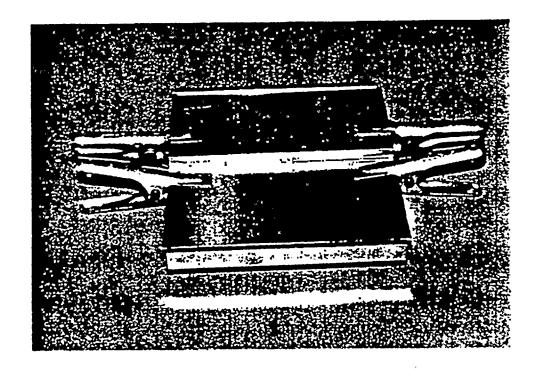


Figure 5
Metal blanks being laminated together in fixture.

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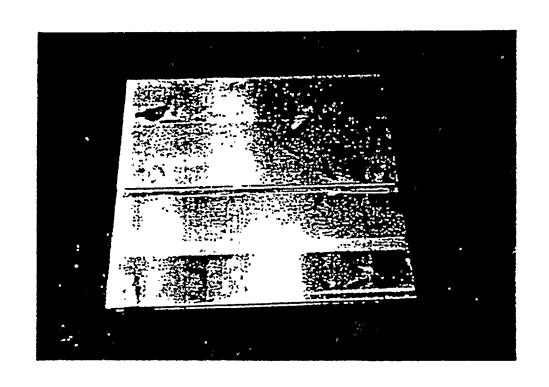


Figure 6

Metal blanks laminated together. Test samples not yet machined.

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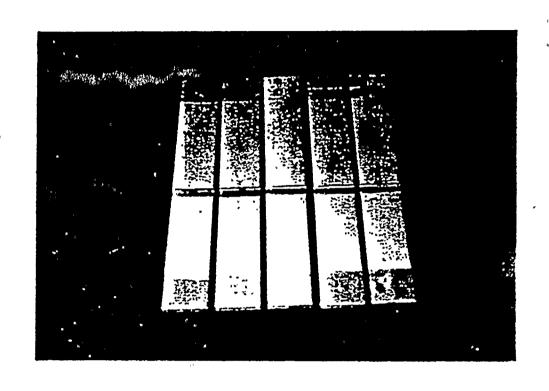
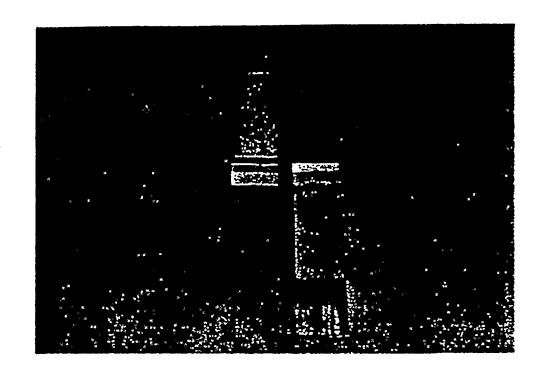


Figure 7
Typical test samples machined

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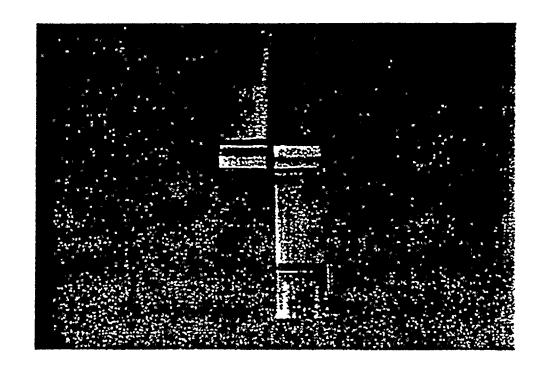


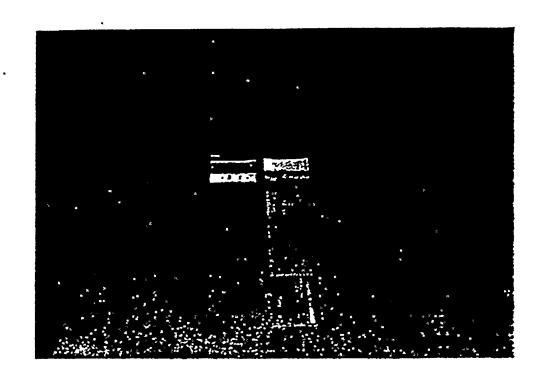
Figure 8

Test samples 6b and 6e after testing.

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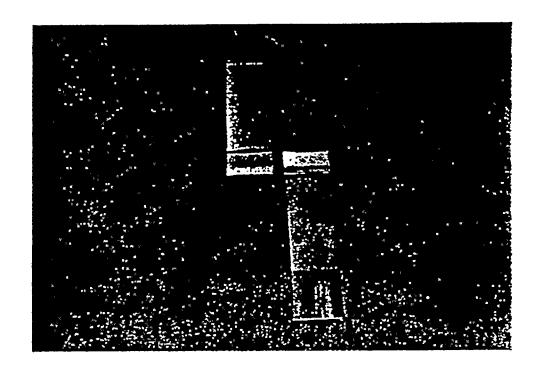
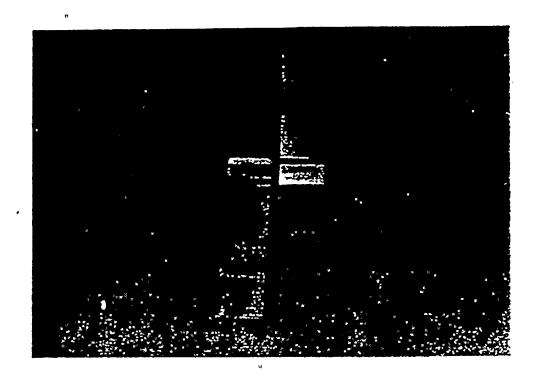


Figure 9
Test samples 8e and 8f after testing.

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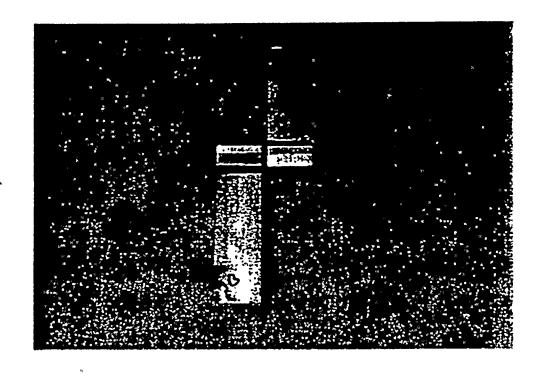


Figure 10
Test Samples 9b and 9c after testing.

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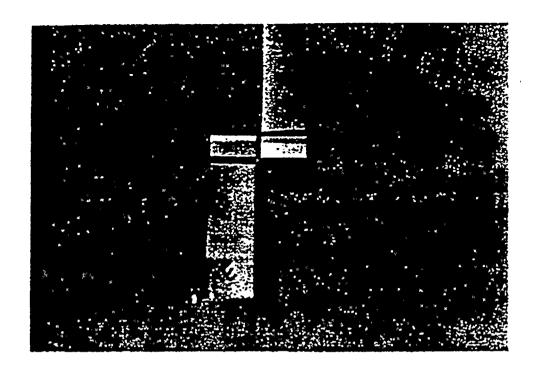
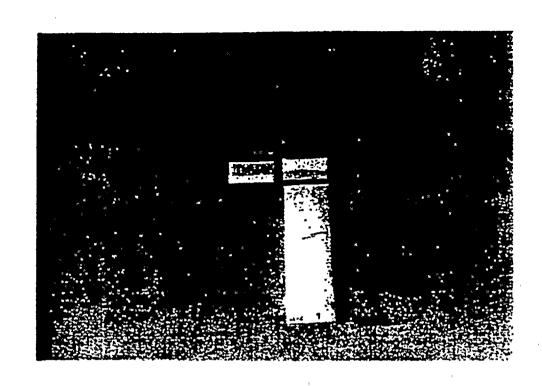




Figure 11 .
Test samples 9d and 9e after testing.

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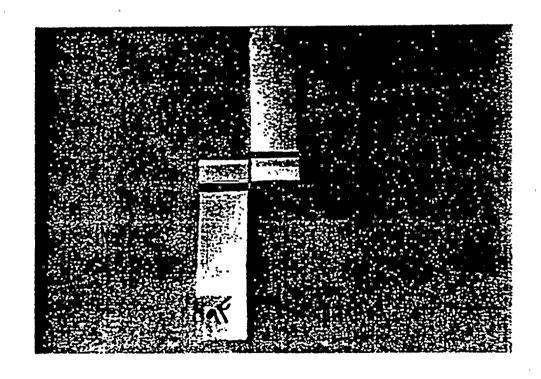
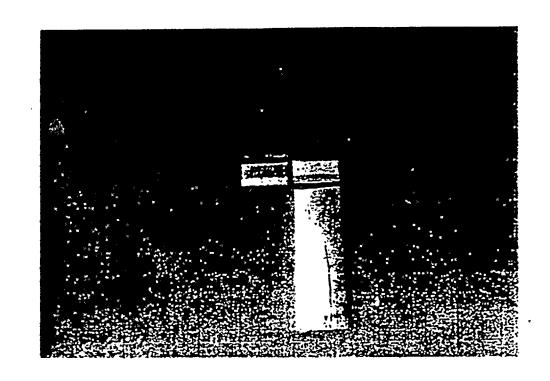


Figure 12 Test samples 9f and 10b after testing.

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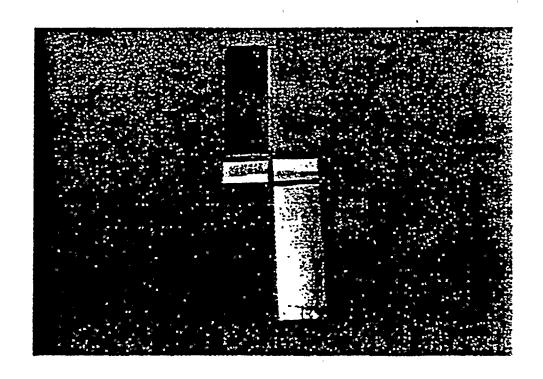
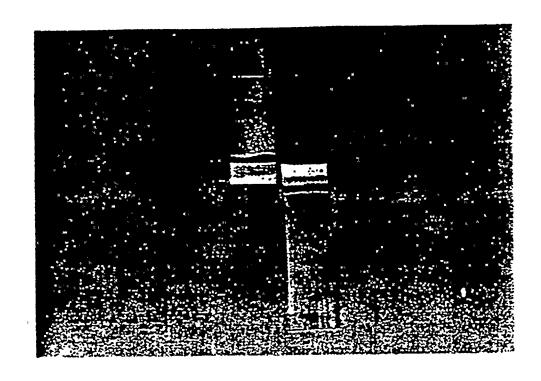


Figure 13
Test samples 10c and 10d after testing.

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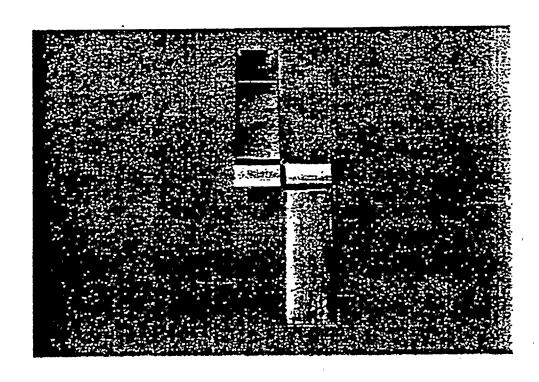
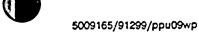


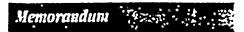
Figure 14
Test samples 10e and 10f after testing.

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Appendix A



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Date:

January 31, 1991

File #:

To:

NUCLEAR OPERATIONS SUPPORT

From:

TECHNICAL & ECOLOGICAL SERVICES

Subject:

Testing of Epoxy Bonding Material (Task ID No. 25)



LAWRENCE F. WOMACK:

Attached per your request is the completed request for Testing of Epoxy Bonding Material (Task ID No. 25) for Diablo Canyon Unit 1.

MICHAEL N. NOREM

MNN(251-5386):vlm 910006.mnn

Attachments

xc: EWalters-333/A7084
DRWolfenberger-TES/San Ramon

ESElliot-TES/San Ramon

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Revision 2
Attachment 7.1
Page 1 of 1



NPG/TES REQUEST FOR NON-RECURRING TASK

164331 ₋ 179824

| | | • |
|--|--|--|
| *** | Initiator | **** |
| Task Title TEST GENERATOR A Nuclear Quality Related: (Yes)No Site/Unit No.: pcff UNIT 2 Component: 2-21-E-GN-DEG 3 | | Date Required 1-25-9/ |
| Description of Requested Work: (IF REQUIRED) AND TENSILE | TEST ADHESIVE | FOR COLOR SPECIFIC GRAVITY GITH PER ATTACHED INFORMATION. |
| Reason for Work/Regulatory Requi of SIXTH DIESEL GENERATO ELECTRIC PRODUCTS EMM | R PURCHASED DC2 - 3372-BK | FROM NEI PEEBLES |
| Specific Work Location: 7ES & Quality Control Requirements [| AN RAMON Routine N |) Specify |
| Handling/Storage Requirements: | NONE. | |
| Progress Report(s) Required: Platory Report(s) Required: Other Special Requirements TEST AST M 0-1002-72 AND M Procedure Sponsor: MOSTEN INTERNATION Prepared by/Extension: FO WALTE *********************************** | PER MORTON IN 10RTON BULLET 10NAL /HST M ERS 3-967? | NTERNATIONAL APTM 40-1285/ |
| Date Received: 1/24/91 | - | ication No.: 25 |
| Assigned Task Leader/Extension:_ | Dale Wolfenberger | 251-5253 |
| Budgeted: Yes/No Div I Task Charge to: 5-000094-0 22 5 | D Acct Sub Ac 1 365 0022 | ct Spec ID M883 |
| ***** | *** TES *** | **** |
| Date Received: 1.29.91 Assigned Task Leader: Dave wo Cost Estimate: 45,500.00 Terms accepted by/extension: E | | Extension: |
| Estimated completion date: 2.2: | 5.91 00 0 | ooner. |

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PG&E File No.:

January 9, 1991

Gene Sullivan, TES, 8-251-5369

From: Ed Walters, NECSME, 415-973-9677

Gene:

To:

Per discussion with Ed Elliott, TES has the capability of doing a tensile test on epoxy adhesive.

The results of this test is to verify that this particular batch of adhesive meets the technical specification for Armstrong A-701, and will be used as part of the evaluation of the sixth diesel generator being purchased from NEI Peebles.

The following information is attached:

Adhesive characteristics and cure time information

Letter to Cox Sales Company requesting the sample.

In the generator assembly, the adhesive is used to hold the coils on the generator rotor in place.

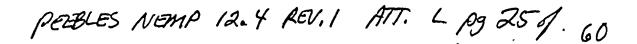
Please perform the following tests:

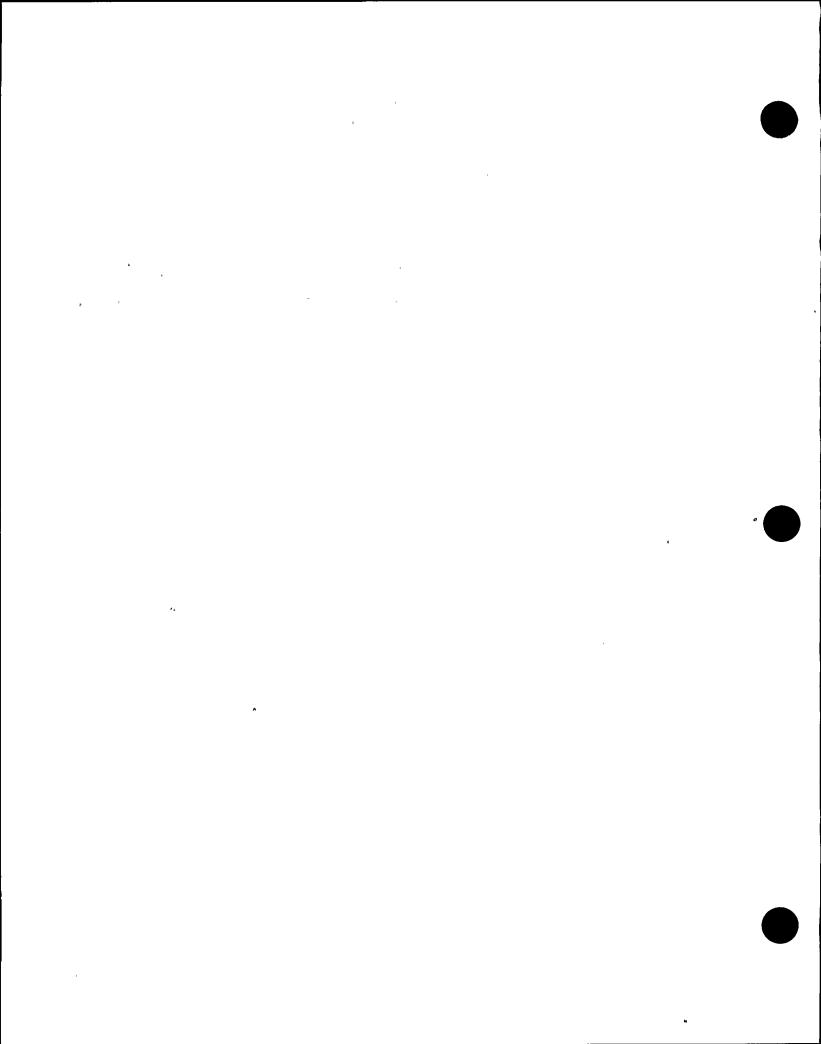
Prior to Cure - specific gravity color

After cure - specific gravity tensile shear strength test

Give me a call if there are any questions. Also, please notify me as soon as the sample arrives. Mr. Cox said he would expedite shipment. If possible, I would like to get a test report by January 23, 1991.

Ed Walters





Appendix B

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Prai Technical and Ecological Services

QUALITY RELATED MATERIALS RECEIPT INSPECTION REPORT

(Instructions for use on back of report)

| 1. | Procurement Information - | | | | | |
|----|--|--|--|--|--|--|
| | Purchase Order No | | | | | |
| | Vendor/Manufacturer | | | | | |
| | tem No. 1991, can of Armstrong A-701 Epony | | | | | |
| | 1 Reich No. 6 A0309 | | | | | |
| | | | | | | |
| | | | | | | |
| 2. | Shipping and Damage Inspection | | | | | |
| | Acceptable Note Damage Under Remarks | | | | | |
| 3. | Hem Inspection | | | | | |
| | A. Inspect each item to the procurement document requirements | | | | | |
| | Acceptable Not Acceptable | | | | | |
| | B. Functional Check Acceptable Not Acceptable Not Applicable | | | | | |
| | List all Discrepancies in "Remarks" | | | | | |
| 4. | Documentation Verification | | | | | |
| | Review documents for each item to the procurement document requirements | | | | | |
| | Acceptable Not Acceptable | | | | | |
| = | List all Discrepancies in *Remarks* | | | | | |
| 5. | Storage and identification | | | | | |
| | is the material and/or equipment tagged or identified and stored properly? | | | | | |
| | If no, explain in "Remarks" Yes No | | | | | |
| 6. | Remarks (attach additional sheets if necessary) The eyery has an | | | | | |
| | expiration Daye of Oct. 1991 | | | | | |
| | | | | | | |
| | | | | | | |
| | Attachments:YesNo | | | | | |

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Prefi Technical and Ecological Services

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Page 2

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| | 6.1 Conditional Release Conditionally released to customer per customer request. Describe Condition: | | | | |
|--------------------------------------|--|--|--|--|--|
| | | | · Date | | |
| 7. | Storage Maintenan Is preventive mainte | ce Scheduling nance required during storag | e? Yes No | | |
| 8. | Inspection Certifica | ation | | | |
| A. The following rejected. ttem No. | | Storage Location | Disposition and/or Problem or Nonconformance Report Number | | |
| | B. The following Iter for Installation ar | | celpt inspection requirements and are acceptable | | |
| | tem No. | Quantity 2 | Storage Location ORW'S Cubine T | | |
| 9. | Shipping and Dama | ge Inspection By: | Dally Lynn 2-1-9/ Signature Date | | |
| 10. | ftem inspection and | Document Verification By: | Odbworklega 2-1-91 Signature Date | | |
| 11. | 11. Review and Approval By: Signature 3/5/9/ Date | | | | |

PEEBLES NEMP 12.4 REV. 1 ATT. L pg 28 of 60

А i . e L

Cox Sales Company

341 RESERVE AVENUE, S. W. ROANOKE, VIRGINIA 24016 (703) 345-2636 OR (703) 989-6777

FAX 703-342-8664

CERTIFICATION

The material furnished on this order was manufactured in accordance with standard production specifications. Production records for each lot are on file with the Morton International manufacturer who is

George W. Cóx, Jr.

Order Number:

16651

Company Name: Pacific Gas & Electric Company

Product Name or Number:

A-701

Batch Number: GA0309

Manufacturing Date:

October 1990

Expiration'Date:

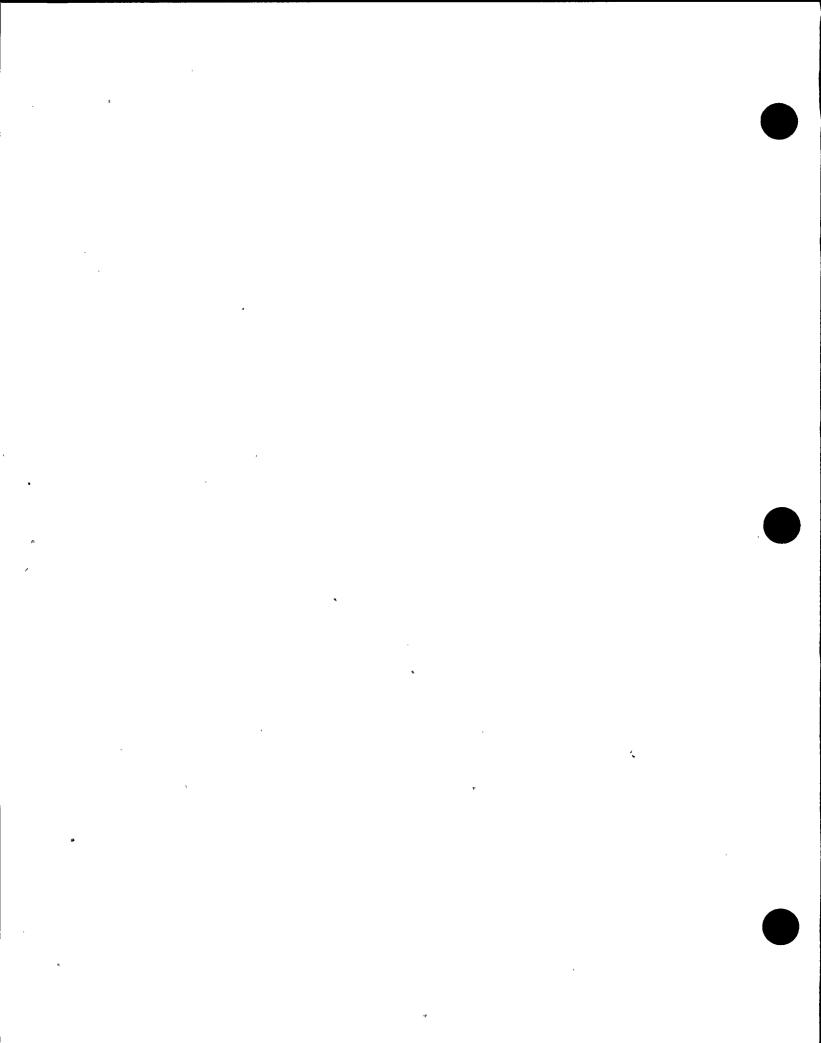
October 1991

Specification: NEI SPEC MV-20.9

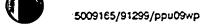
Important notice to the Purchaser: Cox Sales Company's only obligation shall be to replace such quantity of the product if proved to be defective. User shall determine the suitability of the product for his intended use and assume all risk and liability in connection herewith.

Cox Sales Company

PEEBLES NEMP 12.4 REV. 1 ATT. L Pg 29 of 60



Appendix C



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DEC 23 '92 16:23 NEI P-EP



product data

Armstrong Products Company

Warsaw, Indiana 48580/(219) 267-3226

ARMSTRONG A-701 and A-702 EPOXY ADHESIVES

BENERAL DESCRIPTION: Armstrong A-701 and A-702 are ene-component apoxy achieves which are sured by The application of heat above 350°F. These achesives are recommended where elevated "in service" semperatural are encountered. A:701 and A:702 are suitable for bending more metals, seremics, plettics, etc., not effected by the sure temperatures. Both adhesives offer good chamical resistance. A-701 contains fillers of the least exide type, permitting applications where good electrical resistance is required. A-702 is unfilled and can be used as a viscosity control for

Pical Physical Properties

| | A-701 | A.702** |
|---------------------------|-------------|--------------------|
| Viscosity & 77°F. (polse) | 2800 - 5000 | 180 - 260 |
| Specific Gravity | 1.50 - 1.80 | 1.15 • 1.20 |
| Colo: | Light Grey | Amber to Off-White |
| \$helf Life (CBBPF.) | Months | 6 Months |

typical physical properties of cured bystems*

| | | A-701 | A-702 |
|------------------------------|---|------------|----------------|
| Specific Gravity | | 1.55 | 1.17 |
| Tensile Shes: Strength (psi) | | | • |
| € -80°F. | | 3000 | 3000 |
| € 77ºF. | | 2500 | 2600 |
| € 180°F. | | 2500 | 4100 |
| € 278°F. | | 3500 | . 4000 |
| ● \$20°F. | | 2600 | 2300 |
| € \$50°F. | | 1200 | ⊕≎ 0 ° |
| ● 400°F. | | 600 | ` \$6 0 |
| Bond Strength (psi) | | 2500 | 170 0 |
| Ciesvege (psi) | • | 2500 | 8300 |

*Curec 1 hour at 400°F.

**A.702 Avellable/Special Cuptation Univ.

epi classification is

POR INDUSTRIAL USE ONLY! WARNING! Blay soun injury to skin following prolonged or reported equiper. Prevent prolonged or frequent skin contact. If contact occurs, wash at first apportunity with soap and water. AVOID ICONTACT WITH EYES. In case of contact, immediately fluth eyes with planty of water for at least 15 minutes. Get medical attention, MARMFUL IF SWALLOWED. KEEP OUT OF REACH OF CHILDREN.

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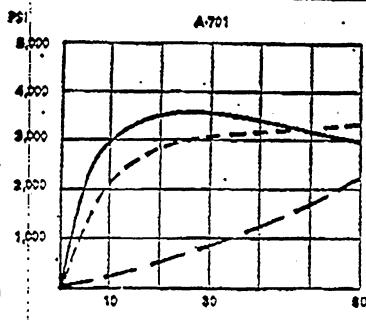
auguested cure schedules for Armstrong A-701 & A-702

| Elevated Temparatura | A-701 | A-702 | |
|----------------------|----------------------|--------------------|--|
| Optimum Cure | 2 hrs. @ 400°F. | 2 hrs. • 400°F. | |
| Fat Cure* . | - 10 mins. ♥ \$00°F. | 10 mins. • \$00°F. | |

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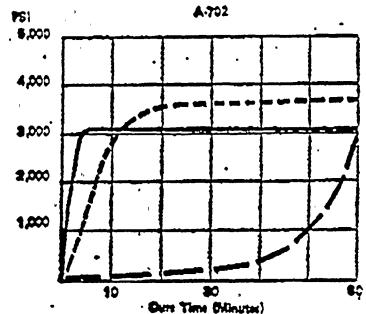
*Cure required to develop handling strangth, Refer to cure schedule surves below for sure schedule most suitable for your application.

CURE SCHEDULE CURVES FOR A-701 & A-702 Sered on Tentle Shart Strength Tests at 77°F. (AL./AL.)



Cure Time (Minutes)

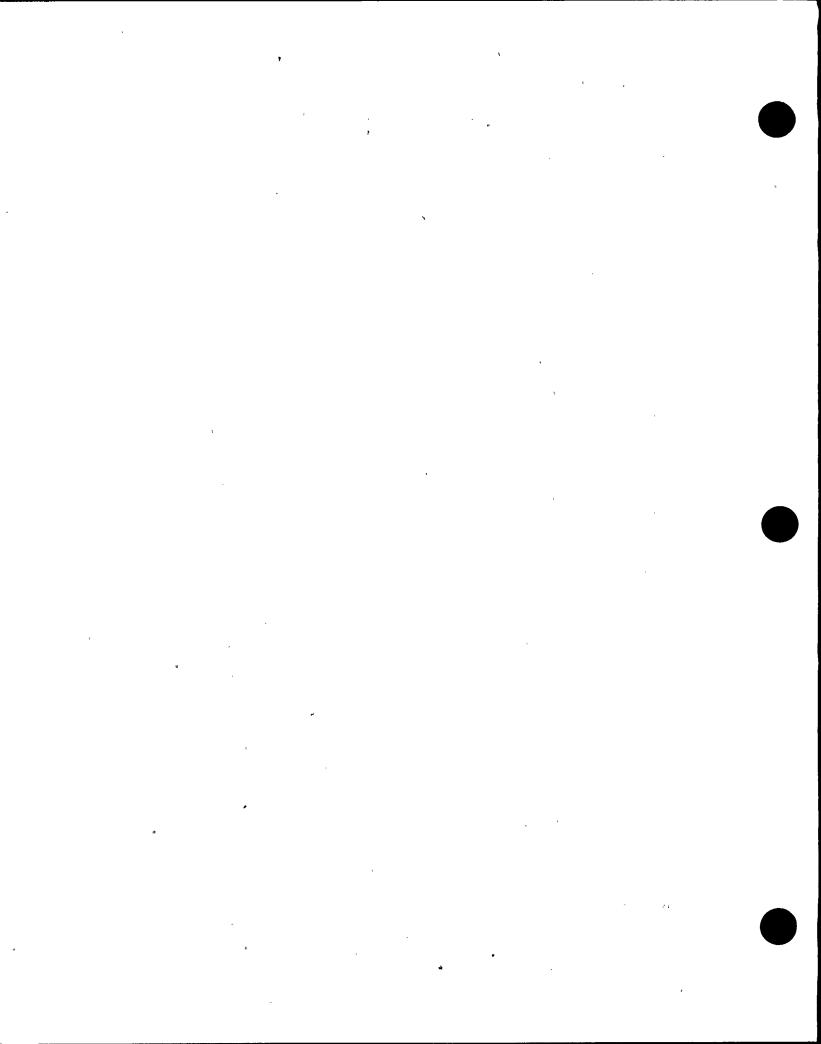
800°F. (Give Line Temp.) 400°F. (Give Line Temp.) 350°F. (Give Line Temp.)



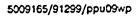
ENSTRUCTIONS:

- 1. Surfaces to be bonded should be clean end dry. For critical applications rater to our suggested surface properation arroadures—Bulletin No. 884.
- 2. Bur the A-701 or A-702 well before use. Avoid introduction of excess air.
- 3. Apply the adhesive to surfaces to be bonded (preferably both surfaces) and press together. Light clamping may be assed to keep parts in position during curing.

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Appendix D



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MORTON THIOKOL, INC.

Armstrong Products Company

APTM #40-1285 Tensile Shear Strength (ASTM D-1002 Modified)

1.0 Scope

1.1 This method is intended for determining the comparatiove strengths of adhesives when tested on a specimen made under a specific set of conditions.

2.0 Apparatus

- 2.1 The testing machine must be capable of maintaining a rate of loading of 200 to 700 lbs. per minute (0.05 inches per minute crosshead travel).
- 2.2 Temperature controlled oven (forced air).
- 2.3 Ultra Sonic Bath
- 2.4 Shear Specimen Jig calibrated for 1/2" overlap.
- 2.5 Fixture for cleaning and/or etching of 1 x 4 inch aluminum coupons
- 2.6 Wooden, spring loaded clothes pins or other suitable clamping device
- 2.7 Temperature controlled water bath capable of temperatures up to 200°F
- 2.8 Beaker of sufficient capacity to accommodate the clean/etch fixture (2.5)
- 2.9 Thermometer 0 to 100°C
- 2.10 Graduated Cylinder
- 2.11 Large Beaker
- 2.12 | Solution Balance or Gram Balance with 1.0 gram accuracy
- 2.13 Timer
- 2.14 Desiccator with desiccant

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3.0 Reagents

- 3.1 Sodium dichromate crystals
- 3.2 Sulphuric Acid 96%

Done by Rich

- 4.0 Test Coupon Surface Preparation Aluminum
 - 4.1 For standard testing, 1" x 4" x 0.054" (± .003") Aluminum 2024-T3 should be used. Other alloys may be used, if so requested by a customer.
 - 4.2 If necessary, degrease the 1" x 4" coupons, using MEK or methylene chloride.
 - 4.3 Place the $1'' \times 4''$ coupons in the holding fixture (2.5).
 - Wear eye protection when handling the acid etch solution. See 7.0 for preparation of etch solution.
 - 4.5 Transfer the holding fixture containing the 1" x 4" coupons, intact, to a beaker. Carefully add enough of the acid etch solution to cover at least the bottom 1 inch of the aluminum coupons.
 - 4.6 Place the beaker and assembly in the water bath (temperature set at 80°C ± 2°C). Monitor the temperature of the acid etch solution with a thermometer. Once the acid etch solution reaches 65°C, set the timer for 8 minutes.
 - 4.7 Monitor the temperature of the acid etch during the 8 minutes. The temperature should not exceed 70°C.
 - 4.8 When the etch cycle is complete, remove the beaker and assembly from the water bath and place it in a sink and position it under the faucet.
 - 4.9 VERY CAREFULLY open the faucet (to avoid splashing) and allow the coupons to rinse for at least 5 minutes. A thorough rinse is essential. Any residual acid on the test coupons will seriously affect the test results.
 - 4.10 The rinsed test coupons must be dried with a clean lint free rag or paper towel or high pressure filtered air. AT NO TIME TOUCH THE ETCH PORTION OF THE TEST COUPON WITH THE FINGERS. THE ONLY CONTACT PERMISSIBLE IS WITH THE LINT FREE RAC OR THE PAPER TOWEL.
 - 4.11 Place the dry coupons in a desiccator, to protect them from contamination and oxidation of the etched area. Etched coupons should be used the same day they are prepared.

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- 5.0 Test Coupon Surface Preparation Steel
 - 5.1 Degrease the steel coupon
 - 5.2 Sandblast or abrade (use medium grit paper) the test area of the steel coupon.
 - 5.3 Degrease again and dry. Use the coupons as soon after preparation as possible.
- 6.0 Test Specimen Preparation Other
 - 6.1 Refer to APCO Bulletin 964 for recommended surface preparation procedures.
- 7.0 Acid Etch Solution Preparation Dane by Rich.
 - 7.1 WEAR EYE PROTECTION. YOU ARE WORKING WITH DANGEROUS CHEMICALS.
 - 7.2 Recipe

10 parts by weight Sodium Dichromate 30 parts by weight Sulfuric Acid 96% 100 parts by weight Distilled Water

- 7.2.1 Measure out about one half of the water into a suitable beaker. Add all of the sodium dichromate and stir until it is dissolved.
- 7.2.2 Continue stirring the mixture and CAREFULLY add the sulfuric acid. (Some heat will be generated).
- 7.2.3 Add the remainder of the water and stir until thoroughly mixed.
- 7.2.4 Transfer to a clean glass of Polyethylene jub, seal and label as follows:

CAUTION: ACID ETCH SOLUTION. WEAR EYE PROTECTION AT ALL TIMES WHEN USING.

| Date Made | • | |
|---|--------------------|---|
| Initials of Technician | • | |
| if accidental contact occurs, for several minutes and see | , flush with water | v |

- 8.0 Test Specimen: Preparation
 - 8.1 Mix the adhesive as instructed.
 - 8.2 Apply the mixed adhesive to the bottom 3/4 inch, and on one side, of the prepared area of two coupons. At least 3 test specimens are required for each test or as required by customer specification.

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- 8.0 Test Specimen Preparation (continued)
 - 8.3 Position the coupons and adhesive in the shear specimen jlg so that the coated surface of each are face to face, and clamp together. This will create the 1/2" overlap required. See Figure 1.

| <u> </u> | 4" | PECIMEN DIMENSION | ns —adhesivE Th | ickuess .OOS É |
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| | | ا د " دِرُانا . کمر | ear Area | - |
| Area/ in test 6-105 | | | | Area Instest |
| 1" | 21;" | 1/2" | 91/2" | 1 1" |

FIGURE 1

- 8.4 Remove the clamped specimen and identify. WIPE AWAY ALL EXCESS ADHESIVE FROM THE BOND AREA.
- 8.5 Cure the tensile shear specimens as required by the product specification or customer specification.

NOTE: Oven position during the cure of tensile shear specimens is very important. It is best to place the specimens at the same level as the thermostat which controls the oven temperature. NEVER PLACE THE SPECIMENS AT THE BOTTOM OF THE OVEN OR TOO NEAR ITS DOOR. Start the time when oven reaches cure temperature.

8.6 At the end of the cure cycle, remove the test specimens from the oven. Allow the specimens to cool to room temperature (75°F ± 3°F). The specimens should remain at room temperature for at least one hour before testing. The specimens must be allowed to cool naturally. They are NOT to be quenched.

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9.0 Test Procedures

- 9.1 Clamp the cooled test specimen in the jaws of the testing machine. The jaws should grip each end of the test specimen. The grip bit should be not over 1 inch to minimize undesirable cleavage forces on the bond area. (See Figure 1).
- 9.2 Activate the test machine and monitor the load. The break point in pounds must be recorded. Crosshead speed must be 0.05 inches/min.

10.0 Calculation

10.1 All falling loads are expressed in pounds per square inch of shear area. Calculate to the nearest 0.01 square inch. (The average of at least 3 test specimens).

11.0 Report

11.1 All pertinent information must be entered on the manufacturing work order for each lot of adhesive made. Pertinent data includes test results, lot numbers of all adhesive materials used, technicians initials and date. All pertinent data are to be entered in blue or black ink, not pencil or other colored inks.

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Morton International

Specialty Chemicals Group

179824 Industrial Adhesives

RECOMMENDED SURFACE PREPARATION PROCEDURES FOR BONDING

The following surface treatments are recommended for preparing various materials for bonding with Armstrong epoxy adhesives, in general, three (3) steps are necessary for cleaning any surface:

- 1. Degressing
- 2. Chemical etching or mechanical abrading

For precious metals and jewels, degreesing will generally be entirely satisfactory. with the possible exception of silver where the tamish should be removed with medium-grit emery paper. A stabilized Trichlorethylene vapor phase degreaser is recommended.

Most plastic parts will have residual mold release or wax on the surface: before bonding, this should be removed with a suitable solvent-such as Methyl Ethyl Ketone or Acetone-and then abraded. lightly. with a medium-grit emery paper.

When mechanically abrading, we recommend the use of medium-grit blesting. It is essential, when parts are grit or sandblasted, that they be degressed again before bonding.

in all cases, parts should be bonded as soon as possible after pre-treatment. If bonding must be delayed, we recommend that the parts be covered with a light tissue paper and stored in a non-contaminating, dry atmosphere.

Following are several chemical pre-treating formulas recommended for the most common adherends. For additional information on material not covered herein, please contact our technical department.

ALUMINUM, ALCLAD OR 24ST

- 1. Degresse with a solvent and dry.
- 2. Clean the surface with a chromic acid solution by immersion at 65.70°C. for 5-10 minutes. Prepare the solution es follows:
 - 10 parts/wt. Sodium Dichromate.
 - 30 paris/wt. 96% Súlfuric Acid.
 - 100 parts/wt. distilled water.

(Dissolve the Dichromate in most of COPPER AND ITS ALLOYS (B1955) the water, add Sulfuric Acid, stirring carefully and then add the remaining water.)

- 3. Rinse the metal thoroughly with clear running water and dry well. (If compressed air is used, extreme care should be taken to see that no oil is sprayed on the surface from the compressed air system.)
- 4. For best results, parts should be coated or bonded immediately.

CAST IRON

Degrease. Grit-blast or abrade with emery paper. Degrease again.

CONCRETE (Portland Cement Type)

- 1. Concrete contaminated with oil or grease must first be scrubbed with a caustic solution such as Ammonium Hydroxiae followed by a thorough flushing with water.
- 2. New or old concrete should be prepared for bonding by one of the following methods:
 - (a) Sand-blast about 1/16" from the surfaces to be bonded and remove dust preferably by vacuumcleaner. Where concrete surface has deteriorated, grind or cut down to good material and remove dust.
 - (b) Remove about 1/6" from the surface by mechanical scarification and remove dust.
 - (c) Chemically etch with a 15%, by weight, Hydrochloric Acid solution (1 gallon to every 5 square yards-spread with stiff bristle street brooms) until bubbling subsides (about 15 minutes). Wash with clean water using high pressure hose until all slush Is removed, If an acid condition persists, as indicated by moist litmus paper, a rinse of 1%, by weight, Ammonia solution should be applied followed by a final flush. Allow surface to dry thoroughly.

- 430 parts/volume Sulfuric Acid.
- 72 parts/volume Nitric Acid.
- 490 parts/volume water.

Procedure: Dip 15 seconds in above solution, rinse in running tap water (25°C.) five seconds, dip in 15% (volume) Hydro-chloric Acid, followed by a 2-minute rinse in running tap water (25°C.).

The following formula may be used:

- 8.0 parts/wt. Ferric Chloride solution.
- 16.3 parts/wt. Nitric Acid.
- 75.7 parts/wt. water.

immerse the parts 1-2 minutes at room temperature, followed by a thorough water rinse and air dry at 60-65°C.

DIALLYL PHTHALATE

Degrease with a rag containing Acetone or M.E.K. Abrade the surface with mediumgrit emery paper. Degrease again with Acetone or M.E.K.

GALVANIZED OR ZINC FINISHED METALS Degrease. Abrade with medium-grit emery paper. Degrease again or use the following etching procedure:

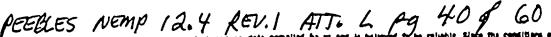
- 20 parts/wt. concentrated Hydrochloric Acid.
- 80 parts/wt. distilled water.

Treat as follows:

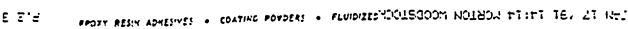
- 1. Degrease.
- 2. Immerse the metal in the Hydrochloric Acid for 2-4 minutes at room temp.
- 3. Rinse in cold running, distilled or de-ionized water.
- 4. Dry in an oven for 20-30 minutes at 60-70°C.
- 5. Apply adhesive as soon as possible.

CLARS

For normal bonding applications, degreasing alone is sufficient for pre-treating glass surfaces, If, however, the very optimum in strength is required, the glass can be grit-blasted with very fine grit until the surface appears frosted.



The information contained herein is based on data complied by us one is believed to be reliable. Since the conditions of ac-SHEETING SHE ASE OF ON BARCOLE SEE SECOND ON COURSE, SO MOUSELY IS STREETING OF MOUNTS FROM THE COMMISSION OF THE PROPERTY OF matter, the results to be estained from the use thereof, or the use of the products, or that such use will set therings ony patters. metroms the tradition or an experience that the second of the part will make your own tests to determine the settablists of the products for your perticular ase.



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LEAD

Degresse. Abrade with medium-grit emery paper. Degresse again.

LEATHER

Degreese with a rag containing Acetone or M.E.K. Roughen with sandpaper. Degrease again.

MAGNESIUM AND ITS ALLOYS

- 1. Vapor degrease with stablized Trichlorethylene.
- 2. Immerse in 10% Sodium Hydroxide for 10 minutes at 76-87°C.
- 3. Rinse 5 minutes in a cold water spray.
- Immerse in a solution of 1½ lbs. Chromic Acid, ¼ lb. Sodium Nitrate in 1 gallon of water for 8 minutes at room temperature.
- 5. Rinse approximately 3 minutes.
- Immerse in a 20% solution of Hydroflucric Acid for 5 minutes at room temperature.
- 7. Rinse 1/2-1 minute.
- Immerse in a boiling solution of Sodium Dichromate 10-15%, and Calcium Fluoride 0.15% for 30 minutes.
- 9. Rinse 1-2 minutes
- 10. Dry in a hot air blast (71-96°C.) for 10 minutes.
- 11. Bond immediately or apply a Zinc primer for protection of freshly etched surfaces.

SILICONE STEEL

8.0 parts/wt. Hydrophioric Acid

7.8 parts/wt. Sulfuric Acid

84.2 parts/wt. Nitric Acid

The parts should be immersed in the above solution (maintained at 70-75°C.) for 10-20 minutes, then rinsed with water at room temperature and brushed with a soap solution to mechanically remove scale loosened by the chemical bath. A hot water rinse (70-75°C.) followed by a hot air dry (70-75°C.) completes the preparation.

STAINLESS STEEL

- 1. Degrezse.
- 2. Etch for 10 minutes at 65-68°C. in a solution containing:

90 perts/wt. water.

- 37 parts/vit. 96% Sulfuric Acid.
- 0.2 parts/wt. Nacconol NR (National Aniline)
- 3. Rinse in tap water or distilled water.
- 4. Immerse for 10 minutes at room

temperature in a water solution containing:

88 parts/wt. water.

15 parts/wt. concentrated Nitric Acid.

2 parts/wt. Hydrofiuoric Acid. -

5. Rinse in distilled water and dry in a 95°C. oven.

TEFLON

Formulas for etching solutions are available: however, because of the danger in the preparation and use of these materials, we recommend that you buy proprietary materials available from the companies fisted below:

W. L. Gore Associates 487 Paper Mill Road Newark, Delaware (Tetraetch)

Acton Associates 1180 Raymond Blvd. Newark 2, New Jersey (Fluoroetch) -

Joslin Manufacturing Co. 15 Lufbery Avenue Wallingford, Conn. (Fluorobond)

W. S. Shamban & Co. 11617 W. Jefferson Blvd. Sulver City, California (Bondaid)

Tellon and other fluorocarbon plastics are available in bondable form from many suppliers.

PHENOLIC RESINS. POLYESTER RESINS. POLYURETHANE RESINS

Degresse with a rag containing Acetone or M.E.K. Abrase with medium-grit emery paper. Degresse again.

CHLORINATED POLYETHER (Penton). POLYETHYLENE, POLYPROPYLENE, POLYFORMALDEHYDE (Delrin)

Either of the following formulas may be used for these plastics:

- 10 parts/wt. Potassium Dichromate.
- 20 parts/wt. distilled water.
- 320 carts/wt. Sulfuric Acid concentrated.
- 15 parts/wt. Sodium Dichromate
- 24 parts/wt. distilled water.
- 300 parts/wt. concentrated Sulfuric Acid.

Prepare as follows: Dissolve the Sodium Dichromate or Potassium Dichromate in water and add the Sulfuric Acid carefully, with constant stirring.

Treat as follows:

- 1. Degreese with a rag containing Acetone or M.E.K.
- 2. Immerse in the Chromic Acid as follows:

Polyether (chlorinated) 5-10 mins. at 65-70°C.

Polyethylene & Polypropylene*
60-90 mins, at Room Temp,
OR 1-2 mins, at 65-70°C

Polyformaldehyde 10-20 secs. at Room Temp.

- 3. Rinse thoroughly with cold running, distilled or de-ionized water.
- 4. Air dry

*25-50% longer times may be required for etching high density polyethylene and polypropylane.

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RUBBER

Surface etching of rubber is recommended for maximum bond strength, A satisfactory bonding surface can be obtained by using the following cyclizing technique:

Immerse the rubber in concentrated Sulfuric Acid (sp. gr. 1.84) for 5-10 minutes in the case of natural rubber and 10-15 minutes in the case of synthetic rubber. Many rubbers are very acid resistant and will require longer cyclizing times to reach a point where the rubber will have fine cracks when flexed.

Alternatively, a paste of concentrated Sulfuric Acid and Barytes can be used. The paste is made by adding Barytes to the acid to give a consistency which will not run. After washing thoroughly with water and drying, the brittle surface of the rubber should be broken by flexing so that a finely cracked surface is produced. It caustic solution to insure neutralization of residual acid which, if not removed, will consume some of the curing agent, weakening the bond strength. The surface is then ready for application of the adhesive.

TIN

Degresse. Abrade with medium-grit emery paper. Degresse again.

MUINATIT

In general, an acid etch is the most effective surface treatment for titanium. Anodizing in 15% Sulfuric Acid or etching in tot Sulfuric Acid solution followed by Cleaning in Alkanex detergent-sodium metasilicate solution produces good results. Still better results are obtained if the titanium surface is first plated with a metal such as aluminum or nickel.

WOOD

Remove any contaminating materials such as oil, rot. etc., with a sander, ax, or plane. Make certain the wood is dry. Smooth with sandpaper.



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A ACTION AND THE PROPERTY OF THE PROPERTY OF

Standard Test Method for Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)1

This standard is issued under the fixed designation D 1002; the number immediately following the designation indicates the year of critical adoption or, in the case of revision, the year of last revision, A number in parentheses indicates the year of last reapproval. A superscript epsilon (a) indicates an editorial change since the last revision or reapproval.

This method has been approved for use by agencies of the Department of Defense to replace methods 1032 and 1032.1T of Federal Test Method Standard No. 175a and for listing in the DoD Index of Specifications and Standards.

The accuracy of the results of strength tests of adhesive bonds will depend on the conditions under which the bonding process is carried out. Unless otherwise agreed upon by the manufacturer and the purchaser, the bonding conditions shall be prescribed by the manufacturer of the adhesive. In order to ensure that complete information is available to the individual conducting the tests, the manufacturer of the adhesive shall furnish numerical values and other specific information for each of the following variables:

(1) Procedure for preparation of surfaces prior to application of the adhesive, the cleaning and drying of metal surfaces, and special surface treatments such as sanding that are not specifically limited by the pertinent test method.

(2) Complete mixing directions for the adhesive.

(3) Conditions for application of the adhesive, including the rate of spread or thickness of film, number of coats to be applied, whether to be applied to one or both surfaces, and the conditions of drying where more than one coat is required.

(4) Assembly conditions before application of pressure, including the room temperature,

relative humidity, length of time, and whether open or closed assembly is to be used.

(5) Curing conditions, including the amount of pressure to be applied, the length of time under pressure, method of applying pressure (pressure bag, press platens, etc.), heat-up rate, and the temperature of the assembly when under pressure. It should be stated whether this temperature is that of the bondline or of the atmosphere at which the assembly is to be maintained.

(6) Conditioning procedure before testing, unless a standard procedure is specified, including

the length of time, temperature, and relative humidity.

A range may be prescribed for any variable by the manufacturer of the adhesive if it can be assumed by the test operator that any arbitrarily chosen value within such a range or any combination of such values for several variables will be acceptable to both the manufacturer and the purchaser of the adhesive.

1. Scope

1.1 This test method covers the determination of the comparative shear strengths of adhesives for bonding metals when tested on a standard specimen and under specified

conditions of preparation and test.

1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and exablish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Apparatus

2.1 The testing machine shall conform to the requirements of ASTM Methods E4, Verification of Testing

Machines. The testing machine shall be so selected that the breaking load of the specimens falls between 15 and 85 percent of the full-scale capacity. The machine shall be capable of maintaining a rate of loading of 80 to 100 kg/cm² 41200_to "1400 psi)/min, of, If the rate is dependent on acrosshead motion, the machine should be set to approach this rate of loading. It shall be provided with a suitable pair of self-aligning grips to hold the specimen. It is recommended that the jaws of these grips shall engage the outer 25 mm (1 in.) of each end of the test specimen firmly (Note 1). The grips and attachments shall be so constructed that they will move into alignment with the test specimen as soon as the load is applied, so that the long axis of the test specimen will coincide with the direction of the applied pull through the center line of the grip assembly.

Note 1-The length of overlap of the specimen may be varied where necessary. The length of the specimen in the jaws, however, must not be varied. The distance from the end of the lap to the end of the jaws should be 63 mm (21/2 in.) in all tests.

Current edition approved July 28, 1972, Published October 1972, Originally Deblished as D 1002 - 49 T. Last previous edition D 1002 - 64 (1970).

P9 421

This test method is under the jurisdiction of ASTM Committee D-14 on Adherives and is the direct responsibility of Subcommittee D14.80 on Metal Bonding Adhesives.

² Annual Breik of ASTM Standards, Vol 03.01.

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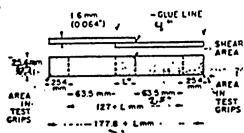


FIG. 1 Form and Dimensions of Test Specimen

3. Test Specimens

3.1 Test specimens shall conform to the form and dimensions shown in Fig. 1. These shall be cut from test panels prepared as prescribed in Section 4. The recommended mickness of the sheets is 1.62 ± 0.125 mm (0.064 ± 0.005) m.). The recommended Ength of overlap for most metals of 1.62 mm (0.064 in.) in thickness is 12.7 ± 0.25 mm (0.5 ± 0.01) in.).

Note 2—Since it is undesirable to exceed the yield point of the metal in tension during test, the permissible length of overlap in the specimen will vary with the thickness and type of metal, and on the general level of strength of the adhesive being investigated. The maximum permissible length may be computed from the following relationship:

$$L = F(v)t/\tau$$

where:

L = length of overlap, in., • 5

t = thickness of metal, in., ••••

Fly = yield point of metal (or the stress at proportional limit), psi, and

150 percent of the estimated average shear strength in adhesive bond, psi.

Note 3—A variation in thickness of the metal, and the length of overlap, will likely influence the test values and make direct comparison of data questionable. For this reason, in comparative or specification tests, the thickness should preferably be 1.62 ± 0.125 mm $(0.064 \pm 0.005$ in.) and the length of overlap should preferably be 12.7 ± 0.25 mm $(0.5 \pm 0.01$ in.), or not in excess of the value computed in Note 2. For development tests values could be different, but should then be constant.

3.2 The following grades of metal are recommended for the test specimens:

| Metal | ASTM Designation A |
|---------------------------|------------------------------|
| Brass | B 36, Alloy 8 |
| Copper | B 152, Type A |
| Aluminum ' | B 209, Alloy 2024, T3 temper |
| Steel | A 109, Grade 2 |
| Corrosion-resisting steel | A 167, Type 302 |
| Titanium | B 265 |

A These designations refer to the following specifications of the American Society for Testing and Materials:

B 36, for Brass Plate, Sheet, Strip, and Rolled Bar,3

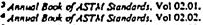
B 152, for Copper Sheet, Strip, Plate, and Rolled Bar,3

B 209, for Aluminum and Aluminum-Alloy Sheet and Plate

A 109, for Cold-Rolled Carbon Steel Strip.

A 167, for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip, and

B 265, for Titanium and Titanium Alloy Strip, Sheet, and Plate⁶



⁹ Annual Book of ASTM Standards, Vol 01.03.

*Annual Book of ASTM Standards, Vol 02.04.

3.3 At least 30 specimens shall be tested, representing a least four different joints. However, if statistical analysis of data and variance is employed, it should be possible reduce this number.

4. Preparation of Test Joints

4.1 It is recommended that test specimens be made up in multiples of at least five specimens, and then cut into individual test specimens (Note 4), Figs. 2 and 3. Cut sheet of the metals prescribed in 3.1 and 3.2 to suitable size. All edges of the metal panels and specimens which will be within (or which will bound) the lap joints shall be machined true (without burns or bevels and at right angles to faces) and smooth (rms 160 max) before the panels are surface-treated and bonded. Clean and dry the sheets carefully, according to the procedure prescribed by the manufacturer of the adhesive, and assemble in pairs. Prepare and apply the adhesive according to the recommendations of the manufacturer of the adhesive. Apply the adhesive to a sufficient length in the area across the end of one or both metal sheets so that the adhesive will cover a space approximately 6 mm (\(\frac{1}{2}\) in.) longer than the overlap as selected in Section 3. Assemble the sheets so that they will be held rigidly so that the length of the overlap will be controlled, as indicated in Section 3, within 0.25 mm (±0.01 in.), and the adhesive allowed to cure as prescribed by the manufacturer of the adhesive.

Note 4—Bonding specimens in multiple panels is believed to give more representative specimens. However, individual specimens may be prepared if agreeable to the supplier or the purchaser of the adhesive.

5. Preparation of Test Specimens

5.1 Cut the test specimens, as shown in Fig. 1, from the panels, Figs. 2 and 3. Perform the cutting operation so as to avoid overheating or mechanical damage to the joints (Note 5). For final preparation trim panel area according to Fig. 2. Measure—the width of the specimen and the length of the overlap to the nearest 0.25 mm·(0.01-jn.) to determine the shear area.

Note 5—A five-tooth, typesetter's circular saw has been found suitable for such purposes.

6. Procedure

6.1 Test the specimens, prepared as prescribed in Section 5, as soon after preparation as possible. The manufacturer of the adhesive may, however, prescribe a definite period of conditioning under specific conditions before testing.

6.2 Place the specimens in the grips of the testing machine so that the outer 25 mm (1 in.) of each end are in contact with the jaws (Note 1) and so that the long axis of the test specimen coincides with the direction of applied pull through the center line of the grip assembly. Apply the loading immediately to the specimen at the rate of 80 to 100 kg/cm² (1200 to 1400 psi) of the shear area per min. Continue the load to faiture. This rate of loading will be approximated by a free crosshead speed of 1:3 mm (0.05 in.)/min.

7. Calculations

7.1 Record the load at failure and the nature and amount of this failure (cohesion in adhesive or metal, or adhesion) for each specimen. Express all failing loads in kilograms per.

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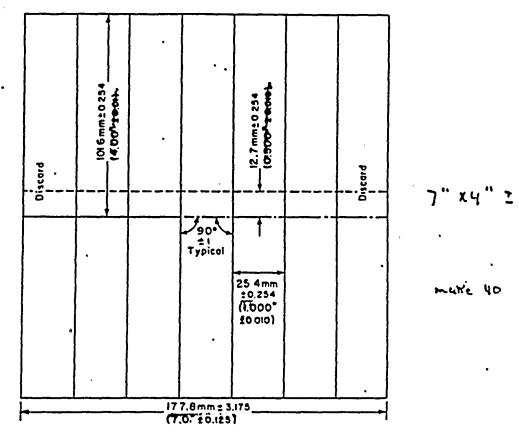


FIG. 2 Standard Test Panel

square centimeter (pounds per square inch) of shear area, calculated to the nearest 0.06 cm² (0.01 in.²).

8. Report

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8.1 The report shall include the following information:

8.1.1 Complete identification of the adhesive tested, including type, source, date manufactured, manufacturers' code numbers, form, etc.,

8.1.2 Complete identification of the metal used, its thickness, and the method of cleaning and preparing its surfaces prior to bonding,

8.1.3 Application and bonding conditions used in preparing specimens,

8.1.4 Average thickness of adhesive layer after formation of the joint within 0.001 in. The method of obtaining the thickness of the adhesive layer shall be described including procedure, location of measurements, and range of measurements.

8.1.5 Length of overlap used,

8.1.6 Conditioning procedure used for specimens prior to esting.

8.1.7 Number of specimens tested,

8.1.8 Number of joints represented and type of joint if other than single overlap,

8.1.9 Maximum, minimum, and average values for the alling load, and

8.1.10 The nature of the failure, including the average estimated percentages of failure in the cohesion of the adhesive, contact failure, and adhesion to the metal.

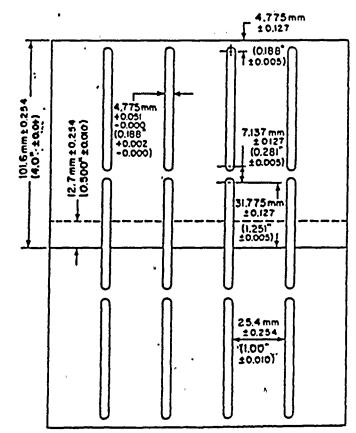
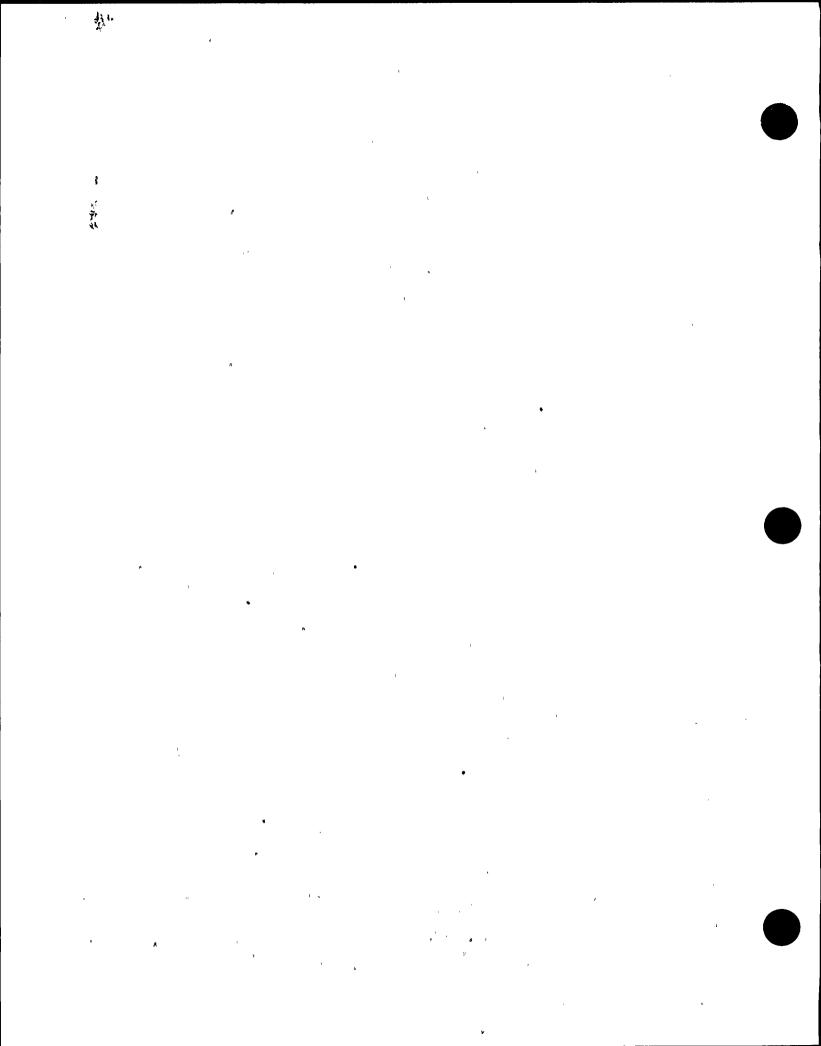


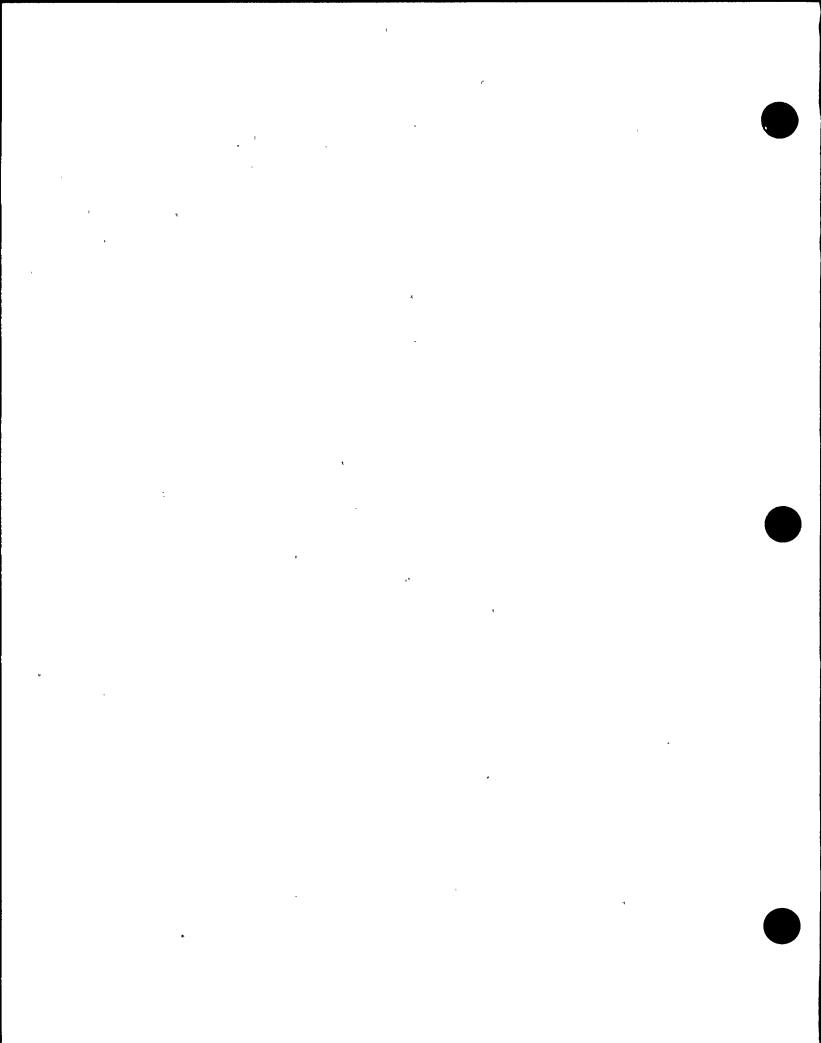
FIG. 3 Optional Panel for Acceptance Tests Only

POEDLES NEMP 12.4 REV. 1 ATT. L PS 44 of 60



The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five yeers and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquerters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1918 Rece St., Philadelphia, PA 19103.



Appendix E

5009165/91299/ppu09wp

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895500/ppu65



Pres Technical and Ecological Services

QUALITY RELATED MATERIALS RECEIPT INSPECTION REPORT (Instructions for use on back of report)

| 1. | Procurement Information | | | | |
|-----------|--|--|--|--|--|
| | Purchase Order No. LO 831970 | | | | |
| | Vendor/Manufacturer Beiner Machine Works Inc. | | | | |
| | Item No. Description | | | | |
| | _1 2024, T3 aluminum plate | | | | |
| | | | | | |
| | | | | | |
| 2. | Shipping and Damage Inspection | | | | |
| | Acceptable Note Damage Under Remarks | | | | |
| 3. | Item Inspection | | | | |
| 1 | A. Inspect each Item to the procurement document requirements | | | | |
| | Acceptable Not Acceptable | | | | |
| | B. Functional Check Acceptable Not Acceptable Not Applicable | | | | |
| s | List all Discrepancies in "Remarks" | | | | |
| 4. | Documentation Verification | | | | |
| | Review documents for each Item to the procurement document requirements | | | | |
| | Acceptable Not Acceptable | | | | |
| | List all Discrepancies in "Remarks" | | | | |
| 5. | Storage and Identification | | | | |
| | Is the material and/or equipment tagged or identified and stored properly? | | | | |
| | If no, explain in "Remarks" Ves No | | | | |
| 6. | Remarks (attach additional sheets if necessary) Mark pieces | | | | |
| | DRW | | | | |
| | PGSE/TES | | | | |
| | | | | | |
| | Attachments:YesNo | | | | |
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Pres Technical and Ecological Services

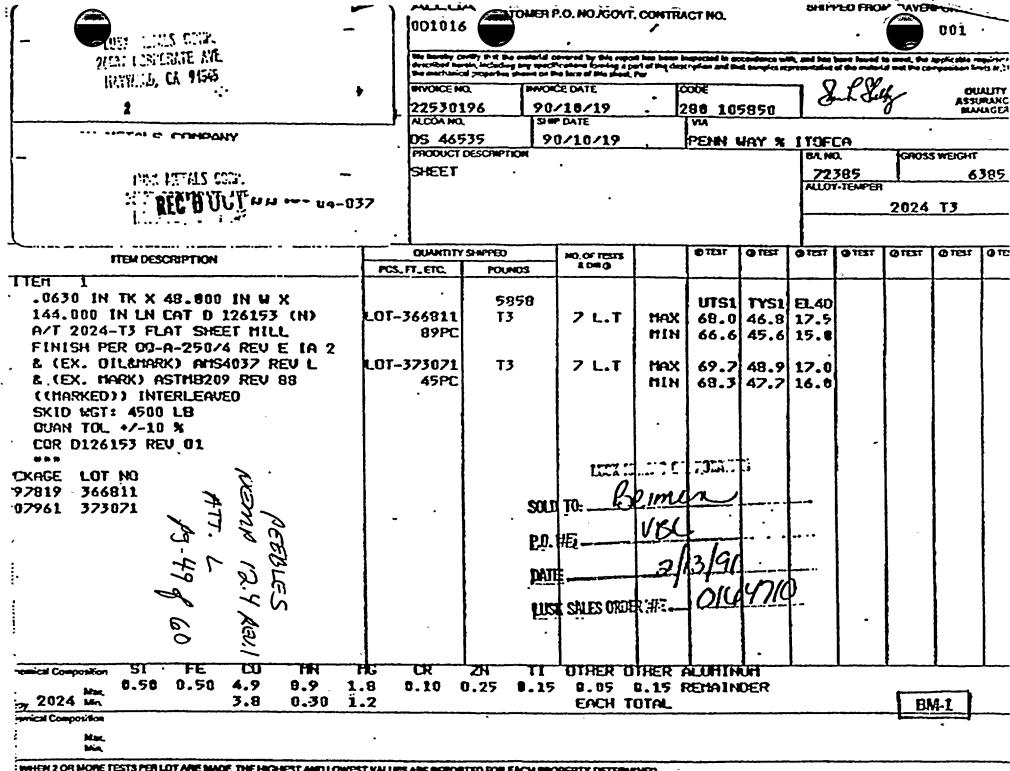
Page 2 6.1 Conditional Release Conditionally released to customer per customer request. Describe Condition: Conditional Release - OK Signature · Date · ' Pending receipt of the following documents 7. Storage Maintenance Scheduling Is preventive maintenance required during storage? No V 8. Inspection Certification A. The following Items do not meet procurement and receipt Inspection requirements and are Disposition and/or Problem or tem No. Storage Location Nonconformance Report Number B. The following Items meet procurement and receipt inspection requirements and are acceptable for installation and use. Item No. Quantity 9. Shipping and Damage Inspection By: 10. Item Inspection and Document Verification By: Asle Wolfield 2-14-91
Signature // Date

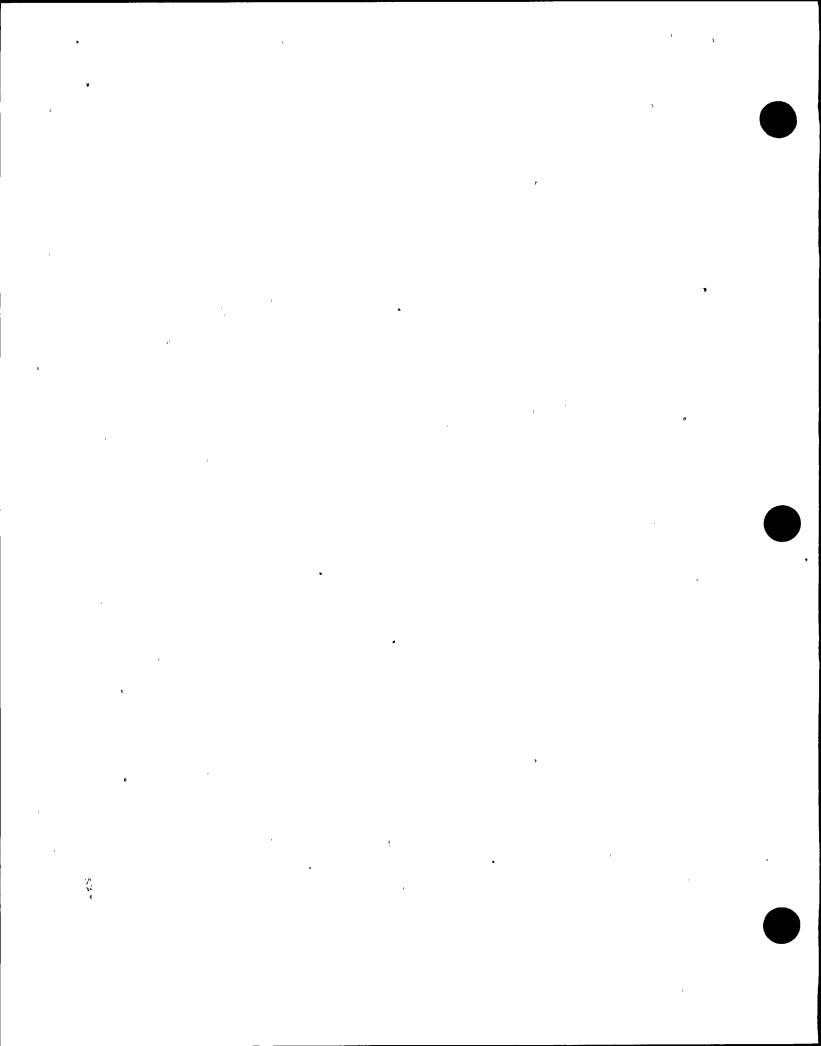
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PEEBLES NEMP. 12:4 REV. 1 ATT. L pg 48 of 60

11. Review and Approval By:

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Appendix F

PETEBLES NEMP 12.4 REV. 1 ATT. L pg 50 f 60

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QUALITY RELATED MATERIALS RECEIPT INSPECTION REPORT

(instructions for use on back of report)

| 1. | Procurement Information |
|----|--|
| | Purchase Order No. LO831970 |
| | Vendor/Manufacturer Beimer Machine Works |
| | tem No. Description Test Specimen Blanks 7"L x 4"w |
| | 2 Test Specimen Bonding Fixture |
| | |
| | |
| 2. | Shipping and Damage Inspection |
| Α | Acceptable Note Damage Under Remarks |
| 3. | Item Inspection |
| | A. Inspect each item to the procurement document requirements |
| | Acceptable Not Acceptable |
| | B. Functional Check Acceptable Not Acceptable Not Applicable |
| | List all Discrepancies in *Remarks* |
| 4. | Documentation Verification |
| | Review documents for each item to the procurement document requirements |
| | Acceptable Not Acceptable |
| , | List all Discrepancies in "Remarks" |
| 5. | Storage and Identification |
| | Is the material and/or equipment tagged or identified and stored properly? |
| | If no, explain in "Remarks" Yes No |
| 6. | Remarks (attach additional sheets if necessary) |
| | |
| | |
| | Attachments: Yes No |

B95500/PPUBS PEEBLES NEMP 12.4 REV. 1 ATT. L pg 51 of 60

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Prat Technical and Ecological Services

| | | • | to | | | | Page 2 | |
|-----|------------|--|-----------------|--------------------|----------------------------|-------------------------------------|--------------------------------|--|
| | 6. | 1 Conditional Release Conditionally released to customer per customer request. Describe Condition: | | | | | | |
| | | | | Signature | | · Date | | |
| 7. | | orage Maintenance preventive maintena | | _ | ? | · 'Yes | No | |
| 8. | ins | spection Certification | | | | | | |
| | A | The following Item rejected. | meet procuremen | and rec | eipt Inspection requir | | | |
| | | Item No. | Sto | rage Location | | Disposition and Nonconformance F | or Problem or Report Number | |
| | B. | The following Items | s meet pro | curement and rece | - - - :ipt inspec | ction requirements and | | |
| | | for installation and | use. | | • | · | | |
| | | Item No. | | Quantity 63 | _ | Storage Lo ORW's cal | inet | |
| | | | | | <u> </u> | DRW: co | bine T | |
| 9. | Sh | ipping and Damage | e Inspecti | on By: | Dale | Wolferly Signature | l <u>/-20-9/</u> Date | |
| 10. | lte | m Inspection and I | Document | Verification By: 2 | Odle | Worferland Signature | /-20-9/ Date | |
| 11. | Rev | view and Approval | By: . | | 450 | Signature | 3/15/9/ / Date | |

PERPLES NEMP 12.4 REV. 1 ATT. L pg 52 of 60

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Appendix G



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Report 491-91.59 Sheet 1 of 1

PG&E

TECHNICAL AND ECOLOGICAL SERVICES STANDARDS LABORATORY (415) 866-5212 (PG&E) 251-5212

CALIBRATION REPORT

Instrument owner: TES - MECHANICAL SECTION

Description: 12" DIAL CALIPER Manufacturer: MITUTOYO

Manufacturer: M1101016 Model No.: 505-628 Serial No.: NONE TES Job No.: 18958Q Cal.Ref.No.: 5265 Other I.D.No.: ERME-054 Procedure No.: MMD-07

Calibration Environment: 23°C and 46% RH.

Instrument was received in good physical condition.

Corrents: First calibration at TES.

As received: In Tolerance.

As returned: In Tolerance (meets manufacturer's specified accuracy).

No maintenance was performed.

Calibration Results: Data in RMS.

CALIBRATION STANDARDS USED:

| DESCRIPTION | MANUFACTURER | MODEL NO | SERIAL HO | CAL DATE | DUE DATE |
|-----------------------|--------------|-------------|-----------|----------|----------|
| GAUGE BLOCK SET | STARRETT | SC84AAX | 93085.2 | 11-06-90 | 11-06-92 |
| GRANITE SURFACE PLATE | STARRETT | AA EDP80310 | ELS-019 | 04-03-90 | 04-03-93 |

Accuracy information is in the calibration procedure.

STANDARDS ARE CALIBRATED TRACEABLE TO MIST, OTHER MATIONAL STANDARDS OR PHYSICAL CONSTANTS, OR CALIBRATED USING ACCEPTED RATIO TECHNIQUES.

CALIBRATED:

03-01-91

Calibrated By

RECALIBRATION DUE:

03-01-92

Reviewed By

Approved By CDAULES

Distribution: DRWolfenberger

DLMayeda-Indexer-Huclear Related

PEEBLES NEMP 12.4 REV. 1 ATT. L pg 54 of 60

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Report 491-91.61 Sheet 1 of 1

PG&E

TECHNICAL AND ECOLOGICAL SERVICES STANDARDS LABORATORY (415) 866-5212 (PG&E) 251-5212

CALIBRATION REPORT

Instrument owner: TES - MECHANICAL SECTION

2" MICROMETER Description:

Manufacturer: STARRETT

Model No.: Serial No.:

NONE

TES Job No.:

18959Q

1298 Cal.Ref.No.:

Other I.D.No.: ERME-036 Procedure No.: MMD-03

Calibration Environment: 23°C and 46% RH.

Instrument was received in good physical condition.

As received: In Tolerance.

As returned: In Tolerance (meets manufacturer's specified accuracy).

No maintenance was performed.

Calibration Results: Data in TES central file.

CALIBRATION STANDARDS USED:

MANUFACTURER DESCRIPTION

KODEL_Ko

SERIAL NO

CAL DATE DUE DATE

GAUGE BLOCK SET

STARRETT

SC84AAX

93086.2

11-06-90 11-06-92

Accuracy information is in the calibration procedure.

STANDARDS ARE CALIBRATED TRACEABLE TO HIST, OTHER NATIONAL STANDARDS OR PHYSICAL CONSTANTS, OR CALIBRATED USING ACCEPTED RATIO TECHNIQUES.

CALIBRATED:

03-01-91

Calibrated By formes Castel

RECALIBRATION DUE: 03-01-92 Reviewed By

Approved By _

Distribution: DRWolfenberger

DiMayeda-Indexer-Huclear Related

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Report Issued:

FEB 27 1991

Report 491-91.44 Sheet 1 of 1

PG&E

TECHNICAL AND ECOLOGICAL SERVICES STANDARDS LABORATORY (415) 866-5212 (PG&E) 251-5212

CALIBRATION REPORT

Instrument owner: TES - MECHANICAL SECTION

Description: MICROMETER Manufacturer: STARRETT

Model No.: Serial No.: 230 NONE TES Job No.: Cal.Ref.No.: 18876Q 1750

Other I.D.No.: ERME-043
Procedure No.: MMD-03

Calibration Environment: 22°C and 38% RH.

Instrument was received in good physical condition.

As received: In Tolerance.

As returned: In Tolerance (meets manufacturer's specified accuracy).

Consents: Anvil and spindle parallelism could not be checked due to a broken optical parallel.

Maintenance Performed: Cleaned interior and exterior.

Lubricated threads.

Calibration Results: Data in RMS.

CALIBRATION STANDARDS USED:

DESCRIPTION MANUFACTURER MODEL NO SERIAL NO CAL DATE DUE DATE

GAUGE BLOCK SET STARRETT SCB4AAX 9308B.2 11-06-90 11-06-92

Accuracy information is in the calibration procedure.

STANDARDS ARE CALIBRATED TRACEABLE TO HIST, OTHER NATIONAL STANDARDS OR PHYSICAL CONSTANTS, OR CALIBRATED USING ACCEPTED RATIO TECHNIQUES.

CALIBRATED:

02-22-91

Calibrated By

RECALIBRATION DUE:

02-22-92

Reviewed By

Distribution: DRYolfenberger

DLWayeda-Indexer-Nuclear Related .

PEEBLES NEMP 12.4 REV. 1 ATT. L Pg 56 of 60

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Report Issued: FEB 12 1991

Report 491-91.28 Sheet 1 of 1

PG&E

TECHNICAL AND ECOLOGICAL SERVICES STANDARDS LABORATORY

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(415) 866-5212 · (PG&E) 251-5212

CALIBRATION REPORT

Instrument owner: TES - MECHANICAL SECTION

STOPWATCH Description: Manufacturer: HEUER Model No.:

TRACKSTAR Serial No.: NONE

TES Job No.: 18656Q Cal.Ref.No.: 3639 Other I.D.No.: ERME-053

Procedure No.: SW-1

Calibration Environment: 22°C and 39% RH.

Instrument was received in good physical condition.

As received: In Tolerance.

As returned: In Tolerance (meets owner's specified accuracy). Comments: Owner's tolerance is +/- 1.0 second per 60 minutes.

No maintenance was performed.

Calibration Results: Data in RMS.

CALIBRATION STANDARDS USED:

DESCRIPTION

KAKUFACTURER KODEL No SERIAL NO

DUE DATE CAL DATE

TIME/FREQUENCY BROADCAST N.B.S.-WWY

Accuracy information is in the calibration procedure.

STANDARDS ARE CALIBRATED TRACEABLE TO NIST, OTHER NATIONAL STANDARDS OR PHYSICAL CONSTANTS. OR CALIERATED USING ACCEPTED RATIO TECHNIQUES.

CALIBRATED:

01-30-91

Calibrated By

RECALIBRATION DUE:

01-30-92

Reviewed By

Approved By _

Distribution: DRWolfenberger

DLWayeda-Indexer-Nuclear Related

PCEBLES NEWP 12.4 REV. 1 ATT. L pg 57 of 60

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Report Issued:

NOV 1 6 1990

Report 491-90.437 Sheet 1 of 1

PG&E



TECHNICAL AND ECOLOGICAL SERVICES STANDARDS LABORATORY! (415) 866-5212 (PG&E) 251-5212

CALIBRATION REPORT

Instrument owner: TES MECHANICAL SECTION

Description: CALIPER Manufacturer: DOALL Model No.: NONE Serial No.: NONE

TES Job No.: 18099Q Cal.Ref.No.: 4139 Other I.D.No.: ERME-052 Procedure No.: MMD-07

Calibration Environment: 22°C and 42% RH.

Instrument was received in good physical condition.

As received: In Tolerance.

As returned: In Tolerance (meets manufacturer's specified accuracy). Limited calibration: Depth caliber is not calibrated.

Maintenance Performed: Checked batteries, cleaned externally.

Calibration Results: Data in TES central file.

CALIBRATION STANDARDS USED:

DESCRIPTION MANUFACTURER MODEL No DUE DATE SERIAL NO CAL DATE GAGE BLOCK SET DO-ALL 88R 6581 01-13-89 01-13-91

Accuracy information is in the calibration procedure.

STANDARDS ARE CALIBRATED TRACEABLE TO WIST, OTHER NATIONAL STANDARDS OR PHYSICAL CONSTANTS. OR CALIBRATED USING ACCEPTED RATIO TECHNIQUES.

CALIBRATED:

11-08-90

Calibrated By

RECALIBRATION DUE:

11-08-91

Reviewed By

Approved By

Distribution: EElliott

DLKayeda-Indexer-Nuclear Related



REBLES NEMP 12.4 REV. 1 ATT. L pg 58 of 60

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PACIFIC CALIBRATION SERVICES P.D. Box 759 La Honda Ca.04020(415) 459-5558 CERTIFICATE No.11144-1

Page 1 of2

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TESTING MACHINE CALIBRATION REPORT

Pacific Gas & Electric 3400 Crow Canyon Rd. San Ramon

CA 94583

Attention: Dale Wolfenberger Machine Mfg: Tinius Olsen

Capacity: 12,000 # Date: 11/01/90 Recall:05/01/91

P.D.No: L0831966 Type: Universal

Mfg.Serial No: 60434-1

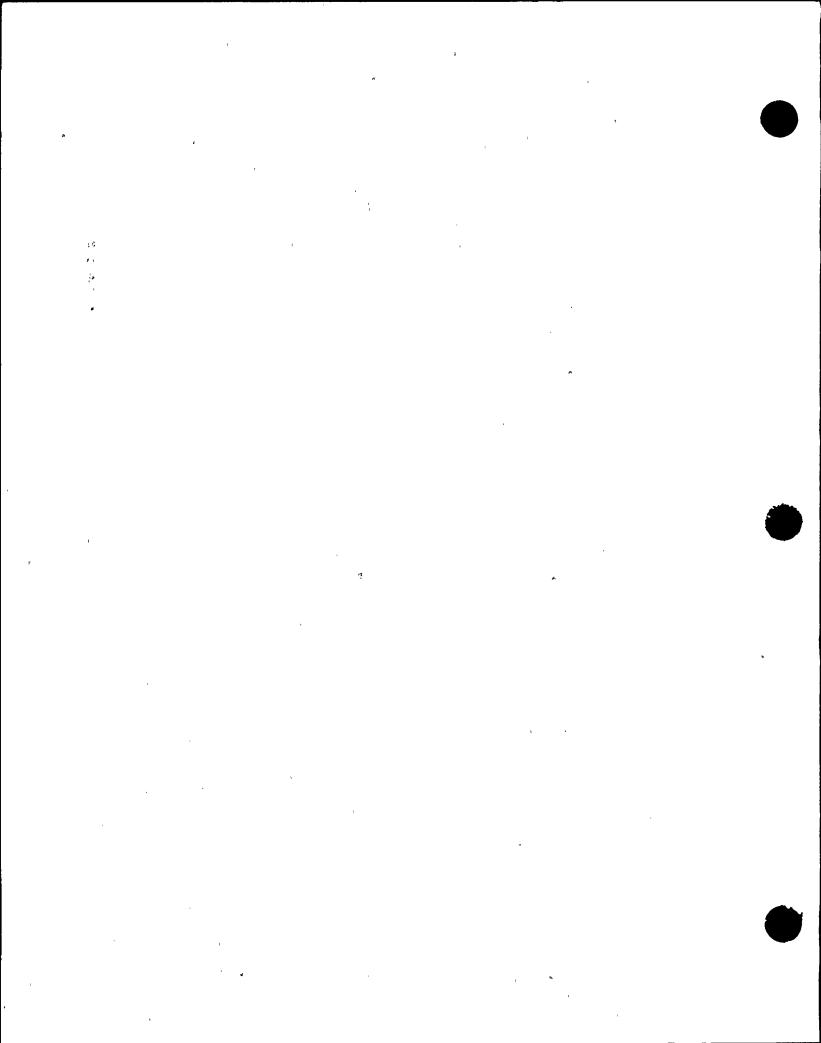
| CALIBRATION EQUIPMENT DATA | | | | | | |
|--|----------|--------|----------|--------------|-----------|--|
| USE | LOAD | MFG BY | | VERIFICATION | LOAD | |
| CODE | CELL | | BY | DATE | RANGE | |
| 1 | 797945 | REVERE | N.S.T.L. | 5/04/89 | 500,000 # | |
| 2 | 788830 | REVERE | N.S.T.L. | 5/04/89 | 50,000 # | |
| 3 | 895442VL | REVERE | N.S.T.L. | 5/04/89 | 10,000 # | |
| 4 | 900157ZL | REVERE | N.S.T.L. | 5/04/89 | 1,000 # | |
| Verified by NBS Letter No 822. A.S.T.M. E 74 NBS# SJT01/104139 | | | | | | |
| METHOD OF VERIFICATION: A.S.T.M. E4 and P.G&E.quality plan. | | | | | | |

| METHOD OF VERIFICATION: A.S.T.M. E4 and P.G&E.quality plan. | | | | | |
|---|-----------------------------|--------|--------|---------|--|
| USE CODE | TEST D VERIFICATION READING | | MACHIN | E-ERROR | |
| 3 | 1,000 | 1,000 | 0# | 0.00% | |
| | 2,010 | 2,000 | - 10# | -0.50% | |
| 3 | 3,010 | 3,000 | - 10# | -0.34% | |
| 3 | 4,004 | 4,000 | - 4# | -0.10% | |
| 3 3 3 3 4 | 5,005 | 5,000 | - 5# | -0.10% | |
| З, | 6,015 | 6,000 | - 15# | -0.25% | |
| 3 | 8,030 | B,000 | - 30# | -0.38% | |
| 3 2 | 10,025 | 10,000 | - 25# | -0.25% | |
| 2 | 12,025 | 12,000 | 25# | -0.21% | |
| | | | | • | |
| 4 | 199.0 | 200.0 | + 1.0# | +0.50% | |
| 4 | 400.0 | 400.0 | . O# | 0.00% | |
| 4 | 797.0 | 800.0 | + 3.0# | +0.38% | |
| 3 | 1,196 | 1,200 | + 4# | +0.34% | |
| 3 | 1,602 | 1,600 | - 2# | -0.13% | |
| 3 | 2,003 | 2,000 | - 3# | -0.15% | |
| 3 | 2 , 395 | 2,400 | + 5# | +0.21% | |
| | | | | | |
| 4 | 50.0 | 50.0 | O# | 0% | |
| 4 | 100.5 | 100.0 | - 0.5# | -0.50% | |
| 4 | 150.5 | 150.0 | - 0.5# | -0.34% | |
| 4 | 200.3 | 200.0 | - 0.3# | -0.15% | |
| 4 | 250.5 | 250.0 | - 0.5# | -0.20% | |
| 4 | 300.3 | 300.0 | - 0.3# | -0.10% | |
| 4 | 401.0 | 400.0 | - 1.0# | -0.25% | |
| 4 | 499.0 | 500.0 | + 1.0# | +0.20% | |

598.5 PETBLES NEMP 12.4 REV 1
USE CODE VERIFICATION READING MACHINE READING MACHINE ERROR

600.0





| 4 | | 10.0 | 10.0 | | 0# | 0.00% |
|---|---|-------|-------|---|--------|--------|
| 4 | | 20.0 | 20.0 | 1 | 0# | 0.00% |
| 4 | • | 39.9 | 40.0 | , | +0.10# | +0.25% |
| 4 | | 59.9 | 60.0 | • | +0.10# | +0.17% |
| 4 | | 80.2 | 80.0 | | -0.20# | -0.25% |
| 4 | | 100.0 | 100.0 | | O# | 0.00% |
| 4 | | 120.0 | 120.0 | | 0# | 0.00% |

No Calibration Adjustments Made

Readings accurate to 1/10 of 1%

A.B.Richardson.



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17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

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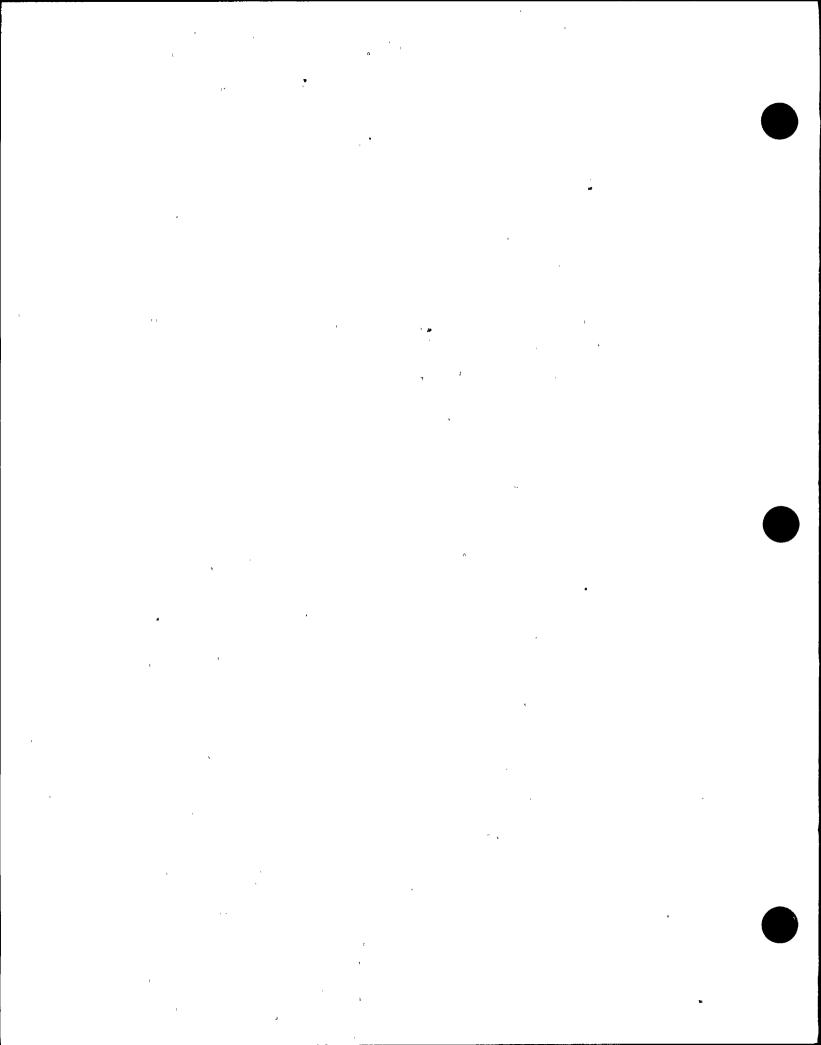
THIS IS THE INFORMATION THAT WE SPOKE ABOUT REGUARDING THE AUDIT FINDINGS OF ATOUR OUR EDINBURCH FACTORY.

SINCERLY

FRANK OMBRINO ASSURANCE

PEEBLES NEMP 12.4 REV. 1 ATT. M By 14 4





NEI Peebles - Electric Products, Inc.

17045 Euclid Avenue Cleveland, Ohio 44112 Telephone: (216) 481-1500 Telex: 241564 Facsimile: (216) 481-8386

January 9, 1991

Mr. Ed Walters
Pacific Gas and Electric Co.
333 Market Street
Room 9087, Ninth Floor
San Francisco, CA 94106

Dear Sir:

I have attached to this letter copies of the Certification on the Fag Roller Bearing, and the Instrument Calibration Cards for the:

- Magnetic Crack Detector
- Interturn Test Unit
- Multimeter

I have been advised that Mr. Burt Hepponstall arranged for Mr. Don Bouers to review NEI Peebles Electric Machine Crimping Procedure No. 5523. I have a copy of this Procedure but can not send it because it is an internal Document.

I hope this letter (with attachments) and the Welding, and N.D.T. Procedure sent to Mr. Burt Hepponstall on December 14, 1990, will close five of the open audit findings. Mr. Charles Moosbrugger will contact you by phone on Friday, January 11, 1991, to update you on the progress of the remaining two open audit findings.

Regards

NEI PEEBLES - ELECTRIC PRODUCTS, INC.

F. D. Marino
Manager Chality Assur

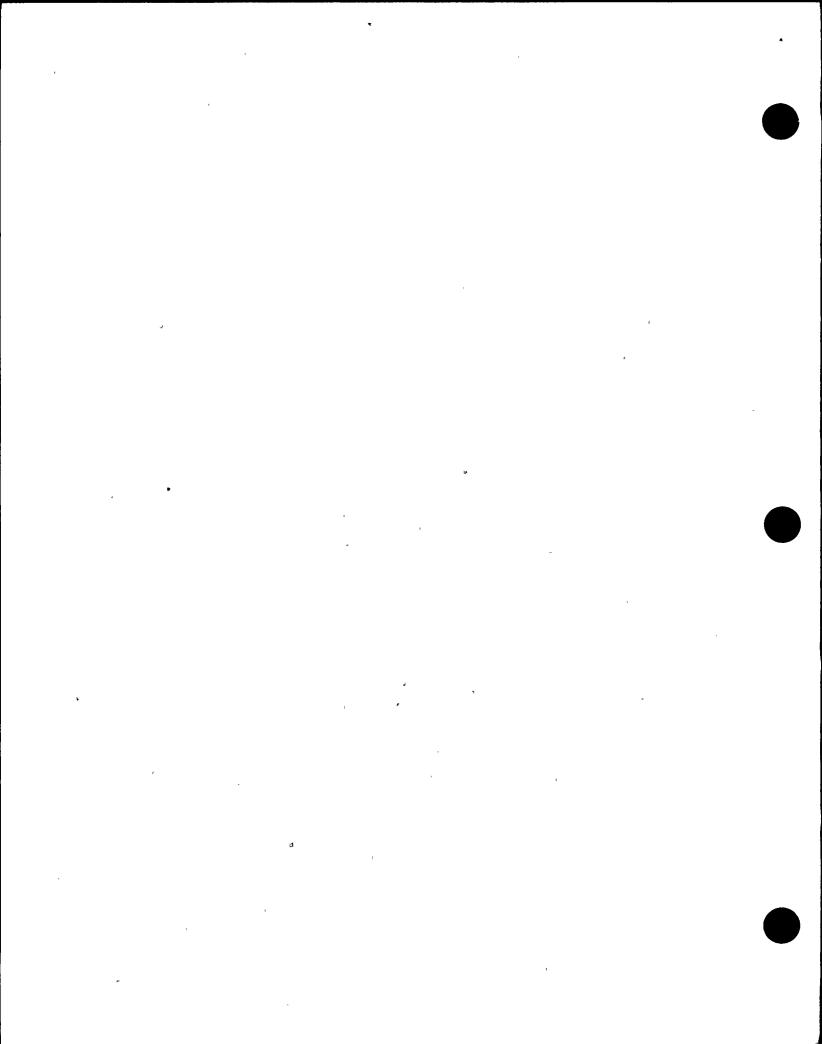
Manager, Quality Assurance

.cc: C. Moosbrugger

FM/ph

Attachments

PEEBLES NEMP 12.4 REV. 1 ATT. M Pg 244



REF EHH DC2 - 8822 - BRH - E REV I ATTACHTM CERTIFICATE OF CONFORMITY

FAG (UK) LIMITED

60 240274

HEATH MILL ROAD, WOMBOURNE, WOLVERHAMPTON WVS BAF.

BEALING Sht 1 of 2

ATTN MR ALEX BROWN

BUSTANC

INVOICE 971382

14.9.90

NEI PEEBLES LTD - EAST PILTON

EDINBURGH

EHS 2XT

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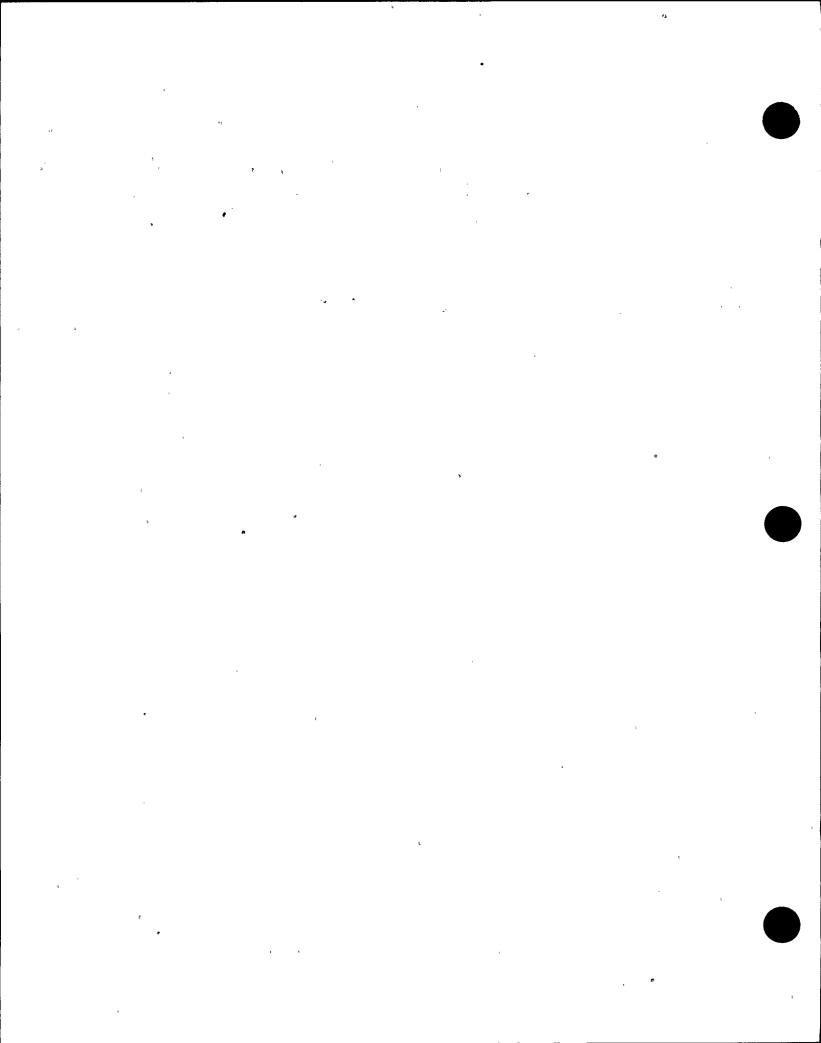
We confirm that the items detailed above have been produced and impacted according to the FAG Curality Assurance System, which compiles with the requirements of AGAP—1 PNATO Curality Commol System).

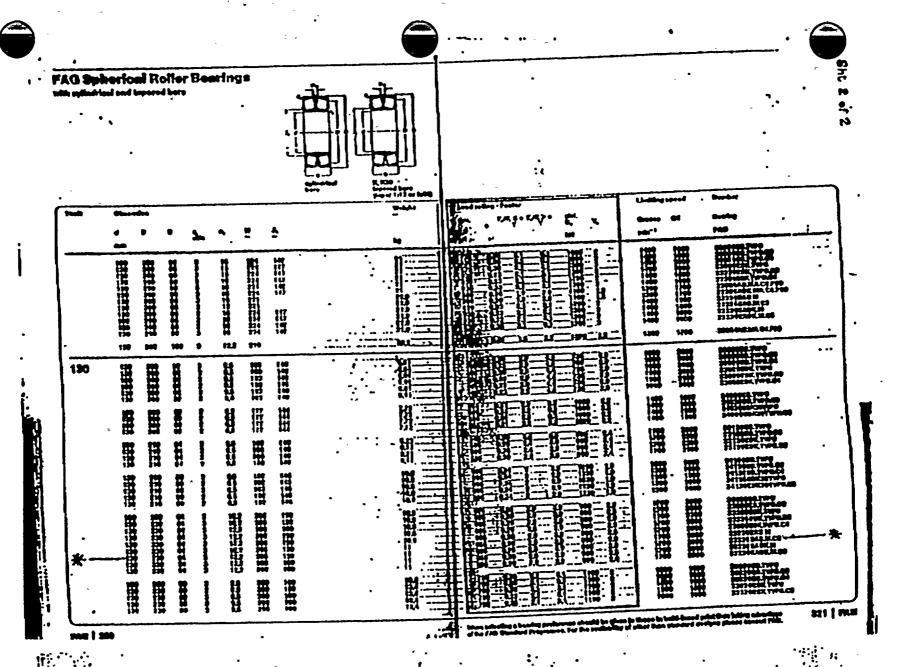
24 SEP 1990

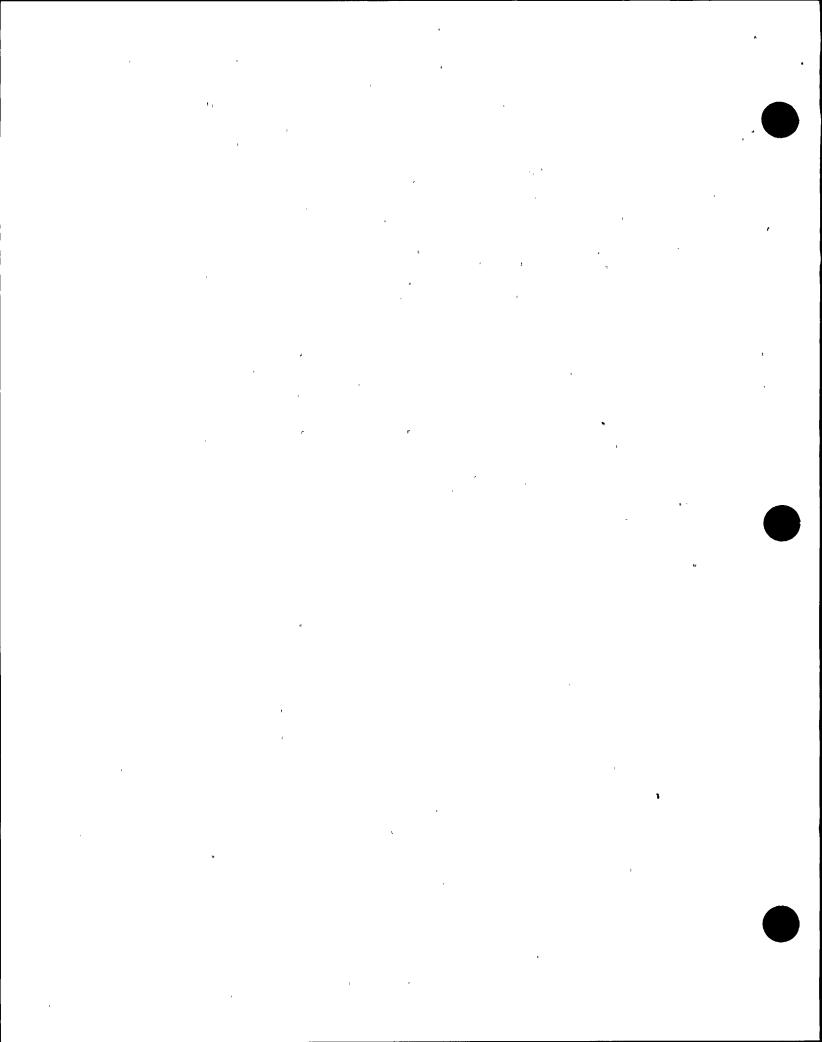
Chief Engineer



PEEBLES NEMP 12.4 REV. 1 ATT. M Pg 3 of 4







JAN 14 791 10:054" NET PEEBLES PROS CLEVELANDIT PEEBLES - ELECTRIC P. I/3DUCTS,

17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

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| To: ED WALTERS | Location: R. G + E CA. |
|-----------------------------------|--------------------------|
| From: Frank D. Marino | Location: NEI, Cleveland |
| Copies to: | |
| Date: 1-14-91 | |
| Number of pages including this: 3 | |
| Reply to Fax No: 216 481-8386 | |

ED:

HERE? 5 A COPY OF AFR 9003-2.

IF YOU HAVE ANY FUTHER QUESTIONS

PLEASE CONTACT ME

F.D. MARINO

MANAGOR, QUALITY ASSURANCE

PEEBLES NEMP 12.4 REV. 1 ATT. N. Pg 18 11



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MEI PEEBLES ELECTRIC PRODUCTS, INC.

AUDIT FINDING REPORT

EQ 1.10 AFR

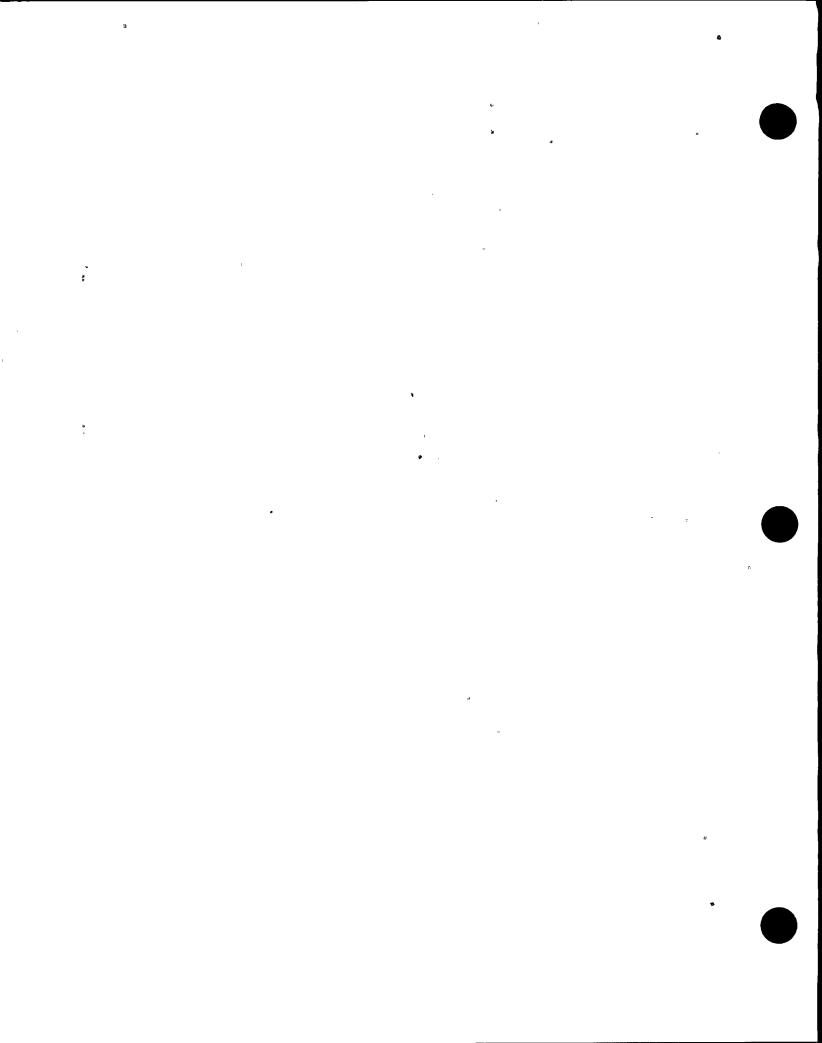
| AFR | NO. | 9003-2 |
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| t) REQUIREMENT/REFERENCE | BE 5750, Para. 4.11 Inspection, measuring, and test equipment | |
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| , | | |
| 5) PROBLEM/DISCREPANCY TO | the quality program for this requirement was not being implemented satisfactorily | / 81 |
| mplemented as evidenced b | by the following observed deficiencies: | |
| a) There were no depart | ertmental procedures describing the in-house calibration of the magnetic | |
| rack detector or the inte | erturn unit (ref. DP 06 E001 and DP 06 E020 respectively, address calibration by | |
| xternal sources.) | (Continued on next page.) | |
| 4) SUGGESTED CORRECTIVE A | CTION Revise referenced procedures, conduct training of cognizant personnel and | 3 |
| aplement as required. | | |
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| 5) AUDITOR STEELE (5) | 11 /1/00 DATE 11/7/00 | |
| | TO BE COMPLETED BY SUPPLIER . | |
| 6) PROBABLE CAUSE | | 7.114 |
| | for in-house calibration. | |
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| 7) CORRECTIVE ACTIONS (RE | MEDIAL/HWESTICKTIVE/PREVENT RECURRENCE) (a) Calibration procedures issued. | |
| 7) CORRECTIVE ACTIONS (REI | HEDIAL/HWGSTIERTIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. n cards to D.P. OSAC19 now being used. (c) Interturn unit calibrated to | • |
| 7) CORRECTIVE ACTIONS (REF (b) Approved calibration procedure and calib | HEDIAL/HAVESTICATIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. In cards to D.P. OSAC19 now being used. (c) Interturn unit calibrated to tration card completed. (d) Calibration of multimater and crack detecti | • |
| 7) CORRECTIVE ACTIONS (REI (b) Approved calibration procedure and calibration equipment establish | HEDIAL/HAVESTIBATIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. In cards to D.P. OSAC19 now being used. (c) Interturn unit calibrated to mation card completed. (d) Calibration of multimater and crack detections astisfactory for operation. | • |
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| 7) CORRECTIVE ACTIONS (REI (b) Approved calibration procedure and calibration equipment establish 8) SCHEDULED CORRECTIVE A | HEDIAL/HAVESTICATIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. In cards to D.P. OSAC19 now being used. (c) Interturn unit calibrated to mation card completed. (d) Calibration of multimater and crack detections astisfactory for operation. CIION COMPLETION DATE 25.11.90 | ian |
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| 7) CORRECTIVE ACTIONS (REI (b) Approved calibration procedure and calibration equipment establish 8) SCHEDULED CORRECTIVE AC 9) APPROVED BY | MEDIAL/HAVESTICATIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. In cards to D.P. OSACIS now being used. (c) Interturn unit calibrated to cration cord completed. (d) Calibration of multimater and crack detectioned satisfactory for operation. CIION COMPLETION DATE 25.11.90 TITLE Quality Manager DATE 29.1/ D BE COMPLETED BY NEI-PREBLES ELECTRIC PRODUCTS QUALITY ASSURANCE D ACCEPTED BY F.O. Manno DATE 1.1/-9/ | · 9 |
| 7) CORRECTIVE ACTIONS (REI (b) Approved calibratio procedure and calibratio equipment establish 8) SCHEDULED CORRECTIVE AN 9) APPROVED BY | THEDIAL/HAVEOTIDATIVE/PREVENT RECURRENCE)(a) Calibration procedures issued. In cards to D.P. OSAO19 now being used. (c) Interturn unit calibrated to mation card completed. (d) Calibration of multimater and crack detects and satisfactory for operation. ICTION COMPLETION DATE 25.11.90 TITLE Quality Manager DATE 29.1/ D BE CON LETED BY NEI-PEEBLES ELECTRIC PRODUCTS QUALITY ASSURANCE D ACCEPTED BY F.O. Manno DATE 1.1/-9/ | · 9 |
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| (7) CORRECTIVE ACTIONS (REP (b) Approved calibration procedure and calibration equipment establish (8) SCHEDULED CORRECTIVE ACTION STORY (9) APPROVED BY TO (10) RESPONSE EVALUATED AND (11) CORRECTIVE ACTIONS VEH 9003-2 | MEDIAL/HAVESTIDATIVE/PREVENT RECURRENCE) (a) Calibration procedures issued. In cards to D.P. OSAGIS now being used. (c) Interturn unit calibrated to mation card completed. (d) Calibration of multimater and crack detects and satisfactory for operation. ICTION COMPLETION DATE 25.11.80 TITLE Quality Manager DATE 29.11 D BE COMPLETED BY NEI-PREBLES ELECTRIC PRODUCTS QUALITY ASSURANCE DATE 1.11-91 IRITIED Rec'D. INFORMATION Valence, Causing | . 9. |
| (b) Approved calibration procedure and calibration equipment establish equipment establish (s) scheduled corrective at (s) Approved by (s) Approved by (s) Approved by (s) response Evaluated and (st) corrective actions very (s) | MEDIAL/HAVESTIDATIVE/PREVENT RECURRENCE) (a) Calibration procedures issued. In cards to D.P. OSAGIS now being used. (c) Interturn unit calibrated to mation card completed. (d) Calibration of multimater and crack detects and satisfactory for operation. ICTION COMPLETION DATE 25.11.80 TITLE Quality Manager DATE 29.11 D BE COMPLETED BY NEI-PREBLES ELECTRIC PRODUCTS QUALITY ASSURANCE DATE 1.11-91 IRITIED Rec'D. INFORMATION Valence, Causing | . 9. |
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AUDIT FINDING REPORT 9003-2 CONTINUATION

- (3) (b) The measurement equipment calibration card being utilized by the test department was not the approved form attached to Departmental Procedure DP AD6 AD19.
- (3) (c) The measurement equipment calibration card was not completed for the interturn unit and a handmede calibration record attached did not list the calibration attached used or the person performing the calibration.
- (3) (d) The magnetic crack detector has been calibrated since Sept. 26, 1988 with a digital multimater that has no certification of traceability to a nationally recognized standard.



JAN 10 791 0111657 NT PEERLS-ELECT PROS CLEVELANDET PEEBLES - RECTRIC PINNUCTS, 1

17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telaphone (216) 481-1500

| To: EO WALTERS | Location: P.G. + E. SAU FRANCISCO |
|---------------------------------|-----------------------------------|
| From: Prank D. Marino | Location: NEI. Cleveland |
| Copies to: | |
| Date: 1-10-91 | |
| Number of pages including this: | |
| Reply to Fax No: 216 481-8386 | |

THIS IS THE INFORMATION THAT WE SPOKE ABOUT REGULARDING THE AUDIT FINDINGS OF AT OUR EDINBURCH FACTORY.

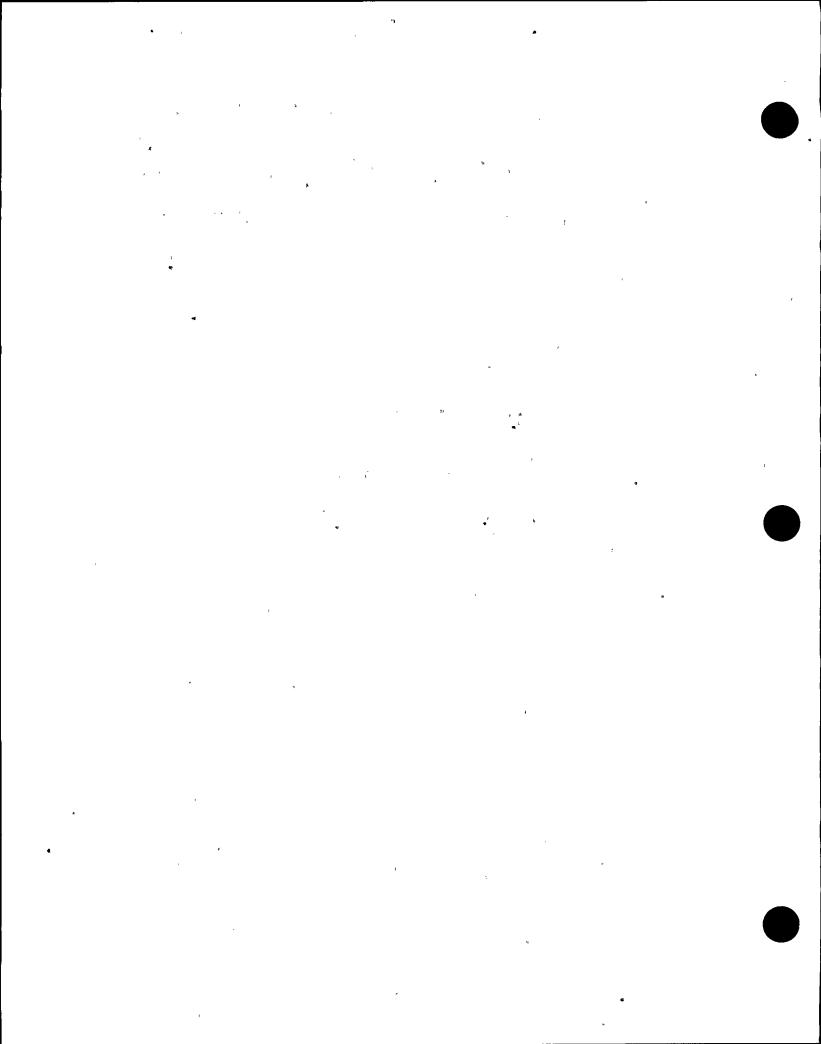
SINCERLY

FRANK D. MARINO MANAGER, QUALITY ASSURANCE

PEEBLES NEMP 12.4 REV. 1 ATT. N Pg 4 of 11



A Rolls-Royce Company



NEI Peebles - Electric Products, Inc.

17045 Euclid Avenue Cleveland, Ohio 44112 Telephone: (216) 481-1500

Telex: 241564

Facsimile: (216) 481-8386

January 9, 1991

Mr. Ed Walters Pacific Gas and Electric Co. 333 Market Street Room 9087, Ninth Floor San Francisco, CA 94106

Dear Sir:

I have attached to this letter copies of the Certification on the Fag Roller Bearing, and the Instrument Calibration Cards for the:

- Magnetic Crack Detector
- Interturn Test Unit
- Multimeter

I have been advised that Mr. Burt Hepponstall'arranged for Mr. Don Bouers to review NEI Peebles Electric Machine Crimping Procedure No. 5523. I have a copy of this Procedure but can not send it because it is an internal Document.

I hope this letter (with attachments) and the Welding, and N.D.T. Procedure sant to Mr. Burt Hepponstall on December 14, 1990, will close five of the open audit findings. Mr. Charles Moosbrugger will contact you by phone on Friday, January 11, 1991, to update you on the progress of the remaining two open audit findings.

Regards

NEI PEEBLES - ELECTRIC PRODUCTS, INC.

Frank D. Marino

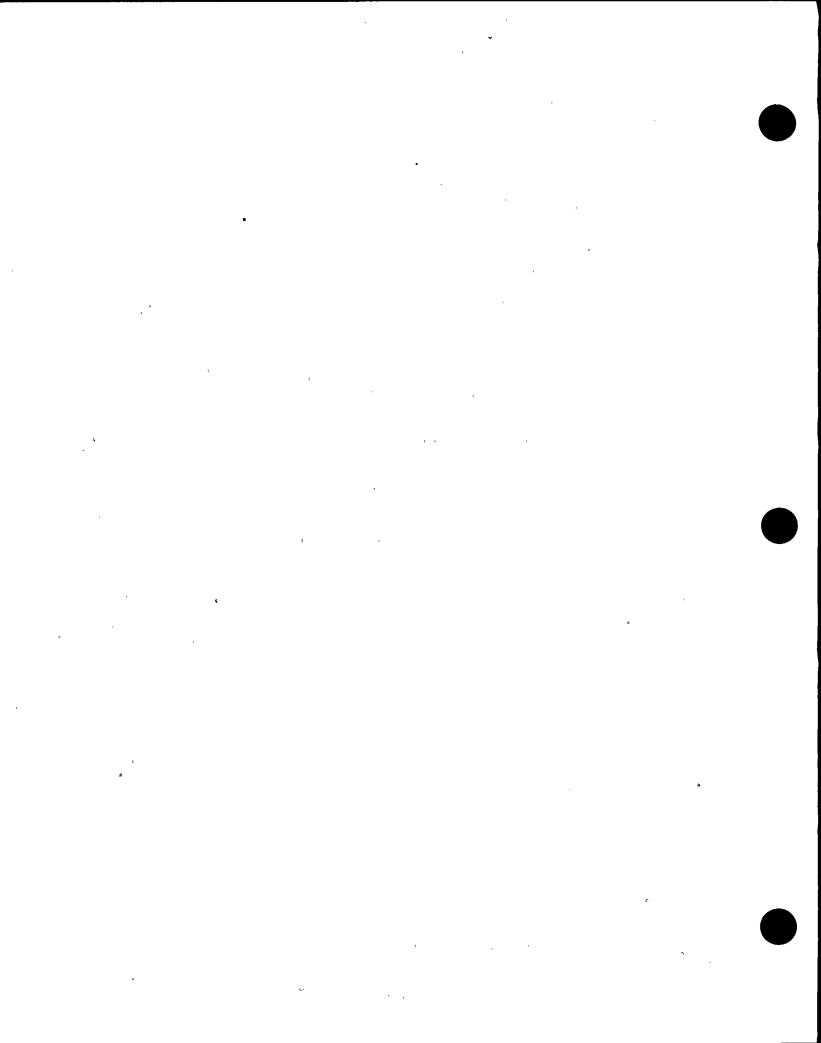
Manager, Quality Assurance

.cc: C. Moosbrugger

FM/ph

Attachments

PERBLES NEMP 12.4 REV. 1 ATT. N Pg 5 of



TICH CALIBRATION CENTRE

GPMDO!

MSL - Lowrech Limited 718 Whitecraigs Road, Glenrothes, Pris. KY8 270X Tel: 0692 773006 Fex: 0682 786341 Telex: 727796

Certificate of Calibration

03.10.90

762473/32728

NEI-PEEBLES LTD

Contract No.

Advice No.

THUS IS TO CHATLEY :-

(1) The undermentioned from her been enformed in accordance with the specification needs.

(I) The test equipment used has been selbresed against assessed tressable to National Standards.

(3) THE GUALITY ASSURANCE ARRANGOENTS ADOPTED ARE IN ACCORDANCE WITH

THE CONDITIONS OF OUR HOD REGISTRATION TO ABAP-4.

(4) THE UNDERNENTIONED ITEM WHEN CHECKED PRIDE TO RECALIBRATION WAS FOUND TO BE WITHIN SPECIFICATION.

Seviement Description

MULTIMETER

Menufecturer

AVD

Type

M2008

Serial No.

M21514570

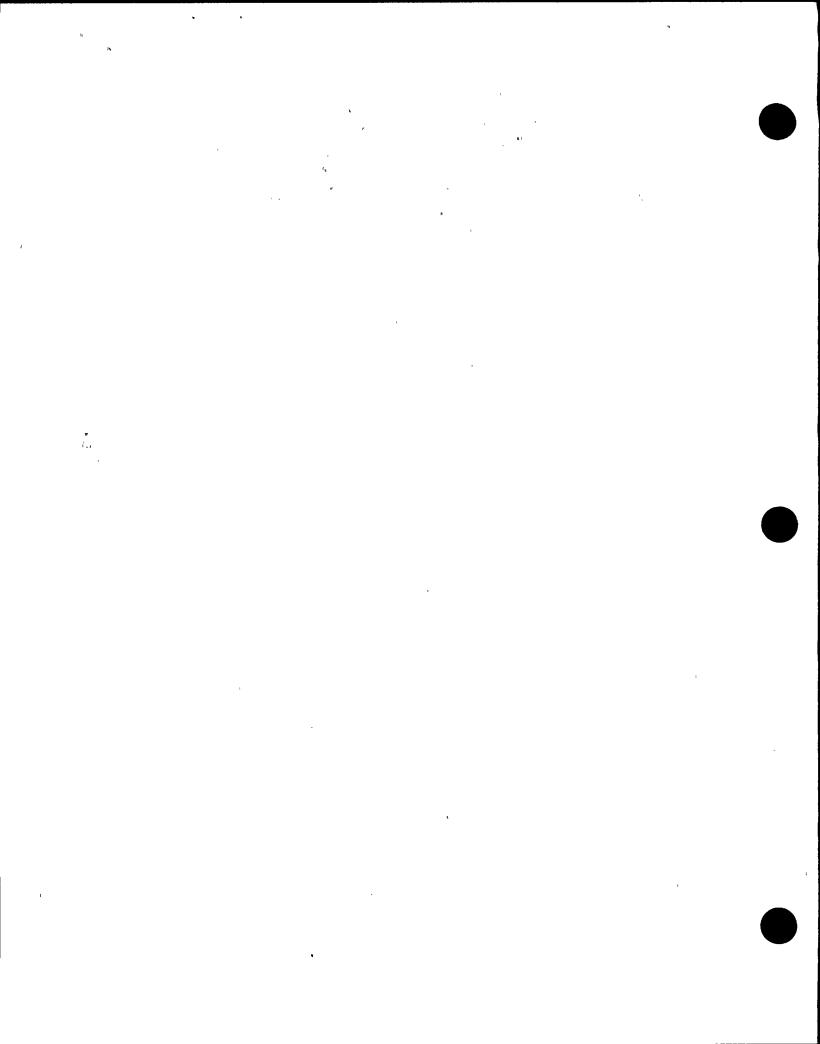
EPECIFICATION

MANUFACTURER'S PUBLISHED ACCURACY SPECIFICATION

REMARKS

THIS IS A SHORTFORM CERTIFICATE: ALL MEASUREMENT DATA ARE MAINTAINED IN THE LABORATORY RECORDS

AND ARE AVAILABLE ON REQUEST



Calibration System

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Pockled Electrical

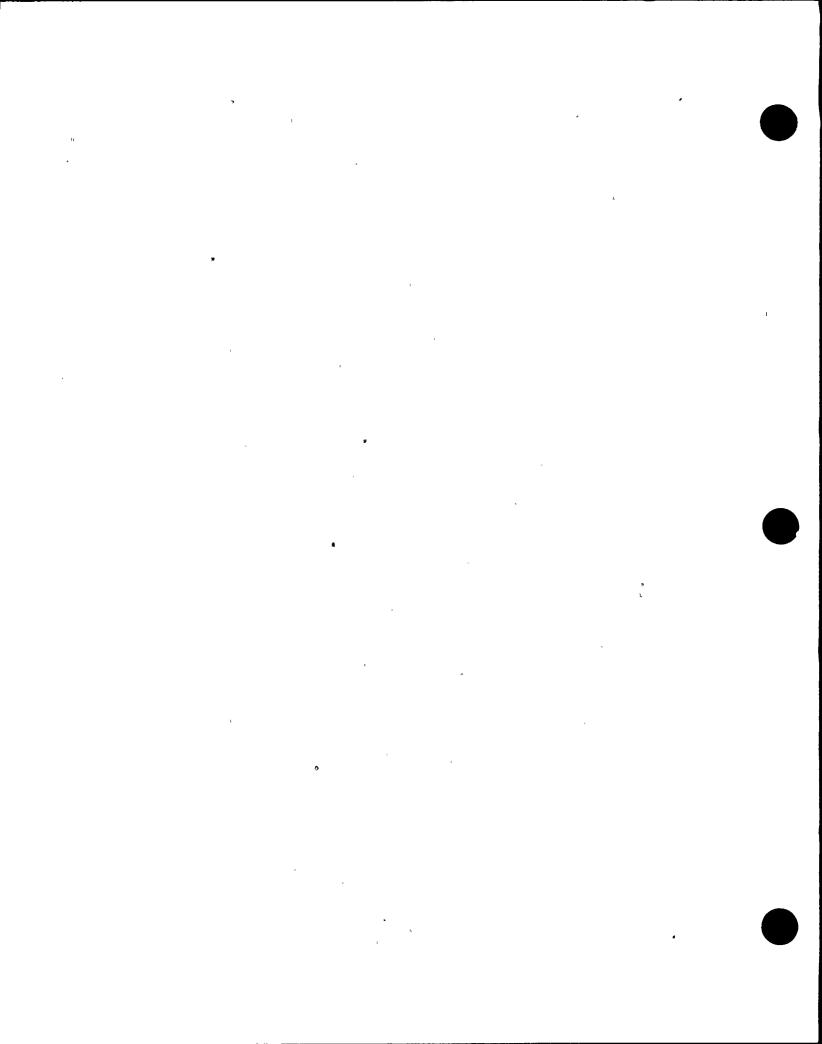
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Calibration System

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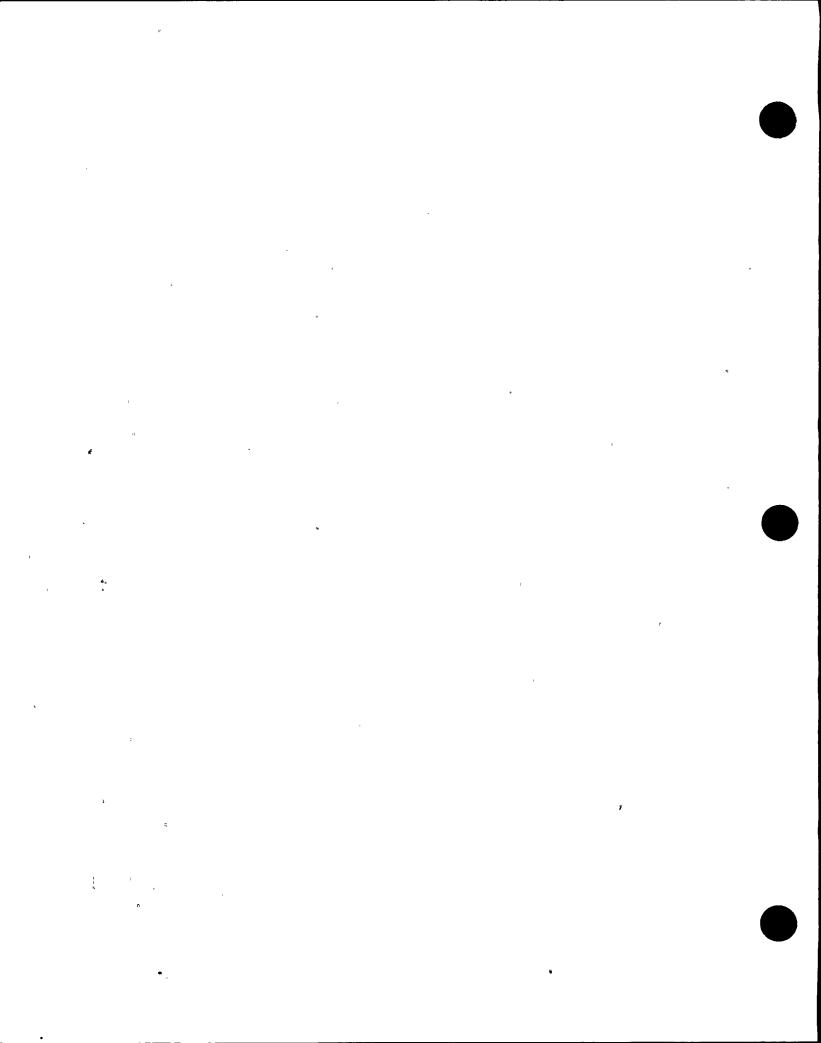
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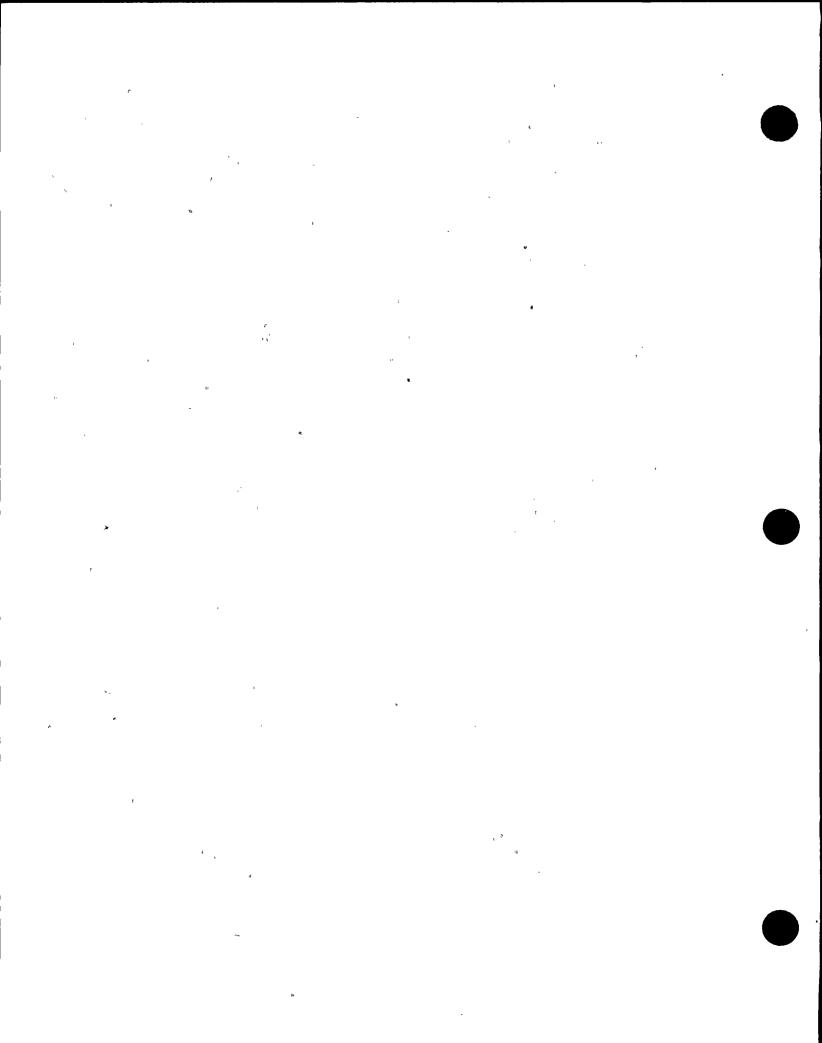
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P.8/10





Pacific Gas and Electric Company Diablo Canyon Nuclear Power Plant

Facsimile Cover Letter

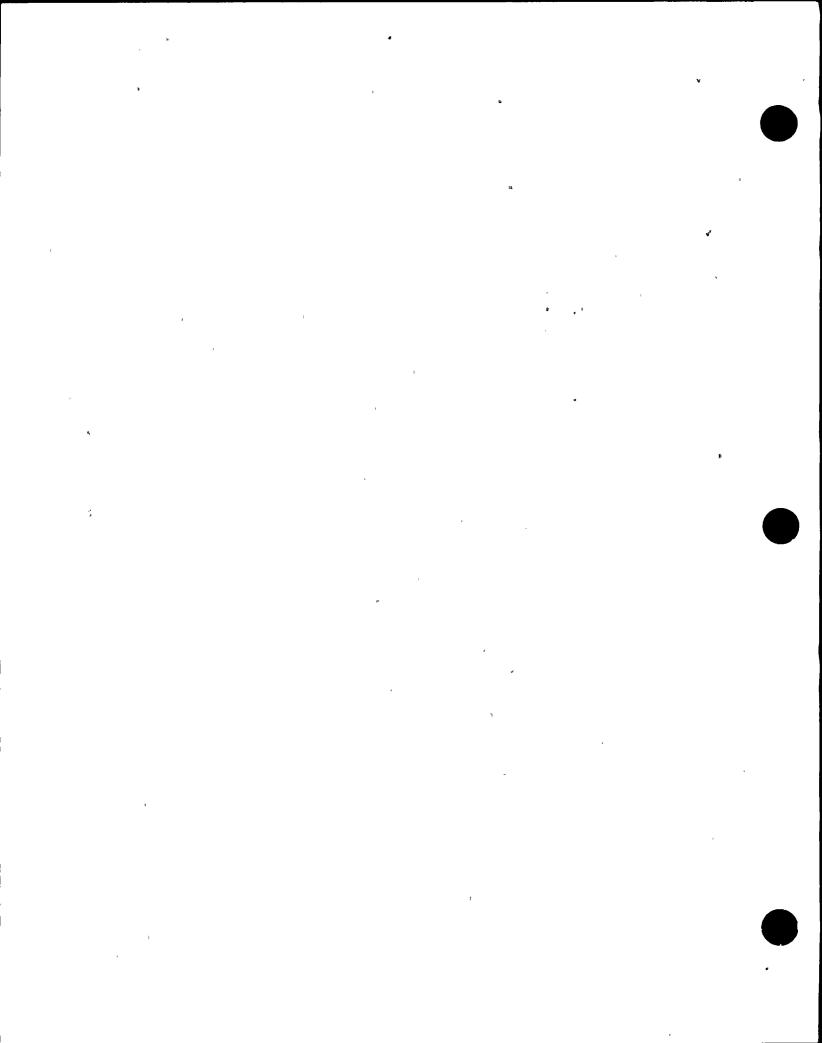


DATE:

2-5-91

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| TO: Burt Hepponstoll | FROM: , D. L. BOYER |
| COMPANY: PS & S | COMPANY: PG 45 |
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| ADDRESS: | ADDRESS: DCPP |
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This final inspection of the subject generator just prior to assembly and test concentrated on machine fabrication techniques, craftsmanship and adherence to design. addition to overall appearance, the following specific items were inspected.

Stator Core

Material Specifications: The material certificates were reviewed and approved during the previous audit.

Appearance:

Tight: Satisfactory. No laminate gaps visible.

Stacked Uniformly: Satisfactory. Slots perfectly aligned.

Ventilation Slots Clear: Unsatisfactory. Numerous slots blocked by insulating resin from the dip-and-bake process. (All slots were cleared prior to my reinspection the following day - Satisfactory.)

Clamping Structure Tight: Satisfactory.

Pasteners Tack Weided: Not Applicable. No through bolts, each compression ring is welded to axial ribs.

Clamping Fingers Tight: Satisfactory. Each welded to the compression ring at the outside diameter.

Burrs, Slot Fingers and Bore Surface: laminates are surface ground after punching.

Core to Frame Mounting: Solid. All core axial ribs welded directly to the frame rings. Full welds, satisfactory appearance.

Stator Core Wedges

Material Type: Gll per approved design change. An unpainted sample was not available for verification, however, the light color of the installed wedges is consistent with Gli appearance.

Design Geometry: Per design, 2.4 x 19.7 x 275 mm with 21.2 edge radius. No or guide chamfer at vertilation alot

Specification Spacing: None. Continuous through slot. driving length is a graftsman selection. Satisfactory as inspected,

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PEEBLES NEMP 12.4 REV. 1 ATT. O pg 2 g



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Tightly Installed: Satisfactory.

Condition After Driving: Good. No damage to the driven surface. No distortion from excess slot fillers.

Frame

Previously Questioned Welds: Appearance satisfactory. Unable to thoroughly inspect or MDE because of a heavy coat of paint. NEI assured that all subject welds were quality control inspected.

Terminal Box Additional Supports: Not yet fabricated. The materials are staged and the design is in the shop. The assembly has not been scheduled.

CT Lead Length: The shop was unaware that the CT secondary wiring was NEI's responsibility. The drawings were located that defined the requirement. Adequate lead length was added as a written final inspection topic.

Vent Screens Adequately Attached: All are secure.

Space Heater Mounting: The heaters are mounted on a single, easily removed bottom panel. Internal wiring with MT insulation is properly routed and anchored.

Stator Winding

Knuckles Solid: Yes (by sound).

End Turns Symmetrical: Yes. Excellent craftsmanship.

Adequate Clearance, Blocking to Bore: Yes. Only three blocks were questionable. These were immediately ground to increase clearance.

Surge Blocking Solid: No. Bore side blocks, both ends, were met matied. This was a fabrication oversight, and is specified in the design. The tying was begun immediately, and expected to take approximately four shifts to complete.

Coil and Insulation Construction: Unable to inspect. The installed coils are totally sealed, and no test coil was provided.

Brazed verses Crimped Coil Terminations: All internal terminations are the crimped type by design. I compared the field termination process standard with the termination maintenance specifications. The requirements were identical.

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PEERLES NEMP 12.4 REV. 1 ATT. O B 3 9 9 500

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The written termination tool calibration procedure was acceptable but marginal. They agreed to investigate a "go/no-go" method for future calibration. Also, future design should specify brazed or silver solder terminations. Motor/Generator manufacturers have found crimped terminations in high voltage/high current machines to be the least satisfactory.

Final Seal Coat (Internal): Not required by design. Earlier machines were seal coated, but it is not a necessity. The coating is more for appearance than service on dipped or VPI'd machines.

Power Leads: SI rubber with external woven jacket per design. The internal routing and support is satisfactory. The support at the frame exit was not installed yet, but was acceptable as described.

RTD's: The RTD's are 3 wire, 10 ohms at 25 degrees Centigrade per design. The routing and support was satisfactory.

Rotor

Brush Rigging: Not available.

Slip Rings: Satisfactory. The rings will be machined concentric with the rotor shaft after mounting.

Pole Key Wedges: Satisfactory. Full width minimum spacers added and driven tight. The wedges will be checked prior to rotor balance, machined flushed with the spider, and tack welded.

Pole "V" Blocks: The blocks do not extend to the lower step portion of the winding, which is unsupported. NEI assured that the improved "pole turn bonding epoxy" will properly support these conductors. Previous bonding material released several turns on one DCPP generator.

Pole Washers: Satisfactory. Changed to GP03. There is sufficient overhang and no fabrication damage.

Pole Terminating Leads: The termination is in progress. Blat extension leads, approximately 1 inch wide, formed, the terminating conductor and are full volume soldered. The support method was questioned. NEI claimed it to be the standard fabrication method.

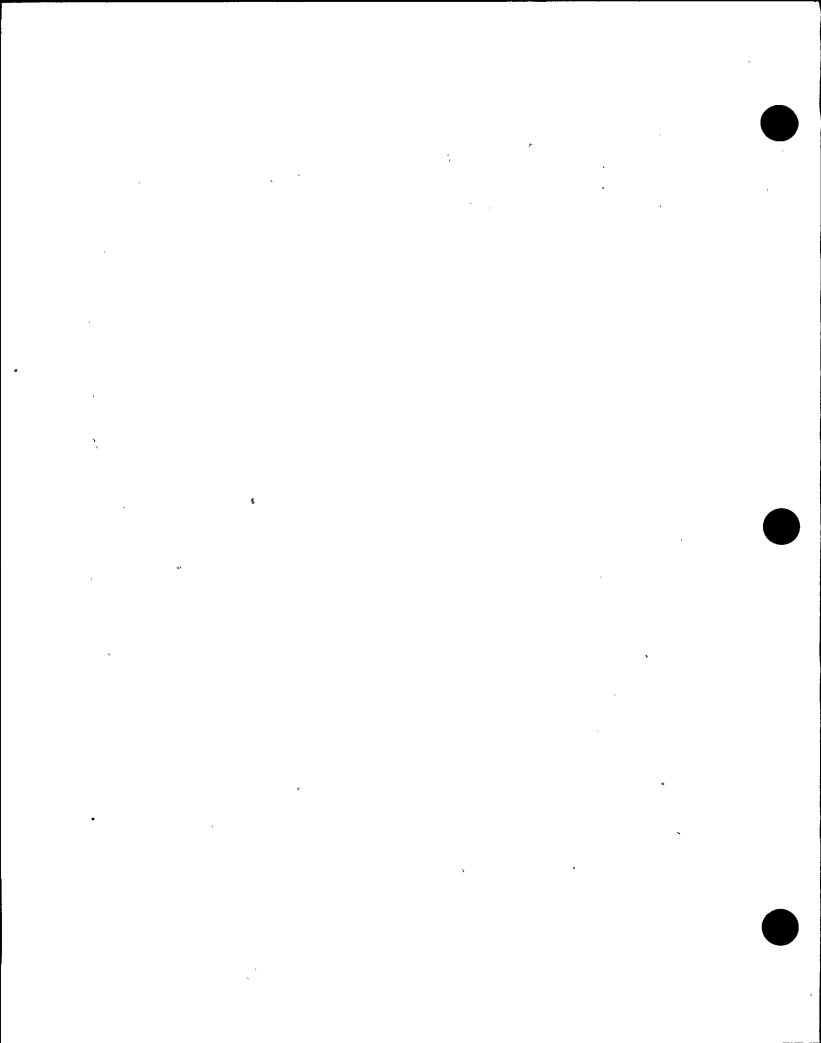
Non Bearing Shaft Surfaces: Satisfactory. The surfaces will be cleaned and painted prior to assembly.

Brushes and Leads: Not available.

DEEDLES NEMP 12.4 REV. 1 ATT. 0 pg 4 of 9

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Bearing Insulation: Not available.

<u>Miscellaneous</u>

Bearing and Bearing Support Properly Preserved Prior to Transport (the bearing and bearing support were badly corroded on the spare generator): WEI will coat the bearing, bearing support and surrounding area with Shell "Ensis" prior to assembly.

Compare Nameplate with Purchase Order Description: Nameplate not yet fabricated.

Any Differences from Previous Machines: Per NEI, none beyond approved design changes. Mowever, this machine will not receive a final stator seal coat. The other machines are coated. This topic could not be located in the available design.

Discussion of Items in PG&E letter dated October 29, 1990: All resolved satisfactorily.

Discussion of Generator Shaft Grounding (why is this not a design feature?): The grounding is usually furnished to the oustomer specifications. It was not specified on this order.

Brush Shipping Method: **Satisfactory.** The brushes are installed in the rigging but isolated (insulated) from the slip ring.

Hardness Testing

I witnessed a European equivalent hardness test performed on the generator rotor shaft coupling end. The hardness readings were taken at several different locations (approximately 18 inch separations). I accepted the manufacturers assurance that the conversion chart furnished was appropriate for verifying the PG&E required hardness (PG&E specified a minimum of 81.5 Rockwell B Hardness). Based on the above, the hardness test as witnessed was acceptable.

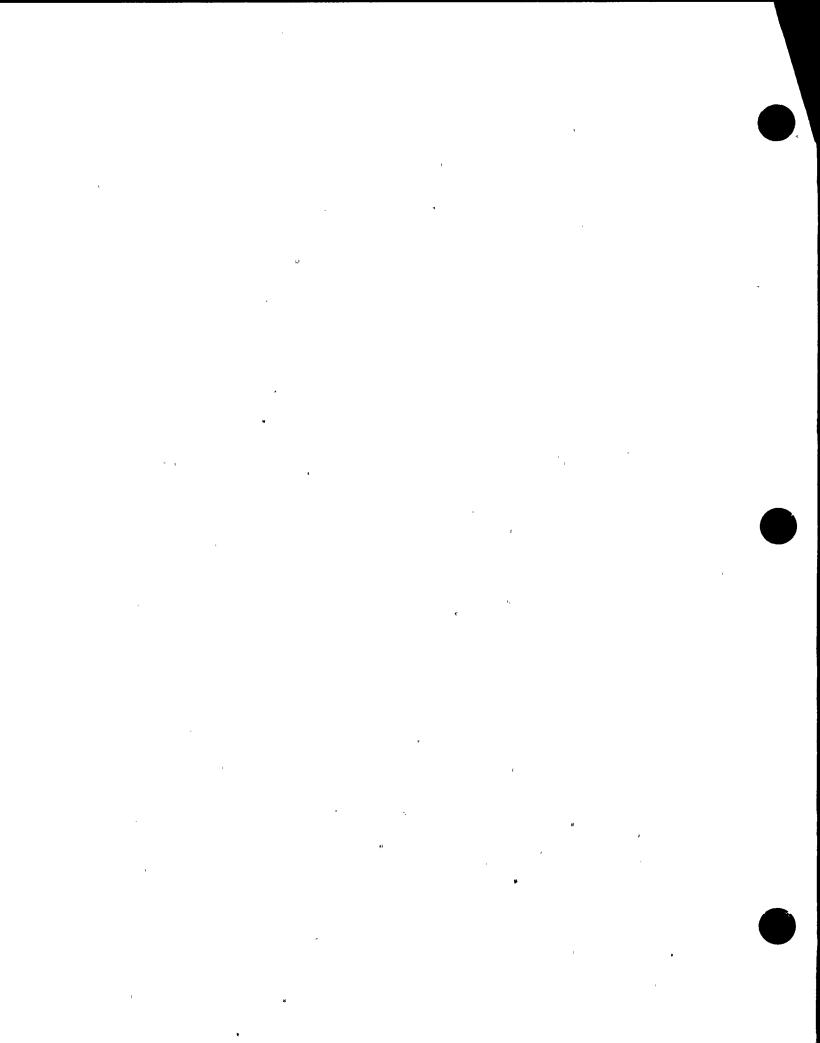
Conclusion

Several unsatisfactory machine conditions were discovered during the inspection and were immediately repaired or scheduled for prompt resolution. Considering the size and complexity of this generator, the number and nature of concerns discovered were small. Assuming no hidden flaws, which will be revealed through testing, this should be a totally reliable machine.

PERSLES NEMP 12.4 REV. 1 ATT. Opg 5 of

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The methods used to fabricate machine components employed tools and technology, selected over many years of experience, to produce the best product not the least costly or quickest to manufacture. NEI admittedly returned to individual hand punching and grinding of each core lamina to assure that motor, generator, and transformer cores were the most efficient and reliable that they could produce. Other similar ideal but labor intensive methods were witnessed along the production lines.

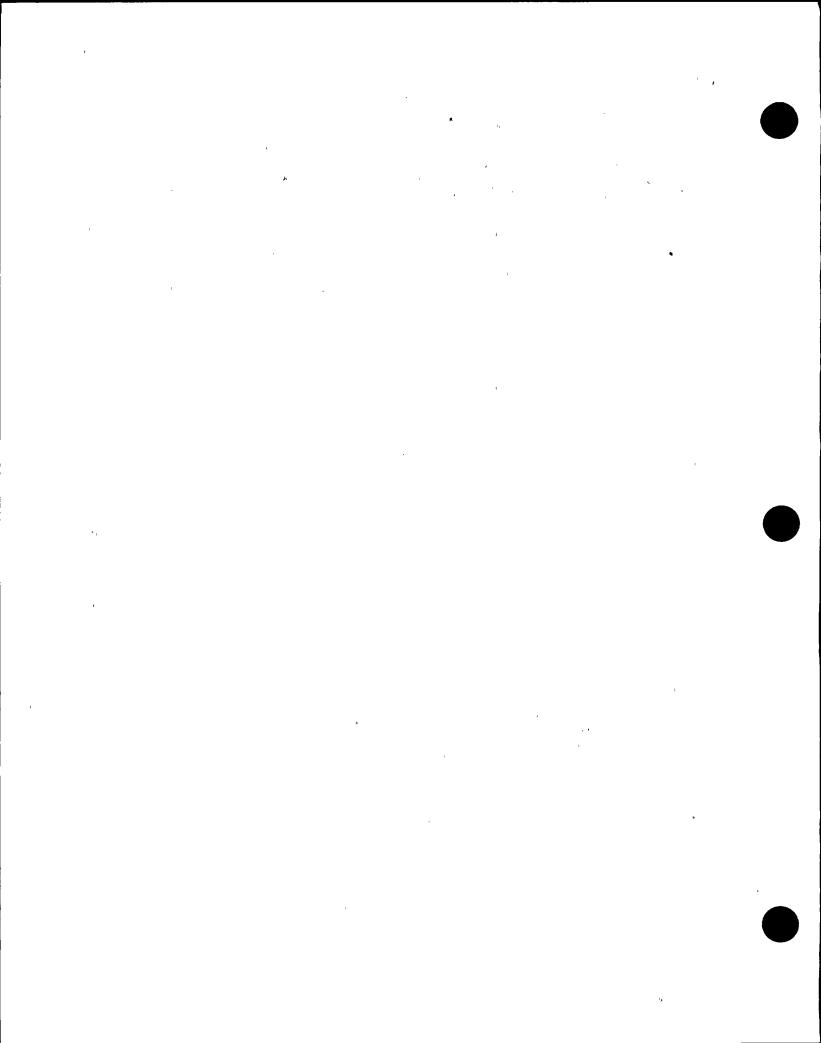
Craftsmanship on this order and throughout the factory was excellent. Production lines were clean and neatly organised. Every person met was friendly and anxious to explain in detail the task being performed. It was obvious that NEI people were considerate of their factory and product.

D. L. Bauer

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PEEBLES NAMP 12.4 REV. 1 ATT. 0 pg 6 of 9





CHECK LIST ISSUE I COMPRESSION JOINTS - STATOR WINDING

| GO | 240 | 274 | <u>.</u> |
|---------|-----|-----|----------|
| MACHINE | NO. | - I | |

PROCESS STD. R6061

| | • | TRIAL JOINTS UNEFECTION) | WINDING JOINTS (SHOP SUPERVISOR) | • |
|--|---|--------------------------|-------------------------------------|-------|
| Joint Type Toint Area """ Joint Const. Connector AMP CODE HYDRAULIC HD DIE INSERTS | COIL TO COIL CMA = 184026 44 0.258 x 0.102 PARALLEL, 86448 2/0 64049 4 8489 | Charles | WAMP SPOR | s. ' |
| Joint Type Joint Area Joint Const, Connector AMP CODE HYDRAULIC HD DIE INSERTS | COLTO BRALE RING CMA = 201039 GOFF & 258 * X O 102" PARALLEL, 36951 4/0 781017 45131/300430 | cheu | es af Amp : | recs |
| Joint Type Joint Area Joint Const. Connector AMP CODE HYDRAULIC HD DIE INSERTS | Benusiring To Cabif EMA= 278026 40ft 1258'x 102' + 70mi PARALLEL, 322275 231-300 MEM 781016 48816 | Chec | es whome s | Pers. |
| Joint Type Joint Area Joint Const. Connector Amp Code Hydraulic Hd Die Inserts | | | | |

CHIEF INSPECTOR:

DESIGN ENGINEER: O HONES CHECKED:

DATE:

DATE: 10/11/90 DATE: 10/11/90

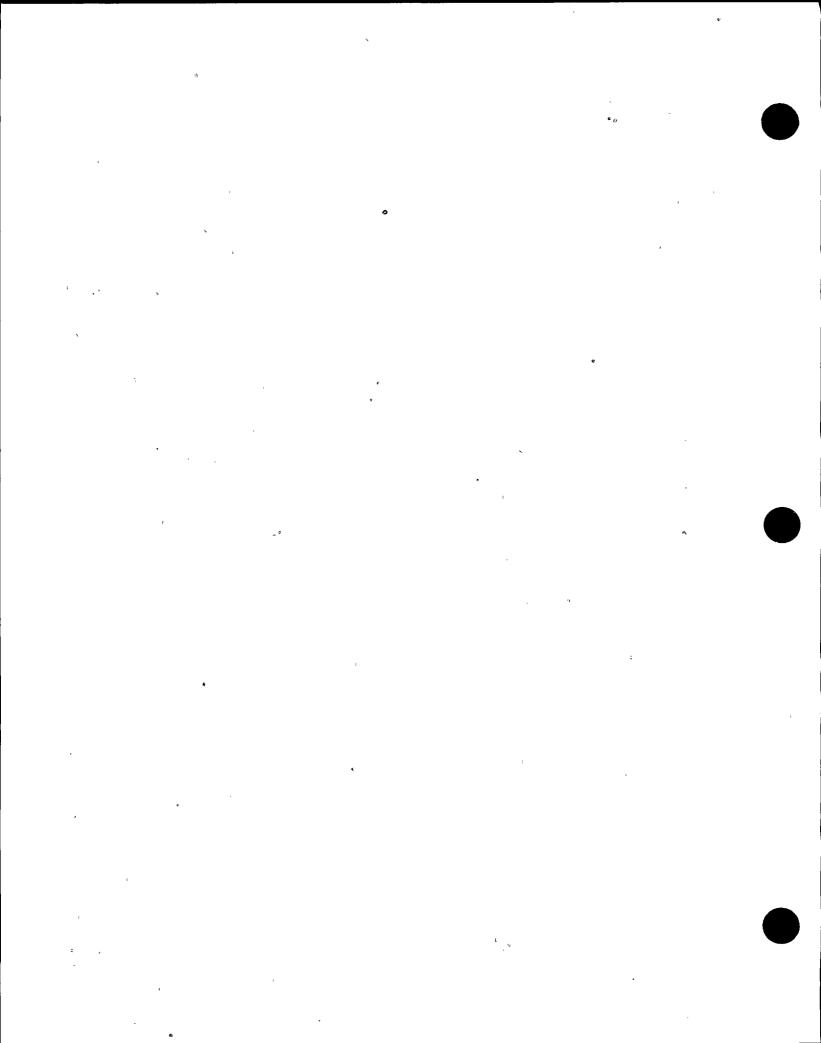
DISTRIBUTION: WDG. SHOP 1.

PEERLES MEMP 12.4 REV. 1 ATT 0 pg 7 of 9

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CI PRPE CLEVELANDS Euclid Avenue

Cleveland, Ohio 44112

Telephone: (216) 481-1500

| To: | Location: SAN FRANCISCO |
|---------------------------------|--------------------------|
| From: N, MONNOLLY | Location: NEI, CLEVELAND |
| Copies to: BURT HEPPON | 15TRLL |
| Date: 1-9-70 | |
| Number of pages including this: | |
| Reply to Fax No: 216 481 8386 | • |

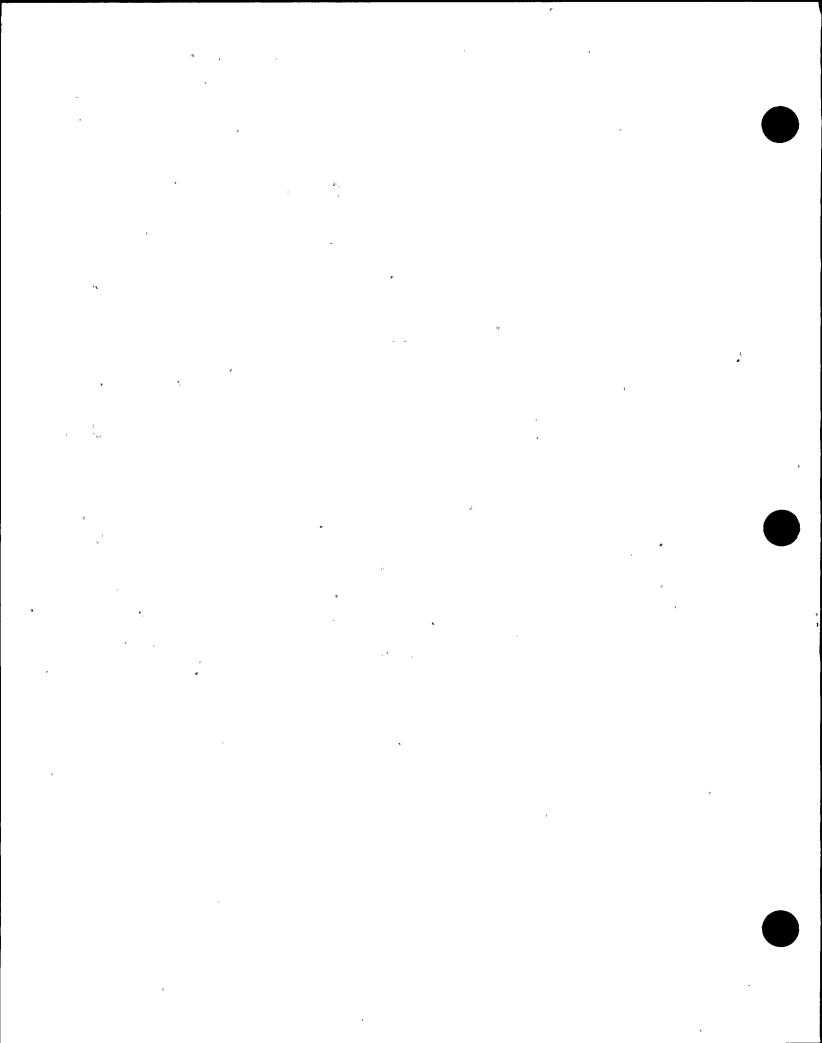
PEF: P.G. F. E P.S. X5-1539-A8-9 SPARE RECEION GEN.

WE CONFIRM THAT DON BAUER WENT OVER THE CRIMPING PROCEDURES AND WITNESSED THE SHAFT MARDHESS TEST. WHILE AT THE BDINBURGH PACTORY. THIS IS FURTHER CONFIRMED BY FACTORY REPORT LENT HEREWITH.

REBARDS

PETBLES NEMP 12.4 REV. 1 ATT. 0 pg 8 & 9









PERBLES LTD

PEEBLES ELECTRICAL MACHINES

East Pilton Edinburgh EHE 2XT Talephoner (051) 582 6361 Tales: 72125 (PP EDIN G) Sen (051) 582 7861

Generator for PGEE Yr O.W. 16271 8-1128 Our Ref BJF/260274

Re your fax of 4th January we advise the following:

- i. Don Bauer discussed in detail with our David Brunton our coil crimping procedures and these were found to be acceptable to him.
- 2. With regard to shaft hardness test this is a new requirement (it was not discussed during the Q.A. Audit) you are aware that we required clarification of this and we contacted Burt Repponstall of PGIT Burt fexed details (copy of fax attached for your records).

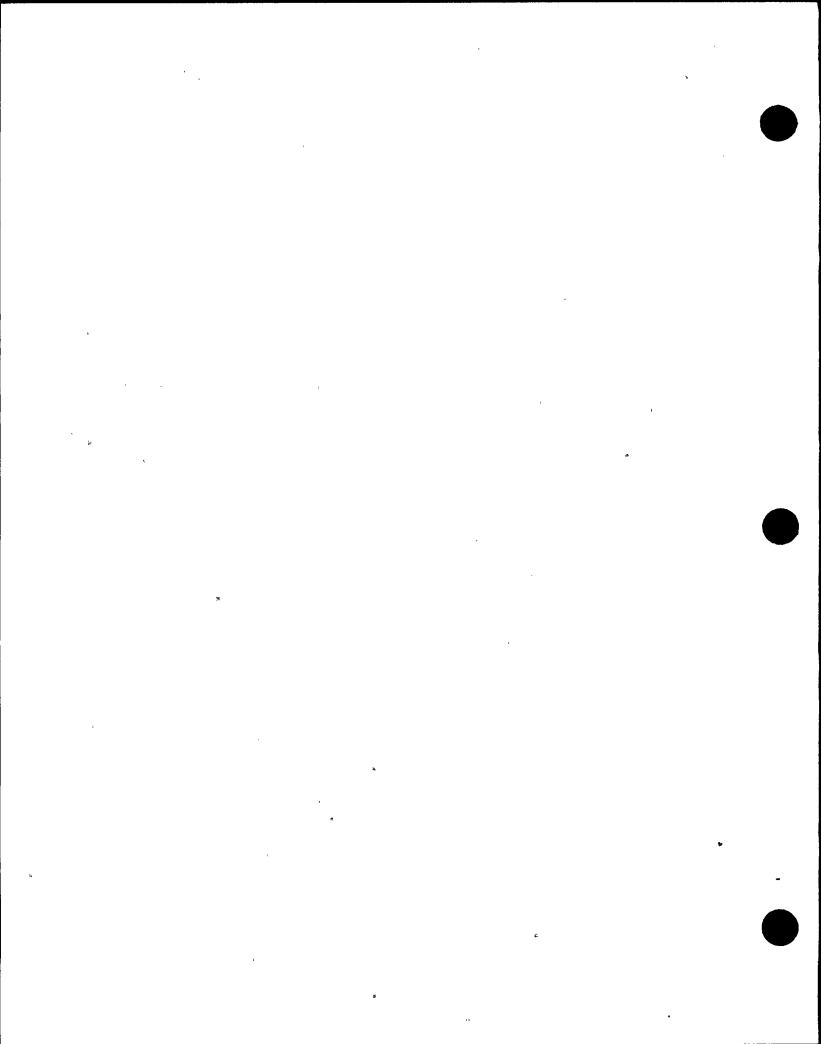
A hardness test was carried out yesterday in the presence of Don Bauer - Test was carried out successfully and I believe a figure of 90 was obtained. I have requested our inspection to give us a test report - this will be submitted to you in due course.

As advised above this test was a new requirement and involved us in much time to dig out equipment and carry out test etc. Accordingly we intend to submit an extra cost for this - this was mentioned to Don and he appeared to accept this.

Bui Fran.

PEEBLES NEMP. 12.4 REV. 1 ATT. 8 pg 9 of 9





PEP FAX

DESIGN CHANGE AND: PROCEDURE EQUIVALENCY

1-18-9/

PEEBLES NEMP 12.4 REV.1 ATT. P pg 1 & 33

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JAN 18 91 04:21PM NEI PEEBLES-ELECT PROS CLEVELAND NEI PEEBLES - ELECTRIC PRODUCTS,

17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

| To: Me. ED | WALTERS | | _Loczdon: | PGf | |
|---------------------|----------------|------|--|--------------|---------------|
| From: C. Moor | sbrugger | | Location: | NEI, Cle | veland |
| Copies to: | Your P.O | 1128 | 5-1539- | #8-9 2662 | DIABLO CANYON |
| Date: JAN | ř. | | | r | |
| Number of pages inc | iuding this: _ | 8 | | | |
| Reply to Fax No: | 216 481 | 8366 | ······································ | | - |
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THE FOLLOWING PAGES SUMMARIZE DUR.

EFFORTS ESTABLISHING EQUIVALENCE AS REQUESTED.

I MAY HAVE A FEW MORE ITEMS . TO

SUBMIT TO YOU AS I CONTINUE MY REVIEW.

Charles Monlyger

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JANUARY 18, 1991

EQUIVALENCY EVALUATION

1.0 PURPOSE

THIS EVALUATION IS IN RESPONSE TO THE REQUEST BY MICHAEL TRESLER OF PG&E TO RON POLITI OF NEI-PEP IN HIS LETTER OF OCTOBER 24, 1990.

2.0 SCOPE

THE SCOPE OF THIS EVALUATION COVERS BOTH ITEMS REFERENCED AS AFR NO. 4 AND AFR NO.6 IN THE LETTER. THE FORMER REQUESTS A DESCRIPTION OF ALL DESIGN AND MATERIAL CHANGES INCURRED SINCE THE MANUFACTURE OF THE OF THE ORIGINAL FIVE GENERATORS WITH TECHNICAL EVALUATION. THE LATTER SUGGESTS AN EQUIVALENCY EVALUATION OF NEI PEEBLES LTD. PROCEDURES AND SPECIFICATIONS TO NEI-PEP PROCEDURES WITH ANY EVALUATION THAT CANNOT ESTABLISH EQUIVALENCY BEING SUBMITTED.

3.0 LIMITING CONSTRAINTS

THE INTENT BY NEI-PEP IS TO PROVIDE AN ACCURATE AND PACTUAL BYNOPSIS COMPARING THE DESIGN, MATERIALS, AND PROCEDURES USED ON THE CURRENT MACHINE WITH THOSE SPECIFIED FOR THE ORIGINAL MACHINES. CERTAIN FACTS LIMIT OUR ABILITY TO DO THIS WHICH MUST BE WEIGHED WHEN INTERPRETING THE EVALUATION.

THE FIRST ORDER COMMENCED 21 YEARS AGO. OUR KNOWLEDGE OF THE ORIGINAL MACHINES AND THE SPECIFICATIONS TO WHICH THEY WERE BUILT IS LIMITED TO THE DOCUMENTED EVIDENCE THAT WAS RETAINED AT THAT TIME. THIS DOCUMENTATION IS WHAT WAS APPROPRIATE AT THAT TIME, BUT SHOULD NOT BE JUDGED AGAINST CURRENT STANDARDS.

NO ATTEMPT IS MADE TO IDENTIFY ANY MATERIAL OR PROCEDURAL CHANGES THAT OCCURED AMONGST THE FIVE ORIGINAL MACHINE; IF, IN FACT, ANY HAD.

NO COMPARISON OR EVALUATION IS ATTEMPTED RELATIVE TO THE GENERATOR BUILT IN 1987 BY NEI-PEEBLES ELECTRICAL MACHINES.

4.0 METHODOLOGY

A HIERARCHY OF CHANGES EXISTS AND IS NOTED ON THE BHEETS AS FOLLOWS:

A. CHARTS HEADED CHANGE OR DISCREPANCY. THESE CHANGES MAY AFFECT THE FORM, FIT, OR FUNCTION OF THE GENERATOR. SUCH CHANGES MUST BE SUBMITTED TO PGEE FOR EVALUATION. OUR EVALUATION OF SUCH CHANGES IS BASED ON PERFORMNCE CHARACTERISTICS OF THE GENERATOR, BOTH ELECTRICAL AND MECHANICAL. FROM EVALUATION OF OTHER CLASS IE GENERATORS WE KNOW THAT THE MAGNITUDE OF BEISMIC STRESSES IS GENERALLY MUCH LESS THAN THE OPERATING STRESSES. WHEN THE TWO STRESSES ARE SUPERIMPOSED THE SEISMIC STRESSES CAN BE CONSIDERED NEGLIGIBLE, BUT SINCE PGGE IS RESPONSIBLE FOR THE SEISMIC EVALUATION, PGGE MUST

peoples Nemp 12.4 REV. 1 ATT. Ppg 3 of 33

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EVALUATE THIS ASPECT.

B. APPLICATIONS (LIKE-FOR-LIKE SUBSTITUTIONS). CHANGES WHICH ARE INCURRED IN THE IDENTIFICATION OF MATERIALS OR PROCESSES DUE TO THE FACT THAT THE ORIGINAL MACHINES WERE BUILT UNDER AN AMERICAN SYSTEM OF SPECIFICATIONS, WHILE THE CURRENT MACHINE IS BUILT UNDER A BRITISH STANDARDS SYSTEM. NEI-PEM HAS FORMALLY NOTIFIED NEI-PEP OF SUCH SUBSTITUTIONS AS WELL, AND NEI-PEP REVIEWED SUCH SUBSTITUTIONS. NEI-PEP WILL MAKE A FORMAL REPLY TO NEI-PEM TO DOCUMENT THIS ACCEPTANCE. THERE IS NO CHANGE IN BUBSTANCE WHEREVER A TRUE EQUIVALENCE EXISTS AS SOME MATERIALS CAN COMPLY WITH BEVERAL STANDARDS SIMULTANEOUSLY.

5.0 DOCUMENTATION OF CHANGES

THE QUALITY CONTROL AUDIT HAS POINTED TO A NEED FOR A MORE STRUCTURED APPROACH TO THE HANDLING OF CHANGES. - WE ARE COMMITTED TO THIS FORMALIZATION. IN ORDER TO CLOSE OUT THE AUDIT FINDINGS ISSUES CONCERNING THE ENGINEERING INTERFACE WILL BE RESOLVED.

TOWARD THIS END, NEI HAS IBSUED DRAWING CHANGE NOTES TO PEP COVERING CHANGES INCLUDING THOSE OF TYPE B ABOVE "APPLICATIONS". PEP HAS APPROVED THESE BY MEANS OF THE "MATERIAL SUBSTITUTION " FORM AND AUGMENTED THE EXISTING PEP MATERIAL SPECIFICATIONS ACCORDINGLY, FOR THE SAKE OF FUTURE CLARITY, WHEREVER THIS IS POSSIBLE.

6.0 ABBREVIATIONS USED IN TABLES

NEI = NORTHERN ENGINEERING INDUSTRIES. REFERS TO ORGANIZATION IN EDINBURGH, SCOTLAND.

PEM = PEEBLES ELECTRICAL MACHINES. SAME AS ABOVE

PEP - NEI PEEBLES- ELECTRIC PRODUCTS. REFERS TO ORGANIZATION IN CLEVELAND, OHIO.

DRAWING CHANGE REQUEST. FORM NO. 1255 IN PEP QUALITY ASSURANCE SYSTEM. IT IS USED TO DOCUMENT DRAWING CHANGE REQUESTS, ADVANCED ENGINEERING CHANGES, ENGINEERING ORDERS, AND MATERIAL SUBSTITUTIONS.

PG&E = PACIFIC GAS AND ELECTRIC CO.

DWG = DRAWING.

Y.P. = YIELD POINT

ULT = ULTIMATE TENSILE STRENGTH

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Page 3

7.0 CONFIDENTIALITY

WE CONSIDER THE INFORMATION WE HAVE GIVEN HEREIN, TO BE HIGHLY PROPRIETARY AND EXPECT THAT IT NOT BE DIVULGED TO ANYONE OUTSIDE OF PACIFIC GAS AND ELECTRIC CO. WITHOUT OUR WRITTEN PERMISSION.

SUBMITTED BY

NEI PEEBLES- ELECTRIC PRODUCTS, CO.

CHARLES MOOSBRUGGER

ENGINEERING SPECIALIST

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|---|------------|---------------------------------------|--|--|--|
| | INE NO. | PEP REF | HET REF | FUNCTION - | EVALUATION |
| | 1 | M3 70.46 | BS 1449 PART 1 1963 GRABE CRSP4GP | LOW CARBON COLD ROLLED STEEL SHEET USED FOR WENT AND STIFFEMER LAMINATIONS. MAY ALSO BE USED FOR BOXES AND PAHELS. | NS 70.46 LISTE T.P. 27500 PSI, BLT. 50000 PSI. CHSPGP BAS LOWER PHYSICAL STRENGTH SO SUBSTITUTION IS ONLY ALLOWED ON PARTS BITH LOW STRESS. HERE HELDARILLITY IS IMPORTANT, NOT NECHAMICAL STRENGTH, SO MATERIAL IS ACCEPTABLE. THIS SUBSTITUTION IS NOT UNIVERSAL. |
| | 2 | MS 79.43 | BS 970 PART 1 1983 GRAVE 878H20 | VEHT SPACERS ARE SHALL I SHAPED BARS WHICH ARE IN- SERTED BETWEEN STATOR LAWINATIONS TO FORM COOLING VEHTS. THEY ARE SPOT WELDED AND PLACED IN CON- PRESSION DURING STATOR ASSEMBLY. THIS DESIGN APPROACH IS USED WORLD WIDE. | THE 870N20 IS THE SAME USED ON ALL PEN MACHINES AND THERE IS NOTHING UNIQUE ABOUT THIS APPLICATION. YIELD STRENGTH IS 2900B PSI NIN. AND IS SUFFICIENT FOR THE COMPRESSION LOAD BARRING ASSEMBLY. MATERIAL IS MELDABLE. SUITABLE FOR UNIVERSAL SUBSTITUTION. |
| | 3 | NS 70.17 (C) | 85 970 PART 1 1983 GMDE 080H38 | ICEY STEEL FOR POSITIONING SLIP RING AND NOTOR SPIDER ON SHAFT. WEDGE SHAPED KEYS USED TO SECURE POLES IN SPIDER. | THESE KEY MATERIALS ARE MAMBER THAN THE ADJUINING MATERIALS. KEYS ARE NOT DESIGNED TO TRANSMIT TOROUG BY TORSTONAL SHEAR. TH COURSO NATERIAL MAS APPROXIMATELY 15 % LOWER ULTIMATE STRENGTH, BUT IS ACCEPTABLE TO PEP. MANDRESS RANGE OF COOKSD ENCOMPASSES THAT SPECIFIED IN MS 70.17. |
| | 4 | HS 70.12 (3) | BS EN 100025 1990 CRAME FE 430A | MEDIEROUS APPLICATIONS IN STATOR ASSEMBLY FOR THIS NOT ROLLED STEEL BAR. THICKEST SECTION USED IS FOR STATOR FEET WHICH ARE 1.5 IN. ALSO USED FOR BOTOR POLE HEAD. (MS 78.14 PROPERTIES CAN BE CERTIFIED (A-36) AND IS USED WHERE CERTIFICATION IS REGID) | NS 70.12 LISTS AVERAGE PHYSICAL PROPERTIES AND REFERENCES AIST N-1020 FOR THE THICKNESS RANGE MEEDED MERE. AIST GIVES HINTHAN VALUES OF YIELD 30000PSI, AND MITIMATE 55000 PSI. THESE VALUES NOWEVER CAN MOT BE CERTIFIED WITHOUT SPECIFIC TEST ON THE ITENTISELE. THE BE STD LIST THESE PROPERTIES AS A FUNCTION OF THE ITENTISES. FOR THICKEST ITEN USED WHERE WALUES ARE LOVEST, YIELD IS 38A25PSI URT 59A50-81280PSI WHICH SURPASSES HIM. REQUB BY AIST. CARE IS NEEDED IN APPLICATION TO CRITICALLY STRESSED PARTS SUCH AS ROTHER POLE NEADS. SUBSTITUTION IS VALID ON THIS MACHINE, MUT CAUTION MUST BE OBSERVED. PEP NOTIFIED PEN TO SCRAP ORIGINAL POLE NEADS AND REDWAYE THEN WITH THE PROPER DIRECTION OF GRAIN ORIENTATION. |
| | 5 | * RES 70.13 (5) | BS 1449 PART 1 1983 CRADE CRSP4GP | NOT ROLLED COMMERCIAL QUALITY STEEL SHEET UP TO 3/16 IN USED FOR PANELS, NOTES, BAFFLES, ETC. | MATERIAL IS SELECTED ON THE BASIS OF FAMRICATION PROPERTIES (MENDING, DRAWING) RATHER THAN NECOMMICAL STRENGTH. (F MEI MAT'L MEETS THE FAMRICATION REQUIREMENTS IT IS SUITABLE. THE SRITISH STD LIKEVISE DOES NOT MAYE NAMOATORY STRENGTH REQUIREMENTS. REQUIREMENTS RELATIVE TO CARRON CONTENT ARE NET BY MEI MATERIAL. SUBSTITUTION IS UNIVERSALLY APPROVED. |
| • | 6 | * * * * * * * * * * * * * * * * * * * | BS 1581 PART 1 1980 TYPE 161 GRADE 430A | NILD STEEL CARON STEEL PLATES USED FOR SUCH ITEMS AS SUPPORT RING ON STATOR FRAME, END BRACKETS, FAM SUPPORT RING, FAM BLAGES. | PHYSICAL PROPERTIES ARE ALMOST IDENTICAL AND MATERIALS ARE UNI- VERSALLY INTERCMANGEABLE. |
| 1 | 7 | ^A RS 10.2 | 873-4951 | INSULATING VARNISH | BOTH FROM STERLING VANHISH COMMAY, ONE US, ONE UK. THE 073-49 MAS HIGHER DIELECTRIC STRENGTH WHEN TESTED TO ASTH D 115 AND 15 AN ACCEPTABLE SUBSTITUTION. |

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| 26g | LINE 100. | PEP REF | NEL REF | FUNCTION | - EVALUATION |
|-------------------------|--------------|---------------|--|--|---|
| 3 Paris | 8 | W 10.5 (10) | W 63 | BLACK AIR DRY INSULATING VARNISH USED TO SPRAY COILS POLES, OR OTHER PARTS REQUIRING A BLACK COATING. | CHEMICAL RESISTANCE, ABRASION RESISTANCE, THERMAL CLASS ARE THE SAME. VA 63 MAS SLIGHTLY HIGHER DIELECTRIC STRENGTH. VA 63 SULTABLE UNERE EVER MY 10.5 IS CALLED FOR. |
| Nem | 9 | * HS 78.77 () | 330-50-AS PEN NAT'L PURCIASE SPEC. R 8046 | ELECTRICAL SHEET STEEL USED FOR STATOR LAMINATIONS | THE METIC LAMINATIONS ARE .OS ON THICKER. THE MATTS/LB LOSS (LINEN COMPARED AT THE SAME FILIX DENSITY AND-FREQUENCY) OF THE BRITISH MATERIAL IS BELOW THE MAXIMUM ALLOWED BY THE MS 70.77 SPECIFICATION. THE SUBSTITUTION IS PERMITTED. |
| p 12 | 10 | *NS 70.38 (2) | TENSILOY 250 | NOT ROLLED "POLE IRON" STEEL USED FOR POLE AND NOTOR LAMINATIONS | TENSILE STRENGTH AND VIELD STRENGTH OF TENSILOY GREATER THAN THAT OF NS 70.38. ELONGATION THE SAME. DC PERMEABILITY OF TENSILOY GREATER THAN MINIMUM REQUIRED BY MS 70.38. SUBSTITUTION IS TREREFORE ACCEPTABLE. |
| CLEVELAND | 11 | *NC 80.5 (2) | BS 1432 GRADE C103 CONDITION 0 | SOFT ONTGEN FREE COPPER BARS, ROOS, OR SHAPES USED FOR POLE END STRAPS AND ROTOR END RINGS. | BOTH ONTGEN FREE GRADES, ANNEALED, COMPARABLE IN TENSILE STRENGTH BS MAT*L WAS SLIGHTLY LOWER TENSILE STRENGTH, BUT THIS IS NOT SIGNIFICANT. (30500PS) VS. 32000PSI). IMPORTANT ASPECT IS TRAT MAT*L IS COVIGEN FREE SO THAT HYDROGEN EMBRITTLEMENT DOES NOT OCCUR. THE MRITISM STAMMARD SPECIFIES FREEDOM FROM BYDROGEN EMBRITTLEMENT. SURSTITUTION ACCEPTABLE. |
| CCI PRDS | 12 | HC 80.6 (G) | BS 4608 GRADE C103 COND1110N 1/2 N | OXYGEN FREE COPPER USED FOR POLE END PUNCHINGS | ABOVE CONVENTS ON HYDROGEN EMBRITTLEMENT APPLY MERE AS WELL. TENSILE STRENGTH IS LESS TRAIN GIVEN IN MC 80.6 BUT RIGH STRENGTH IS NOT REQUIRED FOR PUNCHINGS. SUBSTITUTION ACCEPTABLE. |
| 7;-63-638 813-63-638 | 13 | HC 50.6 | BS 1433 GRADE C103 CONDITION N | NARB DRAIM OKYGEN FREE COPPER USED FOR AMORTISSEUR BARS AND RUTOR BARS | EMBRITTLEMENT AGAIN APPLIES AS ABOVE. STRENGTH IS REQUIRED SO ROOS DO NOT DEFORM DURING MANUFACTURE LINEN THEY ARE DRIVEN INTO SLOTS IN LAMINATED BOTOR POLE. THIS MATERIAL IS STRONGER THAN THE BS 4688 AND IS SELECTED FOR THIS REASON. MATERIAL IS SUITABLE FOR TRIS APPLICATION. |
| 04:24PM NEI | 14 | ₩C 25.3 (1) | POLY-THERMALESE 2008+ DAYGLASS | UNVARNISHED FUSED POLYESTER-GLASS COVERED COPPER MAGNET WIRE SUITABLE FOR MAINTACTURING COLLS OF ELECTRICAL APPARATUS. | THIS IS NOT A MATERIAL SUBSTITUTION AS NV 25.3 LISTS POLYTHER- NALEZE 2000-DAYGLASS MADING THE TRADEMANES OF APPROVED SUPPLIERS. |
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| | CRAL DISCREPARE | SUPPRET | COMMENTS |
|-----------------|-----------------------------|---|--|
| 5,8 | WEL DEFECT MOTE 6188 | THE STATOR FRAME (MF) PEN BA 14901, PEP DAG 8-66825H-1) WE ENTIONALLY INCORRECT. MEE INITIATED CORRECTIVE ACTION AND PEP VIA FAX. PEP APPROVED THE CORRECTIVE ACTION. | |
| Z) | PMONE 1-7-91 | PEP WAS ASKED WHETHER A CONCESSION COULD BE SOUGHT FOR LASHING ON COIL END TURN SPACERS. PEP STATED THAT NO CONCECUED BE GRANTED. LASHING WILL BE DONE TO THE PEP STAMOA | ESSION EVENTS SUCH AS SHORT CIRCUITS AND OUT OF PHASE STACHRONIZATION. |
| | PEP OCR 11422 | JACKING SCHEN HOLES ADDED TO FACE OF SHAFT FLANCE. | PERE REGUEST REF. DAG FC-H-13056 REV. 0 |
| 22 | PEP DCR 11415 | APPLICATION OF NEI STANDARD CABLE FOR DC FIELD LEADS. | THE PEN CAMLE GUMLIFIED TO TEEE 383. THERE IS NO CHANGE. |
| | PEP DCR 11414, 11410 | BOTH DORS MORESS NOT OF LIELDS. BOR 11410 ACCEPTS INAGUET NETHOD AS DEFINED IN HEI SPEC R5036 BY ADDING REFERENCE TO STD PS3022. BOR 11414 FURTHER CLARIFIES PS3022 BY ADDING OPERATOR QUALIFICATION OF R5036 (APPROVAL TO CVIP-MAGPEN TO CEGS STANDARD 98984). ALSO ADDED THAT R5036 IS IN ACCURTH BS 6072. | O IT IN PEP DETECTION OF WELD FLAMS. AS THIS IS A CRAFT SENSITIVE ACT- TIVITY, THE RELIABILITY OF RESULTS IS EMMARCED BY EMPLOYING 4-B1 AND METHODS FAMILIAR TO THE OPERATOR AND AMALYSER. THERE IS NO |
| GNOTING! | PEP DCR 11413 | REINFORCEMENT ADDED TO AC TERMINAL WOK (PEP PAG C-60760A- BRACES ADDED FROM BACK OF BOK TO GENERATOR STATOR FRAME. CORNERS OF BOK ALSO REINFORCED WITH CUSSETS. | |
| CLEVE | PEP DCR 11412 | MATERIAL SUBSTITUTION OF NEWA GRADE GIT GLASS REINFORCED FOR GPO-1 IN SLOT STICKS. GPO-3 SUBSTITUTED FOR GPO-1 IN WASHERS. | |
| Sogrect PRDS | PEP DCR 11411 | BS 605 N36 CONDITION T WAS SUBSTITUTED FOR PEP MS 70.15 S RODS AND STUDS IN ROTATING ELEMENT (PEP DUG A-66826 ITEM MATERIAL WAS SUITABLE FOR THE APPLICATION BUT THE SUBSTIT NECESSITATED SPECIAL ATTEMPTION TO THE MELDING PROCEDURE. WELDING PROCEDURE SPECIFIC TO THIS APPLICATION WAS WRITTE AND APPROVED BY PEP AND PGEE. | 5). THE POR FOR REVIEW. IUTION A |
| NEI PEEBLEBAGLE | | MATERIAL SUBSTITUTION FOR FIELD LEAD TERMINALS FOR ROTOR TENNINALS PER PEP ET 1.1 CALLED FOR 4 THICKNESSES OF .015 COPPER TO BE USED TO FORN THE TERMINAL. SUBSTITUTION OF NESSES OF .5MM x 25MM COPPER WAS APPROVED PROVIDED THAT // NOTEN IN THE POLE WASHER BE EXPANDED TO ACCUMUDATE THE INVIDIN OF COPPER. | 5 x 5/8 IN. 2 THICK- A SMALL HCREASED |
| 300 | PEP DCR 11397 | AC GENERATOR LEAD CABLE WAS PEP MC 18.7, GE VULKAFLEX CAR IS NO LONGER AVAILABLE. SUBSTITUTION OF A SILICONE INSUIT TYPE SINO-KIL, 70MM 6.6KV FLEXIBLE STRAND CABLE HEETING RESISTANCE REQUIREMENTS OF IEEE 383 WAS APPROVED. | CATED THIS APPLICATION. G FLAME |
| 16, 81 | PEP DCR 11382 ₍₎ | INCORPORATED PHASE SEQUENCE CHANGE PEP PGRE REQUEST AND ROTOR INSULATION PROM PEP EI 1.5.0 (A POLYESTER BASED SYSTEM). | CHANGE IN STEM) TO THESE CHANGES A PART OF PEDE PURCHASE ORDER. BOTH SYSTEMS NAME BEEN USED ON OTHER CLASS 1E GENERATORS. |
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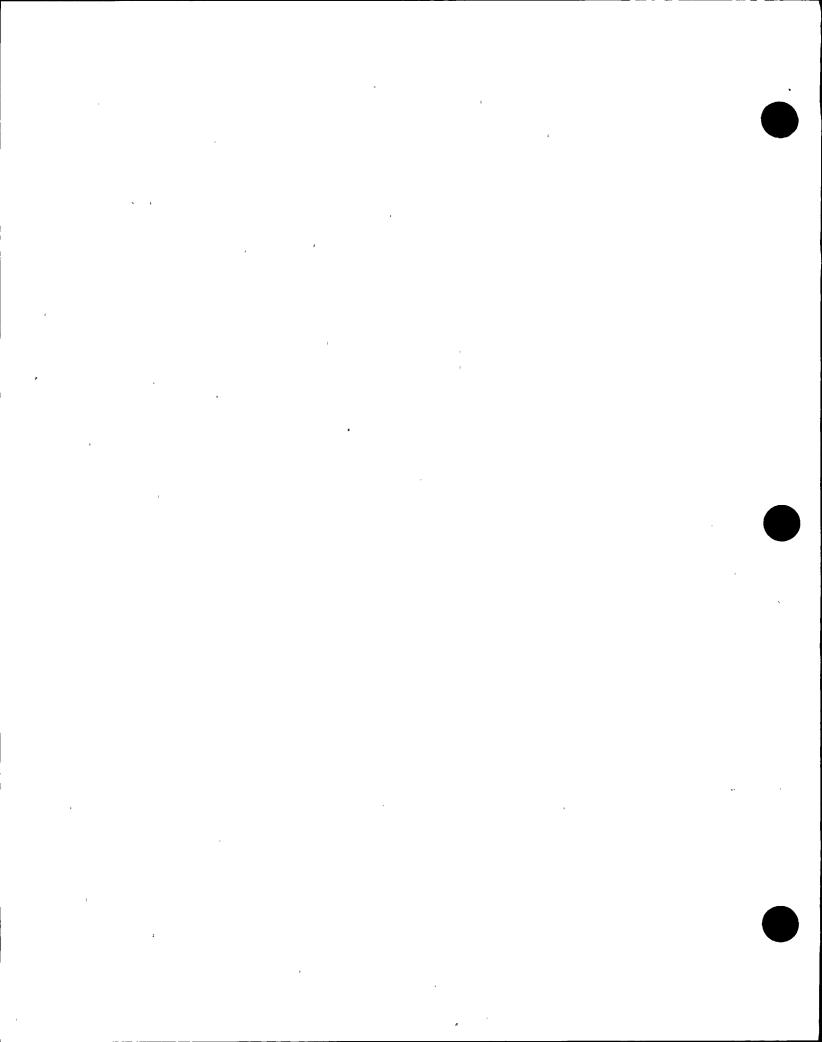
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| DIAL CINCLE | SUWARY | COMMENTS | | | | | |
|---|--|--|--|--|--|--|--|
| Aug. 28 1990 Discrep Hote | SHAFT DIMMETER AT COUPLING END WAS UNDERSIZED BY .0025 IN. PEN REQUESTED PEP TO DETERMINE IF SHAFT WAS ACCEPTABLE, OR IF NOT TO RECOMMEND METHOD OF RECLAIMING DIAMETER. | PEP NOTIFIED AND RECEIVED APPROVAL FROM PGAE TO USE AS IS. | | | | | |
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FEB 07 791 04:15PM NEI PEEBLES-ELECT PRDS CLEVELANDEL PEEBLES - ELECTRIC 1/40DUCTS,

17045 Euclid Avenue. 179824 Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

| TO: MR. ED WALTERS | Location: PG &E / 9TH FLOOR |
|-----------------------------------|-----------------------------|
| From: C. Moosbrugger | |
| Copies to: | |
| Date: FEB 7, 1951 | |
| Number of pages including this: 5 | |
| Reply to Fax No: 216 481 8386 | - |
| TACHED PLEASE FINE | s THE Procedures" |
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Charles Moonly gum

PETELES NEMP 12.4 REV. 1 ATT. Ppg 11 of 33



A Rolls-Royce Company

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NEI Peebles - Electric Products, Inc.

17045 Euclid Avenue Cleveland, Ohio 44112 Telephone: (216) 481-1500

Telex: 241564

FaceImile: (216) 481-8388

February 7, 1991

EI-3224

Mr. Ed Walters Pacific Gas & Electric Co. 333 Market Street Room 9087, Ninth Floor San Francisco, CA 94106

Dear Mr. Walters:

Following up on our communication of January 18, 1991, attached is a summary of the procedures which were required by NEI-PEP purchase order placed on NEI-PEM, and their disposition.

The introduction to that earlier communication would be applicable here, as well.

Yours truly,

NEI Peebles- Electric Products, Inc.

Mooden

Charles Moosbrugger

Technical Manager

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| ITEM | R C | SUMMAY | CONNENTS 5 |
|--------|--|--|---|
| 1 | STACKLING CORE PS-5004 | DELIMENTES SHOP INSTRUCTIONS FOR ASSEMBLY OF SECHENTAL LAMINATIONS AND USE OF DRIFTS TO PROVIDE PROPER SKEW. | CORE BUILT TO THIS PROCEDURE. NO CHAIVE-LE |
| 2 | STATOR COIL INSURATION E1-1.1.0 | THIS ENGINEERING INSTRUCTION DESCRIBES THE INSULATION SYSTEM USED ON STATOR COILS; INCLUDES MATERIALS, AMOUNTS, AND SECUENCE OF OPERATIONS. THIS INFORMATION IS CALCULATED BY PEP ENGINEERING AND RECORDED ON CO-L AMO NO-L DATA SHEETS. | USED AS 18. ANY NATERIAL SUBSTITUTIONS OF APPLICATIONS THAT MAY MAVE OCCURRED AND LISTED IN NATERIAL CHANGES. VU |
| 3 | COIL PROCESSING EP-1.1.8 | LISTS PROCESSING PRACTICES FOR MAKING THE E1-1.1.0 COILS | COILS NAMERACTURED IN ACCORDANCE WITH THIS SPEC. |
| • | URAPPER TAPER CUT EU- 4.1 | DESCRIBES DINENSIONS FOR TRAPEZOID SHAPED COIL MAPPERS. | URAPPERS BUILT TO THIS STANDARD. NC; CHANGE |
| 5 | INSPECTION PROCEDURES ET-3.1, EQ-2.17 | E1-3.1 OUTLINES INSPECTION: DIMENSIONAL CHECKS AT VARIOUS STAGES OF MANUFACTURE E0-2.17 PROVIDED TABLE FOR RECORDING DIMENSIONS FROM INSPECTION IN P.E.P. OC SYSTEM. | THE FET SPEC. 1475 GEEN REWAITTING INTO THE FET STATES SPECS ARE INCORPORATED IN PEN INSPECTION PROCEDURE R-SASA ISSUE 7, REV.1, 16.2.90. NOT NECESSARY TO USE THIS AS INSTRUMENT OF RECORD. FIGH HAS THEIR COUNT 149771 SI/16-157, |
| 6 | COIL TESTING ET-2.2.1 | ENGINEERING SPEC. UNICH DETERMINES IN PROCESS TEST VOLTAGE VALUES. ALSO CONTAINS SOME GUIDANCE AS TO ACTUAL TEST PROCEDURES. | TEST VOLTAGE LEVELS DETERMINED BY THIS SPEC. ME LISTED BY P.E. ON THE NO-L SPEC. JEHN HALL THEIR OWN NATH SHEET, SHINE TEST VOLTAGE, PLECOPPEN. |
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| PEERS-S | 7 | CD-L SPEC. 10823A | STATOR DESIGN DATA SHEET. THIS ENGINEERING DOCUMENT ISSUED BY MEIPPEP DEFINES THE STATOR COILS USING NETHODOLOGY OF EI-1.1.0, AND PROVIDES A BILL OF MATERIAL FOR THE COILS. | THE COILS ARE BUILT TO THIS BOCLHEHT. 1900 17 14/10/01/15 5 |
| S NEW | 8 | ND-L SPEC. 10823A | STATUR FORM COIL WINDING DATA SHEET. THIS ENGINEERING DOCUMENT ISSUED BY NEI-PEP DEFINES THE WOUND COILS AND PROVIDES INFORMATION ABOUT THEIR CONNECTION, RID'S, END BRACING, BILL OF MATERIAL, AND IN PROCESS TEST VOLTAGES. | THE YOUND COILS ARE BUILT TO THIS SPECIFICATION. NO CITALINGS |
| 0 124 | 9 | STATOR BRACING B-67201-2 TYPE 4 | THIS DRAWING ISSUED BY MEI-PEP AND CALLED OUT ON NO-L SPEC. BETAILS THE BRACING OF THE COIL END TURNS. | DISCUSSED ON "CHARGE/BISCHEPANCY" SURVEY AS PROME 1-7-91. |
| LEYEL AND | 10 | INSULATED POLES E1-1.5.1 | THIS ENGINEERING INSTRUCTION INCLUDES NATERIALS, CALCULATED MUILBUPS, AND SOME PROCESSING NOTES. | POLES BUILT TO THIS. NO. CHAINGS |
| AECT, PRISE O | 11 | POLE PROCESS, EP-1.5.1 | PROVIDES FURTHER PROCESSING INSTRUCTIONS FOR MINDING OF THE ROTOR POLES. | POLES BUILT TO THIS SPECIFICATION。 ハルウ くだみがらじら |
| EI PEBLESEE | 12 | POLE WELDING, PS-3022 | TITLED PROCEDURE FOR MELDING NOTOR POLES-BOLTED TYPE. THIS GENERATOR HAS DOMETAIL TYPE POLES, NOT BOLTED. THE WELDS ARE LESS CRITICAL IN DOVETAIL POLES SO THE PROCEDURE ENCOMPASSES REQUIREMENTS OF DOWETAIL TYPE POLES. | THIS PROCEDURE IS SPECIFIES HOR MELDING, MINICH IS ALSO THE NETHOD USED BY PEN. PART 2 OF THIS SPEC IS ANORESSED OF LINE 15. |
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| ETEN | P | SURHARY | COMMENTS |
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| 13 | POLE GRINDING, PS-3014 | TITLED GRINDING OF SYNCHRONOUS POLES -POLTED POLES. AS ABOVE, THESE ARE DOVETAIL POLES, BUT THE INTENT OF GOOD CRAFTHAMSRIP FOR THE GRINDING OF POLES IS APPLICABLE. | MARINFACTURED TO THIS PROCEDURE. NOW CHANGES |
| 14 | POLE BRAZING, PS-3006 | BRAZING OF AMORTISSEUR BARS; CONTAINS GENERAL BRAZING INSTRUCTIONS | HOTE THIS PS-3006 SPEC IS IDENTICAL TO SPEC ER-4.4 WHICH WAS CALLED OUT ON THE BOTOR POLE ASSEMBLY BRAITING. ACTUAL BRAZING COMPATIBLE WITH THIS SPEC. THE A KINGHINKA OF PROJECTIONAL TO PROJECT OF A KINGHING OF PROJECT ON SET AND CONTROL OF AND |
| 15 | NDT, PS-3022 PABA. 2 | NON DISTRUCTIVE TEST NETHOD FOR DETECTING WELD FLAWS. THIS SPEC WAS REVISED ID INCLUDE APPROVAL OF PEN PROCEDURE OF R5036. | • |
| 16 | POLE INSPECTION, PS-3018 SN. 25 | INSPECTION PROCEDURE UNION SPECIFIES PERMISSIBLE BOW AND CHOUM IN BOTTOR POLES. | PHYSICAL DIMENSIONS OF ROTOR POLES WERE INSPECTED TO TRIS SPEC. |
| 17 | ET-1.1, FIELD LEAD TEXNIKALS | SPECIFIES SIZE OF TEXHINAL STRIPS TO BE USED. | PEP DCR 11409 APPROVED CHANGE. EVALUATIVE ETLE WHENCE |
| 18 | INSPECTION, EG 5.8 | AN INSPECTION RECORD SHEET USED IN PEP FACTORY | ALTHOUGH PEN MAS THEIR CAN RECORD SHEET, A COMPLETED EQ-5.8 WILL BE PART OF DOCUMENT PACKAGE. |
| 40 | | | PEN OWN 14779 SHEET, SAME. NOTORECOZUEN, ALEX, PEN FILLS OUT PEN SHEET FOR FILLS NATH PACKAGE. |
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PEP PURCHASE ORDER 16271 TO PEM

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Peebles-Electric Products, Inc.

16271 P.O. NO.

SHOP ORDER NO. S-1128

| | 1100's Estille Vations's Chattering onto antity sembages (510) settlement anti- | | | | | | | | |
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| | NEI PEEBLES LTD | | | | | | | | |
| ROM: | PEEBLES ELECTRICAL MACHINES RECEIVED | ₹, | | " | | 7 | _ | | 744 |
| 1 | EAST PILTON | <u> </u> | <u> </u> | <u> </u> | | | <u> </u> | | <u> </u> |

EDINBURGH EH5 2XT SCOTLAND REO NO DATE BEST. 2-12-90 ACCT NO ITE" CUANT. DESCRIPTION CHANGE ORDER #1 INCREASE PRICE OF GENERATOR BY \$540.00 TO COVER ADDITIONAL COST FOR POLE INSULATION TO SPEC EI-1.5.1 AND EPOXY RESIN PER MATERIAL SPEC MY20.9 1) NEW GENERATOR PRICE \$234,540.00 REF. PAGE 9H CHANGE PENALTY CLAUSE TO READ: 1% PER WEEK TO A TOTAL OF 10% MAX. OF THE CONTRACT PRICE FOR DELIVERY BEYOND 30 OCTOBER 1990, OR AGREED REVISION OF THIS 2) REC'D. BY DATED. FOR INFORMATION ON THIS F CONTACT R.A. ROSSIA CERTIFICATION SEE REVERSE CERTIFICATE OF CERTIFICATE OF NO CERTIFICATIONS REQUIRED.

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PURCHASE ORDER

Peebles-Electric Products, Inc. 17045 Euclid Avenue, Cleveland, Ohio 44112 Telephone (216) 481-1500, Telex - 241564

P.O. NO. 16271

| | EL BEEDLEO (37) | | | t | SHOP | овоев no. 1128 |
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| E | AST PILTON DINBURGH EH5 2X | <u> </u> | | | | PORTATION CHARGES |
| 7: | COTLAND UK | <u></u> | c cc | FOB | TEMES - | 1 OF 10 |
| 01-29-90 | BEST X | | X | | | |
| TEVÍ GUANT | | DESCRIPTICI» | | | ACCT. NO | |
| HOTE | OUTLINE DRAMA=T3, C=T1, 2) PHASE ROTATI B-67041E2 3) POLE INSULAT EPOXY RESIN 4) WOUND ROTOR A-66843#7, R | 10 CODE OF 121 REPORTING APPLICABLE TO (COPY ATTACHE DUPLICATE OF 1076) NEI PEER 100 2/25/86 WITTONS. ON IS CHANGET ING C-08991U B=T2 ON NAMEPLATE TON SPEC EI-1 MV-20.9 POLE ASS'Y | THIS OUR SLES LTI THE OPER | | が記念まずまで、「「「「「「「「「「」」」」というでは、「「」」というでは、「「」」というでは、「「」」というでは、「「」」というでは、「「」」というでは、「「」」というでは、「「」」というでは、「「」 | POR INFORMATION ON THIS CONTACT R. A. ROSSIMA CERTIFICATION SEE REVERSE CERTIFICATE OF AMALYSIS CERTIFICATE OF CONFORMANCE |
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Peebles-Electric Products, Inc. 17045 Euclid Avenue, Cleveland, Ohio 44112 Telephone (216) 481-1500, Telex - 241544

P.O. NO. 16271

| | NEI PE | BLES LTD | | | | | | | | | • | | | 128 | | 10 | | _ | |
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| 91. | -29-90 | | X | F 0.8 | TERMS | ^ |
| LEA | . QUANT | DESCRIPTION | | 建 自选定的 | ACCT, NO | |
| 1 | 1 | DESCRIPTION GENERATOR, SYNCHRONOUS L-108 3250 KVA, 8 PF, 2600 KV, 8 | POLES | | 0014-3100 | |
| | | TANCE (RTD) HORIZONTAL, SING BEARING WITH FORGED FLANGE S 6 EMBEDDED 10 OHM DETECTORS, VOLT 3 PHASE SPACE HEATERS A 3-CURRENT TRANSFORMERS FOR D TIAL OVERCURRENT RELAYING PROUNTED AND WIRED INTO THE MERMINAL BOX LOCATED ON THE | LATION, RESIS- SLE SHAFT. 480 WD OFFEREN ROTECTIO IAIN A.C RIGHT | | - | REC'D, BY |
| 2 | NOTE | HAND SIDE OF THE GENERATOR WIEWED FROM THE BEARING END. INCLUDE (2) SPARE STATOR COIL OUR TEST & SHIP TO NEI PEEBL CLEVELAND, OHIO. THE FOLLOWING WITNESSED TEST | LS FOR ES IN | | 0014-3100 | |
| 2 | — | REQUIRED: 1) INSULATION RESISTANCE, S AND ROTOR. 2) WINDING RESISTANCE, STAT ROTOR. 3) OPEN CIRCUIT SATURATION AND LOSSES. 4) SHORT CIRCUIT SATURATION AND STRAY LOSSES. 5) TEMPERATURE TEST BY SIMULOADING AT ZERO POWER FA | TATOR OR AND CURVES CURVES | | | CERTIFICATIONS CERTIFICATION SEE REVERSE CERTIFICATE OF ANALYSIS CERTIFICATE OF CONFORMANCE NO CERTIFICATIONS REQUIRED |

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Peebles-Electric Products, Inc. 17045 Euclid Avenue, Cleveland, Ohio 44112 Telephone (216) 421-1500, Telex - 241544

P.O. NO. 16271

SHOP ORDER NO.

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| 00.00 | PEG NO | SHE V.A BEST WAY | <u> </u> | | - | ••5 | شب | 7.08 | | | ' | TEAMS | <u></u> | | | |
| -29-90 OUANT | | <u>X-</u> | DE | ESCRIPTION | | <u> </u> | | | | Bigh. | | CCT NO. | 1 | | | |
| NOTE | 6) 7) 8) 9) 10) 11) 12) THES P.G. (A) 1) 2) 3) 4) 5) 6) 7) 8) 10) 11) 12) | HI VOL ROTOR OVERSP CHECK V CHECK V CHECK II E TESTS MAJOR MAIN-67.8 MAJOR MAIN-67.8 MAJOR MAIN-67.8 MAJOR MAIN-67.8 MAJOR MATLINA MFG. ODE STATOR STATOR POLECTRI WOTATII FINISH MFG. AS | ISTANITAGE TAGE ROTAGE ROTAGE ROTAGE RESPECTION RESERVE RESPECTION | CE. TEST, ION SCI HEATE BY WI TATIVE FICATI VINGINA FICATI VINGIN | LLOGR RS VO MATIO TNESS ONS: -0899 L BOX 140-1 ATION 10823 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 1-1.5 | R AN AN AN LTAG N LO ED B 10 ED - 3A 3A 3A 3A 3A 3A 3A 3A 3A 3 | ESSES Y 1.1.0 | | | 2. 在一种的现在分词,是一种一种一种一种一种一种一种一种一种一种一种一种一种一种一种一种一种一种一种 | | - | - 1 | R.A. | RMATION TO THE PROPERTY OF T | TION RSE OF |

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Peebles-Electric Products, Inc.

P.O. NO. 16271



17045 Euclid Avenue, Cleveland, Ohio 44112 Telephone (216) 481-1500, Telex - 241564 SHOP ORDER NO. S-1128 NEI PEEBLES LTD PEEBLES ELECTRICAL MACHINES TE RECEIVED EAST PILTON EDINBURGH EH5 2XT TRANSPORMATION CHANGES SCOTLAND \$ DATE NEO NC BEST WAY 1-29-90 ITEM QUANT DESCRIPTION ACCT, NO **(B)** THE FOLLOWING MATERIAL SPECI-FICATIONS ARE APPLICABLE. A CERTIFICATE OF CONFORMANCE IS REQUIRED FOR ALL MATERIAL EXCEPT FOR (*) A CERTIFICATE OF ANALYSIS IS REQUIRED. STEEL MS-70.77 MS-70.38 MS-70.38 **ELECTRICAT** POLE IRON SPIDER IRON SHAFT FORGING MS-70.42 MS-70.12 HOT ROLLED BARS REC'D, BY HOT ROLLED PLATE MS-70.14 HOT ROLLED SHEET -70.13 COLD FINISH BARS COLD FINISH KEY MS-70.17 STOCK NS-70.16 NS-70.32 COLD FINISH BARS EXPANDED METAL **COPPER** FOR INFORMATION ON THIS P. CONTACT SOFT (OXYGEN FREE) HARD (OXYGEN FREE) MC-80.5 MC-80.6 r.a. Rossman 2) HARD (UNITED WIRE) MAGNET WIRE MW-25.5 MW-25.3 MAGNET WIRE CERTIFICATION MECHANICAL INSULATION SEE REVERSE 1) GLASTIC M=10.1CERTIFICATE OF ANALYSIS CERTIFICATE OF NO CERTIFICATIONS REQUIRED SIM APPROVED NOTES: _

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Peebles-Electric Products, Inc. 17045 Euclid Avenue, Cleveland, Ohio 44112 Telephone (216) 481-1590, Telex - 241564

P.O. NO. 16271

SHOP ORDER NO.

| | NEI PEEBLES LTD | | | | | | |
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S-1128 ZĂI

SCOTLAND UK \$ DATE TERMS NEC NO SEST X X 1-29-90 QUANT DESCRIPTION ACCT, NO ELECTRICAL INSULATION WRAPPER "B" STAGE MW-70.10 MICA TAPE (36YDS LG) MT-10.4 MICA TAPE (144 YDS MT-10.4 MT-10.33 LONG) MICA TAPE "B" STAGE МТ-10.5 МТ-10.38 МТ-10.30 DACRON TAPE COTTON TAPE MT-10.3 DACRON GLASS TAPE POLYESTER GLASS TAPE MT-10.7 DACRON FEL "B" STAGE ROPE (STATOR) MR-20.1 NOMEX (SLOT CELL) MP-5.8 REC'D. BY CABLE 2/0 #5 SPACE HEATER LEAD MC-10.7 MC-10.10 MC-10.13 RESIN FOR INFORMATION ON THIS I 1) EPOXY (POLES) MV-20.9 CONTACT R.A.ROSSMAN VARRISH 1) BLACK MY-10.5 CERTIFICATION SEE REVERSE CERTIFICATE OF CERTIFICATE OF NO CERTIFICATIONS APPROVED THE

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Peebles-Electric Products, Inc.

P.O. NO. 16271

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| MEW QUANT, | | | DESCRIPTION | | | | | ACC | NO | | | | |
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Peebles-Electric Products, Inc.

P.O. NO. 16271

SHOP ORDER NO. NEI PEEBLES LTD 179824 S-1128 PEEBLES ELECTRICAL MACHINES EAST PILTON EDINBURGH EH5 2XT SCOTLAND PAGE 7 OF 10 \$ RES NO COT X SEST X 1-29-90 QUANT. DESCRIPTION ACCT, NO 2) STATOR COIL INSULATION 3) COIL PROCESSING 4) WRAPPER TAPER CUT 5) INSPECTION 6) TESTING(COILS) CDL-10823A STATOR COIL WOUND STATOR WDL-10823A D-67201-2 9) STATOR BRACING TYPE INSULATION POLES POLE PROCESS REC'D. BY POLE WELDING POLE GRINDING 13) PS-3006 14) POLE BRAZING 15) NON DESTRUCTIVE TEST PS-3022 16) POLE INSPECTION PS-3018 17) TERMINALS (POLE) 18) INSPECTION, FINAL FOR INFORMATION ON THIS P.C CONTACT R.A. ROSSMAS DOCUMENTATION REQUIREMENTS: 1) NEI PEEBLES LTD Q.A. PROGRAM SHALL SATISFY THE REQUIREMENTS. OF THE DOCUMENT NUMBERED CERTIFICATION SEE REVERSE ENTEDC2-3322-BRH-E, REV. O ATTACHNENT "A" OF P.O.#ZS-1539-AB-9 ENTITLED "SPECIFICATION CERTIFICATE OF CERTIFICATE OF FOR SUPPLIERS QUALITY ASSURANCE NO CERTIFICATIONS PROGRAM: COPY ATTACHED TO THIS PURCHASE ORDER. 1.1 APPROVED _

NOTES:.

12.4 REV. 1 NEMP

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PURCHASE ORDER

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| • | . NEI | Peebles-Eli Euclid Avenue, Carreland, | | | | NO. 102/1 |
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Peebles-Electric Products, Inc. 17045 Euclid Avenue, Cleveland, Obio 44112 Telephone (216) 431-1500, Telex - 241544

P.O. NO. 16271

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eebles-Electric Products, Inc. 17045 Endid Avenue, Cierritad, Oblo 44112 Telephone (216) 451-1500, Telex - 341564 SHOP ORDER NO. S-1128 NEI PEEBLES LTD PEEBLES ELECTRICAL MACHINES TE ME TO VE EAST PILTON EDINBURGH EH5 2XT PAGE 10 OF 10 . SCOTLAND UK REO NO EMP YM 1-29-90 DUANT DESCRIPTION ACCT, NO (K) NEI PEEBLES LTD. TO SELECT A QUALIFIED IMPORT AGENT TO ARRANGE FOR ALL ASPECTS OF TRANSPORT FROM THE UK PORT OR EXPORT TO G.E.C. PLANT IN ONTARIO CANADA. SHIP (2) SPARE COILS TO NEI PEEBLES ELECTRIC PRODUCTS INC 17045 EUCLID AVENUE (L) CLEVELAND, OHIO 44112 FOR INFORMATION ON THIS P.C. CONTACT A. ROSSMA CERTIFICATION BEE REVERSE CERTIFICATE OF CONFORMANCE NO CERTIFICATIONS APPROVED_ NOTES:.

0. NO.

PEEBLES NEMP 12.4 REVI ATT. P Pg 27 of 33

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REVISION TO NOT/WELDING PROCEDURE PS-3022

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NEI Peebles - Electric Products, Inc.

17045 Euclid Avenue Cleveland, Ohio 44112 Telephone: (216) 481-1500

Telex: 241564

Faceimile: (216) 481-8386

December 14, 1990

Mr. Burt Hepponstall Pacific Gas & Electric Co. 333 Market Street Room 9087, Ninth Floor San Francisco, CA. 94106

Dear Sir's

I have attached to this letter copies of a procedure for welding rotor spider rods, and a procedure for non-destructive testing of the poles.

NEI Peables - Electric Products, Inc., N.D.T. Procedure R5036 is now referenced as an alternative N.D.T. method in our Production Specification No. 3022.

R5036 calls for using a Prod and a magnetic ink to detect surface flaws (cracks.) I have reviewed this procedure and consider it to be acceptable.

The remaining 5 of 7 items discussed between yourself and Mr. Ron Politi by phone on December 13, 1990, are being addressed at this time but remain as open items.

Mr. Charles Moosbrugger of NEI Peebles - Electric Products, Inc. will contact Mr. Ed Walters by phone next week to advise on the progress of these items.

I hope you find the two attached items to be acceptable.

Please direct any further questions to the undersigned.

Bincerely

NEI PEEBLES - ELECTRIC PRODUCTS, INC.

F.D. Marino

Manager, Quality Assurance

FM/ph

Encl

PEEBLES NEMP 12.4 REV. 1 ATT. P. By 29" of 33

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HKUDUCION SPECIFICATION PS 10/16/90 3022

SUPERSEDES PS 01/16/76 3022

SHEET NO. 1 OF SUPERSEDED BY....

PROCEDURE FOR HELDING ROTOR POLES - BOLTED TYPE

THE FOLLOWING PROCEDURE, MATERIALS AND REQUIREMENTS ARE TO BE USED FOR WELDING ROTOR POLES OF THE BOLTED VARIETY TYPE.

SPECIFICATIONS

| POLE LAMINATION MATL | PER EP SPEC MS-70.38 |
|------------------------|---------------------------------|
| . WELDING PROCESS | . GAS METAL ARC WELDING (G MAW) |
| TYPE WELDING | · MANUAL (MIG) |
| POSITION OF WELDING | HORIZONTAL |
| FILLER METAL SPEC. | .E.P. DIV. SPEC ME 1.10 AWS |
| | A5.18E70S 1B - MAX-DIA 5/32" |
| SHIELDED GAS | ARGON 95 OXYGEN 5 |
| MULTIPLE PASS SEQUENCE | SEE . EP SPEC PS-3023 |
| WELDING CURRENT | EP DIV. SPEC. PS 3015 |
| ARC, TYPE | SINGLE |
| WELD CURRENT | . D. C. |

1. PROCEDURE

- 1.1 STACK ROTOR POLE LAMINATIONS IN STACKING AND PRESSING FIXTURE USING ENOUGH LAMINATION TO GIVE THE PROPER STACK AS SPECIFIED ON ROTOR POLE ASSEMBLY DRAWING.
- 1.2 COMPRESS STACK BY PRESSING IN STACKING FIXTURE, MEASURE STACK LENGTH AND ADDITIONAL LAMINATIONS AS NEEDED TO MAKE UP STACK TO PROPER LENGTH.
- 1.3 STRAIGHTEN LAMINATIONS, IF NECESSARY, BE SURE THEY ARE ALL IN WITHIN THE CONFINES OF THE POLE SHAPE. STRAIGHTEN POLE OF ANY WARPAGE.
- 1.4 FASTEN CLAMPS FIRMLY IN PLACE ON CROWN OF POLE TO PREVENT WARPAGE WHEN WELDING.
- 1.5. IF POLES ARE SKEWED REFER TO SPEC. PS-3018 FOR PROCESS:

PORTEC INC.; ELECTRIC PRODUCTS DIVISION, 1725 CLARKSTONE ROAD, CLEVELAND 44112
PREPARED BY: DATE: APPROVED BY: DATE: DAT

PEPLES NEMP 12.4 ROV. 1 ATT. P Pg 30 of 32

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. PS 10/16/90

SUPERSEDES PS 101/16/16

SHEET NO. 2 OF 3 SUPERSEDED BY

PROCEDURE FOR WELDING ROTOR POLES - BOLTED TYPE.

- 1.6 SET MIG WELDER TO THE PROPER SETTING AND WELD POLES.
 PER THE PROCEDURE SET UP ON PS-3015.
- 1.7 SEE SPEC. PS-3023 FOR THE CORRECT NUMBER OF WELD PASSES AND THE SEQUENCE OF GROOVE WELDING.
- 1.8 REMOVE FROM PRESS.
- 1.9 WELD COIL: SUPPORT HEADS ON EACH END.
- 1.10 WHEN WELDER HAS COMPLETED POLE ASSEMBLY HE MUST STAMP IT WITH HIS SYMBOL ON TOP OF POLE HEAD.
- 1.11 GRIND OFF EXCESS WELD PER SPEC. PS-3014.
- 1.12 AFTER GRINDING, CHECK FOR LOW SPOTS IN WELD. FILL WITH WELD IF ANY ARE FOUND GRIND FLUSH WELDS ON SIDES OF POLES MUST BE FLUSH WITH SURFACE.
- 1.13 INSPECTION TO CHECK CONDITION OF POLE PER INSPECTION RECORD SHEET EQ 5.8.
- 1.14 INSPECTOR MUST STAMP TOP OF POLE HEAD WITH HIS SYMBOL ... AFTER INSPECTION, IF IT IS APPROVED.

IF IT IS NOT APPROVED A (DR) DEVIATION REPORT FORM 1289 B WILL BE MADE AND A RED TAG FORM 1159 WILL BE ATTACHED TO REJECTED PART.

2. NON DESTRUCTIVE TEST

- 2.1 COMPLETED POLE IS TO HAVE A NONDESTRUCTIVE TEST PERFORMED.
 - TEST MUST BE PERFORMED BY PERSONNEL QUALIFIED IN ACCORDANCE WITH THE AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTINGS RECOMMENDED PRACTICE NO. SNT-TC-1A AND THE SUPPLEMENT APPLICABLE TO THE METHOD TO BE USED. ONLY INDIVIDUALS QUALIFIED FOR NOT LEVEL I AND WORKING UNDER THE NOT LEVEL II, OR INDIVIDUALS QUALIFIED FOR NOT LEVEL II, MAY PERFORM NONDESTRUCTIVE TESTING.
- 2.3 NDT INSPECTION WILL BE PERFORMED BY THE MAGNETIC PARTICLE METHOD. THE PROCEDURE AND TECHNIQUE SHALL BE IN ACCORDANCE WITH SPECIFICATION ASTM E-109.

PORTEC INC., ELECTRIC PRODUCTS DIVISION, 1725 CLARKSTONE ROAD, CLEVELAND 4411
PREPARED BY:

DATE:

APPROVED BY:

DATE:

APPROVED BY:

DATE:

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| 177 | inspectance in the standard st | inspection is acceptable to in the NEI Pro in the NEI Pro conducted in Ni as stated in Ri operations are Standard 989904 | inspection is difficul acceptable to use a main the NEI Procedure R in the NEI Procedure R conducted in NEI-PEM For conducted in R5036 superstants are approved Standard 989904.) | inspection is difficult to in acceptable to use a magnetic in the NEI Procedure R5036. 3.2 For cases where NEI PEM Procedure conducted in NEI-PEM Facility as stated in R5036 supersedes operators are approved to CSI Standard 989904.) 3.3. For reference, the method of 1 BS 6072. | inspection is difficult to interpret; acceptable to use a magnetic ink meth in the NEI Procedure R5036. For cases where NEI PEM Procedure R500 conducted in NEI-PEM Facility), the or as stated in R5036 supersedes that of operators are approved to CSWIP-MAGPI Standard 989904.) 3.3 For reference, the method of R5036 is BS 6072. | inspection is difficult to interpret, it is per acceptable to use a magnetic ink method such as in the NEI Procedure R5036. 3.2 For cases where NEI PEM Procedure R5036 is empl conducted in NEI-PEM Facility), the operator quas stated in R5036 supersedes that of Section 2 operators are approved to CSWIP-MAGPENH4481 an Standard 989904.) 3.3 For reference, the method of R5036 is in accord BS 6072. | 3.3. For reference, the method of R5036 is in accordance with BS 6072. |

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PROCEDURE FOR WELDING ROTOR SPIDER RODS

179824

ORDER NUMBER GO 260274

CUSTOMER

HEI PREBLES BLECTRIC PRODUCTS INC.

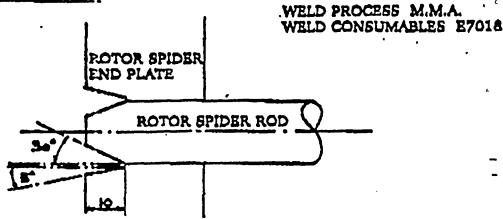
MATERIALS TO BE WELDED

B5970:1976 605M36 CONDIT. "T" BAR

BS1501:

161 GRADE 430 A PLATE

WELD PREPARATION



WELD PROCEDURE

The complete rotor spider is to be placed in an oven and heated to 150°C. This temperature is to be maintained during the complete welding process.

The welding rods are to be of low hydrogen content. The rods are to be baked in an oven at 150°C and maintained in a heated quiver at between 120°C and 150°C until used.

After welding has been completed the assembly is to be heated up to 200°C and maintained at this temperature for a minimum of 4 hours and then allowed to cool.

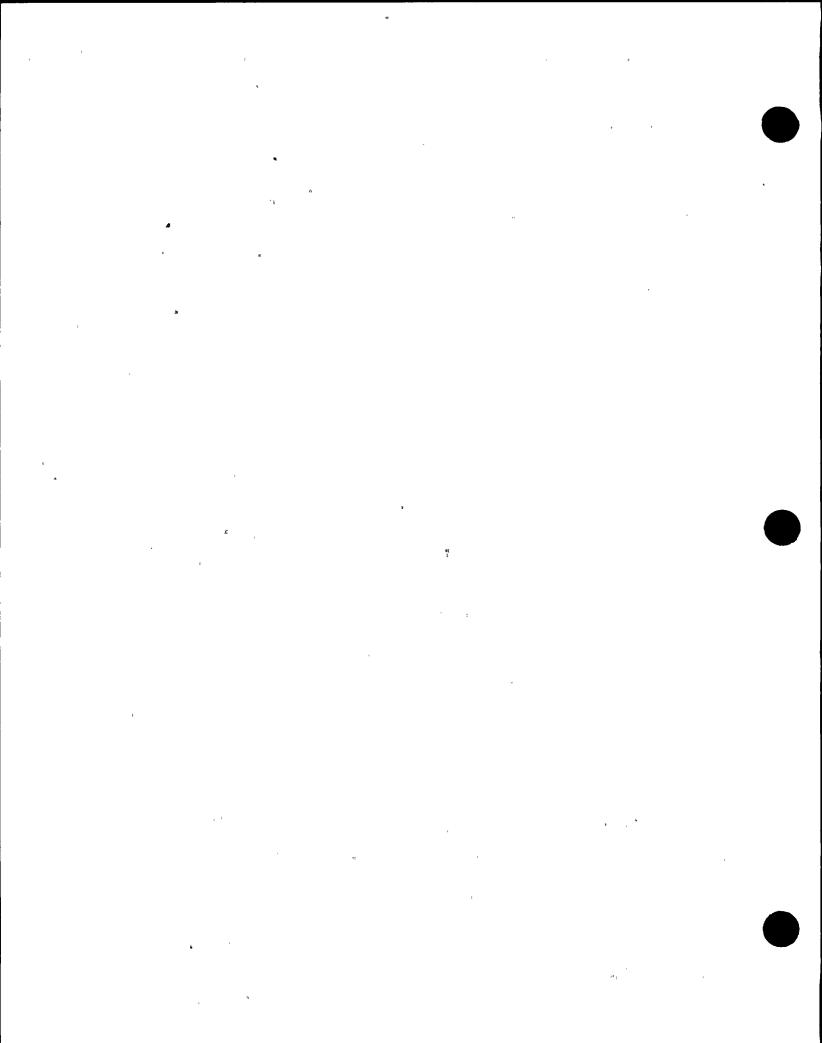
DOCUMENTATION AND INSPECTION

Full heat treatment records are to be made during all three stages of the procedure recording the temperatures.

The welds are to be ground flat after the heat treatment and the following inspection procedures to be used.

- **(a)** Magnetic Particle Inspection to ascertain surface cracking in the welds.
- **(b)** Ultrasonic chec's to be carried out to determine sub-surface flaws in the welds.
- (c) Hardness tests to be carried out on the weld and in the heat affected zone to determine final acceptability of the welds,

PEEPLES NEMP 12.4 REV. 1 ATT. P R 33 of 33



WEI PEEBLES - ELECTRIC PRESIDETS, INC 17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

179824

| To: Mr. | Brian L | ove | | Location: P.G.EE. | | | | | |
|-------------|----------|--------------|-------------|-------------------|-------------|-------------|-------------|--|--|
| From: | Mr. F. | D. Marin | 0 | Location: NE | I. Clevel: | ınd | | | |
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| Copies to: | | | | | | | | | |
| Date: | Novemb | er 29, 1 | 990 | | | | | | |
| Number of | pagesind | luding this: | 14 | | · | | | | |
| Reply to Fa | xNo: | 216 48 | 1 3836 | | | , | l . | | |

I am sending you a copy of the Audit Check Sheet used during the audit of Reliance Electric.

Items 6.0 and 6.1, Page 8 of 18 were found to be unacceptable. These items have been corrected (ref. my fax to you dated 11-28-90).

I have reviewed the audit and found there to be no major non-conformances. As a result I see no problem with the meters. They have calibrated for us.

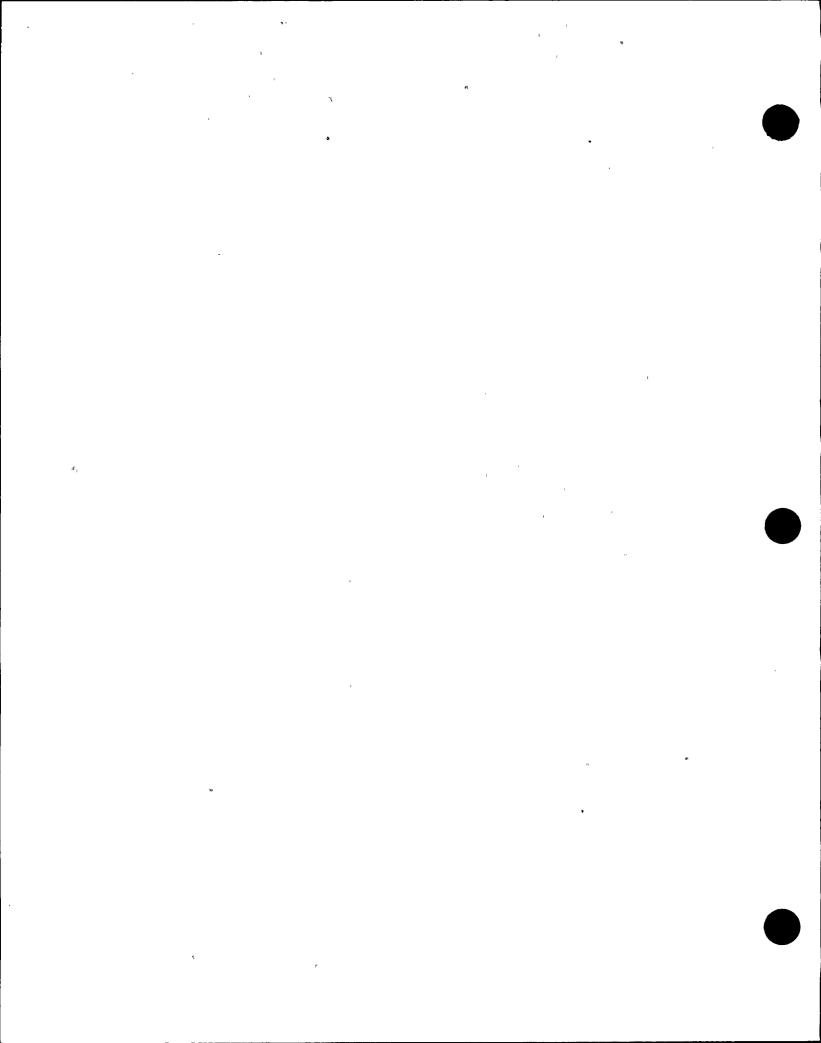
Sincerely

F. D. Marino Manager, Quality Assurance

PEEBLES NEMP 12.4 REV. 1 ATT. Q. Pg 1 of 1

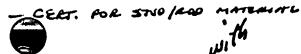


A Rolls-Royce Company



REVIEW OF ALBION STEEL

PEZBLES NEMP 12.4 REV.1 ATT. R By 1 of 31 .





BRIGHT EELS LIMITED

NORTON WORKS MALTON

North Yorkshire

Y017 9BD

Cortilicate No. F.M. 1343 Relating to Q.A.S. 2210/142

Telophone: (STD 0853) 694961 (10 fact)

Telex No. 67925

Facsimile No. ISTO 0663) 606856

CERTIFICATE OF ANALYSIS

To Messry.

Albion Steel Limited, GLASCOW:

Your Order No.

Int. 02/4104 *

KG/LH.

· 13th December 1989.

Reference

We hereby certify that the material specified below has been produced from the cast(s) stated:

| Quantity | Size and Specification | | | | Weight Kild | × | Remarks | | | |
|--------------------------|--------------------------------|----------------------|----------------------------|----------|----------------|------|--|-------|---|--|
| Cast No. | 7/8" diameter Bright Specif | × 10/12 ication (| ft. lengths. 05.H.36.T. | 1 | 03 | | This certificate covers material supplied to you against our Invoice deted 13.12.89. | | | |
| | Car362 | Sil. .26% | Sul040X | Phos026% | Mn. 1.54% | Nic. | Chy. | Moly. | | |
| or and on behalf of BRIC | | | | | | | av Ober | | , | |

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264 Albion Stock Ltd

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Alcan Piste Ltd

333 90R. UK.

DII QA REGISTER

Albion Stock Lad Albion Stock Division Unit 33, New Albion Suzzte, Halley Street, Yoker, Glasgow, Strathelyde, G13 4DJ, Scotland, TEL: 041-052 2221 TZ: 775484 ALISTE FL: 041-052 7534 Amenicant Standard: 255750 Ft2 (20120002, 2001002)

Assument Body: SSI Quality Assurance Assessed Product Basge: The following staterial can be obtained from Quality Assured sources: Black and bright carbon steel, all section steetic and imperial sizes. Black and bright alloy steek, all section metric and imperial sizes. Statnless steeks all sections metric and imperial sizes. Statnless steeks all sections metric and imperial sizes. Other services available: sawcatting.

Albright & Wilson Ltd
PO Box No 3, Ragley Boad West,
Oldbury, Warley, West Midlands,
Bos DNN, UK.
Assessment Standard: \$55750 Pt2 (EN29002,
\$509002)
Assessment Body: \$51 Quality Assurance
Assessed Product Range: Phosphorus
besed chemicals and proprietary
products including metal finishing and
flame-proofing compounds, water
treatment chemicals, elemental
phosphorus.

Albright & Wilson Ltd
Resins & Organic Group
Avonmouth, Bristol, BS11 OYT, UK.
TEL: 022 823613
TX: 449201
Assessment Standard: BS5750 Pt2 (EN29002, BO8002)
Assessment Body: BS1 Quality Assurance
Assessment Body: RS1 Quality Assurance
Assessment Body: BS1 Quality Assurance

Alcad Ltd
Union Street, Smallwood, Bedditch,
Hereford B. Worcester, 1998 78W, UK,
Amessment Standard, AQAP4
Amessment Body: Ministry of Defence
Assessment Standard: 855750 Pt2 (EN2002,
850402)
Amessment Body: BSI Quality Assurance
Assessed Product Eange: Nickel
cadmium batteries and accessories.

Alcan Raffeld Alloys Ltd Bradford Works, Bowling Back Lane, Bradford, West Yorkshire, RD4 855, UK. TEL: 6274 725767 TK: 51467 ALCAN EX: 6274 907610 Amenament Standard: AQAN-Amenament Body: Ministry of Defence Assessed Product Eange: Aluminium alloy foundry ingots including those to semapace specifications.

Alem Enfield Alloys Ltd .

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Bradiona Works

Bowling Back Lane, Beadford, West Yorkahire, BD4 855, UK. Assessment Standard: B55750 Pt2 (D124402, BD5002) Assessment Body: BSI Quality Assessance Assessed Product Range: Alaminium alloy foundry ingots including those to

Alcan High Duty Extrusions Ltd Lillyhall, Workington, Gumbria, CA14 4JY, UK. Assessment Standard: B55750 Ft2 (INDS002, B50002)

Assessment Body: BSI Quality Assurance Assessed Product Earge: Extruded bar solid and hollow sections in aluminium alloys to British, international and Customer specifications. Cast billet for extrusion and forging applications in aluminium alloys.

Alcan High Daty Extrusions Ltd
Extruded Products Division
PO Box 151, Latchford Works.
Warrington, Cheshire, WA4 1NR, UR,
Assessed Product Range: Extruded bar
solid and hollow sections in aluminium
alloys to British, International and
Customer Specifications. Cast billet for
extrusion and forging applications in
aluminium alloys.

Alcan Metal Centres (Midlands) Ltd Brackle Industrial Estate, Bridgend, Mid Glamorgan, CF31 ZAB, UK.
TEL: 0634 55921
TX: 498564
Ameriment Standard: STOCKIST
Ameriment Body: BSI Quality Amurance Amerimed Product Range: Res, plate, sheet, coil and tube in aluminium alloys, steels, stainless steels, bram, copper and brome including those to aerospace specifications (Part 1).

Alcan Metal Centres (South) Ltd
Ascropace
PO Box 186 Lyon Industrial Est. High
Boad, Cawley Paschey, Unbridge,
Middlesex, U86 2JA, UK.
TEL 6095 444000
TEL 23577 AMCURS G
FIL 6095 440002
Assessment Standard: STOCKIST
Assessment Standard: STOCKIST
Assessment Body: BEI Quality Assessment
Sisnet, coll and tube in aluminium alloys,
steels, stainless steels, brass, copper and

bronze including those to acrospace specifications. All material to be reconsigned to the same specification and condition received (Part 1).

P O Box 38), Kitts Green Road, Kitts

Green, Minningham, West Midlands,

TEL (21-71) 4020 TZ. 337417 FE: 821-764 7974 Amestment Standard: AQAM Amesanerit Body: Ministry of Defence America Product Range: Unwrought billet and slab for further external processing by extruders and forge masters. Wrought plate for the aerospace defence (armour) and general engineering industries. Amesoment Standard: \$55750 Pcl (EXCHO)1. 25090011 Assessment Body: BSI Quality Assurance Assessed Product Range: Customet engineering maintenance services for electronic computer systems equipment

(including sub-system equipment).

Aleatel Business Systems Ltd

PO Box 3, South Street, Romford, Essex.

RM1 2AR. DK.

TEL 0704 46000

TX: 894427 RONBOM G

FX: 0708 760431

Assessment Standard: BS5750 Pc1 (EN29001, BO9001)

Assessment Body: BS1 Quality Assurance: Assessment Standard: BS5750 Pc2 (EN29002, BO9002)

Assessment Body: BS1 Quality Assurance: Assessment Body: BS1 Quality Assurance: Assessment Body: BS1 Quality Assurance:

Americal Product Range: Specification

for safety of electrically energised office

puchines.

Alco Valves Ltd
Mission Works, Birds Royd Lane,
Brighouse, West Yorkshire, HD6 1LQ,
UK.
TEL: 9484 719511
TZ: 517319 ALCO V
FX: 9484 719009
Assessment Standard: E51750 Pt2 (E4286)
MO9002)
Assessment Body: British Gas PLC
Production and Supply Division
Assessed Product Range: Manufacture
ball valves up to 2".

If a supplement has been issued check for changes

PREBLES NEMP 12.4 REV. 1 ATT. R R 3 & 31 No.



Pay 3 3.3

344 Bright Brazing Ltd

DTI QA REGISTER

Bright Brazing Ltd
Bott Lane, Walsall, West Midlands,
WS1 2/Q, UK.
TEL: 0922 649149
TEL: 09421 BLANKM G
Amessment Body: BSI Quality Assurance
Amessed Product Earge: Stress relieving
and annealing of ferrous and non-ferrous
alloys, normalising of ferrous alloys,
copper fusion of ferrous materials using
a controlled atmosphere in continuous
sucsh belt furnaces to customer order,
specification and drawing.

Stight Instrument Company Ltd. St Margarete Way, Stukeley Meadows. Huntingdon, Cambridgeshire, PEIS 6EB. TEL: 8480 54576 TX: DIN BENOFT G PX: 0420 \$4033 Amenment Standard: 355750 Pt2 (EN29002. Assessment Body: BSI Quality Assurance Americal Product Range The manufacture to escablished apecifications of cryostats, microtomes and associated accessores for laboratory and medical use. Equipments are capable of working over the range of temperatures from ambient to 45 deg centigrade to produce sections of speciments for microscopic examination.

Bright Plastic Panels Ltd
Hibernia Road, Hounslow, Middlesex,
TW) 3RU, UK.
TEU 01-570 0414
TK: 23152 REF 0371
FK: 01-564 4324
Ameriment Strandard: BS\$750 Pt2 (EN29002,
BO4002)
Ameriment Body: Lloyds Register
Quality Assurance Ltd
Americal Product Range: Manufacture of
plastic laminate bonded panels.

Buight Stocks Ltd
Morton Works, Makon, North Yorkshire,
YO17 98D, UK.
YEL 6613 64461
YZ: 57925
YZ: 8673 645816
Assessment Standard: 885759 Ft2 (2202002,
8504002)
Assessment Body: BEI Quality Assurance
Assessed Product Easge: The
susculacture of a wide range of beight
decure and machined sections especially
secrangles, squares, hexagons and special
publics to sectional, international and
customer standards. Standard sizes and
qualities are available from stock.

Righton Building services

19 Grantham Road, Reighton, Bussex,
BN1 6EE, UK.
TEL. 6273 599577

Assessment Standard: BSS750 Ft2 (2012)002,
BSO5007)

Assessment Body: BSI Quality Assurance
Assessed Product Range: Chemical
damp-proofing.

Brighton Sheet Metal Ltd The Hyde, Anckland Drive, Lower Bevendean, Brighton, East Sumex, EXI2 4]W, DK. TEL 5273 402216 TX: 877652 BENETIN PX- 6273 474153 Ameriment Standard: ADAM Assessment Body: Ministry of Defence Assessed Product Banger Sheet metal Sabrications & assemblies for tubular Fames, Desence equipment. ammunition containers, refigeration units computer, TV & VDU components. cash dispensers. Manufacturers of press work, press tools, has and fixtures for the Electronic and aerospace industries.

Brighton Sheet Matal Ltd Newhaven Division New Road, Newhaven, East Sussex. BM OEH, UK. Assessment Standard: AQAP4 Assessment Body: Ministry of Defence Assessmed Product Range: Scope as main site.

Brimpes Becles Ltd
Brimpes Works, Yorktown Ind Est.
Camberley, Surrey, GUIS 3DB, UK.
Amesument Standard: AQAP9
Amesument Body: Ministry of Defence
Amesument Frontier Body: Ministry of Defence
Amesument Frontier
Bydraulic stackers. power amisted and
manual traction, pullet trucks, mutumatic
lifters and barrel lifters.

Brink BV
PO Box 24. Industrieweg 5. Staphorst.
2950 AA. The Netherlands.
TEL: 95223 9999
TEL 42456
FEL 95225 9722
Assumment Standard: E55750 Ft.1 (E129001.
E00001)
Assessment Body: Llöyds Register
Quality Assumnce Ltd
Assessed Product Eange: Dosign and
manufacture of tow bars.

Brisks Traindustri AB

8 O Box 27, \$-523 01 Ulricehamn,
Sweden.
TEL: 818 46 321 111800
TEL: 36422 BRINK S
Assessment Standard: \$55750 Ft2 (EM29002,
1808002)
Assessment Body: BSI Quality Assurance
Assessed Product Bange: Specification
for timber grades for structural use.

Part of British Steel General Steels Scienworth Strip Mills Diversified Activities PO Box 69, Sheffield Road, Rotherban. South Yorkshire, \$60 157, UK. TEL: 0709-377 113 TE SHOLL MITLER C 275 6709-377113 ext 225 95M BOTHICHAM Amesament Standard: \$25750 Pt2 (20121902) Assessment Body: BSI Quality Assurance: Assessment Standard: NS\$750 Pt2 (CN2900). 10000025 Assessment Body: Yarsley Quality Assured Firms Ltd Assessed Product Range: Hot and cold & rolled narrow strip to mild carbon. free-cutting, hypress, alloy and stainless SCECK.

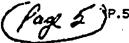
PO Box 16, Exchange Street. Kidderminster, Workestershire, DY10 1AG. UK TEL: 8542 \$20000 TE BESSE FZL 0562 515597 Assessment Standard: BS5750 Pt2 (ESC19) 2309002) Assessment Body: BSI Quality Assess Amened Product Range: Aximinater t Wilcon carpets (rolls and tiles) to accordance with QAS 438/85; Quality Amesoment Schedule relating to the anamofacture of textile floor covers Amened Product Rango Textile Box coverings

Bristons Ltd

Reipac Ltd
18/21 Corsham Street, Hackney, Los
81 6DR, UK.
Assessment Standard: AQAN
Assessment Sody: Ministry of Defin
Assessment Sody: Ministry
Reception of the sequirements of
Reception of tank degressing and is
Remportry protective preservation

PEEBLES NEMP 12.4 REV.1
ATT. R By 4 of 31

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1012 Francis Webster & Sons Ltd

Prancis Webster & Sons Ltd. Eliot Industrial Setate, Arbroath, Angue, DD11 1NT, UK. TEL: 0241 70171 TE NICE WESTER C 172: 0241 77420 WESTER Ameniment Standard: ADAM Amesiment Body: Ministry of Defence Amesed Product Range: Flax and hute convex and duck cloths, loomstate polyester and cotton. Rip stop tentage cloth, flex yeme.

John P Webster Ltd Roelin Road, South Acton Industrial Estate, Acton. London, W3 8DH, UK. TEL: 01441 9916 FX. 01-493 331E American Standard: 255750 712 (2017)002. 15.000071 Assessment Body: Lloyds Register Quality Assurance Ltd America Product Range. Ferrous and pon-ferrous casting.

Josiah Wedgwood & Soms Ltd Wedgwood Hotelware Teacan Works, Forrister Street, Longton. Stoke on Trent, Staffordshire, ST1, UK TEL: 0782 315115 TK. 14192 EX- 0782 343714 American Standard: 355750 Pt2 (EH)9007. 1301002) Assessment Body: BSI Quality Assurance

Assessed Product Range: Specification for the requirements for resistance to water absorption and crazing of vitrified hotelware

Wednesbury Tube Co Muntz Works. Great Bridge Street. West Brownch, W Midlands, 370 ODF. 7302 - A21 557 A415 Assessment Standard: \$55750 Pt2 0EN 29001. Amenment Body: BSI Quality Assutance

Assessed Product Range: Specification for copper and copper alloys. Tubes: copper tubes for water, gas and manutation.

Wednesbury Tabe Co Oxford Street, Miston. Staffs, WV14 7DS. TEL: 0402 41133 TX: 334046 Ameriment Standard: 965750 Pc2 (50129002, 1501007)

Amestment Body: BSI Quality Assurance Amened Product Range: 1 Solid drawn copper tubes for water, gas and sanitation manufactured in accordance with BS 2871: Part 1: 1971 Specified size of tube: 6 to 159 mm inclusive. Table covered: X, Z. Specification size of tube:

6 to 101mm inclusive. Table covered: Y. 2 The above tubes can be supplied with the following protective and decorative coatings: Externally applied coloured blue, green, yellow or white polyethylene to BS M12: 1976 - brand one Protec 2000', Mickel and chromium plated to NS 1224 table 4.

Weeker Electrical Ltd 350 Selbourne Road, Luton. Bedfordshire, LUA SPS, UK. American Standard: AQAPI Assessment Body: Ministry of Defroce Assessed Product Range: Low power junction boxes. Terminal units. Glands and accessories. Fuses. Pure clips and news. Heavy duty switchgear. Switch sockets outlet and plugs.

WEGO Condenset Ca Ltd 42 Bideford Avenue, Perivale, Greenford, Middlesex, U36 772. UK. TEL: 01-993 9011 TE: 913600 WEGO C Amessment Standard: AQAF4 Assessment Body: Ministry of Defence Assessed Product Range: Capacitors. Paper, mica, polyester/paper and polypropylene paper dielectrics. (i) For AC applications power and high frequencies. (ii) For DC applications from 50 volus to 3.5 megavolus. (##) Pulse forming networks, delay lines and voltage multipliers.

Welr Electropics Ltd Durban Road, Bognor Regis, Sussex, 2022 9RW, UK. TEL 024) 845991 TY: MS:43 Assessment Standard: \$55750 Ft1 (05/2900). Assessment Body: BSI Quality Assurance Assessed Product Range: The design and manufacture of switched mode and linear power supply units up to 2kW. Monochrome and colour CRT displays. Laboratory power supply units. High woluge power supply units up to 25 kV.

Well Pumps Ltd 149 Newlands Road, Cathcart, Glasgow, Strathclyde Region, G44 45X, UK. Amenment Standard ADAYI Amestment Body: Ministry of Defence Amenment Standard: M5710 Pcl (EN72900). 1309001) Assessment Body: British Gas PLC Production and Supply Division Assessment Standard: \$65759 Pt | (E012900).

Assessment Body: British Huclear Puels Assessment Standard, 251750 Ft (EN2900), E01001)

American Rody: Lloyda Register Quality Assurance Ltd Amend Product Barne: Reactor coolent, boiler feed, extraction, fresh and salt water centrifugal pumps, fuel and lubicating oil centrifugal and screw pumps. Desalination, deseration and sewage treatment plant. Air ejectors. Meat exchange units. Auxiliary turbines. Mydraulic drives System engineering.

Welbock International Ltd Reinforcement Division Welbeck House, & River Road, Barkine, Beer, IGII OHF, UK. TEL 0144 714 TX: 207494 Assessment Standard: \$55796 Pt2 (\$972)002. 23/01/00/25 Assessment Body: U.S. Certification Anthority for Reinforcing Steel Americal Product Exage: Hot rolled meel : ber to BS4449 and hot rolled but in cut ; and bent form to \$\$4466.

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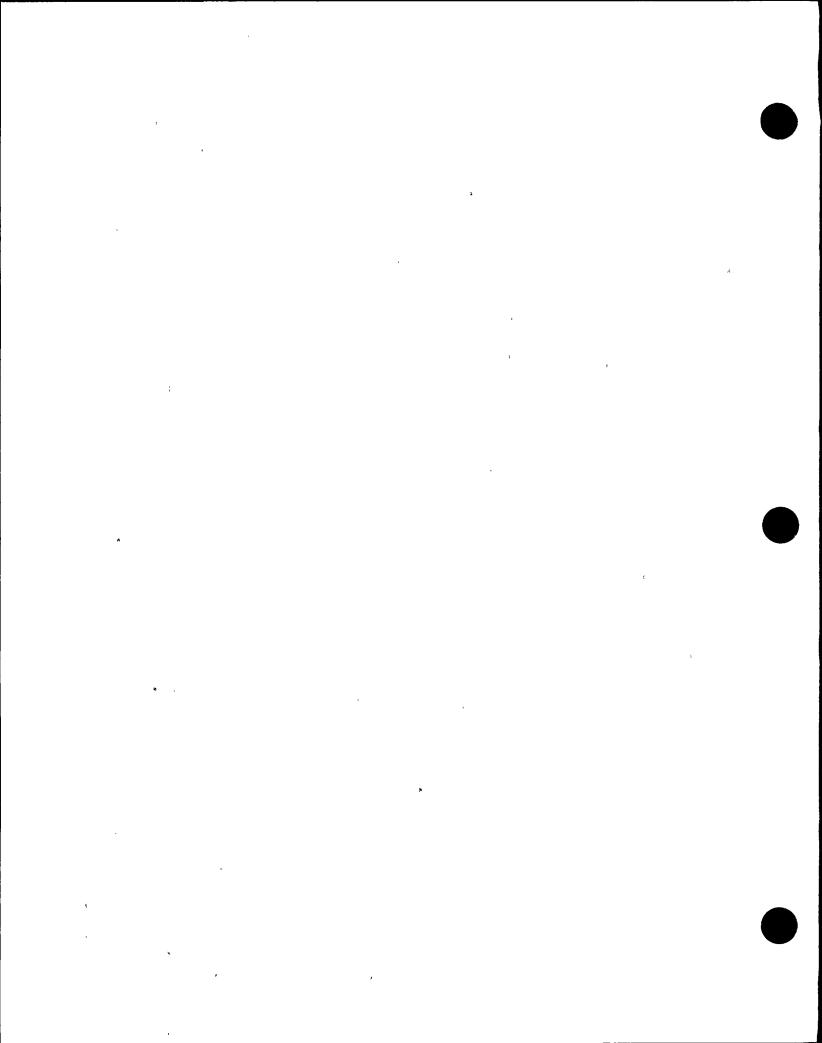
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Welbond Reinfotcoment Ltd 30-14 River Boad, Barking, Rosex. IG11 ODL UK. TEL: 01-594 4456 FZ: 01-594 1735 Assessment Standard: 355150 Pt2 (D029002) Assessment Body: U.K. Certification : 4 Authority for Reinforcing Steel Amessed Product Range: Hot rolled still bar to BS4449. Hot rolled steel bar is cit! and bent form to \$54466 and hot solid meel bar to \$15 142168 grade \$5605: A

Welch Margetson Glenades Factory, Trench Road, Londonderry, \$747 XUS, UK. TEL: 0504 44353 TX: 147239 WHILNOY G FX: OSOH ANSIZ Assessment Standard: \$55750 Pt2 8 2501002) Assessment Body: BSI Quality Am Assessed Product Range: Mets and B Shirts. Underwear and Night-wast! Manufacture of formal and leisure in satural and synthetic fibres and mixtures of these fibres in classical fashion styles and gents ties in setti and synthetic fibres.

Welding Fittings & Flanges Las ? Bramball Moor Ind Park, Head Q Stockport, Cheshire, UK. TEL: ON 4545 NO Amened Product Range: Forget 🕏 and low temperature steel flanger welded Attlags

PERBLES NEMP 12.4 REV. 1 ATT. R B 5 of 31



PIPING MEMO NEW REVERATOR The state of the s the second second

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To:

File

Location: 333/A1254

From:

Victor Vanderzyl

MY

Date: December 11, 1990

Job: 18269 Unit 2

Subject: Emergency Diesel Generator

Rotor Assembly.

File: 129.10

This memo is written to document the chronological sequence in which the problem issues for subject rotor assembly were identified and subsequent events evolved.

On 10/3/90, Project Engineering conveyed their concern in regards to the welding that was performed on the rotating element of the stator for the sixth Emergency Diesel Generator. The two items in question are threaded rods (8 each - 7/8" diameter) inserted horizontally through a set of laminated plates and their covers with nuts screwed on at both ends to hold the assembly together. It was not clear whether the nuts were tack welded or fillet welded. This concern came up when the originally specified material AISI 1113 (.13% carbon content) was replaced with Bright Specification 605.M.36.T (.36% carbon content). This material, because of a higher carbon content, when welded without a correct welding process, i.e., preheat can result in cracking of the heat affected zone on the stud. In question was whether this crack could propagate through the stud and cause a complete failure. The other item concerned rods of the same material (8 each - 7/8" diameter) inserted horizontally through the laminated plates, but fitted recessed into each end plate of the set and plug welded to the last plate. Since there were no shop detail drawings available of the exact configuration, a "picture" of the rotor assembly was constructed by talking to C. Moosbrugger of Peebles, the supplier (Attachment #1).

On 10/15/90, I contacted S. Friedrich at TES and conveyed the information as it was known as well as our concern that there was a potential for cracking. Spence wanted to know the material for the nuts and the laminated plates and weld configuration for the plug welds. He stated that the possibility of cracks on the stud material were probable but unlikely and (assuming AWS fillet welds on standard mild steel nuts) that the occurrence of cracks propagating and causing complete failure were remote. He still wanted the requested details before he could finalize a response.

On 10/26/90 C. Moosbrugger was contacted and asked to sent us the material identity for the stud nuts and the laminated plate and plug welds. The latter, he explained might be proprietary information. The package we received by fax was a Peebles material specification, but did not indicate which material was for the nuts or for the laminations (Attachment #2).

On 11/5/90(?) I talked with E. Kahler and B. Hepponstall in an effort to get a better understanding of what the rotor assembly looked like. At that time Ed indicated that cracking of the plug welds at the laminated plates in conjunction with rotational stresses could cause a failure and result in separation of the laminated plates assembly. At this point the focus shifted from the threaded studs/nuts to the rods.

PEEBLES NEMP 12.4 REV. 1 ATT. R Pg 7 of 31

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On 11/9/90 I talked to R. Politi at Peebles as C. Moosbrugger was out. I explained to him what our concerns were in regards to possible failure of plug welds at stud to laminated plate connections. He explained that the function of the rods was to keep the laminated plate assembly in compression and maintain an alignment for the dove tailed cutouts in the outer perimeter of the lamination plates that are needed to insert the poles for the windings. Once this is done the assembly is shrunk fit onto the rotor shaft and is further secured on the shaft with a key. At this point the function of the rods for compression/alignment purposes becomes redundant and since there is no incentive to remove them, they are left in place. They would share some of the shear loads of the rotating element. I asked Ron to convey that to us in writing.

On 11/9/90 I received data on materials, however it pertained to the stator frame, bearing brackets and studs/rods. Still no information on nuts and laminated plates (Attachment #3).

On 11/13/90, I was on site and tried to track down the spare EDG stator assembly without success. C. Moosbrugger called and stated that the material on the nuts was SAE J995 Gr. 2, which is the equivalent of ASTM A307, a mild steel nut and the material for the laminated plates was ASTM A36 or a similar ASTM A283.

On 11/20/90 during a meeting on the EDG, I explained that the welding issue for the 6th EDG was resolved per conversation with R. Politi and that the studs and rods were removed and would be redone with the proper welding procedure including the required preheat. I was requested to get this in writing. At the same time this issue was raised for the spare Stator assembly which was purchased in 1987 and is stored on site. I indicated that I planned to look at this equipment during my next site visit. AE #01 of AR A0208696 was instituted to track the impact of this condition (Attachment #4).

On 11/20/90, I received information on the function of the rods as described in previous paragraph (Attachment #5).

On 11/27/90, I visited the warehouse and with assistance of J. Love of PSG inspected the spare stator assembly. The assembly is encased and with limited openings (mesh) at the ends, neither the studs/nuts or rods could be observed. There was a spider type enclosure visible, but the rods/nuts were .5" or smaller in diameter. I examined the documentation for the spare stator, but there was no surveillance inspection report for the specific welds. Therefore, there is no record indicating evidence of a potential welding problem for the spare EDG stator.

On 12/3/90 information was sent by Peebles indicating that the stude and rods on the 6th EDG had been redone with proper weld procedures including preheat (Attachment #6).

There is still the possibility of cracked welds. Although they do not affect the intended purpose of the rods, the potential still exists for the cracks to propagate when the rotor is spinning and for small metal deposits to separate and possibly cause damage within the encasement. I discussed this issue with S. Friedrich and he concurred with my assessment. Short of disassembling the stator, I am investigating the use of a boroscope. The

PREBLES NEMP 12.4 REV. 1 ATT. R B 8 of 31

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boroscope is to be used for detection of gross flaws, as paint on the inspection surfaces might mask small indications. In addition I have contacted D. Wright at DCPP for assistance and feedback. Once I get feedback on the possibility of using the boroscope, I will submit a recommendation.

cc: E. Kahler 333/A1404 B. Hepponstall 333/A9087 E. Walters 333/A7084 Rotor_Studs / Rivits ATTACHMENT #1 The original drawing dated 1966 specified ALSI 1113 with a tensile strength 83,500 and referenced material spec 70.15. Pecbles was not able to find a some for the natural. They requested clevelal to afferove an attende natarial. approval was documented by tax. Purchase order was result to Disnac for the alternate auterial after approved of attenute material. Numae is an leables qualified supplies hist and a Coft was supplied. The original material is a relatively mild carbon steel and the approved alternate is British Stanland BS 970: PTI: 1983 grade 605 1136 Coul T which is a hardened and tempered bright alloy steel with a tensile strength approximately 50% greater than the obaginal. The study are used to compress the vator stamping and is a tensile load. The alternate is an

acceptable material for this application.

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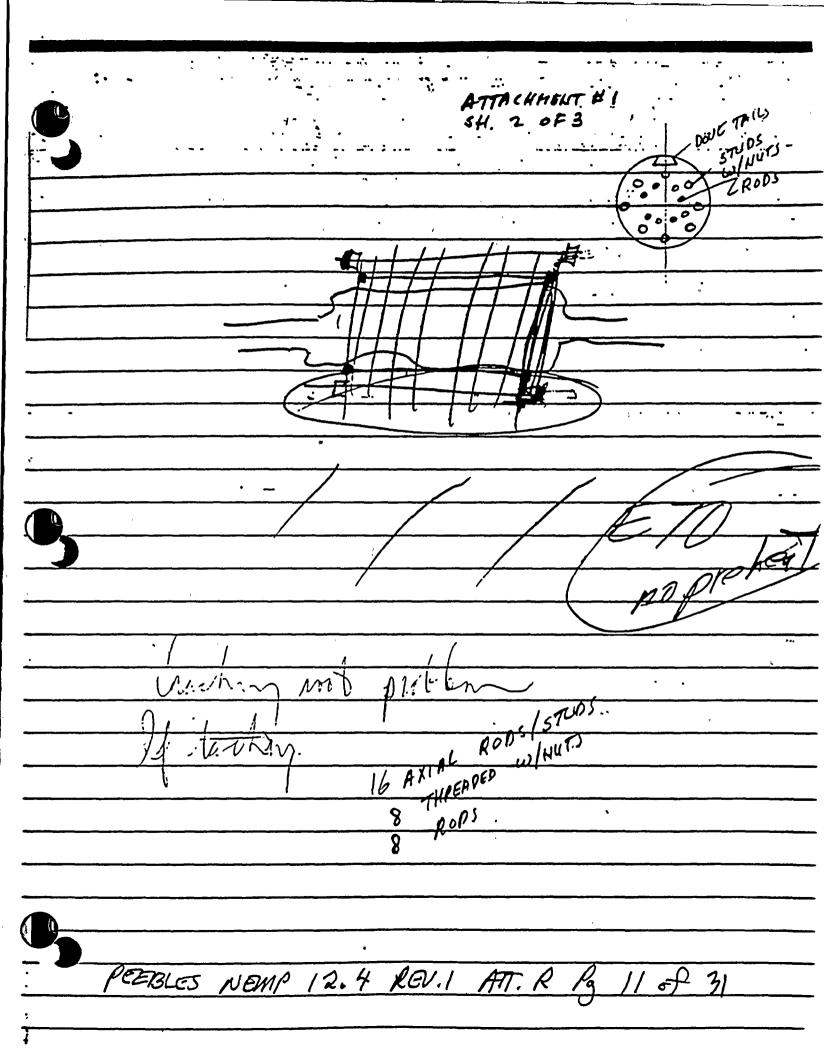
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FACSIMILE MESSAGE

ATTACHMENT W/

PAGE ___ OF

15H. 3 6F 3

| - |
|----------------------------|
| FROM: A.G. Covie |
| DEPARTMENT: PEH Contract |
| TELEPHONE EXT: 176 |
| OUR REF AGC/259132 |
| . DATE: 7th Movember, 1986 |
| |

.PG & E Generator

We have been unable to source the following materials.

- (a) 14 in sq. spider core key. Nove Key May Br Mase From Cas Finus State
- 16) AGTARAS TOS DE ANASTAS A-GESSER-334 (CATES SP. DER STARKES STUDE)
- (c) Screwed rod to A-66667 Co74 Coil washer Stubs

We propose to use the following material 88970 2016T

Carbon 0.32/0.4 .

Silicon 0.1/0.35

Manganese 1.3/1.7 .

Tensile 55/65 Tonf/sq. in (long Tons)

Yield 44 Ton f/sq. in (long Tons)

Elongation 134 .

248/302

MATERIAL IS ACCEPTABLE
FOR STUDS ITAM BYC

Z. Clim

For (b) 36 in long we would like to use stude - not screwed rod i.e. strew out at ends for nuts - centre portion unout. Acceptable 2000 - 10/06

For (c) we would like to use out threads not rolled threads. Acceptable Places

Flease confirm above acceptable.

Please supply a sepy of Dry. ACCILED.

PCERLES NEMP 12.4 REV.) ATT. R Pg 12 of 31

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CT 26 /50 14:24 NET PED FAX MESSAGE

MEI PREBLES - ELECTRIC PRODUCTS, INC 17045 Euclid Avenue 179824 Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

| To: MR. BURT HEPPONSTALL | Location: PGSE |
|---------------------------------|-------------------------|
| From: C. MOOSBRUGGER | Location: NEL CLEVELAND |
| Copies to: | |
| Date:26 OCTOBER 1990 | |
| Number of pages including this: | . . |
| Reply to Fax No: 216 481 8386 | |

HEREWITH ARE THE MATERIAL SPECIFICATION SHEETS YOUR REQUESTED

REGARDS

CHARLIE MOOSBRUGGER

PEEBLES NEMP 12.4 REV. 1

ATT. R Pg 13 of 31



3: 2873

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OCT 26 '90 14:25 NEI P-EP ATTACHNERT #2 SH. 2 OF 5 DDE BATE

MATERIAL SPECIFICATION

15 2/7/73 70.12

P. EPEC. NO.

EMPERSEDES NS 10/14/54 70.12

SHEET NO. 1 OF 1 SUPERSEDED BY

STEEL BARS - HOT ROLLED LOW CARBON

1.0 SCOPE

This specification covers low carbon steel bars either AISI - M1020 up to 3" and C-1018, 3" and larger. They are used for any purpose including welded assemblies, but are not free outting.

2.0 · QUALITY

These materials must be of good quality, free of loose scale and rust. They must conform to all applicable standards.

3.0 COMPOSITION

| Orade | Carbon | Mn | | <u>8</u> · |
|------------------|----------------|----------------|----------|------------|
| C-1018 N-1020 | .1520 .1724 | .6090 .2560 | .04 max. | .05 max. |

4. PHYSICAL PROPERTIES - HOT ROLLED *

| Grade | Tencile Strongth | Yield Btrength | # Elong. | Brinell Hardness |
|------------------|------------------|-----------------------|----------|---------------------|
| C-1018 M-1020 | 69,000 69,000 | 48,000 :::: 47,000 | 38 30 | 143 |

** Color Code FF-EP. 1800k = Bise and Dronge Pore Refer Color Code PS-10002

*Figures shown indicate probable median values only and may not be used as minimum values for critically stressed parts, 1.e., rotor pole heads, for which MS-70.14 (ASTM A-36) should be specified

*Revised-12/1/75-HR

* Rav. 11/24/80 - PMS

ACTEBLES NEMP /2. 4 REV. 1

PROPRIETARY NOTICE

DO NOT REPRODUCE OR DISTRIBUTE
COPIES OF THIS DRAWING OUTSIDE
PARSONS PEEBLES - ELECTRIC

PARSONS PELCTS INC.

PORTEC INC., ELECTRIC PRODUCTS DIVISION 1725 CLARKSTONE ROAD, CLEVELAND 44112
PREPARED BY: DATE: APPROVED BY: DATE: APPROVED BY: DATE:
M. M. Promin 2/7/73 Will- 2/7/73 Will- 2/7/73 Will- 2/7/73

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OCT 26 '90 14:25 NEI P-EP ATTACHACHT Tossesel 84.3 .FS DATE SPEC. N SPECÍFICATION 12/4/75 70.14 SUPERIEDES 15 2/6/73 70,14 SUPERSEDED BY..... ... OF STEEL - MILD STEEL CARBON PLATES (Universal Mill and Bheared Flates) 1.0 SCOPE This specification covers a hot rolled steel plate conforming to ASTM-A283-D or ASTM-A36. A-36 available in bars check Purch (Castle, Ryerson) for available sizes. It is commonly called universal mill edge and sheared or flame out plate. This material will be used for rotor spider webs, rims, and hubs, frame feet, end plates, generator frames and (A-36) for rotor pole heads. COMPOSITION Thickness WPARSONS Carbon Range, 5 . up to 3/4" . .10 - .20 3/4 thru 1-1/2" ..20 - .30 (killed steel) Over 1-1/2" PHYSICAL PROPERTIES ASTM Min. Yield : '..Carbon Co Tensile Spec. Strength Id Strength Content 281 531 Not spec. .26 - 3/4" .27 - 3/4-1-1/2 \ A283-D 60,000-72,000 33,000 in 55,000-80,000 36,000 Or A36 (Elong. : 2" = 23%) Gr .28 - 1-1/2 -.29 over 4" 4.0 QUALITY These materials must be of good quality free of loose scale and rust. They must conform to applicable ASTM Standard. 5.0 RESTRICTIONS 5.1 These materials equal or surpass those called for on QQS-635a for use in parts such as frames, spiders and other welded fabrications, These materials are required for all Q-9858-A order. 5.2

NOTICE

PLEPRIETARY

8

REPRODUCE

PORTEC INC., ELECTRIC PRODUCTS DIVISION, 1725 CLARKSTONE ROAD, CLEVELAND 40

PREPARED BY: DATE: APPROVED BY: DATE: APPROVED BY: DATE

EEBLES NEMP

12.4 REV. 1 ATT. R.

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ATT. # 2 OCT 25 '90 14:25 NEI P-EP SH. 4 0F5 MITE SPEC. NO. CODE 12/4/75 ..79.24... PEREDER 19 2/6/73 70.14 HEET NO... 2... OF.... 2 SUPERSEDED BY STEEL - MILD STREE CARBON PLATES (Universal Mill and Sheared Plates) Use these materials only when certification of both 5.3 chemical and physical requirements are required. Use MS-70.11 and MS-70.12'for all other uses. Color Code : PP-RP-to Turk to Stook - Pink to Refer Color Code PS-10002 PROPRIETARY MOTICE DO NOT REPRODUCE OR DISTRIBUTE DU NUT REPRODUCE UN UNSTRICUTEDE COPIES DE CONTENTE DE PARSONS PEEBLES INTERPREDICTIONS PEEBLES NEMP 12.4 REV. / ATT. R & 160+31 • Rev. 11/24/80 - PMS

PORTEC INC., ELECTRIC PRODUCTS DIVISION, 1725 CLARKSTONE ROAD, CLEVELAND 4411'

APPROVED BY: DATE: APPROVED BY: DATE: APPROVED BY: BATE:

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MATERIAL SPECIFICATION

OCT 26 '98'14:27 NEI PED'" ! # ""

CODE - DA

11/10/72 -76.42

` Sup ersedes ...

3/31/70 ..70.42.

SKEET NO. . . 1. OF . . 1 . . . SUPERSEDED BY.

SHAFT FORGING, CARBON STEEL (NOT RECOMMENDED FOR WELDED LANDS)
USED FOR ALL FLANGED SHAFTS AND ALL SHAFTS OVER 10" DIA.

This material must be in accordance with specification ASTM: A470 Class 1.

PROPRIETARY NOTICE:

DO NOT REPRODUCE OR DISTRIBUTE COPIES OF THIS DRAWING OUTSIDE PARSONS PEEBLES - ELECTRIC PRODUCTS, INC.

Vendor must supply the following documentation:

- 1. Certification of Compliance to ASTM: A470 Class 1.
- 2. Chemical Analysis Report
- 3. Mochanical Test Report
- 4. Ultrasonic Certification Report

(Engineering Reference: The heat treatment consists of double normalizing and tempering with preliminary and second rough machining and stress relieving as specified by this ASTM _______ designation.)

*NOTE: Use MS-70.44 for all applications except when used with integral laminated rotor spider or where poles are bolted directly to shaft.

PETELES NEMP 12.4 REV. 1 ATT. R Pg 17 of 31

Color Code Electric Products Division Stock - None Refer Color Code PS-10002

*Added-4/23/75

ing. . 1 . • ₹. 25° T ... ٠. **%**. *** • **6**

MEI PEEBLIS - ELECTRIC PROJUCTS, IN 17045 Euclid Avenue Cleveland, Ohio 44112-1431

ATT. # 3 SH. 1 of 2 Telephone (216) 481-1500

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| To: MR. VICTOR VANDERZYL | _ Location: PG & Ensuremine. |
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| From: C. Koosbrugger | _ Location: NEI, Cleveland |
| Copies to: | |
| Date: Nov. 9, 1990 | • |
| Number of pages including this: | |
| Reply to Fax No: 216 | 36 |

IN RESPONSE. TO OUR PHONE CONVERSATION YESTERDAY -THE MAT'L SPECS. REQUESTED EARLIER & SENT ON DCT 26 WERE FOR THE FOLLOWING APPLICATIONS . .

MS 70. (2, HOT ROLLED LOW CANBON STEEL BARS - VANIOUS MEMBERS OF THE STATOR FRAME.

MS 70.14 MILD STEEL PLATE, TYPICAL USES LISTED UNDER SCOPE. USED ON FRED OF BEARING BRACKET.

MS 70.42 - SHAFT FORSING,

- THE 8 RODE & 8 STUDS WHICH MUT PART OF THE ROTATING FLEMENT WERE MS 70.15, THE SUBSTITUTION OF BS 605M36 CONTITION T MATIL WAS FOUND ACCESTABLE BY NEI-PEP, WITH APPROPRIATE WELDING PROCEDURES.
- THE BS STEEL HAS HIGHER YIGLD AND ULTIMATE STREWENT AND HIGHER CARBON CONTENT. A WELDING PROCEDURE INCLUDING A PREHEAT TO 150°C AND POST HEAT TO 200°C FOR 4 HOURS IS USED. A COPY OF MS 70.15. CINCA. THE ONIGINAL JUB IS ATTACHED PEEBLES NEMP 12.4 REV. 1

A Rolls-Rover Company

AND THE PARTY OF T Toronto Vale . .

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Date:

November 15, 1990

Fie!: 505.1

To:

DIABLO CANYON PROJECT ENGINEER - ENGINEERING

From:

SENIOR ENGINEER. PROCUREMENT QA - QUALITY ASSURANCE

Subject: Spare Generator



MICHAEL R. TRESLER:

This memo is being written as a result of Audit 9003 of NEI Peebles. Ltd (Scotland), performed by NEI Peebles (Cleveland), and participated in by PG&E auditors.

A potentially significant condition (acceptability of weld procedure used for substituted material) was discovered that may impact the acceptability of the spare generator.

Action Request A0208696 has been initiated to track engineering evaluations.

If you have any questions, please contact Thomas W. Packy at Ext. 2-3823.

MARK C. FREUND

MCF/TWP: 11y

cc: SSBhattacharya/NECS/333/A1414

MSDobrzensky

BRHepponstall/NECS/333/A9087

ERKahler/NECS/333/A1404

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| A/R TYPE : AT OA REQUEST ORG : QAPX REQUEST DATE : 13NOV90 REQUESTED BY : PACKY, TW DATE REQUIRED: 09DEC90 | A/R WUMBER: A0208696 A/R STATUS: ASIGND STATUS DATE: 13NOV90 LAST UPDATE: 13NOV90 PRINT DATE: 14NOV90 |
|--|---|
| EVAL ASIGND TO : TRESLER, MR DA EVAL REQUEST ORG: QAPX EVAL REQUESTOR : PACKY, TW EV EVAL RETURNED BY: | VAL DUE DATE: 09DEC90 ATE ASSIGNED: 13NOV90 VAL STATUS : ASIGND |
| EVAL DESC: SPARE GENERATOR MATERIAL SUBSTITUTION PLEASE EVALUATE THE IMPACT OF THE MATERIAL SUBSTITUTION OF THE MATERIAL SUBSTITUTION OF THE PROPERTY OF THE MATERIAL SUBSTITUTION OF THE SPARE GENERATOR PREVIOUSLY PURCHANGE IN 1986/87. INITIATE AN NCR AS APPROPRIATE TO PROPERLY DISPAND HAVE SPARE GENERATOR PLACED ON HOLD AS APPIAND HAVE SPARE GENERATOR PLACED ON HOLD AS APPIANCE. | STITUTION BXK1 13NOV90 .S. 70.15 BXK1 13NOV90 RES UTI- BXK1 13NOV90 ASED BY BXK1 13NOV90 BXK1 13NOV90 BXK1 13NOV90 POSITION BXK1 13NOV90 LICABLE. BXK1 13NOV90 BXK1 13NOV90 BXK1 13NOV90 |
| | A/R TYPE : AT QA REQUEST ORG : QAPX REQUEST DATE : 13NOV90 REQUESTED BY : PACKY, TW DATE REQUIRED: 09DEC90 EVALUATION NBR : 01 EVALUATING ORG : NCEX EVAL ASIGND TO : TRESLER, MR DEVAL REQUEST ORG: QAPX EVAL REQUEST ORG: PACKY, TW EVAL RETURNED BY: NRC COMMIT CODE : ONE EVAL DESC: SPARE GENERATOR MATERIAL SUBSTITUTION PLEASE EVALUATE THE IMPACT OF THE MATERIAL SUBSTITUTION (BS 970 PT. 1, GRADE 605 M36 CONDITION T FOR MATERIAL) ON THE ACCEPTABILITY OF WELD PROCEDUR LIZED FOR THE SPARE GENERATOR PREVIOUSLY PURCHED FOR THE SPARE GENERATOR PLACED ON HOLD AS APPERLEASE NOTIFY QA AS SOON AS POSSIBLE OF YOUR EXPENSES. |

PEEBLES NEMP 12.4 REV. 1 ATT. R /g 2208 31

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ATT.# 5'

17045 Fuclid Avenue
Cleveland, Ohio 44112-1431
Telephone (216) 481-1500

| To: Mr. Victor Vandersyl | _Location:_ | P.G.EE. En | gineering |
|---------------------------------|--------------|------------|-----------|
| From: C. Koosbrugger | _ Location:_ | WEI. Clave | land |
| Copies to: | • | · · | |
| Date: | • | | |
| Number of pages including this: | | | |
| Reply to Fax No: 216 481 838 | 6 <u>·</u> | | |

I AM RESPONDING TO YOUR QUESTION TO OUR MR. R. POLITI CONCERNING THE STATUS OF THE EIGHT RODS IN THE ROTATING RLEMENT OF THE SPARE DIESEL GENERATOR WHICH WAS SHIPPED IN 1987.

I SPOKE WITH THE DESIGNER OF THE ORIGINAL MACHINE, MR. J. POSPISIL, WHO STRESSED THAT THE RODS ARE AN ASSEMBLY AID WHOSE FUNCTION IS TO ALINE THE LAMINATIONS AND MAINTAIN THE ALINEMENT UNTIL THE ROTATING BLEMENT IS INSTALLED ON THE SHAFT. AS THERE IS NO INCENTIVE TO REMOVE THE RODS ONCE ITS TEMPORARY FUNCTION HAS BEEN FULFILLED. THE RODS ARE LEFT IN PLACE.

SINCE THE RODS ARE A PART OF THE ROTATING ELEMENT, THEY WOULD SHARE SOME OF THE SHEAR LOADS OF THE ROTATING ELEMENT. SHEAR LOADS OF MAGNETIC AND INERTIAL ORIGIN ARE ALSO CARRIED BY THE INTERFERENCE FIT ON THE SHAFT AND THE 8 STUDS, SO THE RODS ARE REDUNDANT. ON THE HEADS WINDAGE ON THE FAN BLADES PRODUCE SMALL FORCES WHICH WOULD BE RESISTED BY THE INTERFERENCE FIT AND REDUNDANTLY BY THE RODS.

THESE RODS ARE NOT CONSIDERED TO BE A CRITICAL ITEM OF THE GENERATOR ONCE IT HAS BEEN ASSEMBLED.

PETERLES NEMP 12.4 REV. 1 ATT. R B 23 of 31



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DEC 83 - 28 1E 32 N P-EP

ATT #6 SH. 10FE

MEI PEERLES - ELECTRIC SCIUDCES, 17045 Euclid Avenue Cleveland, Ohio 44112-1431 Telephone (216) 481-1500

| To: P.G.EE | | L | ocation:_ | San 1 | ranci | 800 | |
|------------------|-------------------------|-------|-----------|-------|----------|-------|---------|
| From: Ron B. | Politi | L | ocation:_ | Cleve | lind | | |
| Copies to: Mr. | •Ed Connell, M | rBurt | Reppon | stall | s Mr. | Usama | Parradj |
| Date: | /90 | , | | 2:50 | № | | - |
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| Reply to Fax No: | 216-481- | 8386 | | • | | | |
| | GENERATOR FOR GO#260274 | | | | | | r |

Re our telcon of Thursday, 29th. November. Attached is a more detailed delivery schedule from Edinburgh. Our larger problem is completing all the paperwork which has arisen as a result of the Edinburgh Audit. We attach the revised welding procedure. You will also have a paperwork schedule faxed to you by December 6th.

P.G.4E. POS 28-1539-AB-9

We are attaching all we have on the Armstrong A701 Epoxy Adhesive but we still do not accept that this is necessary. We are of the opinion that the duty and testing are not fully understood.

- Point (1) There are clamps between the poles to ensure that the copper rotor winding is held in position. Even if the rotor winding did delaminate it would not result in an immediate failure.
- Point (2) When the pole is attached to the rotor and final running tests are carried out, the rotor is run at 25% overspeed. This stresses the adhesive used, to forces well above any that it will experience in its designed duty and gives a significant safety margin.
- Point (3) Taking the above 2 points into consideration, we do not consider the chemical composition critical.

Regards

Ron B.

Ron B. Politi

PEEBLES NEMP 12.4 REV. 1 ATT. R

ATTAG SH 2 OF 2

REF. P.G.&E., Diablo Canyon 8-1128, GO 260274

WELDING PROCEDURE

Application - Welding Armature Rods BS 605M36 Condition 'T' To End Plates BS 1501-161

Synopsis of the NEI Welding Procedure:

- 1) Preheat Assembly to 150°C.
- 2) Electrode Type AWS 7018 is acceptable.
- 3) Electrode is baked to reduce hydrogen level to 5 mls/100 gms in the weld deposit G. Maintain electrodes at 120 to 150°C until use.

This welding procedure was used and welds were checked ultrasonically and found satisfactory.

POEBLES NEMP 12.4 REV. 1 ATT. R By 25 of 31

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PIPING MEMO SPARE GENERATOR.

perbles NEMP 12.4 REV.1 ATT. R

Pg 26 of 31

31

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04/00/81

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HUCLEAR POWER GENERATION TELECOPY COVER LETTER

179824

| | VALTERS A7084 | | |
|-------------------------------|---|--|---------------------------------------|
| FROM: V. V | ANDERZYL contact the above upon rece | Extension 6511 ipt of this Telecopy) | TIME: 7:45 |
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| If yes, complemant individual | te a), b), and c) below: assigned to issue Confirma | tion | · · · · · · · · · · · · · · · · · · · |
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HE ARE TRANSMITTING FROM A CANON FAX-270 AUTOMATIC TELECOPIER.

TO TRANSMIT TO OPEG. CALL (805) 545-6610

TO CONFIRM, CALL THE SENDER

(IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL THE CONFIRMATION NUMBER:)

PEEBLES NEMP 12.4 REV. 1 ATT. R Pg 27 of 31

全者要子会 . £,

To:

File

Location: 333/A1254

From:

Victor Vanderzyl //

Date: February 5, 1990

Job: 18269

Subject: Emergency Diesel Generator

Rotor Assembly.

File: 129.10

NECS Piping reviewed the NDE procedure for the welding of the rotor spider rods for the sixth Emergency Diesel Generator. In addition to the standard magnetic particle examination to detect flaws in the weld to parent metal area, supplementary tests such as ultrasonic checks for detection of sub-surface flaws and hardness tests on the weld in the heat affected zone were specified. In our opinion the three tests assure that the possibility of cracking of the plug welds will be detected during inspection.

Because of the inspection procedure used for the sixth EDG, we expected that a similar process was implemented for post weld inspection of the rotor spider rods for the spare stator located in the warehouse at DCPP. Documentation supplied with this equipment indicates that all 16 welds at the end plates were inspected by using the magnetic particle ink process and that no indications of cracking were found.

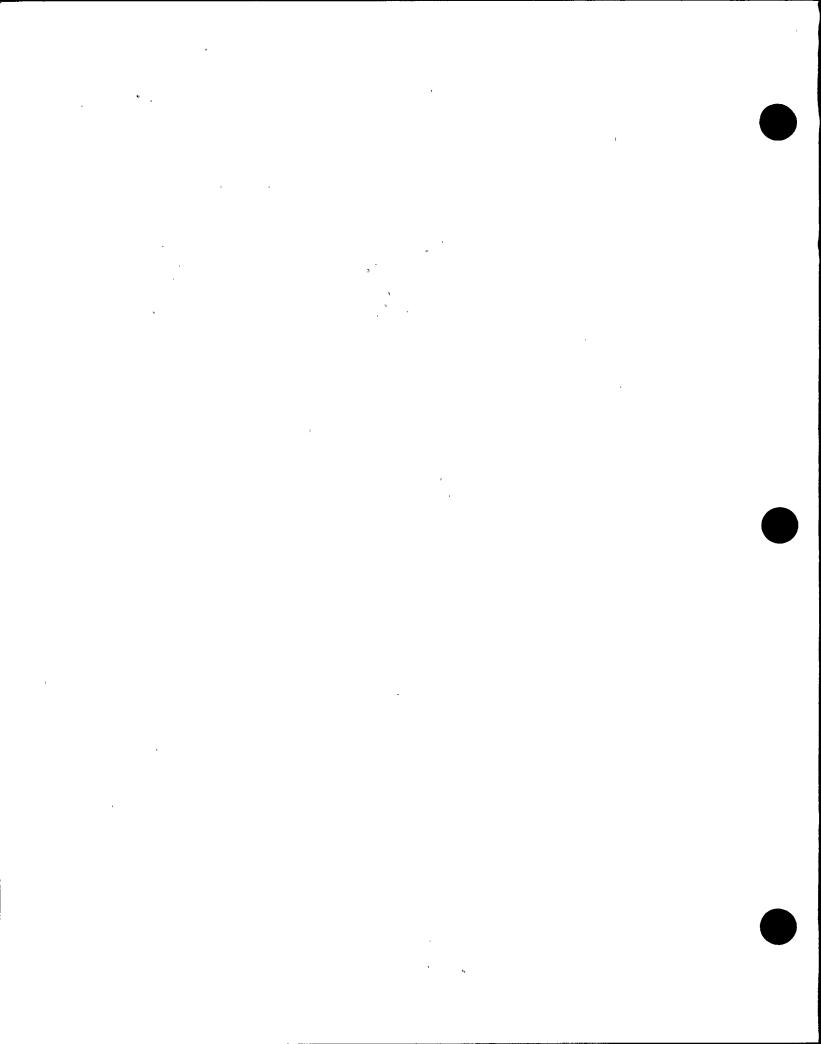
Based on review of the documentation NECS Piping feels that the possibility of cracking at the plug welds is no longer a concern.

cc: E. Kahler 333/A1404

B. Hepponstall 333/A9087

E. Walters 333/A7084

PEZBLES NEMP 12.4 REV. 1 ATT. R & 28 of 31



PEM WEZ-D PROCED ARE ROBS

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FAX MESSAGE

| To: | . Mr R.B. Politi | Location: | PEP Inc Cleveland PEM Edinburgh | |
|----------------|------------------------------------|---------------------|---------------------------------|--|
| From: | Mr M.R. Willis | Location:_ | | |
| Copies to: _ | A.S. Pisher, A. Carnegie, J. Welke | | | |
| Date: | 3rd December 1990 | Our Ref: BJF/260274 | | |
| Number of p | rges including this: | 2. | | |
| Reply to Fax ! | 031 552 758 | J1 , | • • | |

Generation for PG & E - Ref 8-1128

Ref you fax dated 30th November 1990 we advise the following detailed status on the above generator:-

- 1. : Stator · Complete.
- 2. Rotor the remaining programme is as follows:-

Shrink Shaft

Tues Wk49

Fit Poles

Wed-Fri Wk49

Harden Keys

Fri Wk49 - Mon Wk50

Final Pit Poles

Tues - Thurs Wk30

Connect Poles

Fri Wk50 · Tues Wk51

Balance Rotor

Wed Wk51 - Fri Wk01

Paint

Sun Wk02

Witness Hold Point Mon Wk02 (to be confirmed Wk51)

3. Erection.

Thread Rotor

Mon Wk02

Pit Brg Assy's

Tues, Wed Wk02.

Line Up On Test

Thurs Wk02

Close Up

Pri Wk02

4. Testing.

Works Test

Sun · Wed Wk03

Witnessed Test .

Thurs Wk03

We will reply to your other points under separate cover.

PEEBLES NEMP 12.4 REV: 1 ATT. R

Regards,

M.R. Willis



pg 30 of 31

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REF. P.G.&E., Diablo Canyon 8-1128, GO 260274

WELDING PROCEDURE

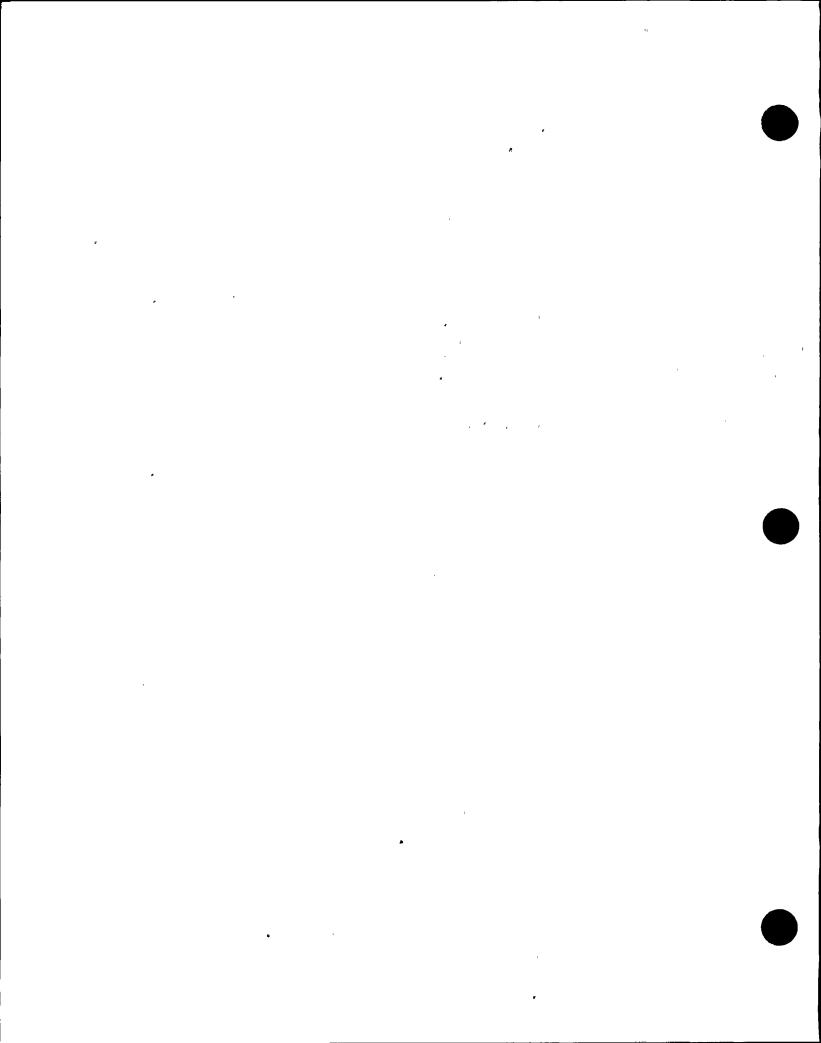
Application - Welding Armature Rods BS 605M36 Condition 'T' To End Plates BS 1501-161

Synopsis of the NEI Welding Procedure:

- 1) Preheat Assembly to 150°C.
- 2) Electrode Type AWS 7018 is acceptable.
- 3) Electrode is baked to reduce hydrogen level to 5 mls/100 gms in the weld deposit G. Maintain electrodes at 120 to 150°C until use.

This welding procedure was used and welds were checked ultrasonically and found satisfactory.

PEERSLES NEMP 12.4 REV. 1 ATT. R & 3155-31



160229

179824

October 29, 1990



Mr. Nick Monolly NEI Peebles - Electric Products, Inc. 17045 Euclid Avenue Cleveland, Ohio 44112

Dear Mr. Monolly:

6th Diesel Generator: PG&E P.O. # ZS-1539-AB-9

Following is a listing of tasks which require your attention to resolve problems encountered in generator operation, outstanding information required by contract, and issues raised by the recent quality survey:

- 1. The terminal box on the side of the "spare" generator is held to the frame of the stator by two welded steel gusset plates. During transit the top heavy terminal box tore away from the metal at the back of the box. Additional supports or bracing at the top of the terminal box to anchor it more rigidly to the frame of the stator should be provided to prevent recurrence of this problem. Please submit a drawing to PG&E proposing your resolution.
- 2. The space heaters on the existing generators are inaccessible. The end bells on the machine must be removed in order to provide access. Due to the close proximity of the heaters to the fibre glass stator coil shields, shield blistering has occurred. Please review your design to verify that the heaters are correctly sized. It appears that a lower heat output may be desirable. As a minimum, the space heaters should be located further away from the fibre glass shields and the space heater accessibility improved. Please provide drawings proposing your solution.
- 3. The CT secondary leads between the CT output and the CT Test Switch are tight (i.e. no slack in these leads at all). There is a strain on these leads when the generator is running and therefore we request that these leads have more slack in them to provide greater flexibility and less strain on the wires and terminations when the generator is running.
- 4. Welding cracks have developed where the skin or cover of the stator frame is joined to the circumferential structural members of the stator around the vent openings, on the installed generators. Particular attention to these welds

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should be given during fabrication to avoid the recurrence of this problem on this generator. Previously in our handwritten transmittal it was reported that the weld cracks were in the main structural members of the stator. This is not the case, as was discovered during our recent, more thorough, investigation.

- 5. NOMEX has served well as the bonding material on top and bottom of the pole turns. Please assure that NOMEX continues to be used on this generator.
- 6. The bonding adhesive between conductors of the straight section of the pole coil conductors is insufficient. The adhesive used has dried out and the coil conductors chatter when the generator is running. A better adhesive with better aging properties should be used on this generator. We understand that Cleveland supplied this adhesive to Scotland and we wish to know how the adhesive selected is qualified to be appropriate for this application and how you verified that the adhesive specified is in fact the adhesive applied to the generator pole coils.
- 7. The polyester glass material used for the stator slot wedges appears to have given satisfactory service on the existing generators. We understand that Scotland has substituted a new material type GPO3. Please provide us with your basis for approval of this substitution.
- 8. Please ensure that the blocking and bracing at the ends of the rotor are completely "flat". We have experienced difficulty when attempting to slide out the rotor from within the stator. Due to the narrow air gap clearances, the end bracing etc. of the rotor tends to scuff the internal side of the stator.
- 9. Slip ring run out: The slip rings, due to either incorrect machining or assembly, are not concentric with the shaft. Considerable "bounce" has been observed on the existing generators when they are running. Closer tolerances should be achieved in the machining and fit of these slip rings.

Items (10) through (15) below are clarifications or reports/certifications or action items that need to be addressed.

- 10. We have changed the specification voltage for the space heaters from 480Vac to 528Vac (maximum). Please redesign the space heaters to allow for this change. If additional costs are required to implement this change, provide a quote and obtain our acceptance before proceeding with this change.
- 11. Include with the documents required to be submitted for this generator, the two-sided capability curve of the generator for leading and lagging power factor.

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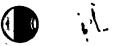
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- Our maintenance personnel wish to inspect the completed rotor and the completed stator just prior to, and during the rotor insertion into the stator. What is your scheduled time frame for this operation?
- Outline drawing C-0899IU Rev. 1 indicated a revision to the jack screw location. What is the reason for this change?
- We have identified a discrepancy in our order P.O. #ZS-1539-AB-9, Rev. 2. The P.O. specifies a testing requirement of "D.C. Voltage Oscillogram". This should read, "A.C. Voltage Oscillogram". Your proposal letter is also in error.
- Furnish all drawings and documentation requested in P.O. #ZS-1539-AB-9 Rev. 2 (see requirements on EMM# DC2-3322-BRH-E, Rev. 2 sht. 10 of 13).

A handwritten draft of this letter was handed over to your Mr. Charlie Moosbrugger in Scotland on 10/11/90 so that early action could be taken on implementing these requests.

Please provide a resolution to these issues or a description of actions and a schedule for those actions for each task as soon as possible.

M. R. Tresler

Diablo Canyon Project Engineer

BRHepponstall:pgp

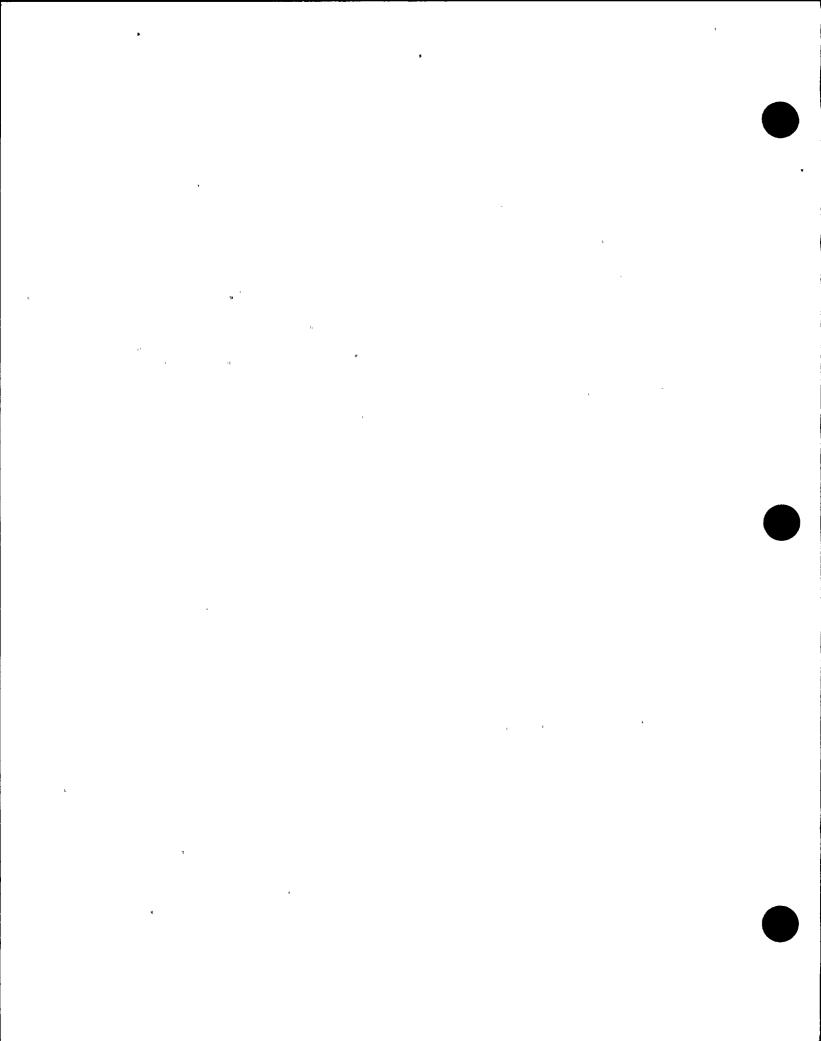
333/A9090 ·cc: M. Basu DCPP/116/1 D. Bauer D. Cathcart 123/G749 R. Clark 333/A7003 U. Farradj 333/A7004 333/A9042 .'T. Fetterman

B. Hepponstall 333/A9087 E. Kahler 333/A14004

DCPP/104/5/523 H. Phillips

xc: Brian Fraser Peebles Scotland Charlie Moosbrugger Peebles Cleveland





PEP RESPONSE TO TECHNICAL ISSUES • r r 1 · · , . • 7 •



NEI Peebles - Electric Products, Inc.

160165

17045 Euclid Avenue Cleveland, Ohio 44112 Telephone: (216) 481-1500 Telex: 241564

Facsimile: (216) 481-8386

October 25, 1990

Pacific Gas & Electric Co. 333 Market St., Rm. 9087 San Francisco, CA. 94106

Attention: Mr. Burt Hepponstall

Reference: P.G.E.&E. P.O. ZS-1539-AB-9

Diablo Canyon 2600 KW Gen

Our Ref. S-1128

Dear Burt,

This is in response to your hand written memo of 10-11-90, listing 16 items identified as deficiencies and clarifications. We address each item herein as follows:

- 1. We are adding to the generator terminal box supports per drawing change request 11413, 3 pages sent herewith. There is no charge for this modification.
- 2. We confirm that the space heaters are correctly sized. The generator is too far along in production to re-design and re-arrange the space heaters from their present position, without causing a serious delay in shipment. Please refer to Item 10.
- 3. Noted. Appropriate measures have been taken to insure that the C.T. secondary leads between the C.T. output and test switch have enough slack in them to prevent strain when the engine is running.
- 4. Noted. Appropriate measures have been taken to insure that special attention is given to all welding in the areas described.
- 5. Noted. Nomex will continue to be used on this generator.
- 6. We no longer use the same pole conductor bonding adhesive used on the past 6 generators. Our current standard is Armstrong 701 Epoxy.



Cont'd. Page 2

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- See Material substitution No. 11412 dated 10-17-90 sent herewith. The factory confirms the use of Gl1 Material.
- We shall take appropriate measures to ensure that the I.D. of the stator coil end turns are concentric, to the degree that the rotor will not rub the end turns during removal.
- Noted. Factory has been notified.
- We can accommodate a change in space heater voltage from 480V 10. to 528V but not on this generator. This would require a change in the total number of heater elements used from 6 to 9, all re-arranged on a new mounting plate. For PG&E future consideration we would offer a space heater replacement kit, interchangeable with the existing heaters and suitable for operation at 528 Volts, 3 Phase supply. The heat produced with the replacement kit would be less but still adequate to prevent condensation from forming within the generator when not running. With less heat the charring effect of the fiberglass shield would also be diminished. Pricing is not available at this time. A separate quotation will follow.
- 11. Curve No. 2184 sent herewith.
- NEI Peebles Electric Products, Inc. will give P.G.&E. two weeks advance notice as to when the rotor and stator are finished and ready for assembly. It will be P.G.&E.'s responsability to be their as we cannot hold production awaiting P.G.&E. arrival. -1:15
- The generator stator frame with feet are built to manufacturing drawings which locate things like the Jack screw hole. The outline was revised to reflect the equipment as built.
- This apparently resulted from a typographical error in our proposal. Our factory is aware that this should be "AC oscillogram".
- Will do. 15.
- The following documentation is sent herewith.

No. 11409 No. 11410 Drawing change request Drawing change request

No. 11411 Drawing change request No. 11412 Material substitution No. 11382 Drawing change request No. 11397 Material substitution Drawing change request/material substitution

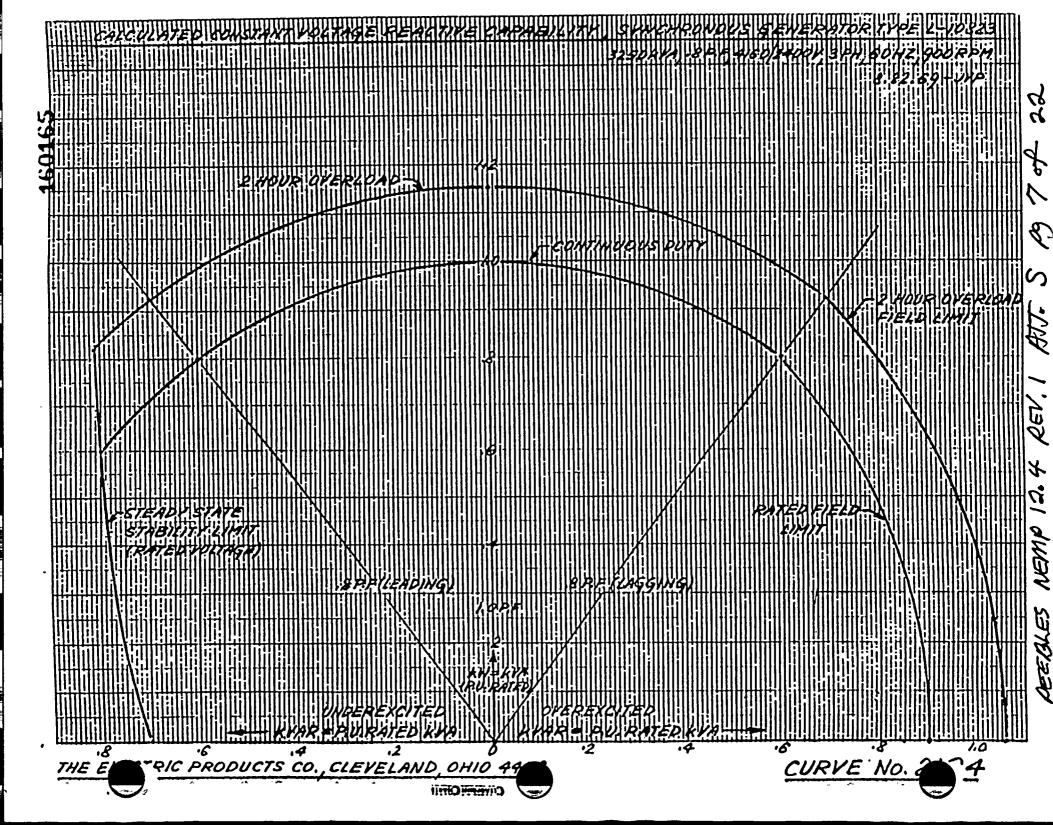
Drawing change request/engineering order

. If, there are any further questions relating to the above items as covered, let us know.

Very truly yours

NEI PEEBLES - ELECTRIC PRODUCTS, INC.

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| DRAWING CHANGE REQUEST | Page Visit |
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ADVANCE DRAWING CHANGE STILL BURNERING ORDER

| Page. | | ";; —— |
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SERIAL NO.

LEAD CABLE

WRITTEN AGAINST ___ CHANGE LETTER

DRAWING NO.

DESCRIPTION OF CHANGE:

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· 160165

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FROM GENERAL ELECTRIC.

CONSISTANT WITH EARLIER MATERIAL

SUBSTITUTION REQUEST, THE TOMMY, 6.6 KV S.C. RUBBER

AS PESCRIBED IN ATTACHMENT TO TELEFAX FROM D. BRUNION

TO R.M. ROSSMAN (PCT/SSI) IS SUITABLE SUBSTITUTION

FUN LEAD CABLE ON EP S-1128 (GO 26 0274).

PLEASE NOTE, BECAUSE OF CUSTOMEN'S Q. A. REQUIREMENT

THE LEAD CABLE DIELECTRIC STRENGTH, NUMBER OF

STRANDS, MARKING ON CABLE, AND INSULATION

THICKNESS MUST BE VERIFIED BY TEST OR

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DRAWING CHANGE REQUEST

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| | DRAWING | CHANGE | REQUEST | | |
|-------------|----------|-------------|---------------------------------------|-------------|---------------|
| ⊔ | | DRAWING | CHANGE | - Pag | 6of |
| | ENGINEER | ING ORDER | | NO | 11412 |
| V | MATERIAL | SUBSTITUT | ION 16 | 0165 p. | 10-17-90 |
| SERIAL NO. | JEMA G- | ! AND | · · · · · · · · · · · · · · · · · · · | | CHANGE LETTER |
| - | GP0-3 | Fun 6P | °0-1 | | • |
| | GPO-3 | Fun GF | 0-1 | | . |
| DRAWING NO. | NAME | | | :- 10.1) Du | oni~G |
| | DAMAGE C | 0 F G P O - | l (our Mi For CH | INGE TO | GP0-3. |

DESCRIPTION OF CHANGES

ACCORDING TO NEMA LI.1-1983; GPD-1, GPD-2, \$690-3

HAVE SIMILAR PHYSICAL PROPERTIES, WITH THE DISTINCTION

BEING THAT GPO-2\$ G.PO=3 ARE: FLAME RETARDANT AND 670-3

IS ADDITIONALLY RESISTANT TO CARBON TRACKING, WE

CAN ACCEPT THE SUBSTITUTION IF YOUR EXPERIENCE

DICTATES ITS DESIRABLUITY, FOR THE POLEMAINES AS

WE HAVE, IN OUR MATERIAL SPECIFICATIONS,

MI 10.1 FOR GPO-1, MI 10.6 FOR, 670-2, AND

MI 10.7 FOR GPO-3, WE CAN'T INCLUDE YOUR GPO-3

MATERIAL WITHIN OUR : MI 10:1 SPECIFICATION, :

AS THE G-11 EXHIBITS: BETTER HIGH TEMPERATURE
AGING CHARACTERISTICS AS ILLUSTRATED IN NEMA
LI 6-1983, WE WOULD PREFER THAT THIS BE USED
FOR THE SLOT STICKS, OUR SPEC. MI 5:5,

INSTRUCTION TO MANUFACTURING DEPTS.

| MANUFACTURE OR REWORK PARTS | K PARTS AS INDICATED - Signed: | | | |
|---|---|---------------------------------|--|--|
| Requested By DBLUNTON Dept. ENG: Supervisor B. SM. TIT Date VIA FAX OCT 11, 1990 | Disposition of Stock Return to Stock Rework Use None Screp | Next Assem. No | | |
| Engr. Action: Approve Reject Reject | Production Engr. Approve Reject Reson for Rejection | Draftsman: | | |
| Project Eng'r. Marile Dete 10-17-90 | By Date | PERBLES NEMP 12.4 ROV. 1 ATT. S | | |

6 · .

| PEF F-A | 190,-260274 | VING CHANGE REQUE ANCE DRAWING CHAI NEERING ORDER RIAL SUBSTITUTION | 160165 NO. 11413 1 Date 10/24/42 WRITTEN AGAINST_CHANGE LETTER ERMINAL BOX |
|---------------|---|--|---|
| , 5 up | THAT REINFO | DRCEMENT BE AD | ADDITIONS WILL |
| | | 2) | ADD 2 SUPPORT STRA L REQ'D ILETTIRIGHTHA ADD BOLTING PLATE TO BACK OF TERM, BOX |
| | | | HARDWARE WILL BE REQUIRED 12.13×13/1 LG SCREI M525.2 2 RED 2 12.13 NUT HEX MS.SI |
| | SEE PAGE 2 & PLEASE ADD TO YOUR DE | AWINGS AS REGID TO MANUFACTURING DEPT | 2 REQ 3 1/2 FLATWASHER MW 5.1 Z REQ 4 1/2"LOCKWASHE MW 5.2 Z RED |
| ٠. | Requested By Re Consens Dept. ENGR Supervisor TVP Date 10/24/90 | Disposition of Stock Return to Stock Rework Use None Screp | Next Assem. No |
| | Engr. Action: Approve Reject Reject Resson for Rejection Project Engr. CM0052 n UBBE 2 Date 10-24-572 | Production Engr. Approve Reject Rescon for Rejection | Draftsman: Check: Ch. Des.: PEBLES NEMP 12.4: PEV. 1 ATT. S PA 14 of 22 |

ţ *****, • 1

| PEF | BO 1627 | NCE DRAWING CHAINERING ORDER | 160165 NO. 11413 Date 10/24/90 WRITTEN AGAINST CHANGE LETTER |
|-----|---|--|--|
| • | REASON: - SEE PG | | |
| | · · · · · · · · · · · · · · · · · · · | н | |
| | DESCRIPTION OF CHANGE: | : | |
| • | ① WELD_ 14"x2"x 41 OF BOX (M570 → 3+ REF RE=+ | 3/4 LG HOT ROLLED ST | L BOLTING PLATEJTO BACK |
| | 9/16DIA - 1/2 1"-3 2 MOLES SEE NOTE | 8" 8" | VER REINFOR CEMENTAL PLATE MS 70.17 |
| | 2" | 1 11 | - UPPER 2 MTG, HOLE TO BE LINE DRILLED AT ASSEMBLY |
| | BOX VIEWED FRO | INSTRUCTION TO MANUFACTURING DEPT | s. , |
| ; | Requested By P C (Dann | Disposition of Stock | Next Assem. No |
| | Dept. ENGR Supervisor JVP Dete D/24/50 | Return to Stock Rework Use None Screp | Affected |
| | Engr. Action: Approve Reject Reject Reson for Rejection | Production Engr. Approve Reject Reject Reason for Rejection | Draftsman: Check: Ch. Des.: AECHLES NEMP12.4 |
| • | Project Eng's C-MOOSRAUGEE A Date 10-24-90 | By Dete | REV. 1 ATT. S |

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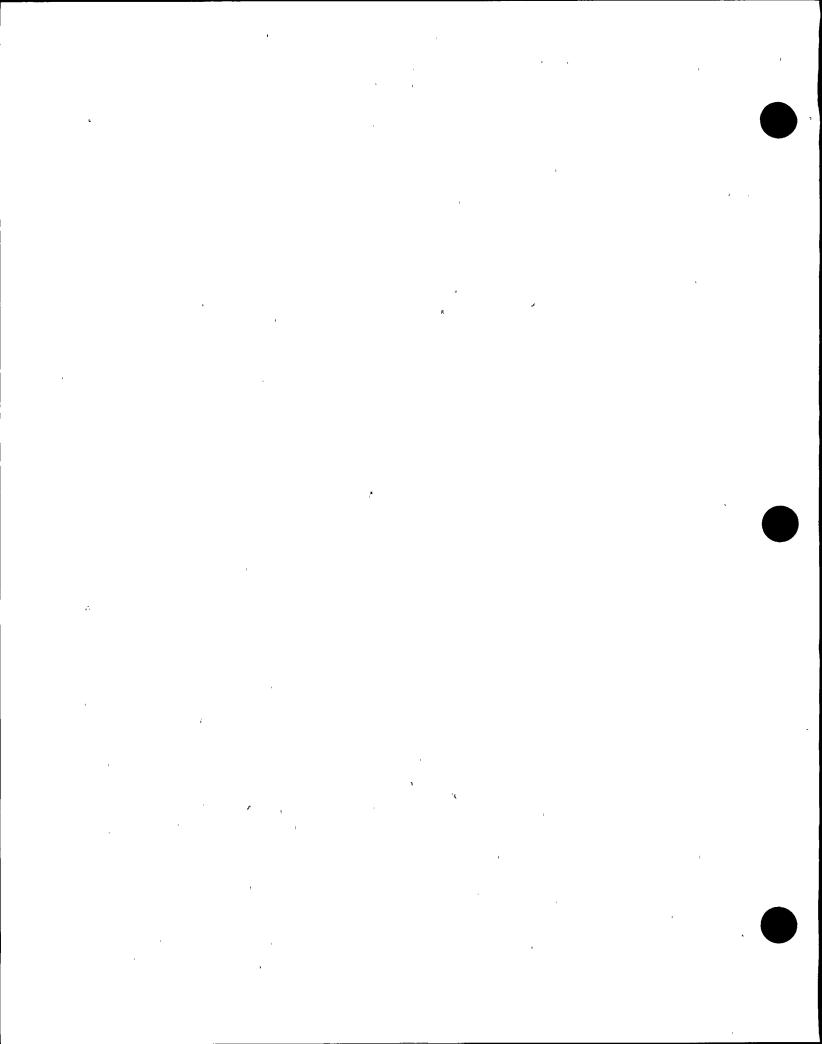
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| ADV ENG | WING CHANGE REQUIANCE DRAWING CHAINERING ORDER ERIAL SUBSTITUTION | |
|--|---|-------------------------------|
| PEP C66760A-7 AC DRAWING NO. NAME | • | WRITTEN AGAINST SULVES ASTERN |
| REASON: SEE PG1 | · · | |
| i i i i i i i i i i i i i i i i i i i | OX SUPPORT. ZEAND & I LEFT HA | D . |
| MAT'L- 3/8 × 2 × 2 = | - 9/16DIA - 23 | TEEL MS 70-12 |
| MANUFACTURE OR REWORK PARTS | INSTRUCTION TO MANUFACTURING STEP | |
| Requested By ROCOMM Dept. ENGR Supervisor TYP Date 10/24/90 | Disposition of Stock Return to Stock Rework Use None Screp | Next Assem. No Affected |
| Reason for Rejection Representation: Approve Reject Representation: Reject Re | Production Engr. Approve Reject Reason for Rejection | Draftsman:Check:Ch. Des.: |

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| · · · <u>L</u> | שווים שוווים | TUL MEGUL | | , 1 |
|--|------------------------------|--|----------------------|------------|
| | ADVANCE DRAV | * - | ▽ | 01_1 |
| • | ENGINEERING C | · · · · · · · · · · · · · · · · · · · | NO. <u>// ;</u> | |
| P.O. 11271 SERIAL HO | MATERIAL SUBS | TITUTION | Date 4/- | -77-70 |
| · · | LEAD CABLE | • | WRITTEN AGAINST CHAP | NGE LETTER |
| DRAWING NO. | NAME | <u> </u> | | |
| arison M.C | | | | _ |
| REASON: ATC / | 10.7 VULKAFLEY | CABLE NO L | ousen Aumensi | -E |
| FILIM GENER | ral Riberric. | | | T. |
| | | | | |
| DESCRIPTION OF CHAN | NGE: CONSISTANT | WITH EAR | LIER MATERIA | + |
| 50857170710~ | REDUEST, 776 | = 20 mm2, | 6.6 KV 50-1 | RUBBEA |
| AS PESCAIRE | D IN ATTACHM | CAT TO TELE | FAX FROM DO | 222-10U |
| TO R.M. ROSS | MRN (PC7/SSI |) 15 5417 | BUE SUBSTITU | 17100 |
| FUR LEAD | CABLE ON EP | 5-1/28 / | 60 240274 | |
| | | | | |
| PLEASE NOTE | , BECAUSE OF | CUSTOMEN | 's Q. A. RE | EQUIREME |
| I HE KEND C | MUSLE DIELECTA | IC STREWAY | | _ |
| STRANDS, 1 | MARKING ON C | ABUE A. | , himsen or | |
| THICKNESS | MUST BE VE | Environ 1 | D. S- | N |
| IN SPECTION | Payon Ta Aca | CAPAT RC | or lest on | • |
| CONSIDERE | PRIOR TO ASS | | THEY ARE | 1) |
| | D " CRITICA | CHANA | => C C S > / C S | • |
| | it is it is | | | |
| , , , , , , , , , , , , , , , , , , , | 1 | /86 . | | |
| , 1 | | | , | |
| | '., 2/ | | NI W | |
| The same of the same | INSTRUCTION TO M. | AHUFACTURING DEPTS! | 7 (1) (4) solu | |
| MANUFACTURE OR REWO | ORK PARTS AS INDICATED - | Signed: | | • |
| Requested By D. BRUN | TON Disposition | of Stock N | ext Assem. No | |
| Dept. PEM - EDINR (FAX - 10-4-70) Supervisor | UR6H Ret | | ffected . | |
| (FAX - 10-4-70) Supervisor | Rework | | ot Affected N. | A- |
| Date 10-4-90 | None 🗵 | — — — — — — — — — — — — — — — — — — — | ifective on Serial | · |
| | | | | |
| Engr. Action: Approve | Reject Production Engr. | . — | eftsmen: | |
| eason for Rejection | Approve Reason for Rejection | | neck: IV III | |
| ` | KASSON TO KEJECTION | | PEEBLES NETHIP | 12.4 |
| Project Eng'r. Machal | Monlegge NI. | | EV. I ATT. S | • |
| Date 4/11/90. | Ву | Date | pg 17 of 25 | 2. |



MEMO FROM NECS ELECTRICAL

SUBJECT: RESOLUTION OF TECHNICAL ISSUES

PREBLES NEMP 12.4 REV. 1 ATT. S py 18 of 22

• v v i. • ч ¥i . e e

Date:

JANUARY 31, 1991

Fle #:

30.

NECS - MECHANICAL ENGINEERING

From:

NECS - ELECTRICAL ENGINEERING

Subject:

Sixth Diesel Generator Purchased from NEI Peebles,

Cleveland



U. FARRADJ:

Attached herewith is our NECS-EE response to the concerns raised by DCPP-Electrical Maintenance on the fabrication/order for the 6th Diesel Generator. This response is needed for completion of the NEMP12.4 evaluation reported being prepared by Ed Walters.

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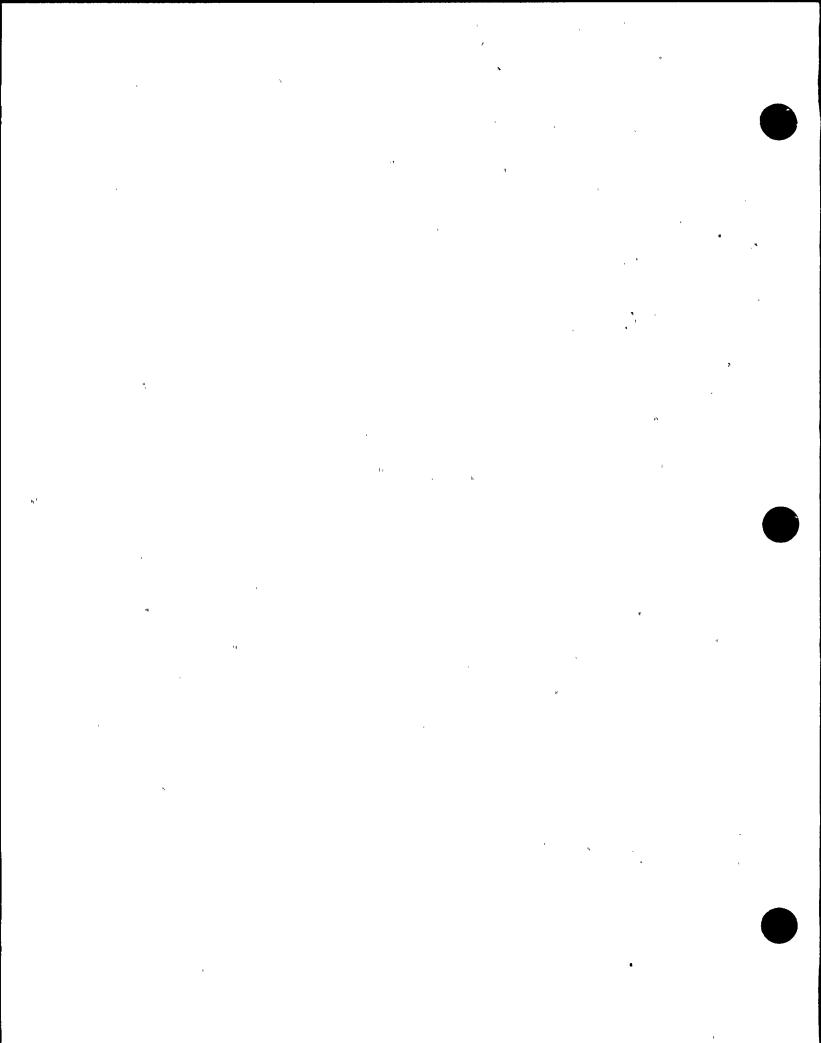
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BHepponstall(3-9827):jeu

Attachments

PERBLES NEMP 12.4 REV. 1 ATT.S pg 19 of 22

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Usama Farradj January 31, 1991 Page 2

bcc: TFFetterman 333/A9042

EWalters 333/A7084

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PEEBLES NEMP 12.4 REV.1 ATT. S PS 20 of 22



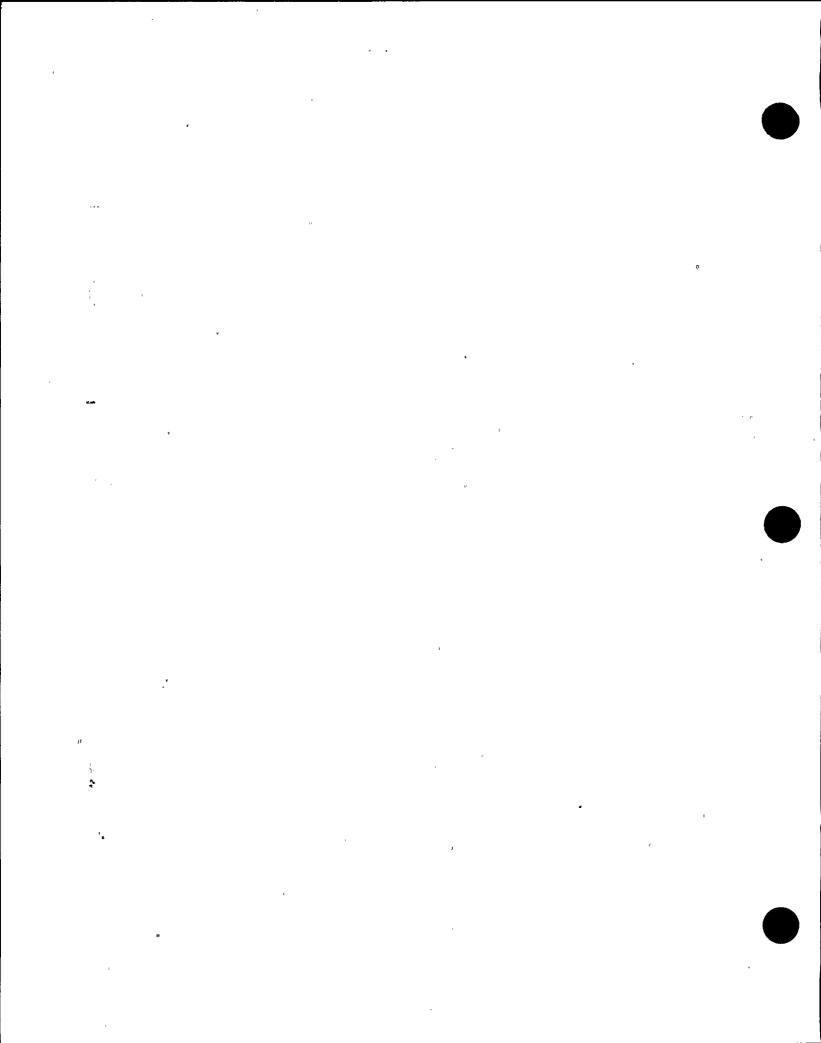




DIESEL GENERATORS AT/FOR DCPP

ENGINEERING RESPONSE TO CONCERNS RAISED BY DCPP (ELECTRICAL MAINTENANCE

| PROBLEM/CONCERN | HOW WAS PROBLEM/ CONCERN SOLVED ON 6TH GENERATOR | HOW WAS PROBLEM/ CONCERN SOLVED ON SPARE GENERATOR | HOW WAS PROBLEM/ CONCERN SOLVED ON 5 EXISTING GENERATORS | ACTION |
|--|---|--|---|---|
| Terminal box not adequately supported. Spare was damaged during shipment | Peebles is designing top bracing to adequately support the box. Don Bauer will inspect and accept fix for PG&E (see Chron #160165 letter from Peebles dated 10/25/90). | Bracing needs to be inspected on spare. Tom Niemi (Warehouse) will inspect and report. | Is not a problem on existing generators. Terminal boxes were not damaged in shipment. | Tom Niemi to report on his inspection of spare. Inspection tracked on AR# A0214809. |
| 2) The space heaters are causing local overheating. | Reason for overheating is the plant supply voltage of 528V instead of 480V, 3ph. This will be corrected along with the other 5 existing generators by means of a DCN to add step down transformers (see Chron #162789 from Peebles dated 11/19/90). | Space heaters will remain rated at 480V, 3ph. | DCN will be issued to add step down transformers or modify power supply to space heaters. | Issue of DCN tracked on AR# A0166454. |
| 3) CT leads in terminal box are too tight. Failure (broken cables) resulted twice at DCPP. | Peebles will provide enough slack in jumpers (see Chron #160165 letter from Peebles dated 10/25/90). | Tom Niemi (Warehouse) will inspect and report. | Field corrected the concern on all existing units by re-routing leads, thus providing longer jumpers and more flexibility; reference DCPP W.O. #'s C0071091, 71192, 71196, & 71198. | Tom Niemi to report on his inspection of spare. Inspection tracked on AR# A0214809. |
| 4) Welding cracks developed in the skin of stator frames at structural joints. | Peebles will pay special attention to welding in these areas (see Chron #160165 from Peebles dated 10/25/90). | Engineering to generate a DCN to fix spare before cracks develop. | Field rewelded the stator covers on existing 5 units with DCN #s 43041 and 44041. | Issue of DCN for spare tracked by AR# A0213896. |
| 5) Nomex material served well on existing units. | Nomex will continue to be used (see Chron #160165 from Peebles dated 10/25/90). | No problem; no action required. | No problem; no action required. | No action needed. |



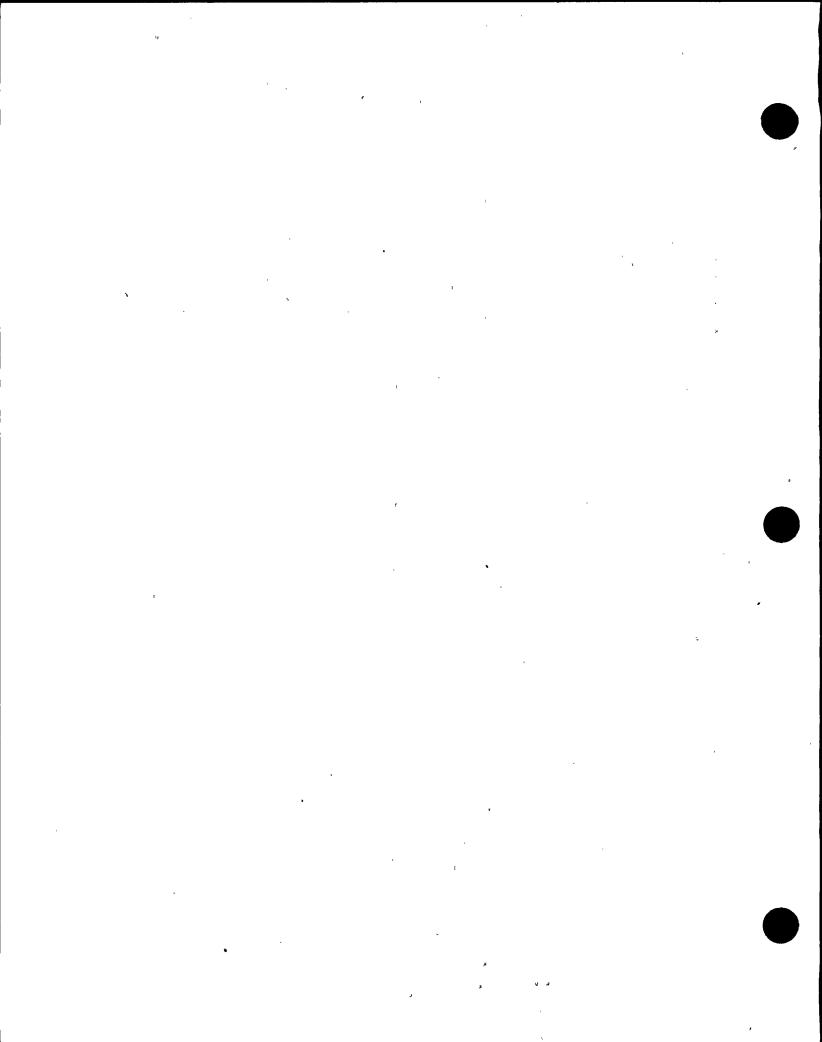






| 6) Bonding adhesive between coils appears to be drying out. | Peebles is using a new, better adhesive (Armstrong 701 Epoxy) (see Chron #160165 from Peebles dated 10/25/90). | No action required at the present time. | DCPP Maint. noticed this on one of the existing units. It is not a critical problem at this time, but is being watched in case it develops. No other action is required at this time. | DCPP Maint, is watching this per their PM program. No further action required at this time. | |
|--|---|--|--|---|--|
| 7) Slot wedge material GP01 has given good service. Do not change to GP03. | Factory changed to GP03 & GP11 which have better properties and better resistance to handling (refer change order request No. 11412 attached to Chron #160165 from Peebles dated 10/25/90). | No action required. | No action required. | No action required. | |
| 8) Blocking and bracing of stator not completely "flat", thereby making it difficult to slide out rotor without rubbing on rotor windings. | Special measures will be taken by Peebles to ensure that rubbing does not occur (see Chron #160165 from Peebles dated 10/25/90). | No action required. Extra precautions will be taken if disassembly required. | No action required. Extra precautions are taken during disassembly | Don Bauer checked 6th generator in Scotland to ensure problem does not exist. No further action required. | |
| 9) Slip ring run out | Closer tolerances will be observed during machining and fit (see Chron #160165 from Peebles dated 10/25/90). | Not observed as a problem. | Slight eccentricity was observed on one unit. Problem is not severe and is being watched on a preventative maintenance basis. No action required at this time. | DCPP Maint, is watching this per their PM program. | |

perbles Nemp 12.4 Rev. 1 12.4 Dev. 1



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| | 179824 |
|---|--|
| | TITLE: Generator For Emergency Diesel #2-3 PLAN NO.: DC-254, REV. 2 |
| • | PROJECT: Diablo Canyon Unit 2 PROJECT FILE NO: |
| | G.M.: 000094 0 SPEC NO.: EMM DC2-3322-BRH-E, REV. 3 |
| | P.O. NO.: ZS-1539-AB-9 & Changes 1 & 2 |
| | SUPPLIER: N.E.I. Peebles Electric Products, Cleveland, OH 44112 |
| | (Edinburgh, Scotland) |
| | |
| | 1 1 A. |
| | Prepared by: 4.M. Escaranio |
| | F. M. Escaranio |
| | 1148 -1 |
| | Approval: 7.7. On Date: 1/18/41 |
| | Approval: H. R. Borgard, Supervising Inspection Engr. Date: 1/18/91 Date: 1/2/1/ |
| | 17/1/3 |
| | B. R. Hepponstall, Responsible Engineer |
| | . B. R. Repponstall, Responsible Engineer |
| | |
| | DISTRIBUTION AFTER APPROVAL Date Distributed: |
| | Inspection Section Job File, P.O. No: ZS-1539-AB-9 |
| | Inspection Section Project Plan File: |
| | Senior Inspection Engineer: J. J. Graham |
| | Inspector: J. R. Starzmann |
| _ | Inspector: J. R. Starzmann Responsible Engineer: B. R. Hepponstall |
| | Others: R. C. Anderson / M. Tresler / E. C. Walters |
| | |
| | <u>Purpose</u> : The purpose of the Inspection Plan is to systematically |
| | identify the Inspector's responsibilities and program his actions to |
| | assure that components are manufactured and tested in conformance with |
| | contract requirements, and in such a manner that they will perform |
| | their intended function. EQS Procedure 2.3 is part of this plan. This |
| | plan conforms to Company quality procedures and instructions, as stated |
| | in the "Purpose" section of EQS Procedure 2.2. |
| | Commanda Thanks the Command Co |
| | Scope of Inspector's Responsibility: Refer to EQS Procedures 2.1, 2.3 |
| | and 2.4 for general responsibilities. The scope of responsibilities |
| | for this assignment is: perform inspection in accordance with attached Checklist. |
| | · · · · · · · · · · · · · · · · · · · |
| | Approved Supplier's Documents: The Inspector shall require documented |
| | evidence that revisions of supplier's documents which are in use have |
| | been approved as required by contract. When documented evidence is not |
| | available or is questionable, the Inspector shall identify with |
| | revision number, those documents used by him when performing the |
| | inspection actions required by this plan. |
| | |
| | Safety Related Function: Standby Emergency Generator |
| | |
| | Peference: FAC Manual Drecedures 2 1 2 2 2 2 and 2 4 |

PEEBLES NEMP 12.4 REV. 1 ATT. T Pg 109 63

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INSPECTION PLAN NO. DC-254 CHECKLIST

Page 2 of 3

Date and Initial Each Time Action

| | | is Performed Sa | tisfactorily | | | | |
|------|-----------------------|---|--------------|--|--|--|--|
| ı. | Prior To Manufacture: | | | | | | |
| | λ. | Actions required by EQS Manual Procedure 2.3, Para. 4.2 and 4.6.2.1. | | | | | |
| II. | Dur | ing Manufacture: | | | | | |
| | λ. | Balance of actions required by EQS Manual Procedure 2.3. | | | | | |
| III. | Upo | n Completion Of Manufacture: | | | | | |
| | Α. | Witness generator tests or observe the collection of test data required for motor calculations, as listed on pages 5 and 6 of the EMM. | | | | | |
| | в. | Verify that all test instruments used in the testing of this generator have current calibration to appropriate standards. | | | | | |
| | c. | Verify that generator has external dimensions which duplicate the existing Electric Products generators, serial nos. 16908022/26, including mounting dimensions and terminal box location (except that 4 1/2" bus insulators are acceptable). | | | | | |
| | D. | Verify that generator is being furnished in accordance with vendor drawing C-08991U, rev. 3 (PG&E record drawing 6011924-12, rev. 1) which has been reviewed and approved by PG&E Engineering. | | | | | |
| | E. | Verify that generator is an electrical duplicate of the existing Electric Products generators, serial nos. 16908022/26, including ratings and phase sequence. | | | | | |
| | F. | Verify that proposed method of packaging the generator for shipment is in accordance with PG&E requirements. | | | | | |

PEEBLES NEMP 12.4 REV. 1 ATT. T Pg 2 of 63 . •. 1

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INSPECTION PLAN NO. DC-254 CHECKLIST

Page 3 of 3



IV. Prior To Shipment

NOTE THAT THIS INSPECTION PLAN IS BASED ON REV. 3 OF EMM DC2-3322-BRH-E. THE INSPECTION SECTION IS NOT RESPONSIBLE FOR ANY DEDICATION ACTIVITIES, AND THE GENERATOR IS NOT TO BE RELEASED FOR SHIPMENT UNTIL CONFIRMATION IS RECEIVED THAT NEI-PEEBLES IS BACK ON PG&E'S APPROVED QSL.

- A. Confirm that NEI-Peebles has been placed back on PG&E's QSL.
- B. Release the generator for shipment.

<u>Inspector's Completion Statement</u>: Include a list of I.R.s which document the details of the action taken by the inspector, and significant events in the performance of the contract by the supplier.

Signed:

Inspection Engineer

Date

Approved:

Supervising Inspection Engineer

Date

Attach to final copy of I.R.

A69/INSPLAN.254

PEEBLES NEMP 12.4 REV. 1 ATT. T By 3 of 63

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PACIFIC GAS AND ELECTRIC COMPANY ENCON QUALITY SERVICES - INSPECTION SECTION INSPECTION PLAN

| | TITLE: Generator For Emergency Diesel #2-3 | PLAN NO.: DC-254, REV. |
|---|---|-------------------------------|
| | PROJECT: Diablo Canyon Unit 2 | PROJECT FILE NO: |
| | | NO.: EMM-DC2-3322-BRH-E, REV. |
| • | P.O. NO.: ZS-1539-AB-9 | |
| | .SUPPLIER: N.E.I. Peebles Electric Products | cleveland, OH 44112 |
| | • | (Edinburgh, Scotland) |
| | | |
| | manage has 1 M Carrier | |
| | Prepared by: J.M. Escaranio | |
| | | . , |
| | Approval: H. H. Borgard, Supervising Inspec | pate: 2/9/90 Date: 2/9/90 |
| | H. H. Borgard, Supervising Inspec | ction Engr. |
| | a V V | mleles |
| | M. L. MINI | Date: 47770 |
| | E. K. Kang, Responsible Engineer | |
| | | • |
| | DISTRIBUTION AFTER APPROVAL Date | Distributed: 12/9/90 |
| | Inspection Section Job File, P.O. No: 2S-1 | SEZO-AR-O |
| | Inspection Section Project Plan File: | 1939-AB-9 |
| | Senior Inspection Engineer: J. J. Graham | |
| | | |
| | Inspector: J. R. Starzmann | |
| | Responsible Engineer: E. K. Kang | |
| | Others: R. C. Anderson / M. Tresler | |

<u>Purpose</u>: The purpose of the Inspection Plan is to systematically identify the Inspector's responsibilities and program his actions to assure that components are manufactured and tested in conformance with contract requirements, and in such a manner that they will perform their intended function. EQS Procedure 2.3 is part of this plan. This plan conforms to Company quality procedures and instructions, as stated in the "Purpose" section of EQS Procedure 2.2.

Scope of Inspector's Responsibility: Refer to EQS Procedures 2.1, 2.3 and 2.4 for general responsibilities. The scope of responsibilities for this assignment is: perform inspection in accordance with attached Checklist.

Approved Supplier's Documents: The Inspector shall require documented evidence that revisions of supplier's documents which are in use have been approved as required by contract. When documented evidence is not available or is questionable, the Inspector shall identify with revision number, those documents used by him when performing the inspection actions required by this plan.

Safety Related Function: Standby Emergency Generator

References: EQS Manual Procedures 2.1, 2.2, 2.3, and 2.4



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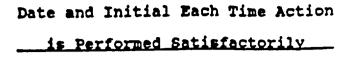
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INSPECTION PLAN NO. DC-254 CHECKLIST

Page 2 of 3



| I. | Pri | or To Manufacture: |
|----|-----------|---|
| | λ. | Actions required by EQS Manual Procedure 2.3, Para. 4.2 and 4.6.2.1. |
| | ъ. | Verify that all required drawings and procedures have been approved by PG&E. |
| | c. | Review supplier's Quality Plan and verify their intended compliance with P.O. requirements. |
| z. | | Note: Per H. H. Borgard's 2/2/90 telephone conversation with R. A. Koschak of PG&E Q.A., the NEI-Peebles-Cleveland, Ohio QA program has been approved by PG&E Q.A. Since NEI-Peebles-Edinburgh, Scotland plant is a sub-vendor of NEI-Peebles-Cleveland, no further action, in this regard, is required of the inspector. |
| ı. | Dur | ing Manufacture: |
| | λ. | Balance of actions required by EQS Manual Procedure 2.3. |
| I. | Upo | on Completion Of Manufacture: |
| - | λ. | Witness generator tests listed on pages 5 and 6 of the EMM. |
| | В. | Verify that all test instruments used in the testing of this generator have current calibration to appropriate standards. |
| | c. | Verify that generator is a dimensional duplicate of the existing Electric Products generators, serial nos. 16908022/26, including mounting dimensions and terminal box location. |
| | D. | Verify that generator is an electrical duplicate of the existing Electric Products generators, serial nos. 16908022/26, including |

PEZBLES NEMP 12.4 REV. 1 ATT. T B 5 of 43

ratings and phase sequence.

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INSPECTION PLAN NO. DC-254 CHECKLIST

Page 3 of 3

| E. | Verify that proposed method of packaging the generator for shipment is in accordance with | |
|----|---|--|
| | PG&E requirements. | |

F. Verify, by review of documentation, that
NEI-Peebles has performed dedication testing
in accordance with Attachment # F to the EMM,
and that the proposed test procedures and test
results are approved/acceptable by PG&E.

Inspector's Completion Statement: Include a list of I.R.s which document the details of the action taken by the inspector, and significant events in the performance of the contract by the supplier.

Signed:

Inspection Engineer

Date

Approved:

Supervising Inspection Engineer

Date

Attach to final copy of I.R.

A57/INSPLAN.254

PEEBLES NEMP 12.4 REV. 1 ATT. T By 6 of 63

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September 7, 1990

NECS - ELECTRICAL ENGINEERING

ENGINEERING SUPPORT SERVICES - EQS INSPECTION

Subject: Order ZS-1539-AB-9 on NEI Peebles

.Generator For Emergency Diesel #2-3



BURT HEPPONSTALL:

Attached is a copy of our Inspection Plan No. DC-254; Rev. 1, Which was written back in February on the subject order.

Since then, several things (and people) have changed, and we want to make sure we are proceeding correctly. Specifically:

- Although E.K. Kang signed off on the Inspection Plan as the responsible engineer, we are currently dealing with you on questions concerning this order. Should the Inspection Plan be revised to reflect you as the responsible engineer, rather than him?
- The note on page 2 of the Inspection Plan refers to a 2/2/90 telephone conversation between the writer and Gina Koschak. However, Gina is no longer around, and we're wondering if this note is still correct.
- In connection with this, although we have not seen an audit report, we have HEARD that a recent audit of NEI Peebles in Cleveland has resulted in their removal from the QSL. If this is correct, we need to delete the note on page 2 of the Inspection Plan and, if this will result in additional inspection requirements, someone needs to tell us.
- Referring to the attached copy of Sig Auer's 10/22/86 letter to NEI Peebles, we are assuming they plan on furnishing the longer (4 1/2") bus insulators on this order, as they did on the spare generator on order 4R71595. If that is the case, we need to revise item III.C. of the Inspection Plan to reflect this.

RECEIVED SEP 1 0 1990

PFS Correte Contret Conter

NEMP 12.4 REV.1

@@18 (mr 3-86)

Burt Hepponstall et al. September 5, 1990 Page 2

We would appreciate receiving your advice on these items at your earliest convenience.

Thanks,

H. H. BORGARD

HBorgard (2-6327):ss A64\Borgard.905

cc: J.R. Starzmann w/o att.

J.J. Graham W/o att. J.C. Young W/att.

U.A. Farradj w/att.

E.R. Kahler w/att. G.C. Kellund w/att.

FILE (P.O. ZS-1539-AB-9) w/att.

LETTERBOOK w/o att.

Attachments

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PACIFIC GAS AND ELECTRIC COMPANY

BOTT SEET . SAN FRANCISCO, CALIFORNIA 94168 . (415) 781-4211 . TWX 910-372-6887

October 22, 1986

MEI Peebles - Electric Products, Inc. 17045 Euclid Avenue Cleveland, Ohio 4412-1431

Attention Mr. Nick Monnoly

Dear Sir:

HHB E.Q.C. JJG
WRM INSPECTION
MJO RECEIVED DEC
CSM
LEM OCT 27 1986 JFN

TMMC

TMMC MHP

CANUONTS PHE ME

FILE

JRB

Attached is the marked-up copy of drawing D67515 which you sent to Bruce Grosse for approval.

There is no objection to your proposed change to increase the length of the bus insulators from 3-1/2" to 4-1/2". The drawing has been stamped "Approved Min may necessary

- Mfg. may proceed".

SIG AUER
Supervising Electrical Engineer

BHG/IS:09 NOU

Written Response Required: No

Attachment: D67515 .

CC:

Medicard

215/Mkt/252 Without Attachment 77/Mkt/1699 Without Attachment

PEEBLES NEMP 12.4 REV. 1 ATT. T

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PACIFIC GAS & ELECTRIC COMPANY INSPECTION SECTION 215 MARKET STREET, ROOM 252 SAN FRANCISCO, CA 94106

INSPECTION REPORT

INSPECTOR:

John R. Starzmann

QUALITY ASSURANCE

ENGINEERING

JASexton RWTaylor/QA Site RAKoschak

TFetterman MRTresler WVahlstrom BMGrosse

BDSmith-Att. EKKang BRHepponstall

NUC PWR GEN DEPT

D.C. QUALITY CONTROL PMLang-Att.

CONSTRUCTION INSPECTION

JDShiffer RCAnderson

D.C. MAINTENANCE TABENNETT CMSeward
D.C. MATERIALS RJMcInerney DLTackett CPNichols RAHarris-Att.
CONSTRUCTION JRManning RLieber

JRManning RLieber CER · HHB JJG-2(1-Att) EKK JRS-3(1-Att)

S L F-Att.

GM

P.O. SPEC. 000094-0

ZS-1539-AB-9, MC #1

EMM-DC2-3322-BRH-E, REV. 1

ISSUE DATE

VISIT DATE

2-23-90

2-12-90 and 2-7-90 (T)

REPORT NO.

ORDER

PLACED ON FOR SHIPMENT TO GENERATOR FOR EMERGENCY DIESEL #2-3

NEI PEEBLES ELECTRIC PRODUCTS, CLEVELAND, OHIO

G.E.C. CANADA LTD., TORONTO, CANADA

SUBCONTRACTOR ITEM

SUBCONTRACTOR ··· FOR SHIPMENT TO GENERATOR FOR EMERGENCY DIESEL #2-3 NEI PEEBLES LTD., EDINBURGH, SCOTLAND G.E.C. CANADA LTD., TORONTO, CANADA

PERSONNEL CONTACTED:

Brian Fraser, Contracts

Jim Rennie, Quality Engineer John Miller, Quality Engineer Derek Morrison, Design Engineer

Nick Monnolly, Sales Engineer (NEI Peebles-

Cleveland) 2-7-90 (T)

VISIT SUMMARY:

While in England on other PG&E business, the writer visited the NEI Peebles facility in Edinburgh, Scotland, to review action items prior

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Page 1 of 4

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to manufacturing as required by Inspection Plan No. DC-254, Rev. 1. Although PG&E's order was placed with NEI Peebles Electric Products in Cleveland -- who forwards PG&E requirements and directs the activities of NEI Peebles in Edinburgh -- the writer was able to verify that the Edinburgh facility intends to build a duplicate generator in accordance with PG&E's requirements.

Our discussions included the following:

1. Prior to our Edinburgh visit, the writer contacted Nick Monnolly in Cleveland to review the dedication testing requirements, which were included with Attachment F to EMM-DC2-3322-BRH-E, Rev. 1. Nick Monnolly had not, as of 2-7-90, received Revision 1 of the EMM, but following a brief review, did not anticipate any problems in incorporating the dedication testing requirements.

From our 2-12-90 meeting in Edinburgh, however, the writer learned that Edinburgh had not yet received from Cleveland the dedication testing requirements of Attachment F in Revision 1 of the referenced EMM. NEI Edinburgh had based their Quality Plan on EMM Revision 0.

The NEI Cleveland order on Edinburgh had only specified that certificates of compliance be supplied for steel, copper, insulation, hardware, cable, and varnish. The NEI Cleveland order on Edinburgh had requested certificates of test or analysis for the electrical tests, pole iron, and shaft forging.

We agreed that NEI Edinburgh would, through discussions with NEI Cleveland:

- a) incorporate the PG&E dedication testing requirements
- b) up-date the NEI Edinburgh Quality Plan to reflect revision 1 of the referenced EMM
- c) determine the specific tests which are required for the shaft forging (i.e. UT examination, chemical and physical properties, etc.) and bearing casting housing
- d) assuming that item 13 in EMM Revision 1, Attachment F, is a typographical error (and should be revised to "shaft/casting"), identify any other specific components (other than the shaft, bearing cap, and slip rings) which are to be included under item 13 of Attachment F
- 2. All test equipment used in the dedication testing of the PG&E generator will be on a calibration schedule and will be within the required calibration period. A list of all test instruments used in the electrical testing of the generator will be recorded at the time of testing.
- 3. The required NEI drawings and procedures have not yet been approved

Page 2 of 4

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by PG&E Engineering, so Section I(B) of PG&E's Inspection Plan No. DC-254, Rev. 1, will be signed-off by the writer at a later date, after approvals have been verified.

The writer reminded Derek Morrison that PG&E's required phase sequence was A-C-B, and there was some initial confusion when NEI indicated that they had changed the phasing from the last order (the writer's recollection was that the phase sequence on the spare generator purchased in 1986 was also correct). Following a review of NEI drawings, the writer concluded that the 1986 spare generator had the correct phase sequence. Also, the generator being furnished on this order will have the correct phase sequence. The proposed internal transposition of leads, in order to obtain the correct phase sequence, is different from the spare generator purchased in 1986.

For the 1986 spare generator, drawing C-08991E shows that EMFs reach positive maximum value in order T1,T3,T2...and further establishes the phase/terminal relationship of A/T1, B/T3, C/T2.

Drawing C-08991U dated 1-26-90 for the generator on this order establishes the phase/terminal relationship of A/T3, B/T2, C/T1.

Electrically the phase sequences are equivalent for the 1986 spare generator and the generator being furnished on this order, and the PG&E approved drawing for phase sequence will be used for inspection purposes. Before finalizing on the exact phase and terminal relationship, however, PG&E Engineering perhaps could review how the differential relay current transformers are labeled or identified.

- 4. NEI Cleveland, we were advised, will be taking the responsibility for arranging shipment from a U.K. port to G.E.C. Canada; i.e., NEI Edinburgh's responsibility is only to ship the generator FOB to a United Kingdom port. The rotor will be shipped in the stator -- supported at one end by the single bearing; supported on the other end by a temporary bracket. Shipment support and crating will be similar to the shipment of the previously referenced spare generator.
- 5. The writer agreed to outline, under separate cover, PG&E's inspection agenda. NEI Edinburgh agreed to note PG&E's inspection and witness test events in the NEI Quality Plan. A copy of NEI's Quality Plan 260274 (which will need to be revised to reflect EMM Revision 1 and PG&E's inspection requirements) is included with Bruce Smith's, P. M. Lang's, and R. A. Harris' copy of this report (3 sheets).

For the record, there have been two significant changes at the NEI Edinburgh facility since the writer's last visit. First, both Brian Fraser and Derek Morrison are fairly new in their positions. The writer's understanding was that Derek Morrison's position was temporary, and that he will eventually be returning to Cleveland, where he had trained for several months.

Page 3 of 4

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Perhaps of more concern to the writer is the fact that, except for the manufacturing of coils, the assembly of the generator, and final test, most all of the work is being performed by subcontractors. Essentially no fabricating and no machining remains in Edinburgh. Even the magnetic steel laminations are now obtained from an NEI subsidiary. Buyers in NEI are now purchasing finished products (i.e., machined shafts rather than raw forgings)...all of which, we were advised, has been a learning experience and added burden. Also, NEI has had to add expediters to their staff. Aside from being more vulnerable to schedule delays brought about by outside influences, it is the writer's concern that NEI Peebles may have a more difficult time in controlling the manufacturing processes of their suppliers.

DEVIATIONS FROM SPECIFICATION: None

SHORTAGES REQUIRING FIELD WORK: None

RESOLUTION OF DEVIATIONS AND SHORTAGES: None

PROBLEMS TO BE RESOLVED: None

CURRENT SHIPPING SCHEDULE: October 30, 1990

JRS:hmb

APPROVED: H. H. Borgard, Supervising Inspection Engineer

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| | Order No. COR 260274/1 Serial Ko. 260274/1 Designation Pacific Co Disb | 1 | Volta | Voltage 4160/2400 Volts Contra Phase 3 Custon | | | | mer MEI, Peebles Electric Product rect Ref. P 0.80, 16271 mers Spec. May DC2-3322-MH-E Hev Attachment A | |
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| 1-4 | Stator Frame | Visual Dimensional Certification | 100 % | # | • | | | | |
| 1.5 | Magnet Wheel Shaft | - 1 | ** | · # | " | | | | |
| | Stator & Magnet Wheel Winding Copper | " | • | • | * | | | | |
| 1.7 | Terminal Boxes | • 1 | • | • | " | | · | | |
| 1-8 | Bearing Assemblies | 1 - 1 | • | • |] "] | , | | | |
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| 5.1 | Acceptance Tests | Electrical, Mechanical, | 100x | Engineering Impuctions | Test Records | | | ٠, . | | |
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PACIFIC GAS & ELECTRIC COMPANY INSPECTION SECTION 215 MARKET STREET, ROOM 252 SAN FRANCISCO, CA 94106

INSPECTION REPORT

INSPECTOR:

John R. Starzmann

ENGINEERING

QUALITY ASSURANCE JASexton RWTaylor/QA Site RAKoschak BLove TFetterman MRTresler WVahlstrom BMGrosse BDSmith-Att. EKKang BRHepponstall-Att.

JDShiffer RCAnderson

NUC PWR GEN DEPT

D.C. QUALITY CONTROL PMLang-Att.

D.C. MATERIALS

D.C. MAINTENANCE TABennett CMSeward

RJMcInerney DLTackett CPNichols RAHarris-Att.

DACathcart

CONSTRUCTION

JRManning RLieber INSPECTION

CER . HHB JJG-2(1-Att) EKK JRS-3(1-Att)

S L F-Att.

GM 000094-0

P.O.

ZS-1539-AB-9, MC #2

SPEC.

EMM-DC2-3322-BRH-E, REV. 2

ISSUE DATE

VISIT DATE

4-27-90 4-23-90 (Transmittal)

REPORT NO.

ORDER

GENERATOR FOR EMERGENCY DIESEL #2-3

PLACED ON NEI PEEBLES ELECTRIC PRODUCTS, CLEVELAND, OHIO

FOR SHIPMENT TO G.E.C. CANADA LTD., TORONTO, CANADA

SUBCONTRACTOR

FOR SHIPMENT TO

SUBCONTRACTOR ITEM GENERATOR FOR EMERGENCY DIESEL #2-3 NEI PEEBLES LTD., EDINBURGH, SCOTLAND

G.E.C. CANADA LTD., TORONTO, CANADA

PERSONNEL CONTACTED: Nick Monnolly, Sales Engineer (NEI Peebles-

Cleveland)

TRANSMITTAL SUMMARY:

In a letter dated 3-19-90, the writer requested information on the specific tests, which are required by NEI Peebles for the shaft forging and cast bearing housings.

The NEI Peebles material specification requirements for the generator

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Page 1 of 2

PEEBLES NOMP 12.4 REV. 1
ATT. T Pg 17 & 63

RECEIVED APR 3 0 1990



shaft forging and gray iron castings are included with B. Smith's, B. Hepponstall's, P. M. Lang's, and R. A. Harris' copy of this report (Attachment A, 3 sheets). Although review of the material certifications has not been included in the PG&E Inspection Plan, if requested by PG&E Engineering, the writer will review the documentation during final inspection.

DEVIATIONS FROM SPECIFICATION: None

SHORTAGES REQUIRING FIELD WORK: None

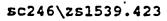
RESOLUTION OF DEVIATIONS AND SHORTAGES: None

PROBLEMS TO BE RESOLVED: None

CURRENT SHIPPING SCHEDULE: October 30, 1990

JRS:hmb

APPROVED: H. H. Borgard, Superising Inspection Engineer



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NEI Peebles - Electric Products, Inc.

149828

17045 Euolid Avenue · Cleveland, Onlo 44112 Telephone: (216) 481-1800 Telex: 241584 Faceimile: (216) 481-8885

April 23, 1990

Pacific Gas & Electric Co. U/o Mr. John R. Staruman RD1, Box 212 London Tract Rd. Landenberg, PA. 19350

PG&E P.O. 28-1539-AB-9 Reference:

2600 KW, 900 RPM Generator

Diablo Canyon Nuclear Power Plant

NEI Peebles - Electric Products, Inc.

Ref. 8-1128

BR HEPPONSTALLS

Dear Mr. Starzman,

Please refer to your letter of March 19, 1990, Pg. 2

The testing that we require of our vendors for the generator shaft forging and bearing cover castings will be as required by the following specifications:

Shaft Forging, Carbon Steel, used for all Flanged Shafts and all Shafts over 10" in X870.42 Diameter.

M825.1 -Iron Castings (Gray Iron) General Purpose

Appropriate back-up Documentation will be provided. We trust this is satisfactory.

Very truly yours

NEI PEBLES - ELECTRIC PRODUCTS, INC.

4-2monns N. D. Monnolly Sales Engineer

Pacific Gas & Blectric Co.

333 Market St., RM A7016

San Francisco, CA. 94106

Attn: Mr. Bruce Smith

PEEBLES NEMP 12,4 REV. I ATT. T PJ 19 of 63

ATTACHHENT (D (1 . P 3)

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MATERIAL SPECIFICATION

MS 11/10/72 70.42

SUPERSEDES ME

3/31/70 70

SHEET NO..... OF ... 1 SUPERSEDED BY......

SHAFT FORGING, CARBON STEEL (NOT RECOMMENDED FOR WELDED LANDS) USED FOR ALL PLANGED SHAFTS AND ALL SHAFTS OVER 10" DIA.

This material must be in accordance with specification ASTN: A470 Class 1.

Vendor must supply the following documentation:

- 1. Certification of Compliance to ASTM: A470 Class 1.
- 2. Chemical Analysis Report
- 3. Mechanical Test Report
- 4. Vitrasonic Certification Report

(Engineering Reference: The heat treatment consists of double normalizing and tempering with preliminary and second rough machining and stress relieving as specified by this ASTM designation.)

*NOTE: Use MS-70.44 for all applications except when jused with integral laminated rotor spider or where poles are bolted directly to shaft.

PERLES NEMP 12.4 REV. 1 ATT. T Pg 20 of 63

color Code Electric Products Division Stock - Mone

Refer. Color Code Ps-10002

ATTACHMENT (D) (2 of 3)

*Auded-4/23/75

PORTEC INC., ELECTRIC PRODUCTS DIVISION, 1725 CLARKSTONE ROAD, CLEVELAND 44112

PREPARED BY: DATE: APPROVED BY: DATE: APPROVED BY: DATE:

11/10/72 Aug. 11/10/72

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MTE

M(9/13/82 25.1

MATERIAL SPECIFICATION

SUPERSEDES MI 1964 25.1

IROH CASTINGS (GRAY TRON); GENERAL PURPOSE .

1. The castings under this specification should conform to one of the following, which is to be noted on the casting drawing.

SAE Grade G2000 and ASTM A48 Class 208 SAE Grade G2500 and ASTM A48 Class 258 SAE Grade G3000 and ASTM A48 Class 308

- 7. It is the intent of this specification to subbidinate chamical composition to physical properties. The castings shall be free from injurious defects, or flaws such as cracks, pornsity, and oxide of sand inclusions in stressed or machined areas. Surface of the costings shell be free from fusad-on send, and shall be reasonably smooth. Runners, risers, fins, and other cast-on pieces shall be removed.
- 3. One of the principal requirements of these castings is that they be free of hard spots on machined surfaces and of good machinability. Their principal use is in motor brackets, siceves, flanges, etc., where good appearance and machinability Is of more importance than strength.
- The castings shall conform closely to the measurements given on the drawing furnished and the dimensions predicated by the pattern.
- Tunsilo Strength:

Class No. 208 - Min. Tensile - 20,000 lbs. Class No. 258 - Min. Tensile - 25,000 lbs. Class No. 308 - Min. Tensile - 30,000 lbs.

- Higher-Strength gray Sron castings eraccovered bywodromaterial apecification Mi25v2. It could be a second to the provide the p Sò.
- Physical Test: Test bars shall be cast separately from the castings, and tested in accordance to A.S.T.M. specifications for pray Iron castings per A-48 when specifically requested.

PEGBLES NEMP 12.4 REV. 1 ATT. T pg 21 of 63

ATTACHMENT ((3 = + 3)

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| PACIFIC GAS & ELECTRIC COMPANY INSPECTION SECTION | HHB FARE INSEAL ITON I MID RECEIVED | EKK DEJ |
|--|--------------------------------------|------------|
| 215 MARKET STREET, ROOM 252 SAN FRANCISCO, CA 94106 | TMMc /USO 1 1990 | JFN JRS |
| INSPECTION REPORT | MHP VITS PRF JHU B/U | רוף האך |
| John R. Starzmann | WIW FILE E FILE W SUPP. LTR BOOK MHS | PDC VJ |
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INSPECTOR:

QUALITY ASSURANCE JASexton RWTaylor/QA Site RAKoschak BLove ENGINEERING TFetterman MRTresler WVahlstrom BMGrosse BDSmith-Att. EKKang BRHepponstall-Att.

NUC PWR GEN DEPT JDShiffer RCAnderson D.C. QUALITY CONTROL PMLang-Att.

D.C. MAINTENANCE TABennett CMSeward

D.C. MATERIALS RJMcInerney DLTackett CPNichols RAHarris-Att.

DACathcart

CONSTRUCTION JRManning RLieber

INSPECTION CER • HHB JJG-2(1-Att) · EKK JRS-3(1-Att)

S L F-Att.

GM 000094-0
P.O. ZS-1539-AB-9, MC #2
SPEC. EMM-DC2-3322-BRH-E, REV. 2

ISSUE DATE 5-11-90
VISIT DATE 5-7-90 (T)
REPORT NO. 3

REPORT NO. 3
ORDER GENERATOR

ORDER GENERATOR FOR EMERGENCY DIESEL #2-3
PLACED ON NEI PEEBLES ELECTRIC PRODUCTS, CLEVELAND, OHIO
FOR SHIPMENT TO G.E.C. CANADA LTD., TORONTO, CANADA

SUBCONTRACTOR ITEM GENERATOR FOR EMERGENCY DIESEL #2-3
SUBCONTRACTOR NEW PEEBLES LTD., EDINBURGH, SCOTLAND
FOR SHIPMENT TO G.E.C. CANADA LTD., TORONTO, CANADA

PERSONNEL CONTACTED: Nick Monnolly, Sales Engineer (NEI Peebles-Cleveland)

TELEPHONE SUMMARY:

Following a conversation regarding another project, the writer was asked for assistance in resolving an open item, as discussed under PROBLEMS TO BE RESOLVED.

THIS REPORT IS COMPANY CONFIDENTIAL

It is not to be transmitted to any supplier or vendor without prior approval of the Supervising Inspection Engineer.

Page 1 of 2

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DEVIATIONS FROM SPECIFICATION: None

SHORTAGES REQUIRING FIELD WORK: None

RESOLUTION OF DEVIATIONS AND SHORTAGES: None

PROBLEMS TO BE RESOLVED:

In a letter dated 3-13-90, NEI Peebles Electric Products advised that the NEI PeeblesEdinburgh weighing scales have an accuracy
class of plus or minus 5%. NEI Peebles has
requested confirmation that the 5% accuracy
tolerance is acceptable for the stator and
rotor weights being furnished to PG&E
Engineering. The NEI Peebles - Edinburgh
factory could rent a more accurate scale or
load cell, but first needs to know the required
accuracy.

A copy of the referenced NEI Peebles - Electric Products' letter is included with B. D. Smith's, B. R. Hepponstall's, P. M. Lang's, and R. A. Harris' copy of this report (Attachment A, 2 sheets). By copy of this report to Bruce Smith, the writer requests that PG&E Engineering advise the needed accuracy of the stator and rotor weights.

CURRENT SHIPPING SCHEDULE: October 30, 1990

JRS: hmb

APPROVED: H. H. Borgard, Supervising Inspection Engineer

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NEI

NEI Peebles - Electric Products, Inc.

17045 Euclid Avenus Oleveland, Ohio 44112 Telephone: (216) 481-1500 Telex: 241554

Facsimile: (216) 481-8386

Mr. T. P. Evans Naterials Dept. Nanagar Attn: Mr. D. A. Cathcart Pacific Gas & Electric Co. 123 Miscion St. Room No. H749 San Francisco, CA. 94106 March 13, 1990

Subject: P.G.&E. P.O. EB-1539-AB-9 Diablo Canyon Nuclear Plant

Gentlemen,

1C

We have received P.G.&E. purchase order change No. 2 dated 2-22-90, which basically changes the information that P.G.&E. requires from us in order to perform seismic analysis. We would comment in turn as follows.

- 6A. Our factory scales have an accuracy class of plus or minus 5%. Please advise if this is acceptable to P.G.&E. If not acceptable how accurate must the weight be? We can rent a load cell for our factory scale that would give a more accurate weight. This involves additional cost depending on the accuracy required and we would expect P.G.&E. to absorb the cost. Please advise.
- 6B. NEI Peables-Electric Products, Inc. will provide the material of the shaft and frame structure as soon as we have received the material from our vendors with proper Q-A Documentation.

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pg 24 of 63

ATTACHMENT (A) (1 of 2)

KKE 110 WRM ENBPECTION PME MJQ RECEIVED **EKK** MH 210 LKM CSM TMMc MAR 1 9 1990 JPN MHP WT3 JKU WIW SUPP. LTR BOOK

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6C. The hold down bolts and alignment dowel pins are not within our scope of supply.

We await your response to Item 6A above.

Very truly yours,

5

REI PEEBLES-ELECTRIC PRODUCTS, INC.

N.D. Monnelly, Sales Engineer

cc: Mr. W. Vahlsletrom
Chief Electrical Engineer
Attn: Mr. T. Fetterman
Pacific Gas & Electric Co.
333 Market Street
Room No. A9040
San Francisco, CA. 94106

Mr. J. H. Aster
Manager, Engr. Support Services
Attention: Mr. C. E. Ralston
Pacific Gas & Electric Co.
215 Market Street
Room No. 252
Ban Francisco, CA. 94106

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PACIFIC GAS & ELECTRIC COMPANY INSPECTION SECTION 215 MARKET STREET, ROOM 252 SAN FRANCISCO, CA 94106

INSPECTION REPORT

INSPECTOR:

John R. Starzmann

QUALITY ASSURANCE ENGINEERING

JASexton RWTaylor/QA Site RAKoschak BLove TFetterman MRTresler WVahlstrom BMGrosse BDSmith-Att. EKKang BRHepponstall-Att.

NUC PWR GEN DEPT

JDShiffer RCAnderson

D.C. QUALITY CONTROL PMLang-Att.
D.C. MAINTENANCE TABennett CMSeward
D.C. MATERIALS RJMcInerney DLTackett CPNichols RAHarris-Att.

G.O. MATERIALS

DACathcart

CONSTRUCTION INSPECTION

JRManning RLieber CER • HHB JJG-2(1-Att) EKK JRS-3(1-Att)

S L F-Att.

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GM P.O. 000094-0

ZS-1539-AB-9, MC #2

SPEC.

EMM-DC2-3322-BRH-E, REV. 2

ISSUE DATE

5-25-90

VISIT DATE

5-17/18,21-90 (Telephone and Transmittal)

REPORT NO.

ORDER

GENERATOR FOR EMERGENCY DIESEL #2-3

PLACED ON NEI PEBLES ELECTRIC PRODUCTS, CLEVELAND, OHIO FOR SHIPMENT TO G.E.C. CANADA LTD., TORONTO, CANADA

SUBCONTRACTOR ITEM GENERATOR FOR EMERGENCY DIESEL #2-3

SUBCONTRACTOR

NEI PEEBLES LTD., EDINBURGH, SCOTLAND

FOR SHIPMENT TO

G.E.C. CANADA LTD., TORONTO, CANADA

C.

PERSONNEL CONTACTED: Nick Monnolly, Sales Engineer (NEI Peebles-

Cleveland)

TELEPHONE AND TRANSMITTAL SUMMARIES:

Following a 5-17-90 phone conversation with Burt Hepponstall, and subsequent fax confirmation of 5-18-90, the writer advised Nick Monnolly that rotor and stator weight, within the ±5% accuracy of the NEI Peebles scales in Edinburgh, are acceptable to PG&E Engineering. This resolves the "PROBLEMS TO BE RESOLVED", which was addressed in Inspection Report No. 3 (issued 5-11-90).

THIS REPORT IS COMPANY CONFIDENTIAL

It is not to be transmitted to any supplier or vendor without prior approval of the Supervising Inspection Engineer.

Page 1 of 3

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However, on 5-17-90, Nick Monnolly requested the assistance of the writer to resolve, through PG&E Engineering, questions which have been raised with regard to the phase sequence of the generator on order, and the past generators which have been supplied and are presently at Diablo Canyon Power Plant (see PROBLEMS TO BE RESOLVED).

DEVIATIONS FROM SPECIFICATION: None

SHORTAGES REQUIRING FIELD WORK: None

RESOLUTION OF DEVIATIONS AND SHORTAGES: None

PROBLEMS TO BE RESOLVED:

In Inspection Report No. 1 (issued 2-23-90), the writer addressed the proposed phase sequence of the generator being furnished on this order, and the phase sequence of the spare generator which was furnished in 1986.

On March 20, 1990, the writer furnished Ron Politi and Nick Monnolly a copy of the 1986 test data for the spare generator (S/N 259132-2), which documented the following phase relationship:

good

With the shaft rotation counterclockwise, viewed from the non-drive end, the phase rotation was A-C-B, left-to-right, when viewing the terminals from the front of the terminal box. The terminals were labeled T1-T2-T3, left-to-right.

Please understand that the above description, documented on the test floor at the time of test, identifies the shaft rotation, phase sequence, and terminal designation.

If not the manufacturer's standard, special phase sequences are generally obtained by the manufacturer, through the use of a transposition within the generator, between the winding parallel ring and terminal stud. Sometimes, however, the manufacturer provides their standard phase sequence machine, and the user -- PG&E -- accommodates our system, non-ANSI phase sequence, by transposing outgoing connections from the machine terminals to our system. When PG&E provides the transposition, the manufacturer's drawing often clarifies that the transposition is taking place outside the manufacturer's scope of supply. This clarification is accomplished in the drawing by showing the machine phase sequence, the transposition, and the system phase sequence.

Following Ron Politi and Nick Monnolly's review of the generator phase sequence as tested in 1986 for S/N 259132-1, NEI Peebles Engineering Specialist, Charles Moosbrugger, researched the history of the phase sequence of Diablo Canyon

Page 2 of 3

PERBLES NEMP 12.4 PEV. 1 ATT. T 19 27 of 63

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emergency generators. The phase sequence history, less the referenced NEI Peebles attachments, is included with B. D. Smith's, B. R. Hepponstall's, P. M. Lang's, and R. A. Harris' copy of this report (Attachment A, 4 sheets).

Since NEI Peebles has been asked to manufacture the generator on this order (ZS-1539-AB-9) identical to the previous generators, NEI Peebles has requested the following information from PG&E Engineering:

- Reconfirmation of the mechanical rotation, phase sequence, and terminal marking requirements. The writer suggests that PG&E reconfirm that "with the shaft rotation clockwise, viewed from the non-drive end, the phase rotation is to be A-C-B, left-to-right, when viewing terminals T1-T2-T3 from the front of the terminal box." If this is not correct, fill in the proper words or letters where underlined.
- Provide NEI Peebles with instructions about the existing generators and drawings, as requested in Attachment A.
- If the generator on order is not an exact duplicate of the existing in-service generators*, or if the spare generator (S/N 259132-1) is not an exact duplicate of the original five generators*, then PG&E Engineering should clarify the design parameters, so that NEI Peebles can properly word the Certificate of Conformance.

*Note: except for the insulation system

Any questions regarding Attachment A should be addressed directly to Nick Monnolly (with a copy to H. H. Borgard in PG&E's Inspection Section).

CURRENT SHIPPING SCHEDULE: With shipment presently scheduled for the end of October, the writer is concerned that, unless design issues can be addressed expeditiously, and correspondence improved, shipment from Edinburgh may be delayed.

JRS: hmb

APPROVED: H. H. Borgand RPT# 4 DATE: 5-25-90 H. H. Borgard, Supervising Inspection Engineer

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Page 3 of 3

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NEI Peebles - Electric Products, Inc.

17045 Euclid Avenue Oleveland, Öhlo 44112 Telephona: (218) 481-1500 Telex: 241584 Facsimile: (218) 481-8388

March 4, 1990

Pacific Gas & Electric Co. c/o Mr. John R. Starsman RD1, Box 212 Landenberg, PA 19350

Ref: P.G.EE. P.O. ES-1539-AB-9 2600 KW 900 RPM Generator Diablo Canyon Nuclear Power Plant NEI P-EP Ref. S-1128

Dear Mr. Starsman,

During a recent telephone conversation that you had with our Mr. Ron Politi, you expressed concern over the generator phase sequence of this latest generator as compared to previous units. We assigned our Engineering Specialist, Mr. Charles Moosbrugger, to research our files regarding the history of phase sequence and a copy of his report is provided herewith.

If you have any questions let us know.

Very truly yours

NEI PREBLES ELECTRIC PRODUCTS, INC.

N.D. Monnolly Sales Engineer

oct Pacific Gas & Electric Co. 333 Market Street Room 978 San Francisco, CA. 94106

Attention: Mr. Burt Mepponstall

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ATTACHHENT (A)

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TO: N. MONNOLLY

NEI

APRIL 3, 1990

FROM: C. NOOSBRUGGER

ZI-3408

SUBJECT: PHASE BEQUENCE OF PG 4E GENERATOR

B-1128

REPERENCES: NEMA MG1-1987

ELECTRIC PRODUCTS ENGINEERING SPECIFICATION EC 7.1

1.0 IT APPEARS THAT THERE HAS ALWAYS BEEN CONFUSION ON THIS PROJECT CONCERNING THE PHASE SEQUENCE AS TWO CHANGE ORDERS ADDRESSED CHANGES IN THE PHASE SEQUENCE IN 1969 AND 1970, AND THE CURRENT PROJECT REFERENCES "AS BUILT " DRAWINGS THAT DIFFER FROM THE RECORD DRAWINGS IN OUR FILES.

THE OBJECT OF THIS PAPER IS TO CLARIFY SOME OF THE AMBIGUITIES DEALING WITH THE INTERPRETATION OF DOCUMENTS RELEVANT TO PHASE SEQUENCE, SO THAT THE S-1128 DOCUMENTS REFLECT THE PHYSICAL REALITY OF THE GENERATOR AND ARE CONSISTENT WITH STANDARD ENGINEERING DEFINITIONS AND PRACTICES.

2.0 THE PHASOR DIAGRAM ON THE GENERATOR OUTLINE DRAWING C-08991E INDICATES THE PG 4 B SYSTEM PHASE SEQUENCE AS:



THIS MEANS THAT THE LINE VOLTAGES WILL REACH THEIR MAXIMUMS IN THE ORDER A-C-B.

- THE PHASE ROTATION TEST (SEE ATTACHMENT) FROM THE GENERATOR BUPPLIED IN 1987 STATES THE PHASE ROTATION IS A-C-B LEFT TO RIGHT VIEWING ON FRONT OF TERMINAL BOX. HERE THE AC CONNECTION TO THE TERMINALS IN THE BOX ARE BEING VERIFIED. THE TERMINALS ARE LABELED T1 T2 T3, LEFT TO RIGHT WHEN FACING THE TERMINAL BOX, AND THE ORDER IN WHICH THESE TERMINALS WOULD REACH THEIR POSITIVE MAXIMUM VOLTAGE IS T1-T3-T2. HERE A-C-B IS BEING USED TO ORDER THE TERMINALS. IT DOES NOT REFER TO THE SITE PHASE SEQUENCE.
- 3.1 THE T1-T3-T2 PHASE SEQUENCE IS CONSISTENT WITH THE AC CONNECTION DIAGRAM, A-66115B, WHICH WAS SPECIFIED FOR THIS GENERATOR. THE CONNECTION DIAGRAM YIELDS A PHASE SEQUENCE OF T1-T3-T2 FOR A COUNTERCLOCKWISE ROTATING ROTOR WHEN VIEWED FROM THE CONNECTION (NON-DRIVE) END. THIS IS IN AGREEMENT WITH THE ENGINEERING SPECIFICATION EC-7.1.

THIS CONVENTION IS ALSO CONSISTENT WITH MG 1-1987, SECTION MG 1-2.24 WHICH STATES THAT "THE DIRECTION OF ROTATION OF A GENERATOR MOUNTED AS PART OF AN ENGINE-GENERATOR SET IS USUALLY COUNTERCLOCKWISE WHEN FACING THE END OPPOSITE THE DRIVE" AND SECTION 2.20.1 WHICH SAYS "...FOR COUNTERCLOCKWISE SHAPT ROTATION...THE PHASE SEQUENCE WILL BE 1,3,2."

PEEBLES NEMP 12.4 REV. 1 ATT. T pg 30 of 63

ATTACHMENT () (2 OF 4)
NEI Poobles-Electric Products, Inc., 17045 Euclid Avenue, Eleveland, Onio 44112

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THE PHASE BEQUENCE INSTRUCTION PLATE, B-670412 (NEI DWG. RE16060) DESCRIBES THE INTERFACE BETWEEN THE GENERATOR AND THE OUTSIDE WORLD. THE PHASE SEQUENCE IS PER USA-C6.1, AS STATED THE PLATE ITERLY. THIS STANDARD HAS SINCE BEEN INCORPORATED INTO THE MG-1 STANDARD. THIS STYLE INSTRUCTION PLATE WILL BE USED ON THE CURRENT NACHINE TO KEEP IT A DUPLICATE OF THE ORIGINALS. THE EXISTING PLATE SAYS TO CONNECT PHASE LEAD A TO TI, B TO TI, AND C TO TR. THIS MEANS THAT THE PHASORS ROTATE IN THE ORDER T1-T3-T2 OR A-B-C WHICH is the "standard" sequence as stated on the drawing and in the ENGINEERING SPECIFICATION, BUT IS OPPOSITE THE SEQUENCE DESIRED AT PGEE. THE DESIRED SEQUENCE COULD HAVE BEEN Achieved by interchanging the internal machine leads from the STATOR TO THE TERMINALS IN THE BOX, OR BY INTERCHANGING TWO OF THE MABO" PRASE LEADS. THE WAS BUILD" DWG. C-08991E,PG &. E RECORD PRINT 663082 BK 3, REV.7 INDICATES: SYSTEM PHABORS ROTATE IN SEQUENCE A-C-B; TERMINALS REACH THEIR MAXIMUM POSITIVE VALUE IN ORDER OF T1-T2-T3; AND THE LEAD HOOK-UP IS A TO T3, B TO T2, AND C TO T1. THIS IS A CONSISTENT SET OF INFORMATION THAT IS PHYSICALLY POSSIBLE IF TWO LEAD CABLES From the generator to the terminal box were interchanged. The CONSEQUENCES OF THIS ARE THAT THE AC INTERCONNECTION DRAWING (A-66115-B) AND ALL DOCUMENTS REFERENCING IT ARE OUTDATED. THE INSTRUCTION PLATE (B-67041-E) AND THE GENERATOR LAYOUT DRAWING ARE ALSO OUT OF DATE. THESE DRAWINGS ARE CORRECTLY REPRESENTING AN "AS BUILT" AND "AS DESIGNED" CONDITION, BUT DO NOT REFLECT AN "AS MODIFIED" CONDITION. SINCE THESE DESIGN DOCUMENTS ARE RECORD QUALITY ASSURANCE DOCUMENTS, WE DO NOT FEEL ALTERING THEM WOULD BE PROPER.

NEI-PEP ENGINEERING WILL UPDATE ALL THE AFFECTED DRAWINGS AND DOCUMENTS FOR THE CURRENT PROJECT TO REFLECT THE "AB BUILT" CONDITION DESCRIBED IN THE FURCHASE ORDER ES-1539-AB-9 CHANGE CONDITION DESCRIBED IN THE FURCHASE ORDER IS REQUIRING THAT THIS DRAWINGS. AS THE PURCHASE ORDER IS REQUIRING THAT THIS REPLACEMENT GENERATOR IS IDENTICAL IN FORM, FIT, AND FUNCTION TO THE ORIGINAL BIX GENERATORS, IT IS ESSENTIAL FOR US TO KNOW WHETHER THE PHASE SEQUENCE OF THE TERNINALS AS GIVEN ON YOUR DRAWING 66302 SHEET 3, REV. 7, IS APPLICABLE TO ALL GENERATORS (S/N'S 16908022, 16908023, 16908024, 16908025, 16908026, AND 38604851), AND WHETHER THE PHASE LEADS (A,B,C) ARE IN THE BAME PHYSICAL LOCATION IN ALL SIX TERMINAL BOXES. NOTE THE TERMINALS ARE DESIGNATIONS ARE ARBITRARY, BUT THE BUS BARS HAVE BEEN STAMPED IN THAT ORDER.

WE ALSO NEED VERIFICATION AS TO WHETHER THE INSTRUCTION PLATES ON THE EXISTING GENERATORS ARE AS SHOWN ON B-67041-E (NEI RE16060), OR WHETHER THEY DUPLICATE THE CHART ON THE "AS BUILT" LAYOUT DRAWING. THE RED "MARK-UP" ON THE LAYOUT OFFERS THE T1-T3-T2 PHASE SEQUENCE, CONSISTENT WITH INTERNAL GENERATOR DRAWINGS, AND THE REQUIRED A-C-B SEQUENCE, BUT THE INSTRUCTION PLATES AND POSSIBLE THE PHYSICAL ARRANGEMENT OF LINE CABLES IN THE TERMINAL BOX WOULD DIFFER FROM THE OTHER GENERATORS.

PERCES NOMP 12.4 REV. 1 ATT. T pg 3/08 63

MEI Peebles-Electric Freducts, Inc., 17045 Suclid Avenue, Cleveland, Ohio 44112

s. . •

THIS PHASE SEQUENCE VERIFICATION WILL ENABLE OUR QUALITY ASSURANCE PERSONNEL TO PROPERLY WORD THE CERTIFICATE OF CONFORMANCE.

5.0 THE DRAWINGS UPDATED FOR YOUR REVIEW ARE:

GENERATOR OUTLINE C-08991U (WITH MARK-UP FOR COMMENT)

*INSTRUCTION PLATE B-67041B

* THIS PLATE IS THE ELECTRICAL EQUIVALENT OF THE

ARRANGEMENT GIVEN ON THE "AS BUILT " DRAWING.

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OTHER ATTACHMENTS:

NEMA MG 1-1967, PART 2, PAGES 1 AND 6
GENERATOR OUTLINE, P G & M 663083 SHT 3 REV 7
INSTRUCTION PLATE B-67041 E
NAMEPLATE NEI RE 16060
ENGINEERING SPECIFICATION EC 7.1

AFTER RECEIVING YOUR RESPONSE, WE WILL FORMALLY REVISE THE NECESSARY DOCUMENTS AND RESUBMIT THEM.

MII PEEBLES-ELECTRIC PRODUCTS, INC.

Charle Montygur

CHARLES MOOSBRUGGER ENGINEERING SPECIALIST

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PACIFIC GAS & ELECTRIC COMPANY INSPECTION SECTION 215 MARKET STREET, ROOM 252 SAN FRANCISCO, CA 94106

INSPECTION REPORT

INSPECTOR:

John R. Starzmann

QUALITY ASSURANCE

ENGINEERING

JASexton RWTaylor/QA Site JCYoung BLove TFetterman MRTresler WVahlstrom BMGrosse BDSmith-Att. EKKang BRHepponstall-Att.

UAFarradj-Att. Dhardesty WJHayes-Att A JDShiffer RCAnderson

NUC PWR GEN DEPT

D.C. QUALITY CONTROL PMLang-Att.

D.C. MAINTENANCE

D.C. MATERIALS
G.O. MATERIALS

CONSTRUCTION INSPECTION TABennett CMSeward

RGMcInerney DLTackett CPNichols RAHarris-Att.

DACathcart

JRManning RLieber

CER HHB JJG-2(1-Att) EKK JRS-3(1-Att)

S L F-Att.

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25-1539-AB-9, MC #2

EMM-DC2-3322-BRH-E, REV. 2

SSUE DATE SIT DATE EPORT NO.

10-12-90 10-3/4-90

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ORDER

PLACED ON FOR SHIPMENT TO

GENERATOR FOR EMERGENCY DIESEL .#2-3

NEI PEEBLES ELECTRIC PRODUCTS, CLEVELAND, OHIO

G.E.C. CANADA LTD., TORONTO, CANADA

SUBCONTRACTOR ITEM SUBCONTRACTOR

FOR SHIPMENT TO

GENERATOR FOR EMERGENCY DIESEL #2-3
NEI PEEBLES LTD., EDINBURGH, SCOTLAND
G.E.C. CANADA LTD., TORONTO, CANADA

PERSONNEL CONTACTED:

Brian Fraser, Contracts

Les Tweedale, Chief Mechanical Design Engineer

Jim Taylor, Quality Engineer

David Forbes, Inspector Willy Mortin, Inspector

Alastaii Ferguher, Inspector Alastaii Carr, Test Supervisor

Bob Walker, Tester

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Page 1 of 6

PEEBLES NEMP 12.4 REV. 1 ATT. T OCT 15 1990

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OCT 15 1990
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VISIT SUMMARY:

The writer visited the NEI Peebles Edinburgh facility to perform an incroses inspection of major components. Components inspected included the generator shaft, stator frame, pole assemblies, and stator coils. Inspection included a cursory review of a portion of the documentation being accumulated as required by EMM Attachment F. Also, our inspection afforded an opportunity to outline one particular concernate fact that not all design changes are being offered to PGLE Engineering for review -- with NEI and PGLE representatives, before a commercial audit commences in Edinburgh on 10-8-90 (see discussion under STATOR FRAME in this report). All attachments referenced in this report are included with Usama Farradj's, Bill Hayes', Burt Hepponstall's, Philip Lang's, Russell Harris' and Bruce Smith's copy of this report.

SHAFT

The shaft was obtained from Weir Pumps Allua Works, and was purchased as a final machined shaft, except for the rough nominal 11.5 inch main diameter. The main diameter was purposely obtained oversized, and will be final machined in Edinburgh (on one of the two remaining lathes) to provide an interference fit of 0.18 to 0.2 mm with the spider.

The shaft had just arrived from Weir, and NEI did not yet have the Weir runout sheets. However, we were assured that NEI would also check the runouts in Edinburgh, and would also obtain documentation from Weir.

Inout information will be available during our final visit.

Inaft dimensions were verified to drawing C-67400-1, rev. 6. The 18 inch diameter had previously been identified as being out of tolerance (see Attachment A). All other dimensions -- including shaft length, bolt hole circles, keyways; and tapped threads -- were acceptable. Measured diameters are shown below:

| SPECIFIED DIAMETER (IN INCHES) | ACTUAL MEASURED DIMENSION (IN INCHES) | |
|--------------------------------|---------------------------------------|--|
| 11.9995 - 12.0000 | 11.9995 | |
| 18.2500 - 18.2525 | 18.2475 * | |
| 17.998 - 18.000 | 17.998 | |
| 11.5 nominal | 11.639 rough | |
| 11.492 - 11.497 | 11.496 | |
| 6.6244 - 6.6250 | 6.6245 | |
| 5.747 - 5.753 | 5.75 15 | |
| 5.1187 - 5.1197 | 5.1187 | |

* See Attachment A.

The LaForgia di Bollate certified test report for the shaft is included with this report as Attachment B.

Page 2 of 6

PERSIES NEMP 12.4 REV. 1 ATT. T pg 34 of 63

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STATOR FRAME

ne stator frame dimensions were verified to NEI Peebles drawing 14901, rev. A. The majority of the micrometers and verniers at NEI are metric. Therefore, drawing dimensions in inches were first converted to dimensions in millimeters. Dimensions verified included the mounting foundation holes and toleranced dimensions as shown below:

| DESCRIPTION Foundation Holes | REQUIRED DIMENSION (INCHES) 49 631/4 111/16 80 diagonal | REQUIRED DIMENSION (MM) | ACTUAL DIMENSION (INCHES) 49 631/4 111/1 80 | COMMENT Okay Okay Okay Okay Okay Okay |
|------------------------------|--|-------------------------|--|---|
| | (INCHES) . | (MM) | (MM) | |
| Core Length | 47 ³ / ₄ (+.000,010) | 1212.85-1212.60 | 1212.77 1212.68 | Okay, but see report comments under paragraph b. |
| Drive End Diameter | 63.000 (+.015,000) | 1600.20-1600.58 | 1600.31 1600.36 1600.22 1600.33 | Okay |
| Posite Drive End Diameter | 63.000 (+.002,000) | 1600.20-1600.25 | 1600.33 1600.47 1600.18 1599.94 | Dimensions exceed specified limits. |
| ·Core ·Diameter | 62.000 (+.000,010) | 1574.55-1574.8 | 1574.57 1574.59 1574.76 1574.55 1574.56 1574.59 | Two sets of measurements at drive end, middle, and stub end are all okay. |
| Length | 57.000 (+.010,010) | 1447.55-1448.05 | 1447.80 | Okay |

Inspection of the stator frame included the following observations:

a. NEI used steel plate which had been rolled to standard metric sizes, which closely approximate the drawing sizes which were specified in inches. Because of the metric thickness, and because some toleranced dimensions were referenced from the core plate key, some spigot depths were slightly different than shown on the drawing. However, critical and toleranced dimensions were maintained.

Page 3 of 6

PEBBLES NEMP 12.4 REV. 1 ATT. T.

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b. The core support ring was originally shifted 1/4 inch towards the drive end. NEI made a modification, shown in Attachment C, to 179824 bring the support ring to the correct axial position. The modification consisted basically of attaching a 1/4 inch plate to the fixed core support ring on the drive end, and enlarging from 1/2 inch to 3/4 inch the groove for the stub end core support key.

The writer's position was that ALL design changes by NEI -- even if modifications were internal to the machine -- should be reviewed with PGLE Engineering, since PGLE is dedicating the generator.

- c. Without the core being in the stator, the stator frame was somewhat flexible. Some diameter dimensions changed by 0.004 inches when measured with the generator vertical or the generator horizontal. Except for the nominal 63 inch stub end diameter, all measured dimensions were acceptable. NEI will complete a discrepancy report for the stub end diameter, which exceeded the nominal 63 inch requirement.
- d. One row of core steel was positioned in the stator. The fit was fairly tight, yet provided adequate separation between segments for adjustment. Core laminations were punched cleanly, had no burrs, and were uniform in size. Based on the fit-up of one row of core steel, the core laminations were deemed acceptable.

POLE ASSEMBLIES

Observed the electrical tests of seven field poles (the eighth pole was till warm, having recently been removed from an oven, and will be sted later by NEI). Electrical tests included the measurements of bil resistance, insulation resistance (before and after hipot), and 1500 volt, 50 hertz, 1 minute hipot test. Also, current and wattage were recorded with 240 volts applied to the pole windings. Tests were acceptable ... including the measurement of resistance which met the D.982 ohm (plus or minus 5%) design criteria.

STATOR COILS

The writer was surprised that NEI no longer performs interturn insulation tests or ground tests of in process stator coils. We were advised that NEI just did not have any significant electrical failures during electrical tests performed after machines are wound. Therefore, our inspection was limited to measuring stator coil width and depth, observing the fit-up of several coils in a model core, and visual inspection.

Of the 96 stator coils for assembly and 2 stator coils requested by NEI Cleveland for additional tests, the Writer selected approximately one dozen coils for inspection. Each stator coil was serialized and had an identification tag, which included assembly and inspection

Page 4 of 6

PEEBLES NEMP 12.4 REV. 1 ATT. T

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information. The coil 16.75 mm side width was verified using a 16.85 mm go gage; the 26.80 mm depth was verified using a 26.9 mm go gage.

lso, coil dimensions were verified using a micrometer. Dimensions and brkmanship were acceptable.

MISCELLANEOUS

The writer briefly reviewed with Jim Taylor the documents, which have been accumulated to date, to meet NEI's dedication in accordance with Attachment F to the EMM. Inspection Plan No. DC-254 requires, "that the proposed test procedures and test results are approved/acceptable by PGLE." Although NEI Edinburgh is only dedicating items 1, 4, 8, 10, 11, 12, 13, and 14 as shown in Attachment F to the EMM (NEI Cleveland is dedicating the remaining items), it did not appear as though the test procedures for dedication, as well as the documentation, had been submitted to PGLE. Documentation received from NEI is included with this report and consisted of the following:

| ITEM | ATTACHMENT |
|--|--|
| stator lead wire stator coil copper magnet wire damper bars magnet coil wire RTD's | D, 2 sheets E, 3 sheets F, 3 sheets G, 5 sheets H, 1 sheet |
| copper bus bar | I, 1 sheet |
| bearing | J, 1 sheet |

For the documentation reviewed, our discussions included the following:

MAGNET WIRE documentation should include stator wire as well as pole
wire, unless otherwise advised by PG&E Engineering.

STATOR RTD'S ... NEI will perform an incoming inspection and verify the catalog number identification. NEI does not generally verify shape and size; shape and size are listed in Attachment F of the EMM.

COPPER BUS IN TERMINAL COMPARTMENT ... NEI will send the bus to a subcontractor for plating. Documentation shows that the bus is BS2870 Clo1 [high conductivity] material. Is NEI to measure the resistance, is resistance to be measured before the silver plating is applied, or is the present documentation adequate?

BEARINGS will be visually checked to a catalog reference, and NEI will provide an incoming inspection report. What is required for "tolerances", i.e., are only the bearing dimensional tolerances to be noted (along with the actual incoming inspection measurements), or are temperature rise tolerances also to be noted?

LEAD TO COIL TERMINATION documentation has not yet been obtained.

Page 5 of 6

PEEBLES NEMP 12.4 REV. 1 ATT. T

Pg 37 of 63

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The writer will need to obtain confirmation from NECS, that NEI has submitted all drawings and procedures for approval. This information as not available in Edinburgh since the drawings and procedures would submitted directly from NEI Cleveland.

Because of the modification required in the stator frame to resolve the core support ring location as noted in this report, the test and shipment schedule has slipped approximately 7 weeks. Testing of the generator is presently scheduled for the week of December 17th.

DEVIATIONS FROM SPECIFICATION: 1.

- 1. All design changes should be reviewed by NEI with PG&E Engineering.
- 2. Shaft nominal 18.25" dimension.
- 3. Stator frame nominal 63" opposite drive end diameter.

SHORTAGES REQUIRING FIELD WORK: None

RESOLUTION OF DEVIATIONS AND SHORTAGES: 1. The writer requested on

- 1. The writer requested on 10-7-90 that the PG&E audit team follow-up on requesting that NEI submit ALL design changes for PG&E review.
- The 18.2475" diameter is acceptable (see Attachment A).
- 3. NEI will write a discrepancy report and resolve the oversized diameter.

PROBLEMS TO BE RESOLVED: None

CURRENT SHIPPING SCHEDULE: End of December 1990

JRS:hmb

APPROVED: WEM: Howell by RPT# 5 DATE: 10/12/90
H. H. Borgard, Supervising Inspection Engineer

57/2S1539B.003

Page 6 of 6

PERBLES NEMP 12.4 PEV. 1 ATT. T Pg 38 of 63

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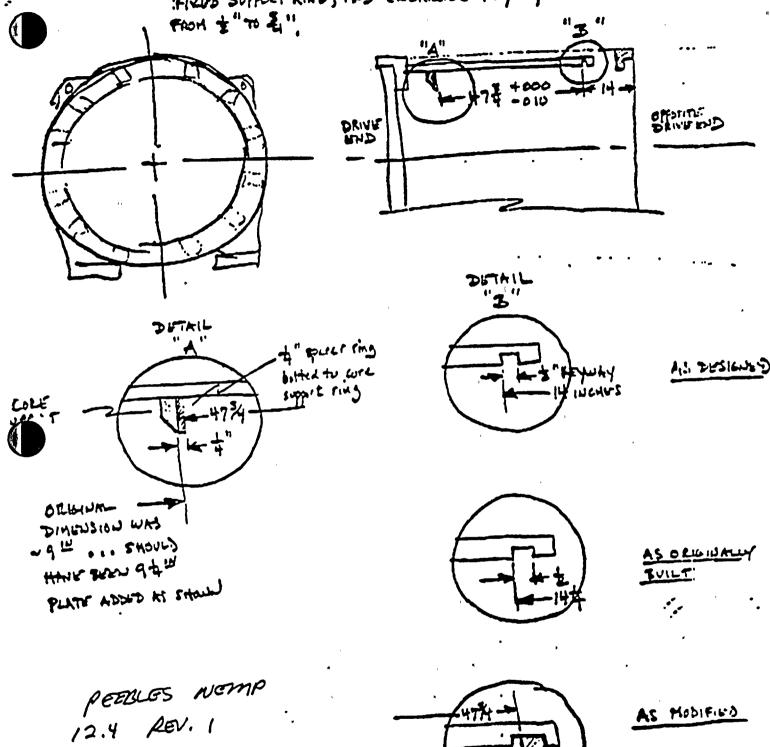
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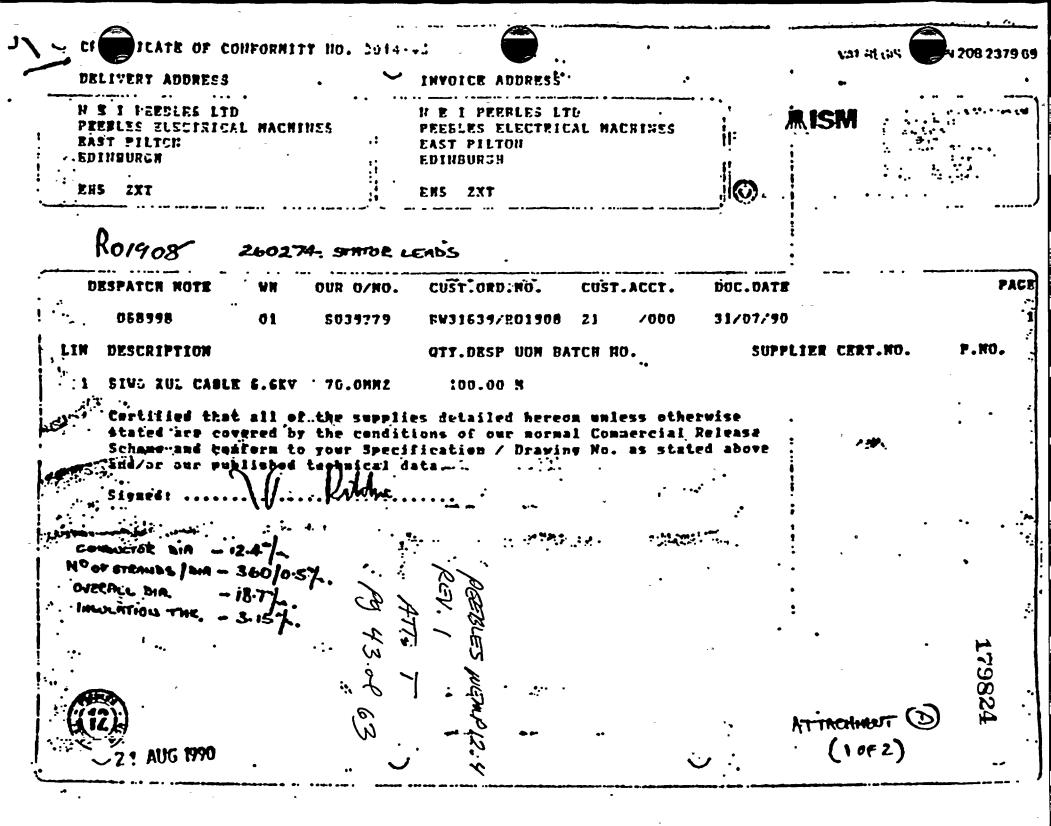
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Bast Pilton Edinburgh Scotland EHS 20T Telephone: (031) 852 6261 Telex: 72125 (PP EDIN G) Fex: (031) 852 7381

STATOR COUNECTION CABLE

70m2 6.6kv Voltage category MEH

Testing of sample cable to Eng. Standard R 8070.

In each of the following tests, a length of approx 100mm was wrapped with a conductive tape and subjected to earth potential. The specified withstand voltage was applied for one minute and thereafter the voltage level was increased until breakdown occurred.

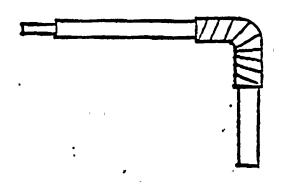
1. Straight length.



Withstand - 15kv.

Breakdown - 60kv.

2. Right angle bend. (2.50)



PERBLES NEMP 12.4 REV.1

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Pg 44 of 63

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R. Weller

E. Walker P.E.K. test 1st Oct. 1990



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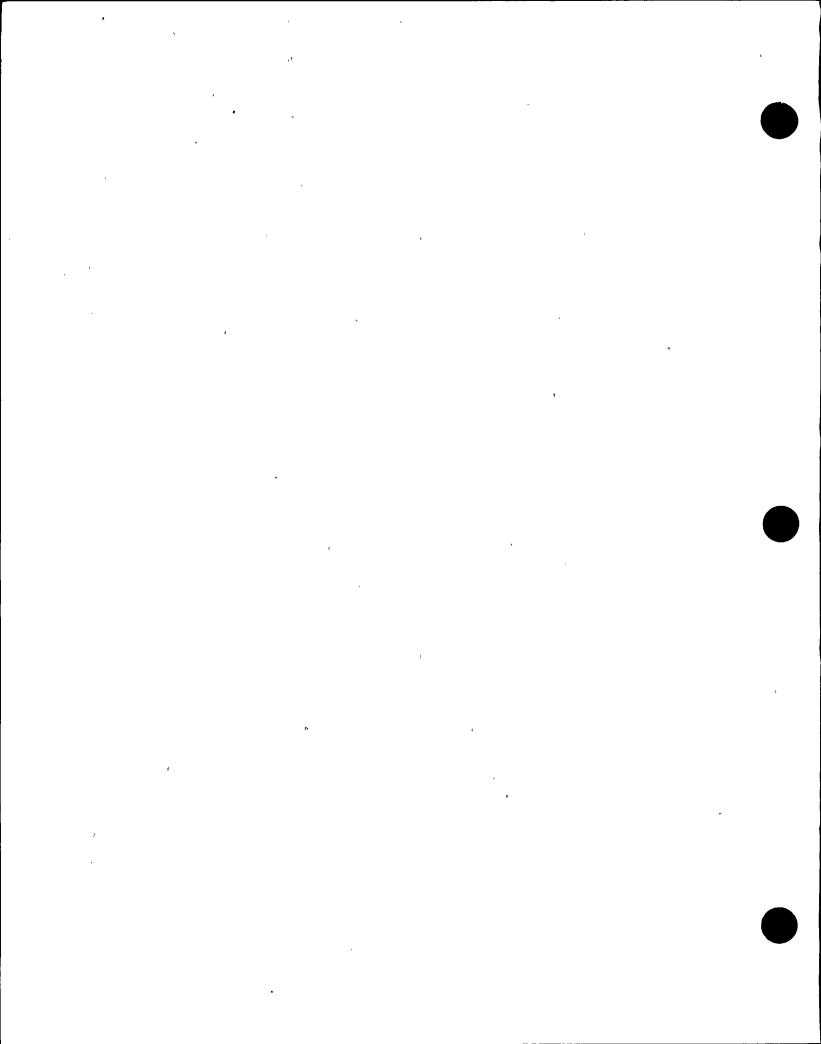
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Thomas Bolton

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MAGNET POLE DAMPER BARS.

Our Ref: MB/JB

29th June, 1990

MEI Parmons Peebles Ltd., Bast Pilton, Bdinburgh. BHS 2XT

Jear Sirs,

Your Order No. 3A 30274

We enclose herewith our Certificate No. 26682 relating to the above numbered order in connection with Oxygen Free HC Copper Rod in 863.6mm Lengths, 12.7mm Dia., 102 Rods, 100 Kgs., to Specification BS 1433 Cl03, as referred to in our Works Order No. 74752.

Yours faithfully,

J. Bridden

PEZBLES NEMP 12.4 REV. 1

ATT. Tpg 48 of 63

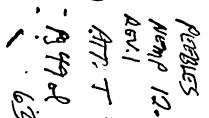
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PO Box 1 Froghall Stoke on True nt ST10 2HF England Telephone 0538 752241

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MAGNET POLE DAMPER BARS

THOMAS BOLTON LIMITED

P.O. BOX I, PROGHALL STOKE-ON-TRENT, STIGSHI

TESTS CERTIFICATE

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MAGNET COIL WIRE

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DUNE COMMANDE

CERTIFICATE OF CONFORMITY
OF AN ORDER

WERKSZERTIFIKAT

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PREPARED BY THE SUPPLY INDUSTRY IN ACCORDANCE WITH FRENCH STANDARD NF L 00018 A

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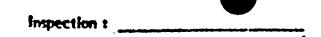
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MAGNET COIL WIRE

QUALITY INSPECTION REPORT

| Reference : | _ | | | • | | | ,,,, | | | | DAGLAS in | |
|-------------------------------------|----------------------|------------------------|----------|--------------|--------------|--------------|-----------|-------------|----------|------------|--------------|-----------------------|
| Number and date of | order : P 00 86 | 98 of 30/04 | <u> </u> | | Qua | ntity : | | 1 216, | 000 kg | | | |
| Contract number : | | | | | Sour | ce of | order: | Insulat | tion Sy: | stems a | nd Machines | LTD |
| | | | | | | | , | Whari | edale n | bad Gi | B - Bradford | Yorkshire BD4 6 SG |
| pea ATT. | • | Resistivit | y | : | 0,01 | 1706 of | ım/mm² | /m | | | | |
| 7000 | | Breakdow electrodes | | | 0,9. | 1. 0,9 | . 0,7. 0, | 8. | • | | | , |
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| M C K | . Conductivité | ъ | As | Sb | Di | Fa | Mj . | Ag | \$ | 02 | SP-850* | |
| SS | **** | • | | | | - | ~~ | | | | | . [[|
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| 4 | 102,04 | 2,1 | 1,1 | | 40,1 | a | 1,8 | 9,9 | 41 : | 190 | 310 | 411 1/30 |
| | 102,11 | 2,4 | 0,8 | | 40,1 | 1,2 | | 9.2 | 2 | 165 | 310 | 7-3- |
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DELLE, le 13. 6.1993

Executed by : C. PATRIX

R. MAUER

Chief Quality Control,

C Soor

(5 of 5)

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ςφουνε **159274**

MINCO PRODUCTS, INC.

7300 Commerce Lene / Minneapolis, Minneaple 55432 / TWX: 910-576-2848 / Telephone: (812) 571-3121

· Dertification of Compliance

TO: CAREL COMPONENTS LTD
C/O CONCORDIA INTL FWDB BROUP
2767 OLD HIGGINS RD
ELK GROVE VILLAGE, IL. 80007

| The teller | ring frome were shipped against the above Purchase C | Order . | , | |
|---------------------------------------|--|--|--|--------|
| n | per our Packing Billo No | . 10906 . | • . | |
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Remarks

Minco Products, Inc

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My Assurance Representative

Form 86225-1

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641 221 6528 JOHN HOOD & CD one oci 421 2433 (3 Knes)

EAP SIDE SIRE

Brass & Copper STOCKHOLDERS

JOHN HOOD & CO.

OUR REF:

Looker & Macleo

QUALITY CONTROL

Dear Sirs.

YOU'R ORDER NO. . 90/9571/1 4 3.2.90

We guarantee that the materials supplied to this order conform to the required Specifications as under. viz:-

1 Sheet

4x2'x Z' copper to BS2870 Cloil

Our Advice Note and Invoice No. H 03533 of 3.8.90 refer.

Yours faithfully John Hood & Coicopper Alloys) Ltd I. A. KINO.

us.

. PERGES NORP 12.4 REV. 1 ATT. T



Pg 57 of 63

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COPPER BUS BAR AL TERMINAL 32445-0274 JA 30372/2

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FAG (UK) LIMITED 159274

BEARING

HEATH MILL ROAD, WOMBOURNE, WOLVERHAMPTON WVB BAF.

Selephene Wombourne (0902) 834321 Seles: 837414 Facelinile Wombourne (0802) 834424

ATTN MR ALEX BROWN

NEI PEEBLES LTD

EAST PILTON

EDINBURGH

- EH5 2XT

Your Drain the BW31406

INVOICE 971382

14.9.90

FAX 031 552 7581

| FAQ Port No. | Qty. | Outsomer Part No. Speciforg. No. No. | Surrus of " Supply Division | . Gemerks |
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| 1 2226EAS.M.C3 | 1 | | AQAP-1 | |
| EDDDS ALRE | DY DESP | TCHED FROM BELLSHI | L OFFICE | |
| | | | | |

We confirm that the items detailed above have been produced and inspected according to the FA3 Cuality Assurance System, which complies with the requirements of AQAP-1 (NATO Quality Control System).

peoples wemp 12.4 per. 1 ATT. T pg 58 of 63

Signed:

Clathan

Position:

Chief Engineer

ATTACHHENT (T)

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PACIFIC GAS & ELECTRIC COMPANY ENGINUERING SUPPORT SERVICES ENGINEERING & CONSTRUCTION BUSINESS UNIT (ENCON)

DATE: 1990

FRUM:

JUHN R. STARZMANN RD 1. BOX 212 LONDON TRACT RUAD LANDENHERG. PA 19350 telephone Panafax

(215) 274-8330

(215) 274-0599

This

TIKE TRESLER Wisiting 10-8-90 from Pacific Bas & Electric) u/c Brian Fraced (NE) Peobles)

NII/+ax 911-44-31-502-7581 phony 011-44-31-552-6261

EQ3 INSPECTION MJO RECEIVED MH

JJG FME EKK DEC CSM

SUBURTET:

Pacific Gas and Electric Company 2600 KW Generator

PH&E arder 25-1597-AB-7 1539 AB9

OCT 0.8 1990 MHP WTS PRF

SUPP. LTR BJOK

LKM

TMMc

JFN **JRS** JW

JHU WJW

FILE E

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Milto Treslers

l committed to Usama Farradj that I would briefly review my inspection concerns from my visit with NE1 Peebles with PG&E Engineering before your visit. I was not able to reach you on Friday, and knowing that Burt Hepponstall was not in Sun Francisco this past week, I am listing below, a few of the topics discussed with NLI on October 3rd and Ath. Please review with Burt, and tellowup with NEI Peebles as necessary.

During my visit, I reviewed the inprocess work and inspected the genulator shaft, statol frame, puls assemblies, and stator coils. Demorally, I found the workmanship acceptable and processes to be in accordance with NEI instructions. Areas where I could use NECS ascistence are the following:

- Subject to NECS approval, I have taken the position that ALL design thanges by NEL ... even if mudifications are made internal to the machine ... should be reviewed with PG&E. discussed this with Les Tweedale (Chief Mechanical Design Engineer at NED), after I observed that the core support ring was orginally shifted 1/4 inch towards the drive end. NEI has made a modification, as shown in the attached sketch, to bring the support ring to the correct exial position. While I do not disagree with the discrepancy resolution, my postion is that NECS should be apprised of ALL modifications, wince FOWE is dedicating the UHHERAKUT.
- I briefly reviewed with Jim Taylor (NEI Quality Engineer), the documents which have been accumulated to date, to meet NE1's dedication in accordance with Attachment F to the EMM. Inspition Plan DC-254 requires "that the proposed test procedures and test results are approved/acceptable by FG&E". I don't believe that the dedication test procedures have been submitted to PS&E. propose that the test procedures for dedication, as well as the documentation, be submitted directly to NECS. For the documentation reviewed, our discussions included the following:

PEEBLES NEMP 12.4 REV. 1 ATT. T Pg 59 of 63

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MAGNET WIRE documentation should include stator wire as well as pole wire, unless otherwise advised by PG&E Engineering.

STATOR RTD'S ... NEI will perform an incoming inspection and verify the catalog number identification. NEI does not generally verify shape and size are listed in attachment F of the EMM.

COPPER BUS IN TERMINAL COMPARTMENT ... NEI will mend the bus to a subcontractor for plating. Ducumentation shows that the bus is B\$2870 C101 [high conductivity] material. Is NEI to measure the resistance, is resistance to be measured before the silver plating is applied, or is the present documentation adequate?

DEARINGS will be visually checked to a catalog reference, and NEI will provide an incoming inspection report. What is required for "tolerances", i.e. are only the bearing dimensional tolerances to be noted (along with the actual incoming inspection measurements), or are temperature rise tolerances also to be noted?

LEAD TO COIL TERMINATION documentation has not yet been obtained.

- 3. According to the <u>Inspection Plan</u>, all drawings and procedures are to be submitted to PG&E for approval. I am not sure of DE1 Cloveland is aware that drawings and procedures are required for approval, but I need confirmation from Burt that NE1 drawings and procedures have been approved.
- 4. The present schedule for testing the generator is the week of December 17th.

If you have any questions regarding my inspection last week, please let un know by October B, 1990.

Thanks for your assistance.

JR blurzmann

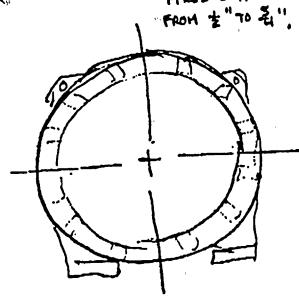
attachment: sketch of core support ring location

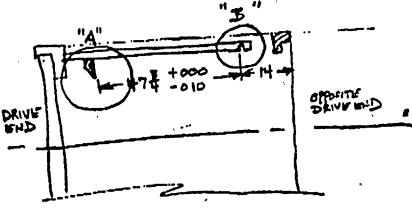
..... Usamu Farradi

Harry Borgard Cille E and file WJ

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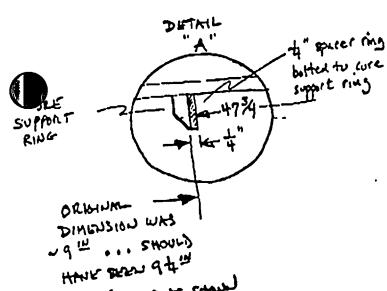
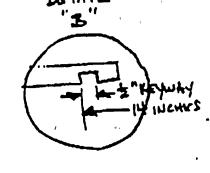
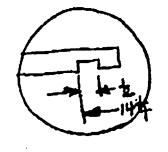


PLATE ADDED AT SHOUL

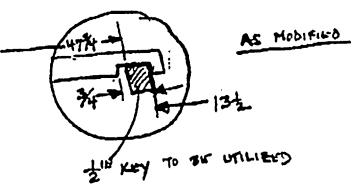


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PERSON NEMP 12.4 REV. 1 ATT. T Pg 61 of 63



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FILE



PACIFIC GAS AND ELECTRIC COMPANY FOR INTRA - COMPANY LIGES

From Division/ Department

ENCON QUALITY SERVICES INSPECTION SECTION

Tor

Burt Happonstall

Fax - (415) 973-9642

Fromi

John R. Starzmann

Phone - (215) 274-8330 Fax -(215) 274-0599

Dater

December 19, 1990

Ret

NEI 2600 kW Generator

ZS-1539-AB-9

Burt:

This is a second request and follow-up on my fax of 11-30-90. In order for me to sign off on Inspection Plan DC-254, revision 1, prior to factory acceptance testing of the generator in Edinburgh, I require confirmation that:

- All required drawings and procedures have been approved by PGKE.
- The generator will be a dimensional duplicate of Electric Prod.ct generators, S/N 16908022/26, but that longer (4º/g") bus insulators are acceptable (similar to those furnished on order 4R71555).
- NEI Peebles has submitted test procedures and test results for dedicated testing as required by Attachment F to the ENM, and that the procedures and test results are acceptable to PG&E.

Thank you for your assistance.

Sincerely,

John R. Starzmann Inspection Engineer

JRS: hmb

HHBorgard CCI

UFarradi JJGraham .

DHardesty EWalters

persues NEMP 12.4 REV. 1 ATT. T

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GAS AND ELECTRIC COMPANY PACIFIC

45 FREMONT STREET . SAN FRANCISCO, CALIFORNIA 941CS . (415) 781-4211 . TWX 910-372-6587 Ber Marie

October 22, 1986

HEI Peebles - Electric Products, Inc. 17045 Euclid Avenue Cleveland, Ohio 4412-1431

Attention Mr. Nick Monnoly

Dear Sir:

E.Q.C. HHB INSPECTION WRM RECEIVED DLM

OCT 27 1986

EB DEC CSM JFN JRS

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LKM TMMC

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MHP CA NOWTS FME ME

WJWCFILE

Attached is the marked-up copy of drawing D67515 which you fent to Bruce Grosse for approval.

There is no objection to your proposed change to increase the length of the bus insulators from 3-1/2" to 4-1/2". The drawing has been stamped "Approved - Mfg. may proceed". .

Sincerely.

SIG AUER Supervising Electrical Engineer

BMG/IS:09

Mritten Response Required: No

Attachment: D67515 .

HABOTORTO CC: MLHurley

215/Mkt/252 Without Attachment 77/Mkt/1699 Without Attachment

persus NEMP 12.4 REV. 1 ATT. T A 63 of 63

ATTACHMENT U

FINAL DESIGN CHANGE/EQUIVALENCY REVIEW

- 1. DRAWING CHANGE LIST (2 PAGES)
- 2. COMPLETE DRAWING LIST (4 PAGES)
- 3. SPECIFICATION EVALUATION FOR PG&E SIXTH GENERATOR (6 PAGES)
- 4. SPECIFICATION EQUIVALENCY REVIEW FOR PG&E SIXTH GENERATOR (5 PAGES)
- FAX FROM NET PEEBLES, DISCREPANCY REPORT 2783, DCR'S 11307, 11308, 11309 AND (1424(7 PAGES)

REFERENCE DOCUMENTS:

NEI PEEBLES LETTER, CHRON # 174863

NEI PEEBLES LETTER, CHRON # 175000

PG&E QA REPORT CHRON # 176519

The second second the state of the s

DRAWING CHANGE REVIEW P G & E, DIABLO CANYON S.O. 39001857, S-1128

BY - < JM 6-19-91 CK - Dec 6/24/91 APP - FOM 6-21-91

PAGE NO. 1 OF 2 ISSUE NO. DATE - 6-24-9/

176519

| [| | 17651 |
|---------------|-----|--|
| DRAWING NO. | REV | DESCRIPTION OF CHANGE |
| A-45115A-3 | 2 | IN 1986 MATERIAL SPECIFIED FOR FAN BLADES CHANGED FROM MS-70.13 TO MS-70.14. MS-70.14 WAS SPECIFIED WHEN MATERIAL CERTS WERE REQUIRED. MS-70.13 WAS COMMERCIAL QUALITY STEEL. |
| A-66824-6 | 3 | REV. 2 IN 1986; REFERENCE TO CD-L AND WD-L SPECIFICATIONS CHANGED. SEE THEM BELOW. REV. 3 IN 1991 FOR DOCUMENTATION CORRECTION. |
| A-66826-5 | 5 . | FIRST 3 REVS. BEFORE 1984. REV. 4, 1990; NOTE REFERENCING WELDING OF ROTOR STUDS. HAD SAID "WELD". CHANGED TO "PUDDLE WELD". PROCESS IS COVERED BY A WRITTEN WELDING PROCEDURE. |
| A-66843-7 | 2 | REV. 1, 1970. REV. 2, 1990; INSULATION SPECIFICATION WAS EI-1.5.0, CHANGED TO EI-1.5.1 PER PROPOSAL. |
| A-67281-9 | 3 | REV. 1, 1969. REV. 2, 1986 DOCUMENTED THAT 4 TAPPED HOLES WERE ADDED FOR MOUNTING OF TERMINAL BOX, PER ENGINEERING ORDER 7059 ISSUED IN 1970. NO CHANGE FROM ORIGINAL DESIGN. REV. 3 FOR DOCUMENTATION. |
| B-49879AH-1 | 4 | REV. 1, 1971. THE REST 1991. REV. 2, HOLE SIZE CHANGED TO ACCOMMODATE BUSHING. REV. 3, NOTE ADDED. REV. 4, DOCUMENTATION. |
| B-49879AJ-1 | 3 | REV. 1, IN 1971. REV. 2 & 3 IN 1991. IDENTIFICATION NOTE ADDED. NO PHYSICAL CHANGE TO BOX. |
| B-49879AK-1 | 3 | ALL CHANGES IN 1991.NOTE ADDED AND TITLE BLOCK CORRECTED. NO PHYSICAL IMPACT ON BOX. |
| B-70202-1 | 2 | REV. 1, 1991; NAME CHANGE ON NAMEPLATE. NO TECHNICAL SIGNIFICANCE. REV. 2, DOCUMENTATION. |
| C-08991U | 7 | OUTLINE DWG FOR EARLIER GENERATORS WAS C- 08991E REV.9. NO CHANGES WERE MADE AFTER 1971. C-08991U DRAWN FOR S-1128 TO INDICATE PHASE SEQUENCE. REVISIONS TO U VERSION PER CUSTOMER REQUEST. ONE REVISION FOR DISCREPANCY APPROVED BY CUSTOMER. |
| C-09299-1 | 22 | |
| C-21490-1 | 4 | REV. 1 & 2, 1969 AND BEFORE. REV. 3 & 4, 1991; REVISIONS FOR DOCUMENTATION ONLY. NO PHYSICAL CHANGE. |
| C-66760A-7 | 3 | INSULATOR SUPPORT MOVED IN 1986 TO ACCOMODATE LARGER STAND OFF INSULATORS. STIFFENING PARTS ADDED IN 1991 PER CUSTOMER REQUEST. |
| C-66890-1 | 4 | ONLY CHANGE AFTER 1984 ON FAN BLADE ASSEMBLY WAS MATERIAL CHANGE FROM MS-70.13 TO MS-70.14 STEEL. SEE ENTRY ON FAN BLADES. |

PETBLES NEMP 12.4 REV. 1 ATT. 4 pg 2 of 25



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DRAWING CHANGE REVIEW P G & E, DIABLO CANYON S.O. 39001857, S-1128

BY - CJ7 6-19-91 CK - PU ()4/91 APP - FOM 6-21-71

PAGE NO. 2 OF 2 ISSUE NO. DATE - 6-24-9/

176519

| DRAWING NO. | REV | DESCRIPTION OF CHANGE |
|--|-----|--|
| C-66890-2 | 4 | FAN BLADE ASSEMBLY ON OTHER END. COMMENT ABOVE APPLIES. |
| C-67400-1 | 7 | FIRST 6 REVISIONS 1969 TO 1971. LAST REVISION, 1990, ADDED TAPPED HOLES IN SHAFT FLANGE PER CUSTOMER REQUEST. |
| CDL-10823A | 2 | REV 1, 1990 CORRECTED QUANTITIES ON BILL OF MATERIAL. REV 2 CORRECTED DOCUMENTATION. NO CHANGE IN DESIGN INVOLVED. |
| L-10823 | 2 | ELECTRICAL DESIGN SPECIFICATION. ONLY CHANGE AFTER 1984 INVOLVED CHANGE OF POLE INSULATION FROM EI-1.5.0 TO EI-1.5.1 AS OFFERED ON OUR PROPOSAL FOR THIS GENERATOR. |
| WDL-10823A | 0 | COIL WINDING DATA SHEET REWRITTEN IN 1986 ON NEW FORM. REF. TO CONNECTION DIAGRAM CHANGED. RTD ASSEMBLY CHANGED. COIL SUPPORT RING INCREASED FROM 5/8 TO 7/8 IN. DIA. IN PROCESS TEST VOLTAGES INCREASED. ALL APPROVED IMPROVEMENTS. |
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PEEBLES NEMP 12.4 REV. 1 ATT. U pg 3 of 25



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DRAWING LIST FOR PG&E GENERATOR (ZS-1539-AB-9) S.O. 39001857, S-1128

BY - RWC CK - RCC APP - COM PAGE NO. 1 OF 4 ISSUE NO. 3 DATE - 7 (30/9)

174863

| DRAWING NO. | REV. | NAME |
|-------------|------|-----------------------------|
| A-7353-29 | 9 | SEAL |
| A-11280-100 | 4 | STATOR SLOT STICK |
| A-13843E | 3 | ROTOR POLE WASHER |
| A-14517-2 | .7 | BRUSH |
| A-15293-5 | 3 | BRUSH STEM |
| A-17171 | 1 | GROMMET |
| A-18405-4 | 5 | BRUSH HOLDER |
| A-27400-92 | 0 | #569 STATOR SLOT DIE |
| A-29412 | 3 | MOUNTING SLEEVE - SLIP RING |
| A-30744-108 | 8 | ROTOR POLE HEAD - |
| A-32641-4 | 5 | SLIP RING MOUNTING SLEEVE |
| A-35081-16 | 4 | STATOR STIFFENER |
| A-37848-12 | 2 | ROTOR SPIDER DRILLING |
| A-39065-75 | 0 | STATOR VENT |
| A-42149-15" | 0 | BUSHING |
| A-42214-18 | 2 | TERMINAL BOARD |
| A-42215-3 | 2 | TERMINAL BOARD |
| A-42215-4 | 2 | TERMINAL BOARD - |
| A-43195-15 | 4 | GROMMENT |
| A-45115A-3 | 2 | FAN BLADE |
| A-46616B-3 | 0 | BRUSH STEM MOUNTING SUPPORT |
| A-47889-1 | 2 | LEAD CLAMP |
| A-47890-3 | 2 | INSULATION TUBE |
| A-47891 | 0 | LEAD CLAMP |
| A-47892 | 1 | LOCK PLATE |
| A-49998A-2 | 1 | LOCK PLATE |
| A-58324E-12 | 1 | SPACE HEATER |
| A-60838E-2 | 0. | ROTOR COIL WEDGE |
| A-63554 | 3 | WEDGE INSULATOR |
| A-63565C | 0 | GUSSET STATOR FRAME |
| A-64934A | 2 | INSULATION RING |

PEEBLES NEMP 12.4 REV. 1 ATT. 4 pg 4 of 25



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DRAWING LIST FOR PG&E GENERATOR (ZS-1539-AB-9) S.O. 39001857, S-1128 PAGE NO. 2 OF 4
ISSUE NO. 3
DATE - 7/20/91

| DRAWING NO. | REV. | NAME , | | |
|-------------|------|-------------------------------|--|--|
| A-65118E-2 | 0 | LEAD CLAMP BASE | | |
| A-65333D-5 | 2 | KEY, ROTOR POLE | | |
| A-66115B | 0 | CONNECTION DIAGRAM - STATOR | | |
| A-66654-5 | . 0 | STATOR COIL SUPPORT | | |
| A-66667C | 4 | STUD - COIL WEDGE | | |
| A-66668G | 3 | STUD - ROTOR SPIDER | | |
| A-66824-6 | 3 | WOUND STATOR ASSEMBLY | | |
| A-66826-5 | 5 | ROTATING ELEMENT | | |
| A-66843-7 | 2 | WOUND POLE ASSEMBLY _ | | |
| A-66866-1 | 0 | END RING - | | |
| A-66874 | 2 | END RING ASSEMBLY | | |
| A-66878 | 0 | COVER | | |
| A-66880 | 0 | SCREEN - COVER | | |
| A-66880A | 1 | SCREEN - COVER | | |
| A-66886G | 0 | 0 SCREEN - STATOR FRAME | | |
| A-66951B | 0 | CONNECTION DIAGRAM - ROTOR | | |
| A-66999 | 2 | CLIP - STATOR BAFFLE - | | |
| A-67000 | 0 | STATOR BAFFLE | | |
| A-67070C-2 | 0 | SCHEMATIC DIAGRAM - ROTOR | | |
| A-67281-9 | 3 | SIDE COVER - STATOR | | |
| A-67281A-3 | 1 | COVER - STATOR | | |
| A-67518-2 | 0 | BUS - NEUTRAL | | |
| A-67578-1 | 1 | BASE - TERMINAL BOX | | |
| A-67579-1 | 1 | BUS | | |
| A-69587A-1 | 4 | RTD - STATOR COILS | | |
| A-70203-1 | 0 | NAMEPLATE - SPACE HEATER | | |
| A-70209-1 | 0 | NAMEPLATE - HEATER WARNING | | |
| A-70210-1 | 0 | NAMEPLATE - HIGH VOLTAGE | | |
| A-70212A-1 | 0 | NAMEPLATE - CAUTION LIFTING | | |
| A-70212B-1 | 0 | NAMEPLATE - CAUTION LIFTING . | | |
| B-36874D-10 | 0 | BEARING COVER | | |

PEEBLES NEMP 12.4 REV. 1 ATT. 4 pg 5 of 25



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DRAWING LIST FOR PG&E GENERATOR (ZS-1539-AB-9) S.O. 39001857, S-1128

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PAGE NO. 3 OF 4 ISSUE NO.3 DATE -7/30/91

| DRAWING NO. | REV. | NAME |
|------------------|------|--------------------------------|
| B-36875C-1 | 0 | BEARING COVER |
| B-49626-8 | 7 | SLIP RING ASSEMBLY |
| B-49879AK-1 | 3 | TERMINAL BOX |
| B-49879AJ-1 | 3 | TERMINAL BOX |
| B-49879AH-1 | 4 | TERMINAL BOX |
| B-66830-3 | 2 | #140 ROTOR SPIDER PUNCHING |
| B-66863-1 | 0, | #140 BRACKET BEARING CARTRIDGE |
| B-66864 PT1 IT1 | 3 | TORCHING STATOR ENDPLATE |
| B-66864E PT3 IT2 | 1 | TORCHING STATOR HEAD |
| B-66865-3 | 4 | ROTOR SPIDER HEAD - |
| B-66865-4 | 4 | ROTOR SPIDER HEAD |
| B-66867 ' | 1 | BRACKET FACE PLATE |
| B-66875 | 0 | FAN ASSEMBLY |
| B-66881-4 | 0 | COVERS - STATOR FRAME |
| B-66881B-4 | 0 | COVERS - STATOR FRAME |
| B-66883-6 | 0 | LOUVER ASSEMBLY |
| B-67041E | 1 | NAMEPLATE - PHASE SEQUENCE - |
| B-67405-1 | 1 | SHAFT FORGING |
| B-70186-2 | 0 | NAMEPLATE - CO. NAME |
| B-70202-1 | 2 | NAMEPLATE - DATA |
| B-70249-1 | 0 | NAMEPLATE - DIR. ARROW |
| C-08991U | 7 | OUTLINE ~ |
| C-09299-1 | 2 | ACCESSORY TERMINAL BOXES |
| C-21490-1 | 4 | TERMINAL BOX . |
| C-47903-6 | 5 | SLIP RING |
| C-66626N-3 | 2 | COIL GUARD |
| C-66760A-7 | 3 | TERMINAL BOX |
| C-66816-1 | 0 | STATOR PUNCHING |
| C-66821-1 | 2 | ROTOR POLE PUNCHING |
| C-66821-2 | 2 | ROTOR POLE END RING PUNCHING . |
| C-66827-5 | 2 | ROTOR POLE ASSEMBLY |

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DRAWING LIST FOR PGGE GENERATOR (ZS-1539-AB-9) S.O. 39001857, S-1128

PAGE NO. 4 OF 4 ISSUE NO.3 DATE - 7/30/51

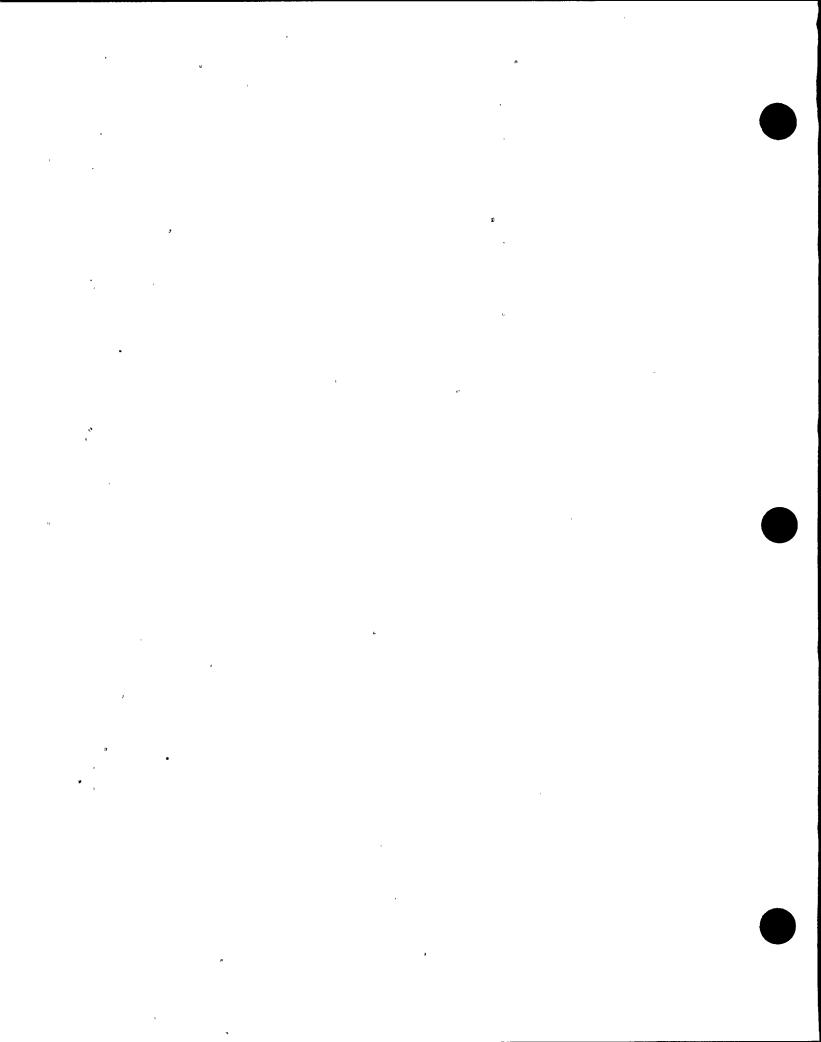
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| | DRAWING NO. | REV. | NAME |
|---|-------------|------|---------------------------------------|
| | C-66890-1 | 4 | FAN ASSEMBLY . |
| | C-66890-2 | 4 | FAN ASSEMBLY · |
| ļ | C-67231-2 | 1." | FAN BAFFLE |
| | C-67400-1 | 7 | SHAFT . |
| | D-66825H-1 | 3 | STATOR FRAME ASSEMBLY |
| | D-66828D-2 | 0 | BRACKET |
| | D-67515-1 | 3 | TERMINAL BOX ASSEMBLY |
| | L-10823 | 2 | ELECTRICAL DESIGN SPEC. |
| | CDL-10823A | 2 | COIL DESIGN SPEC |
| | WDL-10823A | 0 | COIL WINDING SPEC. |
| | AO 140-110 | 1 | PARTS LIST |
| Δ | D-67201-2 | 11 | STATOR WINDING MASTER DRAWING |
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07/31/91





P. G. & E. SPECIFICATION EVALUATION

| _ | | | 79 | | | |
|--------|-----------------------------|-------------------|----|--|----------|--|
| P 6258 | SPEC. | NO. | 77 | DESCRIPTION | DATE | REVISION DESCRIPTION |
| Bis | | _ | | 1 | 1 1 | |
| ces | | 1. 1. 0 | | STATOR - FORM COIL - OPEN | 07/01/81 | DATE CODE AT TOP 5/25/78 EXCEPT PAGES 8,8A-7/1/81. PAGES 16,17,18-4/30/81. PAGE 19-9/15/80. HINOR REVS ON PAGES-HONE AFTER 5/11/81. |
| שע | E1 - | 1. 5. 1 | | ROTOR - SYNCHROHOUS - LAYER WOUND COIL POLE - CLASS | 04/14/81 | MINOR REVS ON PAGES 4/6/81. DATE CODE ON TOP 6/9/77 EXCEPT PAGE 3-4/14/81.PAGE 6-10/4/77.PAGE 15-4/6/81. PAGE 19-7/28/80.NO CHANGE AFTER 1984. |
| Nemp | EI • | 3. 1 ⁻ | | STATOR COIL INSPECTION OUTLINE | 09/14/83 | DATE CODE AT TOP OF PAGES 2/6/79 HINOR REVISION ON PAGE 2-9/14/83 NO REVISIONS AFTER 1984. |
| / ×. |) _{EP} - | 1. 1. 0 | | STATOR - FORM COIL (OKV TO 6.6 KV) | 04/30/81 | DATE CODES, PAGE 1-9/18/80, PAGE 2-7/8/81, PAGE 3-4/30/81. NO CHANGE AFTER 1984. |
| 4 | | 1. 5. 1 | | PROCESS-LAYER WOUND COIL-POLE | 07/14/82 | DATE CODE 11/20/79. HINOR REV 8/18/80 AND 7/14/82. NO CHANGE AFTER1984. |
| Rev. 1 | , , , ^{Ed} . | 2.17 | | FILL IN SHEET . | 01/01/01 | NO DATE OR REVISION LEVEL. FILL IN SHEET DESIGNED FOR IN PROCESS INSPECTION OF STATOR COILS IN PEP QC SYSTEM. NOT NECESSARY TO USE AS INSTRUMENT OF RECORD. PEM INCORPORATED EQ 2.17 AND EI-3.1 IN THEIR R-5034.NO CHANGE IN EQ-2.17 SINCE 1984. |
| | | 5. 8 | | ROTOR POLE ASSEMBLY, WELDING | 12/11/79 | INSPECTION RECORD SHEET USED IN PEP QC SYSTEM. NO CHANGE SINCE 1984. |
| ATT. | | 1. 1 | | FIELD LEAD | 10/25/90 | DATE CODE 10/25/90 (DCR11409) ALLOWED CHANGE IN SHAPE OF CU STRAP. 2/8/90 REV (DCR 11384) CLARIFIED STRAP LOCATION. REV. 10/20/87 REHOVED WET ASBESTOS AS TEMPORARY HEAT SINK AND ADDED SKETCH (PAGE 2) TO ASSIST CONSTRUCTION AT PEM FOR PG &E GEN. |
| U P3 | ET - | 2. 2. 1 | | DIELECTRIC TEST OF AC STATOR COILS | 10/27/82 | DATE CODE ON ALL 4 SHEETS 12/28/78. MINOR REV, PAGE 1-10/27/82,PAGE 2-8/23/79,PAGE 4-8/24/79. NO CHANGE AFTER 1984. |
| Q | 2 EM - | 4. 1 | | TAPER CUT | 12/30/75 | DATE CODE 9/23/75. TABLE WAS REVISED 12/30/75. NO CHANGE AFTER 1984. |
| 8 | Ь на - | 10. 2 | | ADHESIVE FOR SPACERS | 12/14/77 | ONE PAGE. DATE CODE 03/03/77. HINOR REV 12/12/77. NO CHANGE AFTER 1984. |
| ٠. |) HC - | | | CABLE - 5000 VOLT CLASS B 130 | 05/25/73 | ONE PAGE. DATE CODE 07/19/66. HINOR REVISION 05/25/73. NO CHANGE AFTER 1984. |

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Page No.

07/31/91

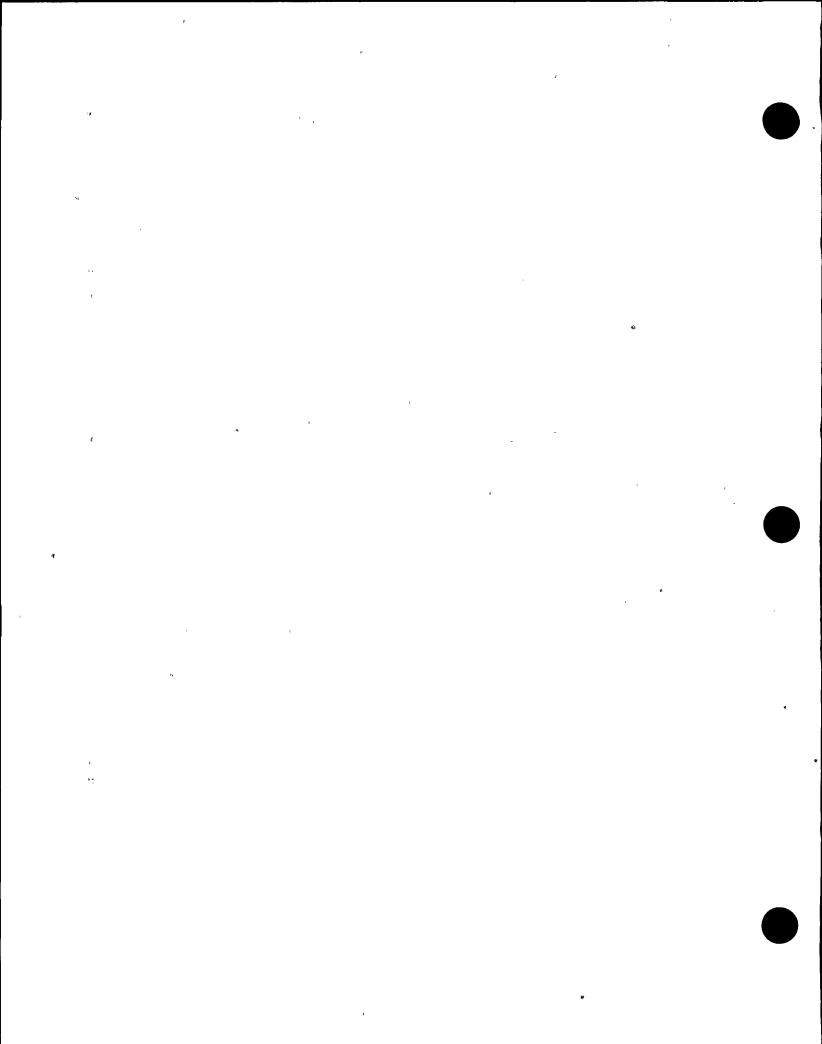




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| SPEC. NO. | DESCRIPTION | DATE | 'REVISION DESCRIPTION |
| <u> </u> | • | f 1 | the state of the s |
| нс -10.10 | CABLE - 600 VOLT CLASS B 125 C | 07/18/80 | ONE PAGE. DATE CODE 08/19/75. MINOR REVISION 07/18/80. NO CHANGE AFTER 1984. |
| ис -10.13 | CABLE - SPACE HEATER HOOKUP . | 06/15/81 | ONE PAGE, DATE CODE 06/02/71. LAST MINOR REVISION 06/15/81. NO CHANGE AFTER 1984. |
| нс -10.15 | SOLID - 600V - CLASS A | 03/12/76 | 2 PAGES DATE CODE 3/12/76, NO OTHER REVISION. |
|) HC -20. 1 | CONNECTOR | 04/25/91 | TWO PAGES, DATE CODE 04/25/913 (DCR 11450) ADDED REF TO AMP SOLISTRAND CONNECTOR PART MUMBERS. BOTH AMP SOLISTRAND AND AMPOWER TYPE CONNECTORS WERE ACCEPTABLE UNDER PREVIOUS ISSUES OF THIS SPEC. LAST PREVIOUS REV 12/14/77. NO OTHER CHANGE SINCE 1984. |
| мс -80. 1 Г | HARD DRAWN, BARS, ROOS & SHAPES | 11/21/80 | ONE PAGE DATE CODE 5/7/73, MINOR REVISION 11/21/80, NO CHANGE SINCE 1984. |
| ис -80. 2 | SOFT DRAWN, BARS, ROOS & SHAPES | 11/21/80 | ONE PAGE DATE CODE 5/3/73, MINOR REVISION 11/21/80. NO CHANGE SINCE 1984. |
| ис -80. 5 | COPPER-ANNEALED-OXYGEN FREE OR DEOXIDIZED-BAR RODS & SHAPES | 02/14/91 | DATE CODE 02/14/91(DCR 11434) ADDRESSED APPLICATION OF BS STD. MATERIAL. PREVIOUS REVISION 08/16/76. NO OTHER CHANGE SINCE 1984. |
| мс -80. 6 | COPPER-HARD DRAWN-OXYGEN FREE OR DEOXIDIZED-BAR ROO & SHAPES | 02/14/91 | REVISION 02/14/91 (DCR 11435) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION 09/18/74. NO OTHER CHANGE SINCE 1984. |
| MF - 3. 3 | TREATED DACRON FELT | 07/17/80 | ONE PAGE. DATE CODE 07/17/80. NO REVISION. NO REVISION AFTER 1984. |
| и - 5. 1 Q | INSULATION, COTTON - PHENOLIC SHEET | 10/22/79 | 2 PAGES DATE CODE 10/22/79. REV 11/17/83 UPDATED REFERENCE TO NEMA STD. REV 11/21/80 ADDED VENDOR. NO CHANGE SINCE 1984. |
| Б нг - 5. 3 | INSULATION, COTTON BASED - PHENOLIC TUBE | 01/05/84 | DATE CODE BOTH PAGES 10/22/79. LAST MINOR REVISION 01/05/84 WHICH UPDATED REFERENCE TO NEMA STD LI-1-1983 AND CORRECTED TRADE NAME ON PREVIOUSLY APPROVED SUPPLIER. NO OTHER CHANGE SINCE 1984. |
| [[]) HΙ -10. 1 | POLYESTER GLASS LAMINATE | 09/24/82 | DATE CODE PAGES 1 THRU 4-2/11/76, PAGE 5 09/24/82. MINOR REVISIONS PAGE 1 LAST-12/22/78, PAGE 2 01/31/78, PAGE 3 AND 4 LAST 12/22/78, PAGE 5-NONE. NO CHANGE AFTER 1984. |
| MI*-25. 1 | IRON CASTINGS (GRAY IRON), GENERAL PURPOSE | 09/13/82 | ONE PAGE DATE CODE 09/13/82. NO REVISIONS. THUS NO REVISIONS AFTER 1984. |

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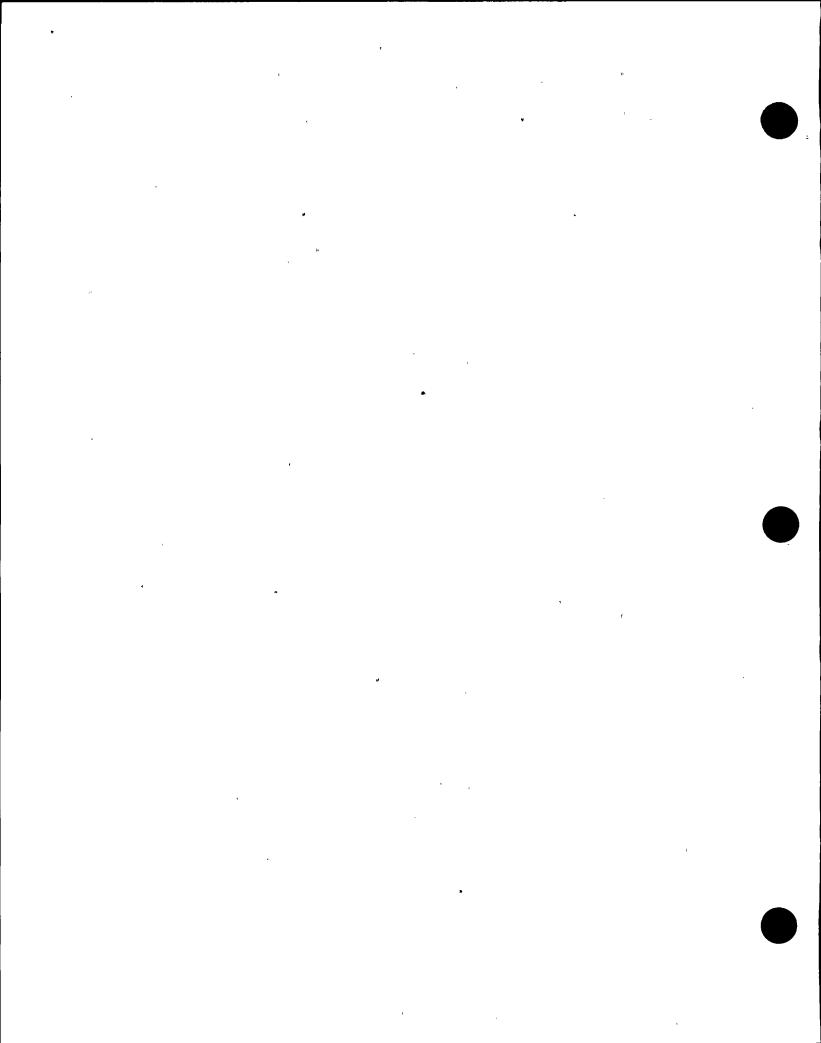
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P. G. & E. SPECIFICATION EVALUATION

| 8 | 07/31/91 | | | |
|--------|----------------|---|----------|--|
| (E) | SPEC. NO. | DESCRIPTION | DATE | REVISION DESCRIPTION |
| Ø | | • | t t | |
| NEM | MN -50. 1 | NUTS - FINISHED HEX - PLATED (THIS SPECIFICATION ALSO APPLIES TO HEX JAM NUTS) | 05/06/91 | DATE CODE ALL 4 PAGES 05/06/91. THIS REVISION (DCR 11454) REFERENCES CURRENT AMERICAN STANDARDS AND INCLUDES APPLICATION OF BRITISH STANDARD MATERIAL. PREVIOUS DATE CODE 12/10/81. NO OTHER REV AFTER 1984. |
| ダーダーダ | | NUTS - HEX - HEAVY SEMI-FINISHED - PLATED (THIS SPECIFICATION APPLIES ALSO TO HEX JAM NUTS) | 05/07/91 | DATE CODE BOTH PAGES 05/07/91. THIS REV (DCR 11455) UPDATES REF TO CURRENT U.S. STANDARDS AND INCLUDES APPLICATION OF BS STD MATERIAL. PREVIOUS REV 12/10/81. NO OTHER CHANGE AFTER 1984. |
| REV. | ми -50. 4 • | HUTS - HEX, MACHINE SCREWS PLATED (THIS SPECIFICATION ALSO APPLIES TO SQUARE NUTS) | 02/10/77 | ONE PAGE. DATE CODE 1954. MINOR REVISION 02/10/77. NO CHANGE AFTER 1984. |
| · ' | HP - 5. 8 | NOMEX ARAMID PAPER | 12/15/78 | ONE PAGE. DATE CODE 09/03/75. LAST HINOR REVISION 12/15/78. NO CHANGE AFTER 1984. |
| ¥ | MR -20. 1 | ROPE-THERMOSETTING FIBER GLASS | 03/23/81 | ONE PAGE. DATE CODE 10/15/70. LAST HINOR REVISION 03/23/81. NO REVISION AFTER 1984. |
| 17. | MS -25. 1 | SCREWS CAP - HEX HEAD - PLATED (SAME AS FINISHED HEX HD. BOLT) | 04/27/77 | 3 PAGES, DATE CODE 1954. PAGE 1 LAST MINOR REV. 04/27/77. NO CHANGE AFTER 1984. |
| 2 | HS -25. 2 | SCREWS-CAP-HEX HEAD PLATED-HI-TENSILE | 11/15/79 | ONE PAGE, DATE CODE 04/27/77. MINOR REV 11/15/79. NO CHANGE AFTER 1984. |
| A ' | MS -25. 7 | SCREWS-ROUND HEAD MACHINE - PLATED | 02/10/77 | ONE PAGE DATE CODE 1954. MINOR REVISION 02/10/77. NO CHANGE AFTER 1984. |
| 9 | HS -40. 3 | SLEEVING - COATED ELECTRICAL - CLASS F | 06/12/79 | 3 PAGES, DATE CODE ON ALL 06/12/79. NO REVISIONS, THUS NO CHANGE SINCE 1984. |
| • | HS -70.12 | STEEL BARS-HOT ROLLED LOW CARBON | 02/14/91 | REVISION 02/14/91(DCR 11419) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION 11/24/80. NO OTHER CHANGE SINCE 1984. |
| | HS -70.13 | STEEL-HOT ROLLED SHEET AND STRIP COMMERCIAL QUALITY | 02/14/91 | REVISION 02/14/91 (DCR 11427) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION 12/14/82. NO OTHER CHANGE SINCE 1984. |





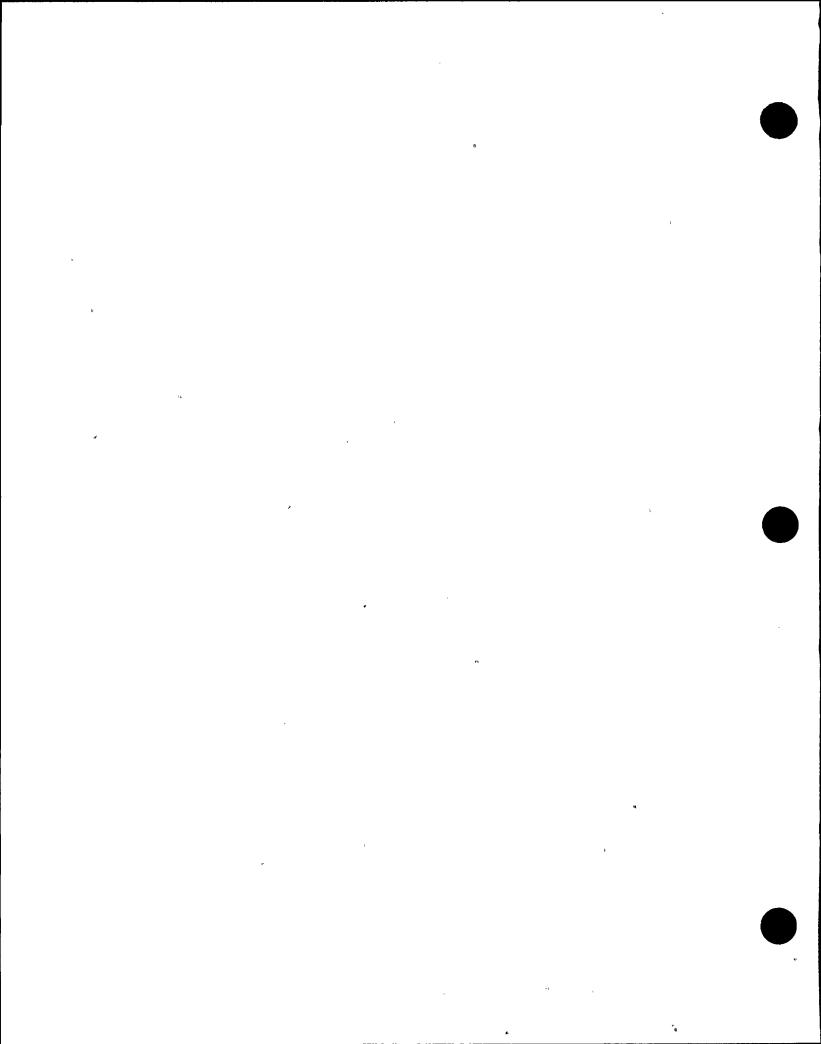
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Page No. 4 P. G. & E. SPECIFICATION EVALUATION

| | 07/31/91 | • | | _ | t - |
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| Acessues | | 3 | | - | |
| 3 | SPEC. NO. | 863 | DESCRIPTION | DATE | REVISION DESCRIPTION |
| 馬 | | だ | 1 | 1 1 | |
| s Nemy | MS -70.14 | ₩ | STEEL-MILD STEEL CARBON PLATE (UNIVERSAL MILL AND SHEARED PLATES) | 02/14/91 | REVISION 02/14/91 (DCR 11428) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION 11/24/80. NO OTHER CHANGES SINCE 1984. |
| DIE | HS -70.15 | | STEEL-COLD FINISH BARS AISI-C-1215 | 11/14/80 | DATE CODE 02/07/73. HINOR REVISION 11/14/80. NO CHANGE AFTER 1984. |
| , ø, | HS -70.16 | | C. F. AISI C-1018 | 07/23/91 | ONE PAGE DATE CODE 7/23/91 ADDED APPLICATION OF BS STD. MAT'L. PREVIOUS ISSUE DATE CODE 2/8/73 WITH MINOR REV. 11/24/80. NO OTHER CHANGE SINCE 1984. |
| y REV. | MS -70.17 | | STEEL-AISI-C-1018-SAE-1018 COLD FINISHED KEY STOCK (SOUARE STOCK ONLY) | 02/15/91 | REV 02/15/91 (DCR 11418) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION 11/24/80. NO CHANGE AFTER 1984. |
| v. 1 | HS -70.32 | | FLATTENED EXPANDED METAL-STEEL | 04/17/91 | DATE CODE 04/17/91 (DCR 11449) INCORPORATED BRITISH SOURCED MATERIAL. PREVIOUS DATE CODE 03/09/73. NO OTHER CHANGE SINCE 1984. |
| 4777 | HS -70.38 | | STEEL-HOT ROLLED POLE STEEL | 02/14/91 | REV 02/14/91 (DCR 11433) ADDRESSED APPLICATION OF BRITISH MATERIAL. PREVIOUS REVISION WAS 06/15/81. NO OTHER CHANGE SINCE 1984. |
| ~ 4 Pg | MS -70.42 | | SHAFT FORGING, CARBON STEEL (NOT REOMHENDED FOR WELDED LANDS) USED FOR ALL FLANGED SHAFTS AND ALL SHAFTS OVER 10" DIA. | 04/23/75 | DATE CODE 11/10/72, MINOR REVISION 04/23/75. NO CHANGE AFTER 1984. |
| // 0 | нs -70.43 | | STEEL-VENTILATING SPACER-C-1008 | 02/14/91 | REV 02/14/91 (DCR 11417) ADDRESSED APPLICATION OF BS STD HATERIAL. PREVIOUS REVISION WAS 03/06/73. NO OTHER CHANGES SINCE 1984. |
| 7 25 | HS -70.46 | | STEEL-SHEET-COLD ROLLED ASTH A-366-72 | 02/14/91 | REV 02/14/91 (DCR 11416) ADDRESSED APPLICATION OF BS STD HATERIAL. PREVIOUS REVISION 05/09/83. NO CHANGE SINCE 1984. |
| |) HS -70.75 | 4. | STEEL-ELECTRICAL SHEET (USE ELEC. AISI SPEC. M36) (CORE | 03/13/74 | DATE CODE PAGE 1-03/13/74. DATE CODE PAGE 2-6/01/67. NO CHANGE AFTER 1984. |





Page No.





P. G. & E. SPECIFICATION EVALUATION

| | Page No. | 5 | | | P. G. & E. SPECIFICATION EVALUATION |
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| beers | 07/31/91 | | | | |
| • | SPEC. NO. | ٠ | DESCRIPTION | DATE | REVISION DESCRIPTION |
| B | • | | • | 1 1 | na dia mandria di Kalendaria di Kalendaria di Kalendaria di Kalendaria di Kalendaria di Kalendaria di Kalendari |
| 5 | MS -70.77 | | STEEL-ELECTRICAL SHEET-FULLY PROCESSED | 02/14/91 | REV 02/14/91 (DCR 11432) ADDRESSED APPLICATION OF BS STD MATERIAL. PREVIOUS REVISION WAS 03/13/74. NO OTHER CHANGE SINCE 1984. |
| NEMP | HT -10. 4 | | MICA PAPER TAPE | 06/15/81 | DATE CODE PAGES 183-08/31/73, PAGES 284-11/12/80. MINOR REVISIONS PAGE 3-12/15/75, PAGE 4-06/15/81. NO CHANGE AFTER 1984. |
| će | MT -10. 5 | | DACRON TAPE005 | 06/15/79 | DATE CODE 12/21/78. LAST MINOR REVISION 06/15/79 OH ONLY PAGE. NO CHANGE SINCE 1984. |
| 4 | HT -10. 7 | | POLYESTER-GLASS BANDING TAPE | 05/10/82 | DATE CODE BOTH PAGES 01/17/80. LAST MINOR REV ON PAGE 2-05/10/82. NONE ON PAGE 1. NO CHANGE AFTER 1984. |
| Kev. | MT -10.16 | | MAT ADRESIVE TAPE | 07/16/79 | 3 PAGES ALL WITH DATE CODE 06/30/69. LAST MINOR REV PAGE 1-09/23/77, PAGE 3-07/16/79. NONE PAGE 2. THUS NO REVISION AFTER 1984. |
| `` | HT -10.17 | | HIGH SHRINK HYLAR TAPE | 04/04/79 | ONE PAGE. DATE CODE 02/25/70. MINOR REV 04/04/79. THUS NO CHANGE AFTER 1984. |
| AT. | HT -10.23 | _ | VARNISH HAT TAPE | 05/25/78 | 4 PAGES TOTAL. DATE CODE PAGES 1,2,3-11/20/68. DATE CODE PAGE 4-01/31/78. MINOR REV PAGE 1 & 2-05/25/78. THUS NO CHANGE AFTER 1984. |
| 2 | MT -10.30 | | COTTON TAPE | 09/23/77 | ONE PAGE. DATE CODE 08/20/76. LAST MINOR REVISION 09/23/77. NO REVISION AFTER 1984. |
| 1 /2 | HT -10.33 | | B-STAGE MICA PAPER TAPE | 09/03/80 | DATE CODE 06/25/70 ON ALL 3 PAGES. MINOR REVISION PAGE 1-09/03/80, PAGE 2 LAST-07/16/79. NO REVISION AFTER 1984. |
| 7 | HT -10.37 | • | B-STAGE DACRON-GLASS TAPE ` | 07/21/80 | DATE CODE BOTH PAGES 12/15/77. LAST MINOR REVISION PAGE 1-07/21/80. NONE ON PAGE 2. NO CHANGE SINCE 1984. |
| Ŋ | HT -10.38 | | POLYESTER GLASS TAPE | 07/27/83 | DATE CODE ON BOTH PAGES 07/27/83. NO REVISIONS. THUS NO REVISIONS SINCE 1984. |
| J. | HV -10. 2 | | POLYESTER INSULATING VARNISH | 02/14/91 | REV 02/14/91 (DCR 11430) APPROVED USE OF BRITISH SOURCED MATERIAL. PREVIOUS REVISION WAS 03/25/80. NO OTHER CHANGE SINCE 1984. |
| 5 | HV -10. 5 | | INSULATING ENAMEL-BLACK-AIR DRY | 02/14/91 | REV 02/14/91 (DCR 11431) ADDRESSED REFERENCE TO BRITISH SOURCED MATERIAL. PREVIOUS REVISION WAS 04/23/81. NO OTHER CHANGE SINCE 1984. |
| | HV -20. 9 | | BONDING ADHESIVE FOR ROTOR COILS | 01/12/81 | ONE PAGE, DATE CODE 04/07/71. MINOR REVISION 01/12/81. NO CHANGE AFTER 1984. |

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P. G. & E. SPECIFICATION EVALUATION

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| 07/31/91 | | | |
| S SPEC. NO. | | | |
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| ₩ SPEC. NO. | DESCRIPTION | DATE | REVISION DESCRIPTION |
| মি | • | 1 1 | na dia mandria dia mandria dia mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpika Mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpikambana dia mpika |
| , | | | 100/ |
| HW - 5. 1 | WASHERS - STEEL PLATED | 02/10/77 | ONE PAGE, DATE CODE 05/17/55. HINOR REVISION 02/10/77. NO CHANGE AFTER 1984. |
| <u> </u> | ASA-827.2-53 | | |
| ₹ ₩ - 5. 2 | HACHERS - CROTHS LOCK - DIATER | 09/23/80 | DATE CODE PAGE 1-09/23/80, PAGES 283-05/05/55. NO REVISIONS. NO CHANGE AFTER 1984. |
| \$ MA - 2. 5 | WASHERS - SPRING LOCK - PLATED | 09/23/60 | DATE CODE PAGE 1-07/23/00, PAGES 283-05/05/55: NO REVISIONS. NO CHANGE AT LEE 1704. |
| 0 | LIGHT HEDIUM HEAVY EXTRA HEAVY | | · |
| → MW -25. 3 | MAGNET WIRE-ROUND, SQUARE, OR | 06/15/81 | DATE CODE 09/09/68 ON PAGES 1 & 3. DATE CODE 06/24/77 ON PAGES 2 & 4. LAST MINOR REV. 06/15/81. NO |
| N | RECTANGULAR- UNVARNISHED FUSED | | CHANGE SINCE 1984. |
| • | POLYESTER/GLASS COVERING, WITH | | |
| ~ | OR WITHOUT ENAMEL UNDERCOAT, | | |
| | CLASS F 155C | • | |
| X | | | |
| 2 HW -25. 5 | MAGNET WIRE-ROUND, SQUARE, OR | 05/10/82 | DATE CODE PAGE 1-6/24/77, PAGES 2 & 3-11/15/68. HINOR REVS PAGE 1-01/31/78, PAGE 2-06/24/77, PAGE |
| | RECTANGULAR CLASS H (180 C) | | 3-05/10/82. NO CHANGE SINCE 1984. |
| | | | 2000 0000 4 0/ 00000 0 0/ 00000 0 0/ 00000 0000 0000 0000 00000 0000 0000 0000 |
| HW -70.10 | B-STAGE MICA WRAPPER | 09/03/80 | DATE CODE PAGE 1-06/25/70, PAGE 2-06/07/78. HINOR REVS PAGE 1-LAST 09/03/80, PAGE 2-06/15/79. NO CHANGE |
| P | | | SINCE 1984. |
| Ps - 3006 | BRAZING AMORTISSEUR BARS | 08/01/67 | NO REVISION SINCE 1984. |
| .7 73 3000 | GRACING MICKIESSEON DANS | 00/01/01 | no nevision since 17544 |
| PS - 3014 | GRINDING OF SYNCHRONOUS POLES | 06/04/70 | HO REVISIONS AFTER 1984 |
| | BOLTED POLES ONLY | | |
| £: | _ | | |
| PS - 3018 | SEHI-AUTOMATIC POLE WELDER | 10/04/79 | DATE CODE ON ALL PAGES 07/12/90 EXCEPT PAGE 24 WHICH IS 10/4/79. NO CHANGE AFTER 1984 |
| $\tilde{\omega}$ | SKEWED BOLT ON POLES | | |
| | • | | # # # # # # # # # # # # # # # # # # # |
| Q PS - 3022 | PROCEDURE FOR WELDING ROTOR | 12/05/90 | DATE CODE 10/16/90 (DCR 11410) ADDED ALTERNATE NOT METHOD, MAGNETIC INK PER PEN PROCEDURE R5036. 12/05/90 |
| g PS - 3022 | POLES-BOLTED TYPE | | REV (DCR 11414) FURTHER DESCRIBED THIS ALTERNATE METHOD. PREVIOUS ISSUE WAS 01/16/76, SO NO OTHER CHANGES |
| 0.1 | • | | SINCE 1984. |
| G1 PS - 5004 | STAKING CORE IN MACHINED FRAME | 05/12/67 | NO REVISION SINCE ORIGINAL ISSUE. THUS NO CHANGE SINCE 1984. |
| 1 23 2 3004 | FOR SKEWED CORE, SEGHENTAL | 07, 12,01 | NO HELIOTOR STREET STREET THESE IN STREET TO S |
| | 100 OVERER COURTACOURTAINE | | |

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P. G. & E. SPECIFICATION EQUIVALENCY REVIEW

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DATE: 08/02/91

| 9 | SPEC NO. | DESCRIPTION . | EQUIVALENCY SALE SALE SALE SALE SALE SALE SALE SALE | APPROVAL DOCUMENTATION |
|-----------|------------------|--|---|--|
| 002131.05 | EI - 1. 1. 0 | INSULATION SYSTEM, STATOR - FORM COIL - OPEN | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | H/A |
| R | E1 - 1. 5. 1 | INSULATION SYSTEM, ROTOR - SYNCHRONOUS - LAYER WOUND COIL POLE - CLASS | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | H/A , |
| Nemp | EI - 3. 1 | INSPECTION, STATOR COIL INSPECTION OUTLINE | PEP SPEC. EI-3.1 INCORPORATED INTO PEH SPEC R-5034. | E.O. 11462 |
| 7/0 / | EP - 1. 1. 0 | PROCESSING PRACTICES - COILS, STATOR - FORM COIL (OKV TO 6.6 KV) | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | H/A |
| らな | j | POLE, PROCESS-LAYER WOUND COIL-POLE | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | Н/А |
| y | EQ - 2.17 | STATOR COIL INSPECTION REPORT, FILL IN SHEET | PEP SPEC EQ-2.17 INCORPORATED INTO PEM SPEC R-5034. SEE PROCEDURE SUMMARY. NOT NECESSARY TO USE EQ-2.17 AS RECORD. | ·E.O: 11462 |
| にて | EQ - 5. 8 | INSPECTION REPORT, ROTOR POLE ASSEMBLY, WELDING | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | EQ- 5. 8 WAS SUBHITTED BY PEH. |
| _ | ET - 1. 1 | TERMINALS, FIELD LEAD | SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. MAT'L SAME, DCR ADDRESSES CHANGE IN CONFIGURATION. | DCR 11409 10/3/90 |
| 11 | ET - 2. 2. 1 | TESTING, DIELECTRIC TEST OF AC STATOR COILS | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | H/A |
| , / | EW - 4. 1 | WRAPPER, TAPER CUT | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | H/A |
| 2 | HA -10. 2 | ADHESIVES, ADHESIVE FOR SPACERS | PEH USES 200% FELT SPACERS (R8010) WHICH DO NOT REQUIRE THE USE OF ADDITIONAL ADHESIVE. | N/A |
| 107 12 | HC -10. 7 | CABLE, CABLE - 5000 VOLT CLASS B 130 C | MATERIAL USED: SILICON INSULATED TYPE SIWO-KUL, 70MM SQ., 6.6KV FLEXIBLE STRANDED CABLE WITH FLAME RESISTANCE REQUIREMENTS WHICH MEET IEEE 383 (ADDED TO MC-10.7). | DCR 11397 DATED 04/11/90, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE. |
| <i>*</i> | нс -10.10 | CABLE, CABLE - 600 VOLT CLASS B 125 C | MAJERIAL USED: SILICON INSULATED TYPE SIWO-KUL, 16MM Sp., 3.3KV FLEXIBLE STRANDED CABLE WITH FLAME RESISTANCE REQUIREMENTS WHICH MEET IEEE 383. | CERTS ON FILE AT PEH. |
| T V | нс -10.13 | CABLE, CABLE - SPACE HEATER HOOKUP | NON-1E CIRCUIT. CABLE USED FLAME RETARDANT, HALOGEN FREE, HI TEMP, GLASS BRAIDED LIKE MC-10.13. | CERTS ON FILE AT PEH. HTC 1743 MAPPROVES USE. |
| al S | нс -10.15 | CABLE, SOLID - 600V - CLASS A | MATERIAL USED: SILICON INSULATED TYPE SIMO-KUL, 16MM SQ., 3.3KV FLEXIBLE STRANDED CABLE WITH FLAME RESISTANCE REQUIREMENTS WHICH HEET IEEE 383. (REPLACES HC-10.4 WHICH IS ASBESTOS TYPE) | HS 11419 DATED 01/07/91, CERTS ON FILE AT PEM. |
| | ИС -20. 1 | CONNECTORS, CONNECTOR | NO CHANGE | CERTS ON FILE AT PEN. |

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DATE: 08/01/91

| SPEC NO. | DESCRIPTION | EQUIVALENCY | APPROVAL DOCUMENTATION '- |
|-----------|---|---|---|
| нс -80. 1 | COPPER, HARD DRAWN, BARS, ROOS & SHAPES | SPECIFIED BUS BAR MATERIAL IS ETP 110, USED IN TERMINAL BOX. BRITISH MATERIAL (BS 2870 GRADE C101) IS AN EQUIVALENT BUS BAR MATERIAL. STRESSES IN THIS APPLICATION VERY LOW. | H/A |
| HC -80. 2 | COPPER, SOFT DRAWN, BARS, ROOS & SHAPES | THIS SOFT TEMPER BUS BAR USED WHEN BARS ARE FORMED. BRITISH SID MATERIAL (BS 2870 GRADE C101) IS AN EQUIVALENT GRADE. LOW STRESS APPLICATION. | н/а |
| HC -80. 5 | COPPER, COPPER-ANNEALED-OXYGEN FREE OR DEOXIDIZED-BAR ROOS & SHAPES | APPROVED EQUAL WAS BRITISH ST'D BS-1432 - 1987, GRADE C103 CONDITION O. SEE APPLICATIONS TABLE. BRITISH ST'D SPEC. ADDED TO HC-80.5. MAT'L USED WAS BS 2870 C 101 (NOT OXYGEN FREE). DEVIATION WAS ANALYSED AND ACCEPTED IN DISCREPANCY REPORT. | DCR 11434 DATED 02/12/91, CERTS ON FILE AT PEM &PEP. DIS. REPORT 2783. |
| нс -80. 6 | COPPER, COPPER-HARD DRAWN-OXYGEN FREE OR DEOXIDIZED-BAR ROO & SHAPES | MATERIAL USED: COMPLIES TO BRITISH ST'D BS-4608, GRADE C103 IN HALF HARD CONDITION FOR SHEET. FOR DAMPER BARS BS-1433 GRADE 103C USED. BRITISH STD SPECS. ADDED TO HC-80.6 AS ACCEPTABLE. SEE APPLICATIONS TABLE. | DCR 11435 DATED 02/12/91, CERTS ON FILE AT PEH. CERTS ALSO IN DOC. 1. PACKAGE. |
| HF - 3. 3 | FELT, TREATED DACRON FELT | PEH USES FELT WITH 200X RESIN SATURATION (R8010) THUS ELIMINATING THE NEED FOR ADDITIONAL ADHESIVE MA-10.2. | R 8010 ON FILE AT PEP. |
| HI - 5. 1 | INSULATION, INSULATION, COTTON - PHENOLIC SHEET | NEMA GRADE LE WAS SPECIFIED BY PEM. HI 5.1 IS NEMA GRADE C (GENERAL PURPOSE). BOTH ARE PHENOLIC-COTTON SHEETS AND ARE APPROVED. | CERTS ON FILE AT PEH. |
| HI - 5. 3 | INSULATION, INSULATION, COTTON BASED - PHENOLIC TUBE | MATERIAL OBTAINED FROM PEP. | CERTS ON FILE AT PEP. |
| HI -10. 1 | INSULATION, POLYESTER GLASS | PEH USED: HI-10.7 (GOP-3) FOR ROTOR POLE WASHERS, HI-5.5 (G-11) FOR STATOR SLOT STICKS. | HST TATE DATED 10/17/90, CERTS ON FILE AT PEH. |
| н1 -25. 1 | IRON, IRON CASTINGS (GRAY IRON), GENERAL PURPOSE | SUPPLIED BY PEP. | H/A. |
| HN -50. 1 | HUTS, HUTS - FINISHED HEX - PLATED (THIS SPECIFICATION ' ALSO APPLIES TO HEX JAH HUTS) | MATERIAL USED COMPLIES TO BRITISH ST'D BS-1768 GRADE 1. BRITISH ST'D SPEC. ADDED TO MN-50.1 ACCEPTABLE. | DCR 11454 DATED 05/06/91 CERTS ON FILE AT PEH. COPIED TO PEP. |
| หห -50. 2 | NUTS, NUTS - HEX - HEAVY SEHI-FINISHED - PLATED (THIS SPECIFICATION APPLIES ALSO TO HEX JAH NUTS) | MATERIAL USED COMPLIES TO BRITISH ST'D BS-1768 GRADE 3. BRITISH ST'D SPEC. ADDED TO HC-50.2 ACCEPTABLE. | DCR 11455 DATED 05/06/91 CERTS ON FILE AT PEH. COPIED TO PEP. |
| ин -50. 4 | HUTS, HUTS - HEX, HACHINE SCREWS - PLATED (THIS SPECIFICATION ALSO APPLIES TO SOURRE HUTS) | SUPPLIED BY PEP. | 'H/A |
| MP - 5. 8 | PAPER, NOMEX ARAMID PAPER | BOTH NOMEX 410, UNCOATED. | CERTS ON FILE AT PEH. COPIED TO PEP. |
| HR -20. 1 | ROPE, ROPE-THERHOSETTING FIBER | SAME MATERIAL SUPPLIED BY A PEH APPROVED VENDOR. | CERTS ON FILE AT PEM. CON |

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| n | | P. G. & E. S | PECIFICATION EQUIVALENCY REVIEW | PAGE 3 OF 5 |
|------|--------|---|--|--|
| | - | | | DATE: 08/01/91 |
| SPEC | : Na · | DESCRIPTION CONTRACTOR | EQUIVALENCY | PAPPROVÁL DOCLMENTATION |
| HS - | 25. 1 | SCREUS, SCREUS CAP - HEX HEAD - PLATED (SAME AS FINISHED HEX HD. BOLT) | BS 1768 GRADE S EXCEEDS REQ. OF MS 25.1. | CERTS ON FILE AT PEN. COPY AT PEP. AS THE |
| HS - | 25. 2 | SCREWS, SCREWS-CAP-HEX HEAD PLATED-HI-TENSILE | BS 1768 GRADE S HAS SAME PROOF LOAD. | CERTS ON FILE AT PEH. COPY AT PEP. NO 11465 |
| HS - | 25. 7 | SCREWS, SCREWS-ROUND HEAD MACHINE - PLATED | SUPPLIED BY PEP. | H/A |
| HS · | 40. 3 | SLEEVING, SLEEVING - COATED ELECTRICAL - CLASS F | NOT USED. HICA TAPE USED TO INSULATE STATOR LEADS. ACCEPTABILITY CONFIRMED BY HI POT TESTING. OPTION ALLOWED AS PART OF EI 1.1.0. | H/A |
| Н . | 70.12 | STEEL, STEEL BARS-HOT ROLLED LOW CARBON | MATERIAL USED: COMPLIES TO BRITISH ST'D 85-4360 GRADE 43A (EN 10 025:1990 GRADE FE 430A). BRITISH ST'D SPEC. ADDED TO HS-70.12 ACCEPTABLE. REF. APPLICATIONS TABLE. | DCR 11419 DATED 01/23/91, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE |
| HS | -70.13 | STEEL, STEEL-HOT ROLLED SHEET AND STRIP COMMERCIAL QUALITY | HATERIAL USED: COMPLIES TO BRITISH ST'D BS-1449 GRADE CR SP4 GP. BRITISH ST'D SPEC. ADDED TO MS-70.13 ACCEPTABLE. SEE APPLICATIONS TABLE. | DCR 11427 DATED 02/14/91, SPEC DOESH'T REQUIRE TEST CERTS |
| HS · | -70.14 | STEEL, STEEL-HILD STEEL CARBON PLATE (UNIVERSAL HILL AND SHEARED PLATES) | MATERIAL USED: COMPLIES TO BRITISH ST'D BS-15C1-161 GRADE 430A. BRITISH ST'D SPEC. ADDED TO MS-70.14 ACCEPTABLE. SEE APPLICATIONS TABLE. | DCR 11428 DATED 02/12/91, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE |
| HS · | -70.15 | STEEL, STEEL-COLD FINISH BARS AIST-C-1215 | HATERIAL USED: COMPLIES TO BRITISH ST'D BS-605 M36 CONDITION T. | DCR 11411 DATED 10/15/90, CERTS ON FILE AT PEM. |
| HS · | -70.16 | STEEL-DRAWN OR ROLLED, C. F. AIST C-1018 | BS 970, 070H20 APPROVED AS EQUAL FOR STATOR TOOTH SUPPORTS. | DCR 11440 3/4/91 |
| HS | -70.17 | STEEL, STEEL-AIST-C-1018-SAE-1018 - COLD FINISHED KEY STOCK (SQUARE STOCK ONLY) | HATERIAL COMPLYING TO BRITISH ST'D BS-970 PT 1 GRADE 080M30 WAS APPROVED AND ADDED TO MS-70.17. A HIGHER TENSILE SIEEL BS-970 605 M36 CONDITION WAS USED WHICH IS SUPERIOR AND HENCE ACCEPTABLE. | DCR 11418 DATED 01/23/91, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE |
| HS | -70.32 | SIEEL, FLATIENED EXPANDED METAL-SIEEL | MATERIAL USED: COMPLIES TO BRITISH ST'D BS-1449 PT 1. BRITISH MATERIAL ADDED TO HS-70.32. SIZE OF OPENINGS IN EXPANDED METAL VARIES FROM ORIGINAL, BUT IS NOT CRITICAL. | CATALOG INFO AVAILABLE. DCR 11449 |
| HS | -70.38 | FSTEEL, STEEL-HOT ROLLED POLE STEEL | HATERIAL USED: TENSILOY 250 HOT ROLLED STIL. MATIL ADDED TO MS-70.38 ACCEPTABLE. | DCR 11433 DATED 02/11/91, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE |
| .нѕ | -70.42 | STEEL, SHAFT FORGING, CARBON STEEL (NOT RECHMENDED FOR WELDED LANDS) USED FOR ALL FLANGED SHAFTS AND ALL SHAFTS OVER 10" DIA. | HATERIAL USED: COMPLIES TO BRITISH ST'D BS-970-080H40 WHICH ENCOMPASSES REQ'TS OF PEP SPEC. | DOC. FOLDER, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE. |

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| u | | | DATE: 08/01/91 |
| SPEC NO. | DESCRIPTION | EQUIVALENCY | APPROVÁL DOCUMENTATION |
| HS -70.43 | STEEL, STEEL-VENTILATING SPACER-C-1008 | MATERIAL USED COMPLIES TO BRITISH ST'D BS-970-070M20. BRITISH ST'D SPEC. ADDED TO MS-70.43 ACCEPTABLE. SEE APPLICATIONS TABLE. | DCR 11417 DATED 01/23/91, CERTS ON FILE AT PEM. CERTS ALSO IN DOC. PACKAGE |
| HS -70.46 | STEEL, STEEL-SHEET-COLD ROLLED ASTH A-366-72 | MATERIAL USED COMPLIES TO BRITISH ST'D BS-1449 PART 1 GRADE CRSP4GP. BRITISH ST'D SPEC. ADDED TO MS-70.46 ACCEPTABLE. | DCR 11416 DATED 01/07/91, CERTS ON FILE AT PEN. |
| HS -70.75 | STEEL, STEEL-ELECTRICAL SHEET (USE ELEC. AISI SPEC. M36) (CORE PLATED) | NOT USED | NOT USED |
| HS -70.77 | STEEL, STEEL-ELECTRICAL SHEET-FULLY PROCESSED | MATERIAL USED COMPLIES TO BRITISH ST'D BS-6404 PT 8 SECTION 8.4, GRADE 310-50-A5. | CERTS ON FILE AT PEN. CERTS ALSO IN DOC. PACKAGE. |
| HT -10. 4 | TAPE, HICA PAPER TAPE | SUPPLIED BY PEP TO PEH UNDER P.O. JA30245. | CERTS ON FILE AT PEP.: CERTS ALSO IN DOC. PACKAGE. |
| HT -10. 5 | TAPE, DACROH TAPE005 | THE DIRECT EQUIVALENT TAPE IS MADE TO BS 6551 1985. SAME THICHNESS IS USED. | CERTS ON FILE AT PEM. BS - STD. ON FILE AT PEP. |
| HT -10. 7 | TAPE, POLYESTER-GLASS BANDING TAPE | THE HYPERTEN TAPE USED IS A DIRECT EQUIVALENT. THIS IS USED AS A BANDING TAPE, NOT AN INSULATING TAPE. | CATALOG INFO AVAILABLE AT PEP. |
| HT -10.16 | TAPE, MAT ADHESIVE TAPE | NOT USED. HAS APPLICATION AS AN OUTER COVERING ON STEEL SUPPORT RING. MT 10.38 WAS USED IN ITS PLACE. | H/A |
| HT -10.17 | TAPE, HIGH SHRINK HYLAR TAPE | THIS MATERIAL IS USED ONLY IN THE PROCESS OF WINDING THE COIL AND IS THEN DISPOSED OF. | CERTS NOT REQUIRED. |
| HT -10.23 | TAPE, VARNISH MAT TAPE | HT 10.33 SUPPLIED BY PEP WAS SUBSTITUTED FOR HT 10.23 WITH PEP APPROVAL. THIS TAPE INSULATES THE SUPPORT RING. | SEE HT 10.33 |
| HT -10.30 | TAPE, COTTON TAPE | THIS IS A SERVICE MATERIAL USED IN MANUFACTURE AND IS NOT IN THE FINAL MACHINE. | CERT NOT REQUIRED. |
| HT -10.33 | TAPE, B-STAGE HICA PAPER TAPE | SUPPLIED BY PEP TO PEM UNDER P.O. JA30245. | CERTS ON FILE AT PEP. |
| HT -10.37 | TAPE, B-STAGE DACRON-GLASS | THIS TAPE WAS NOT USED. ' INTENDED FOR JACKETING COIL CONNECTIONS. MT 10.38 WAS USED. | N/A |
| HT -10.38 | TAPE, POLYESTER GLASS TAPE | A DIRECT BRITISH EQUIVALENT (BS 3779 1985) WAS USED FOR THIS POLYESTER GLASS TAPE. | STD. AVAILABLE AT PEP. |
| HV -10. 2 | VARNISH, POLYESTER INSULATING VARNISH | HATERIAL USED BY PEH: STERLING 073-4951 CLASS A-H. ADDED TO SPEC MV-10.2 ACCEPTABLE. SEE APPLICATIONS TABLE. (REGULAR DOCUMENTED IN HOUSE TESTING) | DCR 11430, CERTS ON FILE AT PEH. |
| HV -10. 5 | ENAMEL, INSULATING ENAMEL-DLACK-AIR DRY | MATERIAL USED BY PEM: STERLING VA63. ADDED TO SPEC HV-10.5 ACCEPTABLE. | DCR 11431 DATED 02/11/91, CERTS ON FILE AT PEH. |

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P. G. E. SPECIFICATION EQUIVALENCY REVIEW

Page 500 of 5

DATE: 08/01/91

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|--|-----------|---|--|---|
| | HV -20. 9 | ADHESIVE, BONDING ADHESIVE FOR ROTOR COILS | SUPPLIED BY PEP. | CERTS ON FILE AT PEP. |
| | нw - 5. 1 | WASHERS, WASHERS - STEEL PLATED ASA-B27.2-53 | BRITISH FASTENER HARDWARE SURPASSES OR EQUAL TO THAT SPECIFIED IN STRENGTH. | CERTS ON FILE AT PEM |
| | KW - 5. 2 | WASHER, WASHERS - SPRING LOCK - PLATED LIGHT HEDIUM HEAVY EXTRA HEAVY | BRITISH STANDARD HARDWARE EQUAL OR SURPASSES SPEC REQUIREMENT. | CERTS ON FILE AT PEM. |
| | HW -25. 3 | HAGNET WIRE, HAGNET WIRE-ROUND, SQUARE, OR RECTANGULAR- UNVARNISHED FUSED POLYESTER/GLASS COVERING, WITH OR WITHOUT ENAMEL UNDERCOAT CLASS F 155C | SAHE MATERIAL, SAHE TRADENAME. | CERTS ON FILE AT PEH. CERTS ALSO IN DOC. PACKAGE. |
| | NV -25. 5 | WIRE, MAGNET WIRE-ROUND, SOUARE, OR RECTANGULAR CLASS II (180 C) | FABRICATED TO NEMA SPECIFICATIONS. | CERTS ON FILE AT PEH. CERTS ALSO IN DOC. PACKAGE. |
| 2007 | HW -70.10 | WRAPPER, B-STAGE HICA WRAPPER | SUPPLIED BY PEP TO PEH UNDER P.O. JA30245. | CERTS ON FILE AT PEP. CERTS ALSO IN DOC. |
| ì | PS - 3006 | BRAZING, BRAZING AMORTISSEUR BARS | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. INCORPORATED IN PEM R6095. | 60 11457 5/10/91. |
| ֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓ | PS - 3014 | POLES, GRINDING OF SYNCHRONOUS POLES BOLTED POLES ONLY | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. PEM INCORPORATED THIS IN THEIR R 6095. | EO 11457 5/10/91. |
| | PS - 3018 | WELDING, SEMI-AUTOMATIC POLE WELDER SKEWED BOLT ON POLES | APPLICABLE PORTION IS SHEET 25 OF THIS SPEC. (INSPECTION) EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. PEM POLE INSPECTION R 5015 INCLUDES REQUIREMENTS. | EO 11480 5/15/91. |
| | PS - 3022 | WELDING, PROCEDURE FOR WELDING ROTOR POLES-BOLTED TYPE | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. PART DEALING WITH NOT DOCUMENTED WITH PG & E.(DCR 11410 10/16/90). PEM R 6095 INCORPORATES THIS SPEC. | DCR 11410, 11414. EO 11460. |
| | PS - 5004 | PROCEDURE FOR STACKING CORE, STAKING CORE IN MACHINED FRAME FOR SKEWED CORE, SEGMENTAL LAMINATIONS | EQUIVALENT - SEE PROCEDURE SUMMARY SHEET DATED 2/7/91. | н/А |

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OCT 17 '91 11:19AM NEI PEEBLES-ELECT PRDS CLEVELÄND

FAX MESSAGE



ROLLS-ROYCE INDUSTRIAL POWER GROUP

| Date: | 17 October 1991 | No. of Pages (incl. this): | | |
|---------------------|---|---|--|--|
| | | • | | |
| To: Mr. Ed. Walters | | From: Frank Marino | | |
| Fax No.: | | Fax No.: 216-481-8386 | | |
| Location: | ••••••••••••••••••••••••••••••••••••••• | Location: NEI PEEBLES-ELECTRIC PRODUCTS, INC. | | |
| Copies to | *************************************** | | | |
| | • | *************************************** | | |
| | ······································ | • | | |
| | Dear Ed, | а | | |
| | Here are copies of the De | screpancy Report, and DCRB that | | |
| | you requested per C. Moos | brugger. | | |
| 0 | Regards | | | |
| | | | | |

Frank D. Marino Manager Quality Assurance

PEEBLES NEMP. 12.4. REV. 1 ATT. U

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| DISCREPANCY REPORT ALL AND THE | DATE | | TO: P.Z/ | |
|--|------------------------------------|-----------------|--------------------------|-------------|
| DISCREPANCY REPORT No. 2783 | 7-26-91 | NORMA | LRUSH | |
| SECTION I - INSPECTORS REPORT : BY INSPECTOR | DRWG. NO. | | | |
| VENDOR OR OPERATOR POTOR ASSY. A- | <u>66826°</u> ₹ 5 71 | WORKS | 128. TATION OR MACHINE | |
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| | ., | INSPECTOR SOM | ROBEAGED NEI IGA C | -2.91 |
| SECTION II - DISPOSITION, CORRECTIVE ACTION AN | ID COMMENTS | 10000 | | |
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| CORRECTIVE ACTION. | | | | |
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| VENDOR NOTIFIED OF DISCREPANCY | DEFT. SUPERVISO | OR REVIEW | • | |
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| DATE | BY NOTING | FIED TO CORRECT | | |
| RESPONSIBLE DEPT. PEM | | LA, MOR. | DATE | |
| SECTION III - COST OF DESCREPANCY | | | 1 Janus | |
| DECTION IN COST OF PEDGILE AND | | | | |
| REPLACEMENT MATERIAL: 8 | RE-WORK LABOR | | | i |
| | TOTAL COST OF I | | | |

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SECTION II DISCREPANCY REPORT NO. 2783

179824

DISPOSITION. CORRECTIVE ACTION AND COMMENTS

THE APPLICATION OF BRITISH STANDARD MATERIAL BS 1432 GRADE C103 HAD BEEN ALLOWED VIA DCR 11434. THIS IS OXYGEN FREE MATERIAL. THE MATERIAL USED C101 IS NOT CONSIDERED OXYGEN FREE.

NEI-PEP CONCURS WITH THE POSITION OF PEM ENGINEERING IN ALLOWING THE USE OF THIS GRADE OF COPPER IN THIS APPLICATION. THIS DECISION IS SUPPORTED BY THE FOLLOWING FACTS:

- 1. IT HAS BEEN PEM ESTABLISHED PRACTICE TO USE THIS GRADE FOR THIS APPLICATION.
- 2. BRAZING IS DONE TO THEIR ESTABLISHED PROCEDURE.
- 3. USING THIS METHOD AND MATERIAL FOR OVER 25 YEARS THEY HAVE NOT EXPERIENCED PROBLEMS WITH EITHER THE WELD OR PARENT METAL IN THE VICINTITY OF THE WELD.
- 4. THE RING IS BOLTED AND THE JOINT TO STRAPS IS RIVETED AS WELL, SO THE BRAZING IS NOT SUBJECTED TO ANY SIGNIFICANT STRESS.
- 5. AFTER BRAZING, THE PART IS NOT SUBJECTED TO COLD WORKING.

WE FEEL THE RESULTING ASSEMBLY IS RELIABLE AN CAN BE USED AS IS WITHOUT ANY ADVERSE CONSEQUENCES AS TO THE FUNCTION OF THE GENERATOR.

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| APPROVED THY PACIFIC BY SIG AUER, Supresson | SIMS ELECTRICAL 配いらいのは INSTRUCTION TO MANUFACTURING DEP | B.C. OCT/22/86 |
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| MANUFACTURE OR REWORK PARTS | INSTRUCTION TO MANUFACTURING DEPT | E.C. 047/22/86 |
| MANUFACTURE OR REWORK PARTS Requested By Regulation Dept. OR Supervisor Regulation | INSTRUCTION TO MANUFACTURING DEPT AS INDICATED - Signed: Disposition of Stock Return to Stock Rework Use | Next Assem. No. 7-67515-1 |
| MANUFACTURE OR REWORK PARTS Requested By Regulation Dept. OR Supervisor Regulation | INSTRUCTION TO MANUFACTURING DEPT AS INDICATED - Signed: Disposition of Stock Return to Stock | Next Assem. No. 7-67515-1 Affected |
| MANUFACTURE OR REWORK PARTS Requested By Reconstruct Dept. OR Supervisor Revort Date 10-30-86 | INSTRUCTION TO MANUFACTURING DEPT AS INDICATED - Signed: Disposition of Stock Return to Stock Rework None Scrap | Next Assem. No. D-67515-1 Affected Not Affected Effective on Serial 5-1076 |
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OCT 17 '91 11 E1AM NET PEEBLES-ELECT PROS CLEVELANDQUEST

C-66760A

DRAWING NO.

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ENGINEERING ORDER

MATERIAL SUBSTITUTION

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| Project Eng'r. | | REV. 1 ATT- 4 |
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| OCT 17 '91 | ADVANCE DRAWING CHANGE BIGINEERING ORDER MATERIAL SUBSTITUTION | . NO. 11309 |
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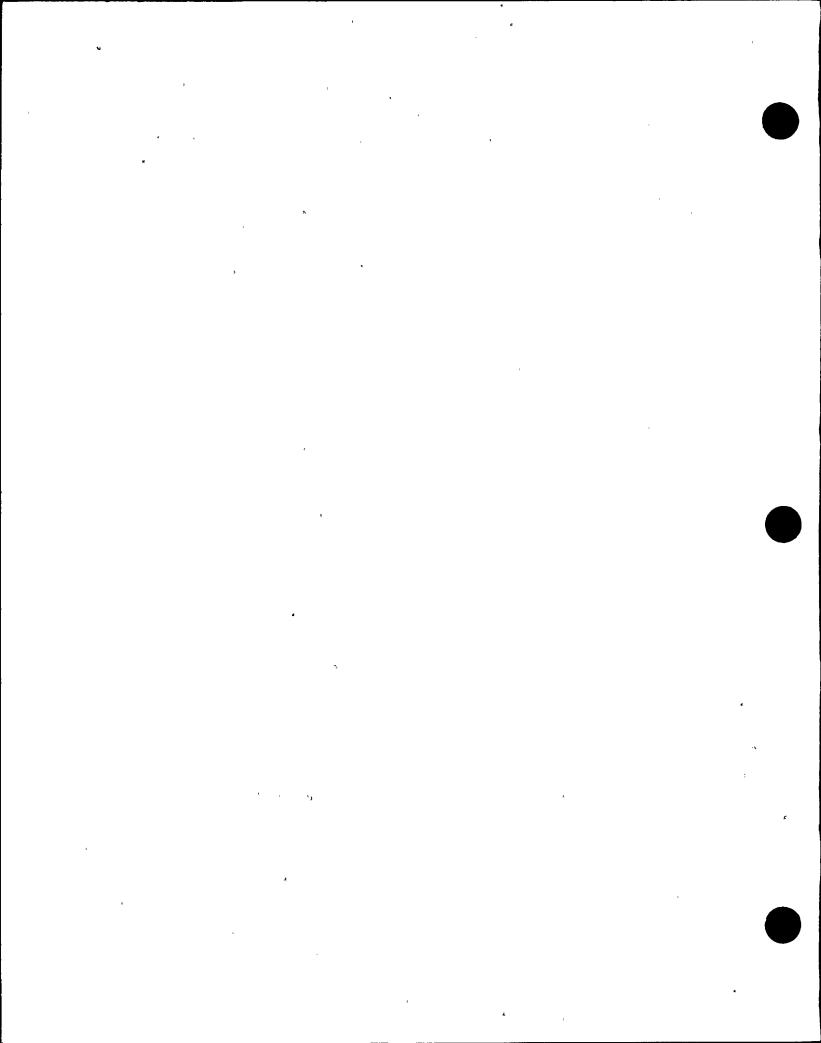
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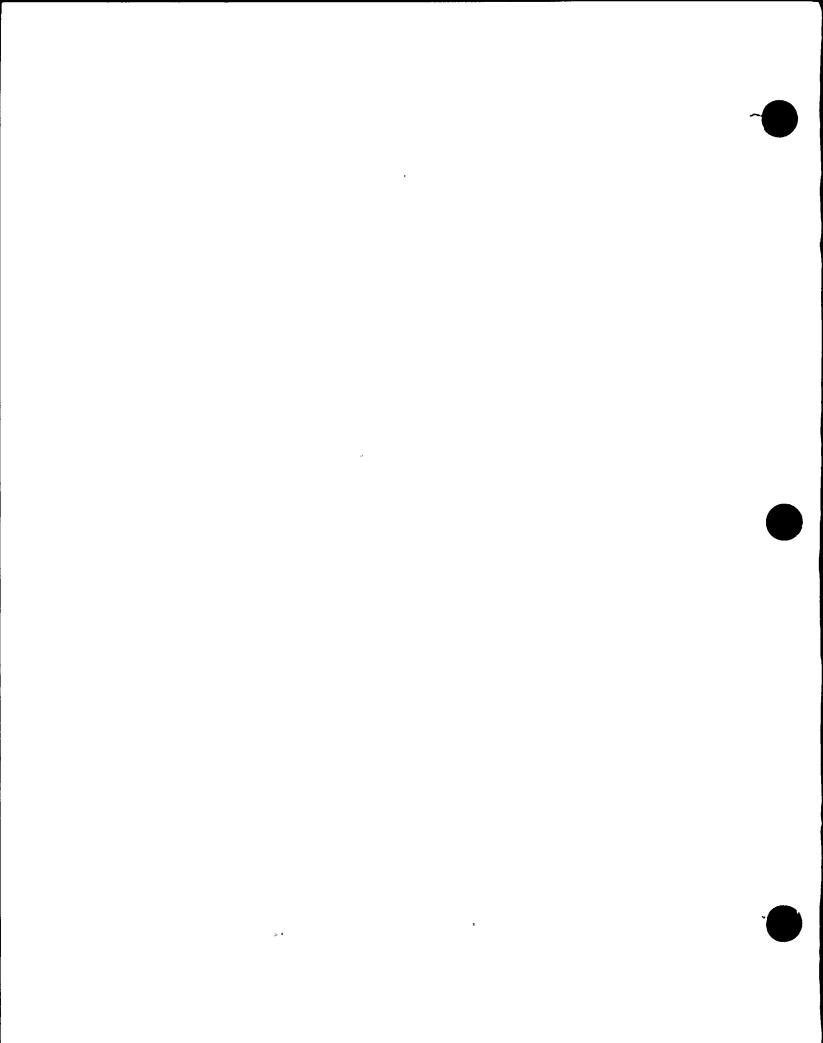
ADD 5/4-1142/4 SCREWS MG-25,2 QUAN- B

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| INSTRUCTION TO MANU | FACTURING DEPTS. |
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| Date 1-16441 | Die 125 g 25 |



ATTACHMENT 3 SUMMARY OF PG&E ENGINEERING AND QUALITY ASSURANCE DOCUMENTS FOR THE QUALIFICATION OF P-EP



ENGINEERING DOCUMENTS

- A. EMM DC2-3322-BRH-E, Revision 0, issued January 5, 1990, invoked SP-D-Peebles, Revision 3, and did not include an Attachment F for critical items.
- B. EMM DC2-3322-BRH-E, Revision 1, issued January 16, 1990, invoked SP-D-Peebles, Revision 3, and added Attachment F, which identified the following items:

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11.

12.

13.

14.

Bearings Shaft/Casting

- 1. Lead Wire
- 2. Insulators
- 3. Insulating Bushings
- 4. Magnet Wire
- 5. Insulating Material
- 6. Bearing Seals
- 7. Brushes and Brush Holders
- 8. Stator Resistance Temperature Detectors
- 9. Current Transformers and Test Switch
- C. EMM DC2-3322-BRH-E, Revision 2, issued February 12, 1990, invoked SP-D-Peebles, Revision 3, and the same Attachment F critical items as EMM, Revision 1. Note that EMM, Revision 2, was issued to request additional information for PG&E's seismic analysis.
- D. EMM DC2-3322-BRH-E, Revision 3, issued January 28, 1991 invoked SP-D-Peebles, Revision 5, and a new Attachment F, which identified the following critical items:
 - 1. Rotor shaft
 - 2. Stampings
 - 3. Magnet Wire
 - 4. Bearing Bracket
 - 5. Stud/Threaded Rod
 - 6. Roller Bearing
 - 7. Spider End Rings 8. Pole End Rings
 - 9. Short Circuit Bars
 - 10. Pole Head
 - 11. Tapered Keys
 - 12. Rotor Wedge
 - 13. Rivets
 - 14. Insulating Washers

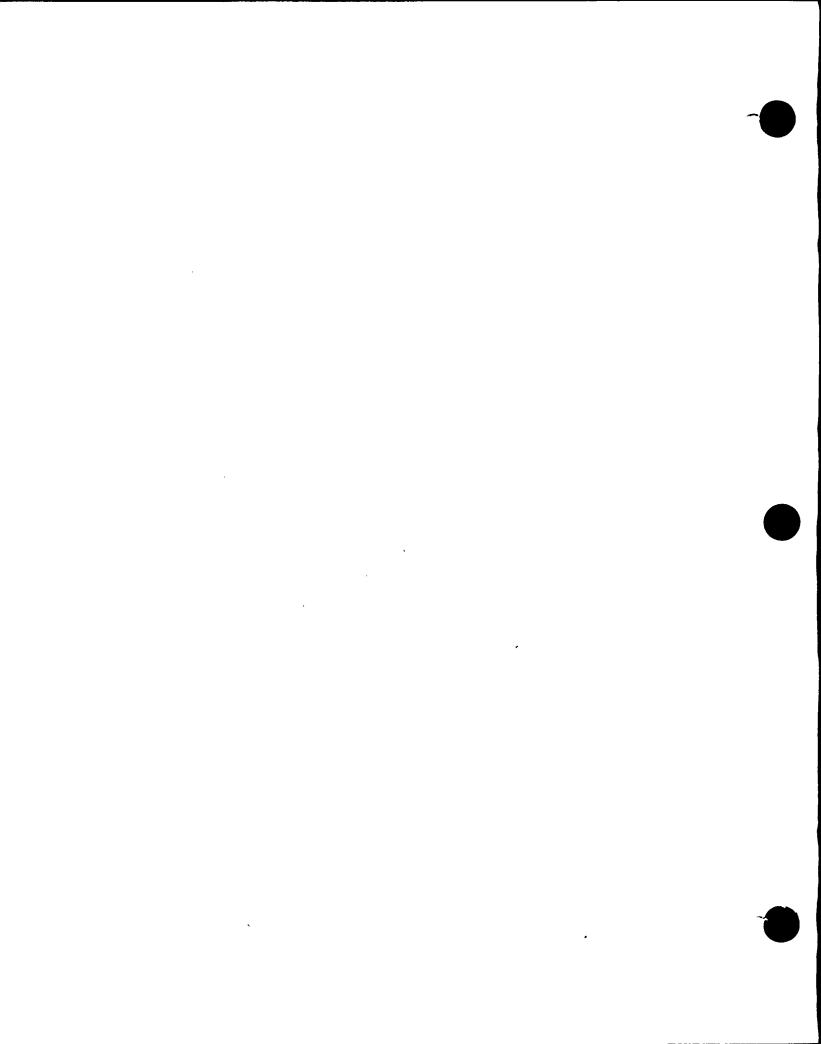
- 15. Stator Coils
- 16. Lead Wires
- 17. Slip Rings
- 18. Stator Frame
- 19. Brush Holder
- 20. Brush
- 21. Current Transformer
- 22. Insulator
- 23. Bearing Seal
- 24. Bushing Insulator
- 25. Current Transformer Test Switch

Copper Bus, Terminal Box

Lead to Coil Termination

Stator and Rotor Core

- 26. Insulation
- 27. Adhesives

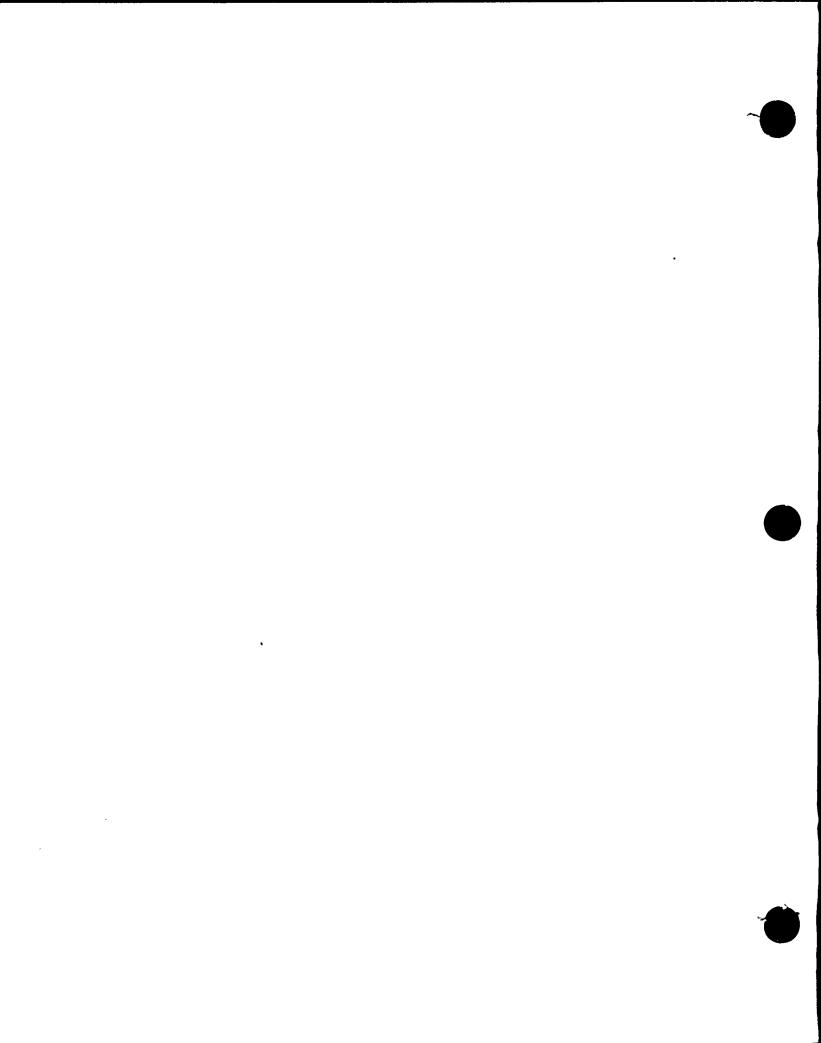


OUALITY ASSURANCE DOCUMENTS

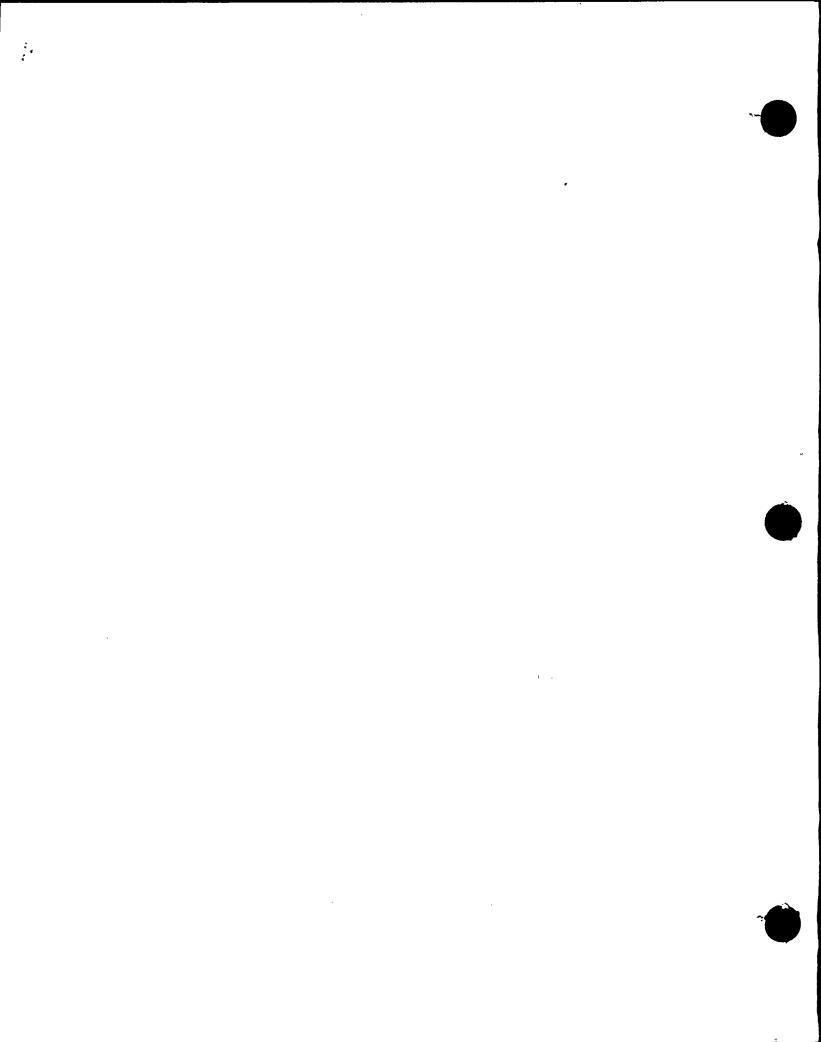
- PG&E Audit 89295S was conducted December 11, 1989, to qualify P-EP to provide spare emergency generators for DCPP in accordance with specification SP-D-Peebles, Revision 4. The results of the audit indicated three deficiencies in the P-EP OA program:
 - Drawing card file not up to date.
 - 2. Some QA procedures not reviewed and approved.
 - 3. Internal audits not performed as required.
- F. PG&E Audit 90197S was conducted from August 15 to August 17, 1990, to verify implementation of the P-EP QA program for PG&E purchases for DCPP in accordance with specification SP-D-Peebles, Revision 4. The results of the audit indicated six deficiencies in the P-EP QA program:
 - 1. Procurement/commercial grade dedication.
 - 2. Test control.
 - 3. Audits.
 - 4. Measuring and test equipment.
 - 5. Design control.
 - 6. OA records.
- PG&E auditing, technical specialists and management personnel participated in the joint P-EP/PG&E Audit 9003 of PEM conducted from October 8 to October 12, 1990, to verify implementation of PEM's quality program in accordance with BS 5750, Part 2. The results of the audit indicated six deficiencies in their quality program:
 - Procurement control.
 - 2. Inspection, measuring and test equipment.
 - Receiving inspection documentation.
 - No procedure describing the P-EP/PEM design interface; drawing document control.

 - Inadequate crimping procedure.
 No documentation of equivalency evaluation of PEM versus P-EP procedures and specifications.
- H. Follow-up visits were made to P-EP by PG&E QA and Engineering personnel on March 12 and 13, 1991, and July 30 and 31, 1991, and all findings from Audits 90197S and 9003 were considered satisfactorily resolved for the one-time purchase of the generator.





ATTACHMENT 4 ADEQUACY OF P-EP COMMERCIAL GRADE DEDICATION ACTIVITIES FOR PG&E'S SIXTH GENERATOR





The dedication testing of fourteen critical items initially included as Attachment F in Revision 1 of EMM DC2-3322-BRH-E was required of P-EP. However, P-EP's final scope of material supply was limited to nine out of the fourteen items, and dedication testing was performed for all items except adhesives for which material evaluation was performed by PG&E. PG&E's NEMP 12.4 evaluation included a review and approval of dedication evaluation of all nine items. For each item, inspection/test results and acceptance criteria were clearly stated, and Engineering and QA approval were documented.

The stator resistance temperature detectors were included as critical item in the initial list of 14 items, but were subsequently deleted from the final list of 27 items because they do not perform a safety-related function and their failure does not affect the safety function of the generator.

The slip rings were not identified as a critical item in Revision 1 of EMM DC2-3322-BRH-E. Revision 1 identified only those components supplied by P-EP to address lack of a P-EP dedication program. These components were not included in the P-EP supply scope and therefore were not included in Revision 1 of the EMM. However, slip rings are included in the final list of 27 items since they are considered to be critical components and were supplied by PEM.

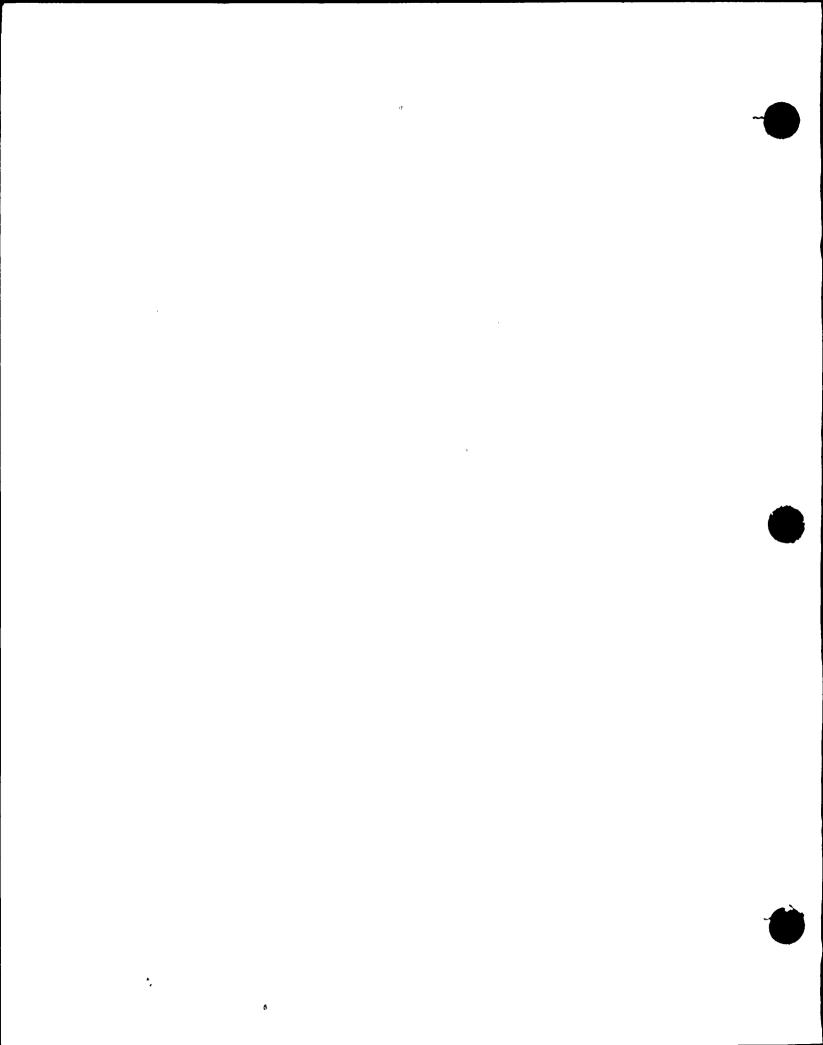
The mounting sleeve insulator for slip rings was not identified as a critical item. Exclusion of this insulator was based on lack of a credible failure mode (see Attachment 1).

Vibration indicating devices were not required by the PG&E purchase order for the generator. Vibration monitoring is conducted by portable vibration monitors during surveillance testing of the engine generator.

Supporting information for acceptability of P-EP's dedication testing for items 1 through 10 in the NRC IR, pages 20 through 23:

- (1) Insulators P-EP verified the insulator weight and dimensions and also the dielectric strength. NEMP 12.4, Revision 1, Attachment H, page 23, documents the acceptance criteria for dielectric strength and also the results of the dielectric tests. Page 24 tabulated the values of the megger testing.
- (2) Insulating Bushings P-EP identified the shape and size (configuration) as critical characteristics and verified the configuration. Dielectric strength was not considered as a critical characteristics since the function of the insulating bushing is to provide mechanical protection of the insulated lead wires.
- (3) Insulating Materials The thickness of the insulating material was specified as the critical characteristic and was verified. Verification of other attributes (i.e., lot homogeneity of the insulation and material constituents) were not required since the thermal and electrical characteristics of the insulating material were verified through extensive production tests performed for the completed coil assemblies and also through the final performance test of the generator.







- (4) Bearing Seals PG&E identified the critical characteristics as configuration (thickness and shape) and texture. The final verification of the quality of the bearing seals is performed by checking any bearing seal oil leaks during the performance test of the generator.
- (5-1) Brushes PG&E identified the critical characteristics as size, shape, final generator test to verify resistance, material and contact pressure and these were verified by P-EP. Lack of verification by P-EP of (1) the material constituents, (2) wire lead size or type, (3) wire lead terminal connections, and (4) electrical resistance, did not compromise the performance quality of the component. PG&E's acceptance criteria of the generator performance tests adequately ensure the acceptable performance of the individual attributes.
- (5-2) Brush Holders PG&E identified the critical characteristic as configuration, which was verified by P-EP. Lack of verification by P-EP of (1) the spring tension or (2) the technical quality requirement, or the critical characteristics of the Grade X Spaudite Bakelite cylinder that fits over the brush holder stud and functions as the insulator for electrical separation between the brush holder and the generator frame, did not compromise the performance quality of the component. Physical verification of the configuration as the primary critical characteristic is adequate since the final performance tests of the generator provide a check for the spring tension and overall verification of the integrity of the brush holder assembly.
- (6) Stator Resistance Temperature Detectors These were included as critical item in the initial list of 14 items and subsequently deleted from the final list of 27 items because they do not perform a safety function and their failure does not affect the safety function of the diesel generator.
- (7-1) Current Transformer PG&E identified the critical characteristics as configuration(size, weight), mounting, insulation resistance and continuity, and these were verified by P-EP. The acceptance criterion for the dielectric strength of the current transformer was not required to be obtained from the manufacturer. Also, the electrical characteristics of the current transformer (i.e., load, ratio) were not required to be verified. The routine test on the completed generator included insulation resistance and high voltage tests of the current transformers, and the test results are documented in the P-EP test report.
- (7-2) Test Switch for Current Transformers PG&E identified the critical characteristics as configuration, dielectric strength and continuity, and these were verified by P-EP. The dielectric strength readings were recorded in NEMP 12.4, Revision 1, Attachment H, page 61.
- (9) Slip Ring Assembly Slip Ring Assembly was not supplied by P-EP and, as such, no commercial grade dedication by testing was required. This assembly was supplied by PEM.
- (10) Adhesives PG&E identified the critical characteristic as material. The acceptability of the epoxy material was documented by evaluation contained in NEMP 12.4, Revision 1, Attachment L.

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ATTACHMENT 1

NEI PEEBLES - ELECTRIC PRODUCTS, INC. LETTER TO PG&E,

DATED JANUARY 17, 1992.

RESOLUTION OF ISSUE IN NRC IR 50-323/91-202

REC'D W/LTR DID 02/12/92....9202260197

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NEI Peebles - Electric Products, Inc.

183532



EF-3458 January 17, 1992

Pacific Gas and Electric Company NECS- Engineering Building Equipment Qualification Group

Attention: Mr. Ed Walters

Subject: Emergency Diesel Generator

Our S-1128

Dear Mr. Walters:

We wish to comment on the concerns raised in the letter to your Mr. Shiffer, which you sent to us on the 14th of January.

The rotor pole magnet wire was specified by PEP as MW 25.3 (unvarnished Dayglas to NEMA MW - 1000) the same as the original machines. PEM's Purchase Order specified it as the same, and their supplier (ISM) certified it as unvarnished. The ISM supplier (UDD) certified (in French) that it was varnished. Upon checking, PEM received confirmation that the wire was "lightly" varnished.

Both types of magnet wire have been used successfully by PEP over the years in rotating machinery. As this is slightly different than the pole wire on your original machines, however, we concluded that the critical aspect of the difference would be in its adhesive properties, and that testing of the actual wire with the pole adhesive would be prudent in order to support the acceptability of the wire. Since the machine has passed its factory tests including overspeed, we have no reason to believe that this wire will not prove to be acceptable.

The materials for test purposes have been placed on order, but the test schedule is not at this time finalized.

The second point raised by the NRC dealt with the bearing insulation ring (A - 64934 A), which was not identified as a Critical Component, but in their discussions at PEM was deemed to have criticality (in shear).

The ring's function is to insulate the bearing housing from the bearing bracket in order to prevent circulating currents which can pit the bearing surface and eventually lead to bearing failure.

The verification of this function is the bearing insulation test of IEEE 115 - 1983, section 3.6.

In the formal Failure Modes and Effect Analysis written by PEP in accordance with IEEE 352 to support our equipment qualification program to IEEE 323 - 1974, the credible failure mode of the

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bearing insulation was determined to be a short across the insulation due to moisture, dirt, or mechanical damage. The failure was assigned a critically of 3 (on a scale of 1 to 5) meaning that the system is degraded (not a catastrophic failure) and that adequate warning is given of an eventual failure.

The mechanical failure of the insulation had not been deemed a credible failure mode. While we would agree that the ring is part of the support system of the bearing housing, due to the sandwich design (see typical cross section attached), and lack of any known failure of this design, the mechanical strength was not considered a critical design characteristic.

As with the electrical mode, any degradation would be progressive (not catastrophic) and would reveal itself by an increase in vibration while running.

It should be noted that the design is exactly the same as the original machines. This method of bearing insulation was the standard, and was used on many machines.

The drawing (A-64934 A) specified the material to be "C. B. Bakelite" (the C.B. meaning canvas backed). Bakelite was used generically to describe phenolic based laminates. The ring for the new generator is NEMA Grade LE (NEMA LI 1 -1983, Industrial Laminated Thermosetting Products), which is, likewise, cotton fabric with phenolic resin binder.

We will, of course, notify you of the wire testing when the details are finalized.

Yours truly,

NEI Peebles - Electric Products, Inc.

Charles Moosbrugger

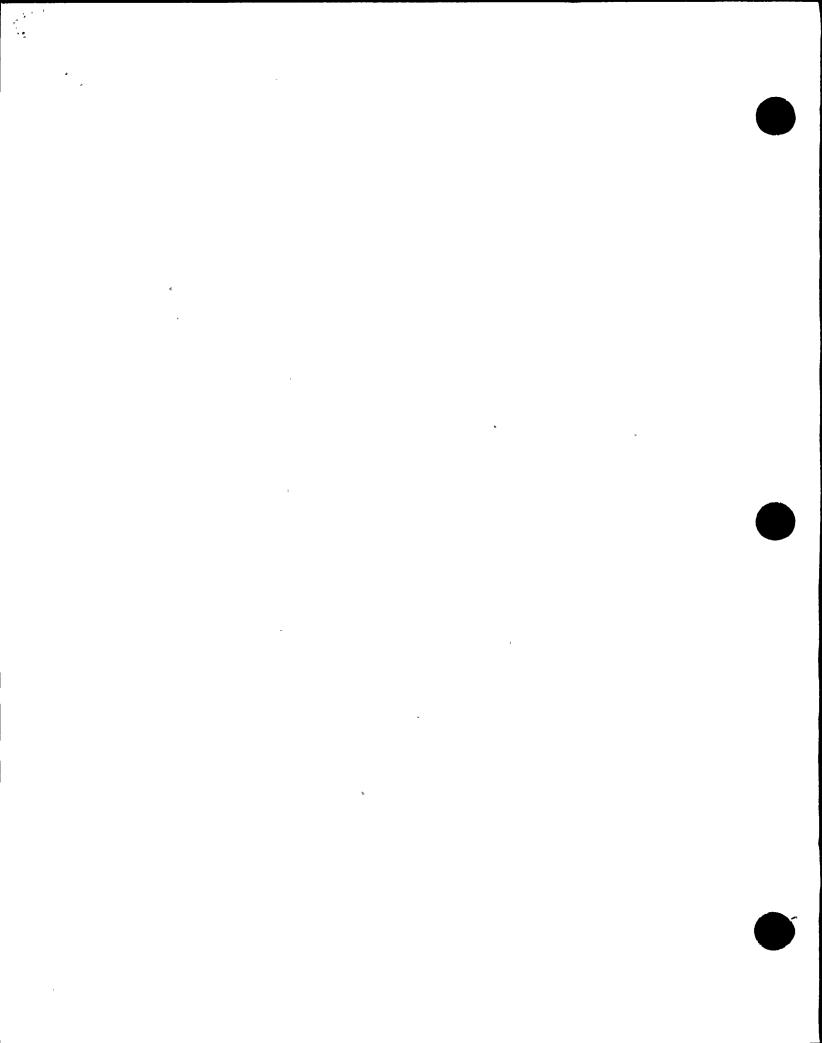
Charles Moorlingger

Technical Manager

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PG&E ENGINEERING EVALUATION OF P-EP NEMP 12.4, REVISION 1



179824

Date:

October 31, 1991

File#: 10.20, 129.70

To:

QUALITY ASSURANCE

From:

DIABLO CANYON PROJECT ENGINEER

Subject:

Revision 1 to NEMP 12.4 Engineering Evaluation of NEI

Peebles Electric Products, Audit 90197S



JAMES A. SEXTON:

This memorandum transmits Revision 1 of the evaluation of NEI Peebles Electric Products Inc. of Cleveland, Ohio. The purpose of this revision is to incorporate the results of Audit 90197S Follow-Up Report and the additional design change and equivalency evaluations performed by the supplier.

Based on the attached evaluation, NECS Engineering recommends that all open items regarding the Qualification of the Sixth Diesel Generator purchased by order ZS-1539-AB-9 be closed.

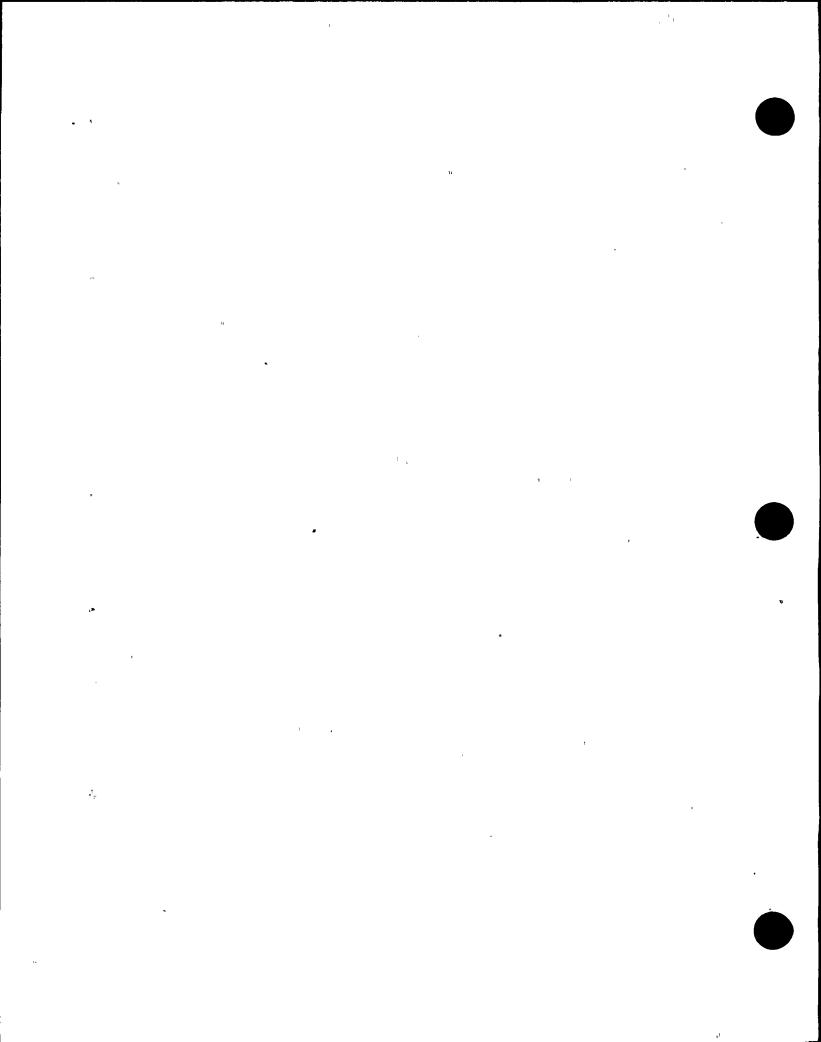
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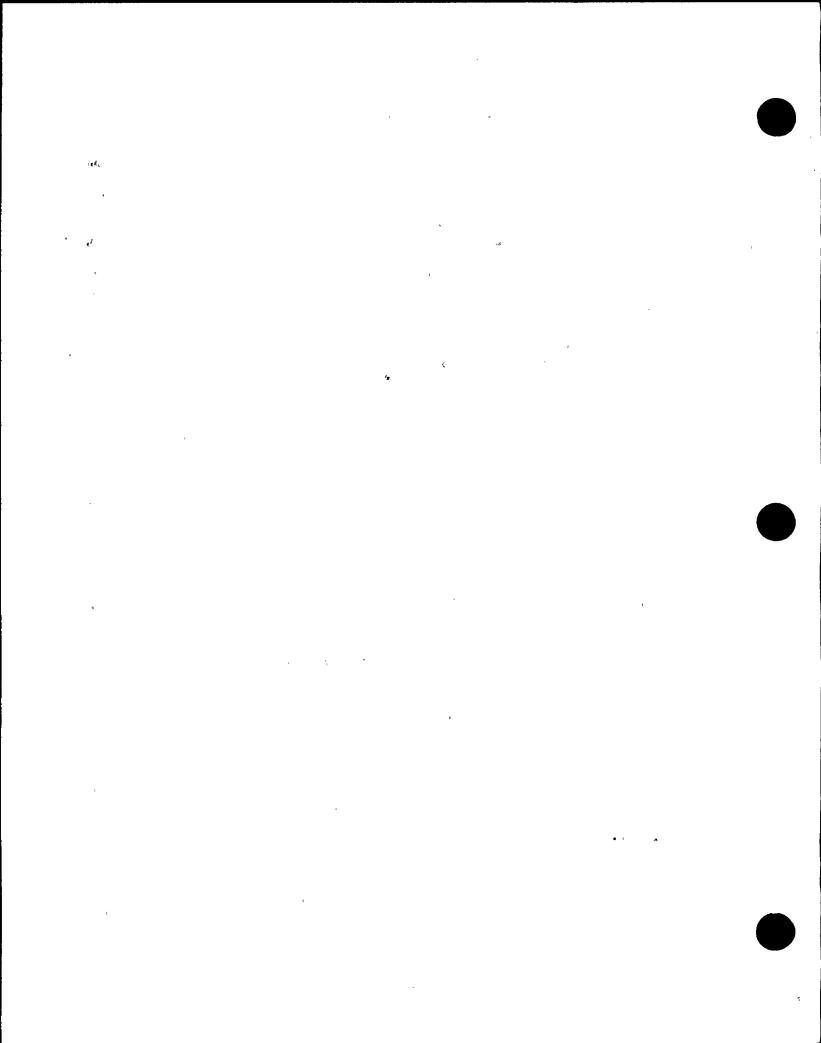
| cc: | MBasu | <pre>(w/o attachment)</pre> | 333/A9090 |
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| | HHBorgard | (w/o attachment) | 1 Cal/408D |
| , | RBClark a | (w/o attachment) | 333/A1414 |
| | MDobrzensky | (w/o attachment) | 1 Cal/18th floor |
| | UAFarradj - | é | 333/A7004 |
| | TFFetterman | <pre>(w/o attachment)</pre> | 333/A9042 |
| | ERKahler | (w/o attachment) | 333/A2011 |
| | AKKar | • | 333/A9088 |
| | DCTateosian | (w/o attachment) | 333/A7003 |
| | GATidrick | (w/o attachment) | 333/A2010 |
| | ECWalters | • | 333/A2007 |

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- Government Industry Data Exchange Program

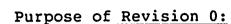


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I. OVERVIEW



Revision 0 of this document was issued to evaluate all Audit Findings for NEI Peebles Electric Products in accordance with Procedure NEMP 12.4. These findings were a result of the PG&E assessment of NEI Peebles Electric Products in Cleveland and the Cleveland assessment of their subsupplier, Peebles Electric Machines in Scotland.

Purpose of Revision 1:

Revision 1 of this document is being issued to incorporate the following:

- Recently Identified 10 CFR 21 Reports for Peebles
- Results of PG&E QA Audit 90197S Follow-Up
- Results of PG&E Independent Testing of Adhesive
- Results of Final Design Change and Procedure Equivalency Review performed by NEI Peebles.

Background:

The following excerpt from NRC Vendor Inspection Report 99901065/86-01 gives a synopsis of the history of the Generator Supplier:

"The electrical generators for the emergency diesel engines installed at the Diablo Canyon Nuclear Power Plant were originally designed and manufactured by Electrical Products Incorporated (EPI) located in Cleveland, Ohio. Northern Engineering Industries Parson Peebles (NEI Parson Peebles) of Great Britain bought EPI in 1979 and renamed it Parson Peebles EPI. The manufacturing operations of Parson Peebles EPI ceased in the fall of 1984. Peebles Electrical Machines, a subsidiary of NEI Parson Peebles is currently manufacturing a spare electrical generator for the Diablo Canyon Nuclear Power Plant. Parson Peebles EPI is furnishing the design drawings and all the components available from their storage to Peebles Electrical Machines for the manufacture of an identical spare electrical generator."

*** For the purposes of this evaluation, NEI Peebles Electric Products Inc. in CLEVELAND shall be designated as "PEP", and Peebles Electric Machines in EDINBURGH Scotland shall be designated as "PEM". ***





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Pacific Gas & Electric is purchasing a generator for the Sixth Diesel Installation Project. The generator will be supplied as a safety related item by PEP. Although PEP controls the design of this product, it is procured by PEP as a commercial grade item from PEM.

Audit 89295S was performed on PEP in December 1989. This audit resulted in PEP being placed on the QSL.

PG&E issued Purchase Order ZS-1539-AB-9 in January 1990 for the generator in accordance with QA Specification SP-D-Peebles Revision 4.

In August of 1990, Implementation Audit 90197S for PEP was conducted in accordance with QA Specification SP-D-Peebles Revision 4. This audit identified the problems which are addressed in this evaluation.

As part of the resolution of subsupplier evaluations [AFRs 90-068, 90-069 and portions of 90-072 from Implementation Audit 901975], PG&E participated in PEP's Audit 9003 of PEM. These results are also evaluated here.

For each problem identified, this evaluation also includes a statement of impact regarding the spare generator in stock at Diablo Canyon.

This evaluation only applies to the purchase of the Sixth Diesel Generator and the stocked spare. Any future purchase of fully qualified parts from Peebles will require further audit.



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II. EVALUATION RESULTS



The following items have been reviewed to determine whether they affect the quality of the sixth diesel generator or the spare purchased from PEP:

- 74 NPRDS Reports
- '3 10 CFR 21 Reports and Utility Reports
- 79 Bulletins, Letters, SER, SOER
 - 1 LER 90-012-01, WPPSS
 - 1 Restricted Equipment List Revision 12
 - 3 NRC Vendor Inspection Reports
 - 1 Government Industry Data Exchange Program

Out of the 162 items, twenty required further assessment. It has been determined that none of these have an impact on the new generator or the stocked spare.

Based on review of these documents, NECS Engineering concludes that there are no related part failures that indicate PEP is not controlling the design or quality of parts. The isolated incidents do not indicate any programmatic concerns.

Supplier Qualification

All audit findings have been reviewed. Additional investigations regarding subsupplier issues have been performed as required. Also, to provide added assurance, independent testing of the adhesive and rotor shaft has been performed. Based on the enclosed evaluation, NECS Engineering concludes that PEP is qualified to supply the sixth diesel generator.

Actions to Maintain Qualification/Release Spare

NECS Engineering concludes that no additional verification or testing is required to qualify the new generator.

The spare generator can be released for installation (as a unit assembly) upon completion of the following design changes:

Welding of Stator Frame, see PIMS Action Request A0213896

Addition of Terminal Box Supports, see PIMS Action Request A0214809.





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III. PRODUCT PERFORMANCE EVALUATION

Based on QA concerns related to the implementation of Specification SP-D-Peebles, we have reviewed the referenced documents and information to determine if there are repeated instances of questionable product performance.

Per discussions with Mr. Ron Politi of PEP [216-481-1500], PEP has supplied generators to 26 Nuclear Utilities in the past 10 years. He also stated that there are in excess of 150 PEP electric generators in operation at this time.

This review included the applicable NPRDS data, 10 CFR 21 Reports, NRC notices and bulletins, License Event Report 90-12-01, Restricted Equipment List NPAP D-11 Rev 12, NRC Vendor Inspection Reports, and the Government Industry Data Exchange Program summary of failures.

The problems identified along with NECS Engineering's resolution are summarized below. Note that PG&E's generators are Model 140, Type L-10823.

Nuclear Plant Reliability Data System

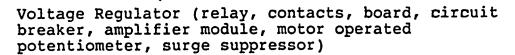
See Attachment A - This data base was searched by "Parson Peebles", "NEI Peebles", "Electric Products" and "Portec." There were twelve records found under Parson Peebles Electric Products Inc, and sixty-two records found under Portec. These records are summarized below:

- 2 Condensate booster Pump Motor
- 1 Batteries
- 1 DG Room Exhaust Fan Relay
- Diesel Engine (overspeed trip, governor, lube oil cooler gasket, turbocharger bearing, immersion heater contacts)
- 54 Control Circuitry

Excitation Panel/Field Flash (firing module, relay, resistor, diode, contacts, motor operated potentiometer, cable, fuses, saturable reactor transformer)
Generator Control Panel (diode, silicon controlled rectifier, relay, meter, load sensor module, fuse, fuse holder, speed switch, frequency module, resistor)



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Annunciator Panel (diode)

The above listed failures are not applicable to the evaluation of the generator. For the Sixth Diesel Installation, the generator control panel, excitation panel/voltage regulator and associated components are being purchased and assembled by PG&E, and are not being supplied by the generator manufacturer. These components are individually dedicated and tested in accordance with the Replacement Part Evaluation process (See Reference 8).

The remaining 10 records not shown above deal with the actual generator, and are evaluated below.

Problem: Gulf States Utilities, River Bend 1
Parson Peebles Electric Products
Generator Model L-11071

Rotor windings on number 14 pole had separated from the shaft pole washer and bowed out towards the stator.

Resolution: The probable cause was determined to be a combination of:

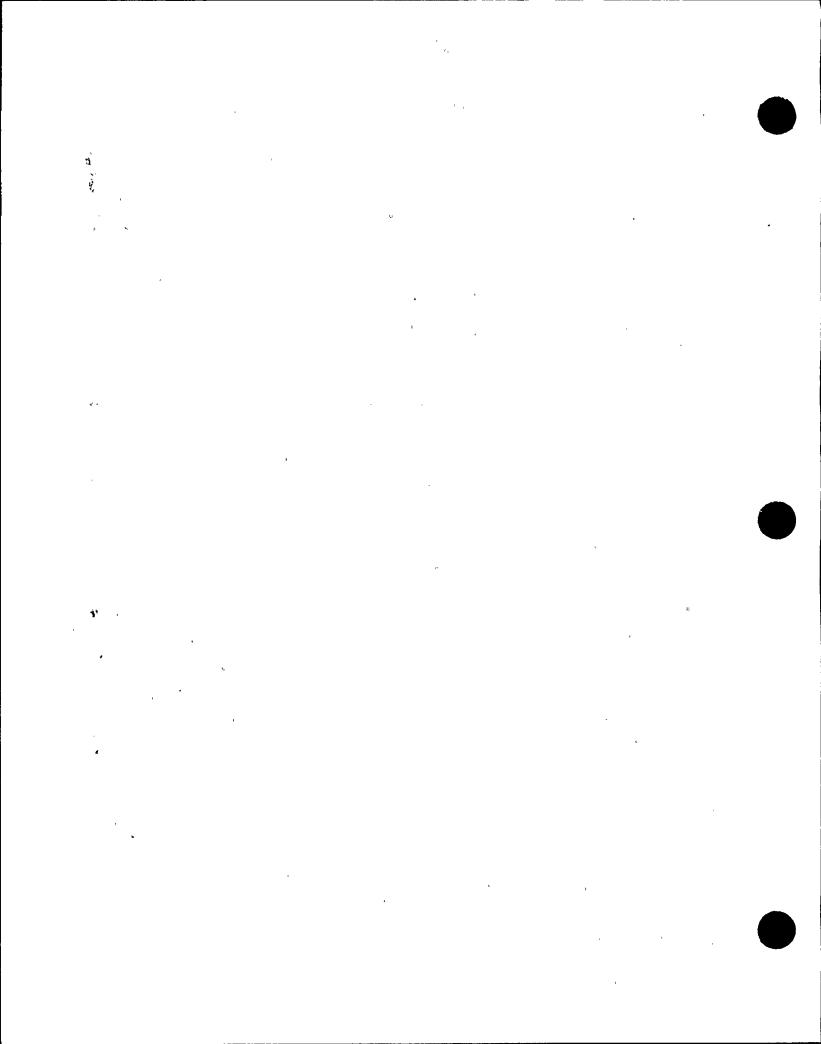
- 1) Inadequate attention to shelf life and storage conditions
- 2) resin application errors
- 3) contamination during resin application.

Per discussion with Mr. Ron Politi of PEP, this failure is not a concern for PG&E, since the engine in question is a different model/size/design than those used at Diablo Canyon. River Bend has a 450 RPM, 16 pole machine. Also, our machine design has wedges, while this one does not. He added that the adhesive used on this machine is not used on our new generator, since this product is no longer available. Mr. Politi also stated that this problem is still under investigation, but that preliminary indications are that it was not a manufacturing problem. PEP believes that the assembly was damaged on site prior to installation (dropped).

Additional justification for this view is that the separation only occurred on one out of sixteen poles, which would not be the case if the resin was installed improperly.

Problem: Pennsylvania Power & Light, Susquehanna l Portec Model 170







Oil leakage from the air vent part of the generator bearing high temperature trip sensor.

The cause of the leakage was that the trip sensor Resolution: had not been properly reinstalled in its mounting hole after an 18 month diesel overhaul.

This failure is due to improper maintenance, and has no effect on the spare or new sixth diesel generator.

Pennsylvania Power & Light, Susquehanna 1 Problem: Portec Model 170

The winding resistance check (Megger) as part of the technical specification inspection did not meet the acceptance criteria.

The suspected cause of the insulation breakdown Resolution: was wear. Root cause was not clearly identified, since a subsequent megger test met the acceptance criteria.

This failure has no impact on the spare or new generator. Final testing of the new generator assembly will verify the insulation resistance. Also, the spare generator megger checks are satisfactory (See preventative maintenance work orders, Reference 21).

Pennsylvania Power & Light, Susquehanna 1 Problem: Portec Model 170

The surveillance test failed the megger acceptance criteria on the exciter portion of the generator. After servicing the DG for this problem the generator was operated. During this operation, the generator had an arc-over which started a fire in the main plant process computer.

The root cause of the megger test failure and Resolution: possibly the fire were from grounding of the generator. This grounding was probably caused by dirt and moisture accumulation in the generator, which was in turn due to construction on a new diesel addition. The arc-over was caused by human error because the slip ring wiring lugs were not tightened.

This failure has no impact on the spare or new generator, since the problem was caused by improper maintenance/cleanliness by the utility.



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Problem: System Energy Resources Inc., Grand Gulf 1

Portec

Model L-11022

Sparks were observed coming from the generator bearing end cap.

Resolution: Maintenance inspection revealed a low spot in the insulation under the generator inner race. This condition allowed excessive radial movement of the generator shaft which created circulating currents. These currents resulted in the sparks

and overheating of the generator.

This bearing insulation failure is not a concern for our generators. Based on discussions with PEP in 1986, "...DCPP generators were manufactured prior to the model which incorporated the glass/resin bearing insulator. Since we are currently, manufacturing a spare generator for DCPP, we recently investigated this exact topic to be certain that a design variation from the exact duplicate, as you ordered, would not be required. Previously installed DCPP E-P generators, the stocked spare, as well as the sixth generator currently in progress include a bearing support insulator and do not use the subject shaft insulator."

The insulator failure is not applicable to PG&E's new or spare generator, since they do not use this type of shaft insulator.

Note that this same failure is evaluated later in this section under SER 86-054.

Problem: System Energy Resources Inc., Grand Gulf 1

Portec

Model L-11033

The bolts in the generator termination box cover were stripped out and needed to be replaced.

Resolution:
The bolts were stripped due to misalignment between the termination box cover bolt holes and their permanent nuts tack welded to the lip of the termination box.

This failure has no impact on the spare or new generator, as the misalignment is a maintenance problem, not a manufacturing defect.

<u>Problem:</u> Southern California Edison, San Onofre 1
Portec

Model L-11058

Maintenance found the emergency generator lower outboard support (casting) broken at the upper outside where the dust seal sits.



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Resolution:

This was caused while attempting to lift out the lower bearing half. The jack and the lift plate slipped and crushed the lower part of the generator bearing housing and broke approximately 7 inches off the housing around the dust seal enclosure.

This failure has no impact on the spare or new generator, since the support was broken during maintenance activities.

Problem: Tennessee Valley Authority, Sequoyah 1
Portec
Model L-10906

During plant shutdown, surveillance indicated diesel generator bottom outboard brush tension was out of adjustment.

Resolution: Root cause unknown.

This failure has no impact on the spare or new generator, since the brush adjustment indicates improper maintenance not a manufacturing defect.

Problem: Arizona Public Service Company, Palo Verde 1
Portec
Model L-11094

Three of the top mounting bolts for the cage of the shroud assembly were stripped out. The bolts and nuts serve to hold wire mesh screen on the generator end for ventilation.

Resolution: The cause was that the bolts had been over stressed during tightening.

This failure has no impact on the spare or new generator, since the stripped bolts indicate improper maintenance not a manufacturing defect.

Problem: Arizona Public Service Company. Palo Verde 2
Portec
Model L-11094

During normal preventative maintenance on the diesel generator a broken brush on the top west inner ring was found.

Resolution: Root cause unknown.

This failure has no impact on the spare or new generator. The brushes are items subject to normal wear.



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10 CFR 21 Reports



See Attachment B

Report: Issued by NEI Peebles, Dated November 24, 1986

Utility: Arizona Power, Palo Verde Unit 3

Customer: Cooper Energy

The problem identified in this report is that a copper winding on a pole had moved. The equipment was manufactured by Parsons Peebles Electric Products in 1980. The cause of the defect was a substandard bond of the polyester resin and the field coil conductor in certain localized areas of the wirewound rotor pole, resulting in the separation of the wire from the coil.

This separation could be brought about by: mechanical damage; improper formulation, mix, or cure of resin; or improper resin application. In this case, there is no evidence of mechanical damage. NEI Peebles performed a review of their records for rotor poles manufactured using this particular resin mix, and determined that this batch only affects the two duplicate diesel generators supplied to Palo Verde Unit 3.

NEI Peebles recommended two corrective actions: remove the rotor poles from both diesel generators and replace them with spares; perform an overspeed testing to determine the adequacy of the installed resin on the rotors and rewind the rotor if necessary.

Based on the investigations and testing performed by the supplier, the most probable cause of the resin failure was improper application that resulted in a local dilution of the amount of resin applied to the rotor. These types of defects are detectable after resin curing by tapping the coils for hollow sounds in accordance with Peebles routine QC Procedures.

As described above, the subject rotors were also subjected to overspeed testing to verify that the rest of the applied resin functioned per design. The tests did not identify any other defects.

Based on the evidence and evaluation performed, NEI Peebles concluded that the improper resin application was an isolated incident with no significant generic implications.

Arizona Power also issued a Final Report (DER 86-31) to the NRC discussing the defects found in their generators for Unit 3. Two additional problems described in the utility report were a second pole separation which occurred in July of 1987, and pole piece fasteners had low torque values.



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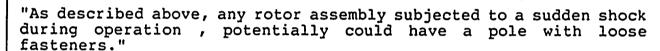
The cause of the second pole separation at Palo Verde was a mechanical shock to the generator due to an engine rod failure.

The following excerpts are taken from the conclusions drawn by Arizona Power regarding the failures:

"There are approximately 1200 poles in machines presently in service that have been encapsulated with DlllA resin. Additionally, the same rotor design, type of resin, and pole piece fasteners have been used in over fifty similar machines, some of which have been used in nuclear facilities since 1972. The first pole deficiency is the only known pole to suffer winding separation during its infancy. Since the characteristics of this deficiency are very weak adhesive bonds that fail very early in the life of the pole, this is considered to be an isolated case."

"Any rotor assembly subjected to a sudden shock during operation potentially could have winding separation on its poles."

"The first case of loose fasteners was determined to be the result of a deviation in the torque values used at the manufacturer's facility during fabrication: As mentioned above, these fasteners have been used in over fifty similar machines and none are known to have been found with loose fasteners. This deviation is considered to be an isolated event."



Impact:

Based on the investigation and additional testing performed by NEI Peebles, the pole separation and loose pole fasteners identified at Palo Verde have no impact on PG&E's new or spare generator.

Report: Issued by Gulf States Utility, Dated November 16, 1987

On the standby generator at River Bend Station, the rotor windings on pole number 14 were found separated from the shaft pole washer and bowed toward the stator. The individual wires had delaminated and overlapped. This condition was found by visual inspection.

Per discussion with Mr. Ron Politi of NEI Peebles, although this problem is still under investigation, it has no impact on PG&E's equipment.



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Impact: The delamination identified at Gulf States Utilities has no impact on PG&E's spare or sixth generator. First, the generator design that experienced the problem is different, since it does not use pole wedges in the assembly. Second, the most probable cause is the adhesive used in the rotor assembly. The Gulf States machine used a polyester type adhesive, while PG&E's new and spare generators utilized and epoxy resin.

Report: Issued by NEI Peebles, Dated January 4, 1991

Utility: Georgia Power Vogtle Plant

Customer: Cooper Enterprise Engine Division

The problem identified in this report was a failed weld on one air louver. The equipment was manufactured by Parsons Peebles Electric Products in 1981.



During the removal of the coil guard cover for cleaning purposes, an air baffle louver broke loose. The louver had been tack welded to the cover in three places, and two of these welds were completely rusted through. Inspection of the remaining louvers showed that ten of the twelve had been full length welded to the cover. The eleventh louver was also tack welded in three places, and these welds were intact.

NEI Peebles stated that the physical integrity of the louver is important because if all welds failed and the machine was operating, the louver could hit the rotating fan and projectiles created may damage the rotor or coil ends.

The supplier feels that this was not a design defect, but an isolated incident. They recommended that the utility incorporate inspection of these louvers as a regular maintenance activity.

<u>Impact:</u> This failure has no impact on PG&E's sixth or spare generator, since our design does not utilize this type of dripproof cover.





NRC Information Notices, Bulletins, Letters INPO Significant Event Reports (SER), Significant Operating Experience Reports (SOER)

See Attachment B

The documents relevant to this evaluation were determined by a review of the "System # 21, Diesel Engine Generator System (EDG)" binder maintained by the Nuclear Operations Support (NOS) Group. Attachment B pages 66-73 show a table of contents listing all of the information reviewed for applicability. The three documents summarized below were determined to have a possible impact on PG&E's purchase of a Sixth Generator and the stocked spare manufactured by PEP.

Problem: Safety Review Event Follower 80-028 - Notepad 5-14-80, LER 335/80-13

The generator failed to accept full load during a test.

Resolution: The cause was incorrect exciter leads to the generator field. The leads were undersized.

Based on the successful performance of the five generators installed at Diablo Canyon, the exciter leads to the generator field are adequate for the new generator being purchased and the stocked spare.

Problem: Safety Review Event Follower 85-136 - IN 85-68

The insulation on the stator windings had been rubbed and abraded to the point where one stator winding had been exposed.

Resolution: The cause of the failure was determined to be a broken interpolar connecting bar on the rotor.

The generator with the failed connecting bars was manufactured by Louis Allis.

Based on discussions with PEP cracking interpolar connecting bars on their design are not a problem, since they "are equipped with fully interconnecting damper cages...This damper cage construction is fail-safe under centrifugal and thermal overstress. All cage components remain captive upon their (unlikely) fracture and , therefore, cannot damage the stator winding or any other generator components."

This failure is not applicable to PG&E's new or spare generator, since our design has a feature which prevents a cracked connecting bar from damaging the generator internals.



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Problem: Safety Review Event Follower 86-054 - IN 86-26, SER 70-84

The notice and SER identified two major problems:

- 1. The shim required to maintain clearance at the thrust bearing was missing. As a result, high vibration levels accompanied by sparks from the rotor shaft bearing area were generated.
- 2. Electrical insulation between the rotor shaft and the slip-ring end bearing inner race had come loose. Consequently, the rotor shaft has dropped slightly and rubbed on the bearing housing. The subject insulation is utilized to prevent circulating currents through the generator shaft.

Resolution:

Item 1 above is not a concern, since the Diesel Generator history of operation at Diablo Canyon has shown no vibration problems similar to those caused by a missing shim in the thrust bearing.

Item 2 is also not a concern for our generators. Based on discussions with PEP in 1986, "...DCPP generators were manufactured prior to the model which incorporated the glass/resin bearing insulator. Since we are currently manufacturing a spare generator for DCPP, we recently investigated this exact topic to be certain that a design variation from the exact duplicate, as you ordered, would not be required. Previously installed DCPP E-P generators, the stocked spare, as well as the sixth generator currently in progress include a bearing support insulator and do not use the subject shaft insulator."

The insulator failure is not applicable to PG&E's new or spare generator, since they do not use this type of shaft insulator.

Licensee Event Report

See Attachment B

LER 90-012-01 was forwarded to PG&E by NRC Region V. It is a report issued by Washington Public Power Supply System regarding the failure of their emergency generators manufactured by PEP, and is evaluated for impact below.



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Problem:

1. Bearing Failure -

"... failure was due to loss of lubrication to the generator thrust bearing which was caused by leakage of oil from the bearing oil reservoir which supplies the bearing. The oil leakage was caused by an inadequate O-ring seal between the walls of the thrust bearing bracket and the generator housing which form the reservoir. The inadequate O-ring seal was caused by the existence of an extra O-ring groove machined into the generator housing adjacent to the thrust bearing bracket which prevented the O-ring from being compressed to obtain a tight seal."

Shorted Field Winding -

"The original generator field pole windings were not wound in accordance with the design requirements in that a polyester resin was used to encapsulate the windings vice the required Armstrong one-part epoxy resin. The process used to wind the pole pieces also allowed bunching and abrading of the Dacron glass covering on the winding wire and did not provide adequate direction to assure proper encapsulation (wetting) by the epoxy resin. The combination of these errors resulted in two generator field poles in E-DG-1 containing shorted windings and one pole in E-DG-2 containing shorted windings."

Resolution:

The generator used at this plant is a model L-11011. This particular application uses two engines, with the generator mounted between them.

Per discussions with Mr. Ron Politi of PEP, the problems identified in this report are still under investigation. However, he was able to provide the following information regarding the potential impact of these problems on our generator.

The generator design in the above case has two bearings, a roller and a tapered. The tapered bearing is the one that failed in this case. Our design does not use a tapered bearing, only the roller bearing. As discussed in the event report, the extra bearing groove does not appear on PEP design drawings. Mr. Politi did state that this utility had a conversion performed on this generator by someone besides PEP, and that may be where the groove came from. Also, this utility had extensive problems maintaining oil in this bearing.



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Mr. Politi stated that they do not know where this extra groove came from, but to his knowledge this problem has not occurred on any other Peebles generator.

Based on the design difference, satisfactory operation of our generators, and the fact that this seems to be an isolated case, this failure has no impact on PG&E's installed, spare, or new generator.

For the shorted windings, the event report states that the failure was due to the improper application of the wrong resin on the windings. Per discussion with Mr. Politi, the Armstrong epoxy was not is use when this engine was manufactured. Also, this utility has had some operational problems which may have attributed to the shorted windings.

Based on the satisfactory operation of our installed generators, this failure of does not impact their operation.

For the spare generator, shorted windings are not a problem, since the Diablo Canyon Preventive Maintenance Program performs megger checks to ensure integrity of the windings (See Reference 21).

For the new generator being purchased, the Armstrong adhesive is being used in the manufacture, and is also independently tested and evaluated in this document. This failure has no impact on this purchase.

Restricted Equipment List NPAP D-11, Revision 12

A review of NPAP D-11 Revision 12 has shown that there are no components manufactured by PEP or PEM listed.



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NRC Licensee Contractor and Vendor Inspection Status Reports (NUREG 0040)

See Attachment C

The NUREG-0040 Quarterly Reports from March 1981 to December 1989 were examined for Inspections performed by the NRC on PEP/PEM. Three reports were found. The summaries below state the Inspection Scope, Problems Identified, and Impact on PG&E's new and spare generator.

Report: 99900772/82-01

Parsons Peebles-Electric Products Cleveland, Ohio

Scope:
The inspection was conducted as a result of a Part 21 pertaining to the improper application of a current transformer in the exciter voltage regulator. Also, the following programmatic areas were inspected:

- initial management meeting
- initial quality assurance program
- manufacturing process control
- change control
- Part 21 implementation

Problems Identified:

- 1. Posting of 10 CFR Part 21 is inadequate.
- 2. Records of evaluation for the current transformer did not meet specification.
- 3. No documented evidence that a transformer conformed to the procurement requirements.
- 4. Inspection instructions and results were not on a shop traveler.
- 5. Stator punching operations were not properly logged.
- 6. Revised product travelers and QA documents were not reviewed and approved per the QA Manual.



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Impact:

This inspection was performed by the NRC in 1982. PG&E has recently performed audits on PEP and their major subsupplier PEM. These audits have reviewed, in depth, the programs examined by the NRC. Any programmatic concerns have been documented in Audit Finding Reports and are evaluated elsewhere in this document. Also, the specific problem with the current transformer is not applicable here, since it is part of the voltage regulator and not supplied as part of the new or spare generator assembly.

Report: 99901065/86-01

Peebles Electric Machines Edinburgh, Scotland

Scope: Implementation of the quality assurance program in

selected areas.

Problems Identified: None

Impact:

During this visit the NRC reviewed or witnessed:

- Parson Peebles purchase orders for the PG&E spare purchased in 1986
- incoming material inspections
- storage
- coil bending and forming operations
- insulation of windings
- calibration of test equipment

There was one inconsistency found: the components supplied to PEM by PEP lacked unique identification and could not be traced to the item numbers of the PO and subsequently the C of C's. The quality control engineer took immediate corrective action by writing deficiency reports and affixing nonconformance tags to the components as required by the quality control procedure. PEM then contacted PEP and requested they identify each item supplied with the relevant PO item number for future shipments and provide a cross reference in the C of C. This Inspection report has no impact on PG&E's new or spare generator.

Report: 99900772/86-01

Parsons Peebles-Electric Products Cleveland, Ohio

Scope: Review actions taken on previous inspection findings,

review documentation for failures.





Problems Identified:

1. Parson Peebles did not indicate applicable drawings, revisions, specification or 10 CFR 50 Appendix B applicability on a purchase order to Concorde Controls for a safety related manual voltage regulator to be used at Grand Gulf Nuclear Power Station.

Impact:

- 1. PG&E's purchase order references drawings, revisions, and serial numbers. A comparison between the sixth generator and the spare has been provided by PEP/PEM to ensure that the generator design is consistent with the original five. Also, PG&E has reviewed all Design Changes and Discrepancy Notes as part of this evaluation.
- 2. 10 CFR 50 Appendix B was referenced in the purchase order to PEP. In PEP's order to PEM, 10 CFR 50 Appendix B does not apply, since PEM is a commercial grade supplier.

This inspection Report has no impact on the new or spare generator. Recent audits (See References 4 and 5) performed by PG&E have reviewed the procurement documents associated with this purchase, and any discrepancies have been documented in Audit Finding Reports and are evaluated elsewhere in this document.



See Attachment D

A review of this data base did not identify any failures for generators/parts manufactured by PEP/PEM.



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IV. SUPPLIER QUALIFICATION REVIEW

The following numerical listing shows all Findings for PG&E Audit 90197S and PEP Audit 9003 (References 4 and 5):

| PG&E Audit 90197S | PEP Audit 9003 |
|-------------------|----------------|
| AFR 90-067 | AFR 9003-1 |
| AFR 90-068 | AFR 9003-2 |
| AFR 90-069 | AFR 9003-3 |
| AFR 90-070 | AFR 9003-4 |
| AFR 90-071 | AFR 9003-5 |
| AFR 90-072 | AFR 9003-6 |

The purpose of this section of the evaluation is to review each finding, evaluate the qualification of the new generator purchase, and determine the acceptability of the stocked spare.

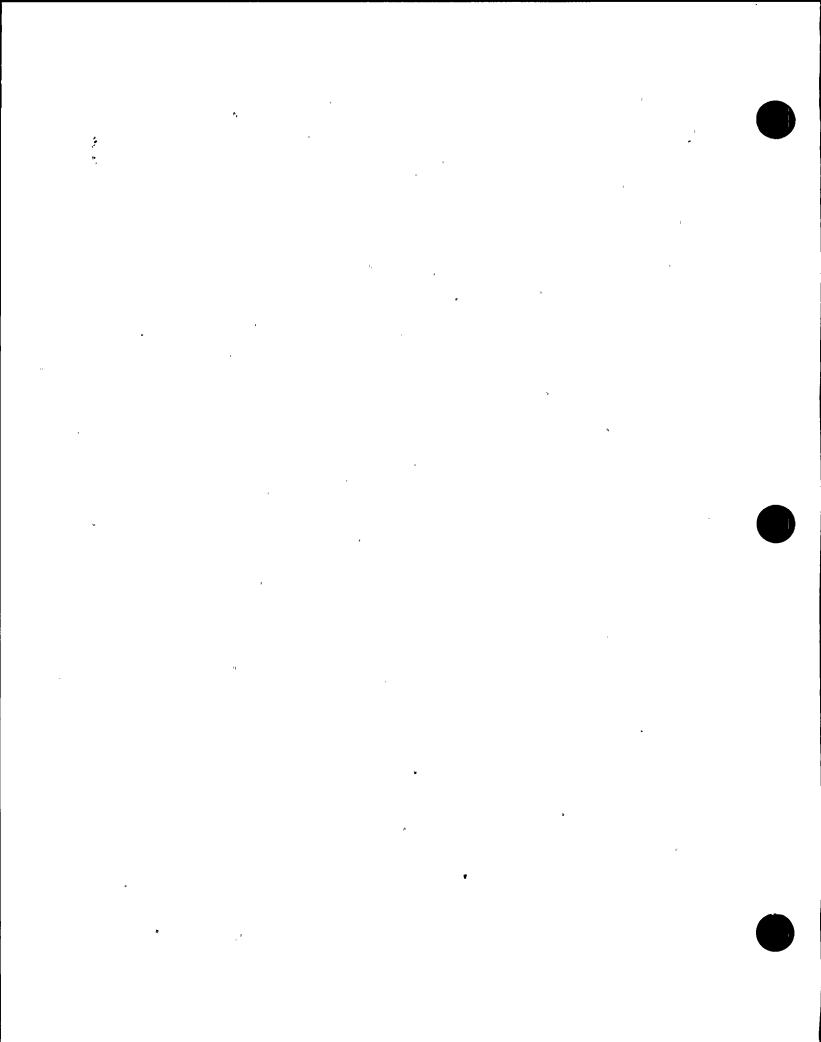
The first section shows a listing of all critical parts in the generator. The critical parts were determined jointly by PEP, PEM, and the NECS Engineering Team based on the function of the parts in the generator assembly.

Next, the basis for the determination of which critical parts procured by PEM would be evaluated during Audit 9003 is discussed.

Following the sample determination, there are two tables. The first shows the critical parts procured by PEM, their critical characteristics, and their method of qualification. The second table shows the critical parts procured by PEP, their critical characteristics, and their method of qualification. The parts are separated according to what facility procured them, because those supplied by PEM are qualified by Audit 9003/Engineering Evaluation, while those supplied by PEP are qualified by PEP Dedication/Engineering Evaluation.

Finally, each audit finding is listed, along with NECS Engineering's resolution and a statement of impact regarding the spare generator.





Generator Critical Parts

This list shows the twenty seven critical parts in the generator assembly (See Attachment E).

Adhesive Bearing Bracket Bearing Seal Brush Brush Holder Bushing Insulator Current Transformer CT Test Switch Insulation Insulating Washers Insulator Lead Wires Magnet Wire Pole End Rings Pole Head Rivets Roller Bearing Rotor Shaft Rotor Wedge Short Circuit Bars Slip Rings Spider End Rings Stampings Stator Coils Stator Frame Stud/Threaded Rod Tapered Keys



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Representative Sample of Critical Parts Supplied by PEM for Audit 9003

Eighteen of the twenty seven critical parts were purchased by PEM. Seven of these were specifically examined during Audit 9003.

In order to determine a representative sample for the performance of the audit, the critical parts were divided into product type categories based on their function in the generator assembly. The following matrix shows these categories and the associated critical parts:

| CATEGORY | PART |
|--------------------|--|
| Bearing . | Roller Bearing |
| Fastener | Stud/Threaded Rod Rivets |
| Electrical | Magnet Wire Stator Coils Lead Wires |
| Electro-mechanical | Stampings Pole Head Slip Rings Short Circuit Bars Insulating Washers |
| Mechanical | Rotor Shaft ' Tapered Keys Rotor Wedge |
| External Support | Bearing Bracket |
| Structural | Stator Frame Spider End Rings Pole End Rings |

By selecting one part from each category, the following seven were chosen as the representative sample:

Roller Bearing, Studs/Rods, Magnet Wire, Stampings, Rotor Shaft, Bearing Bracket and Stator Frame.

Based on the examination of one part from each product type category, the results of Audit 9003 are representative for all critical parts procured by PEM.



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Note that Audit 9003 (Reference 5 pages 27 and 28) also showed insulation and adhesives as part of the audit sample. However, Audit 9003 is not the qualification basis for these components. The insulation and adhesives were purchased by PEP. The insulation has been dedicated by PEP. The adhesive is evaluated in section V of this document.

Also, following the Audit the question was raised regarding the criticality of the stator frame material. NECS Engineering has concluded that the stator frame material is not critical (See Reference 19).

Definitions for the following TABLES:

In the How Qualified column -

"Cleveland Dedication" refers to the Dedication Evaluations performed by PEP and included as Attachment H.

"Audit" refers to the seven parts examined during joint PEP/PG&E audit 9003 of PEM.

"Audit Sample" means that the part is qualified based on the representative sample of parts used during Audit 9003.

"Evaluation" refers to the NECS Engineering evaluation of AFRs in this document.

"Source Inspection" refers to EQS Inspection Plan DC-254.

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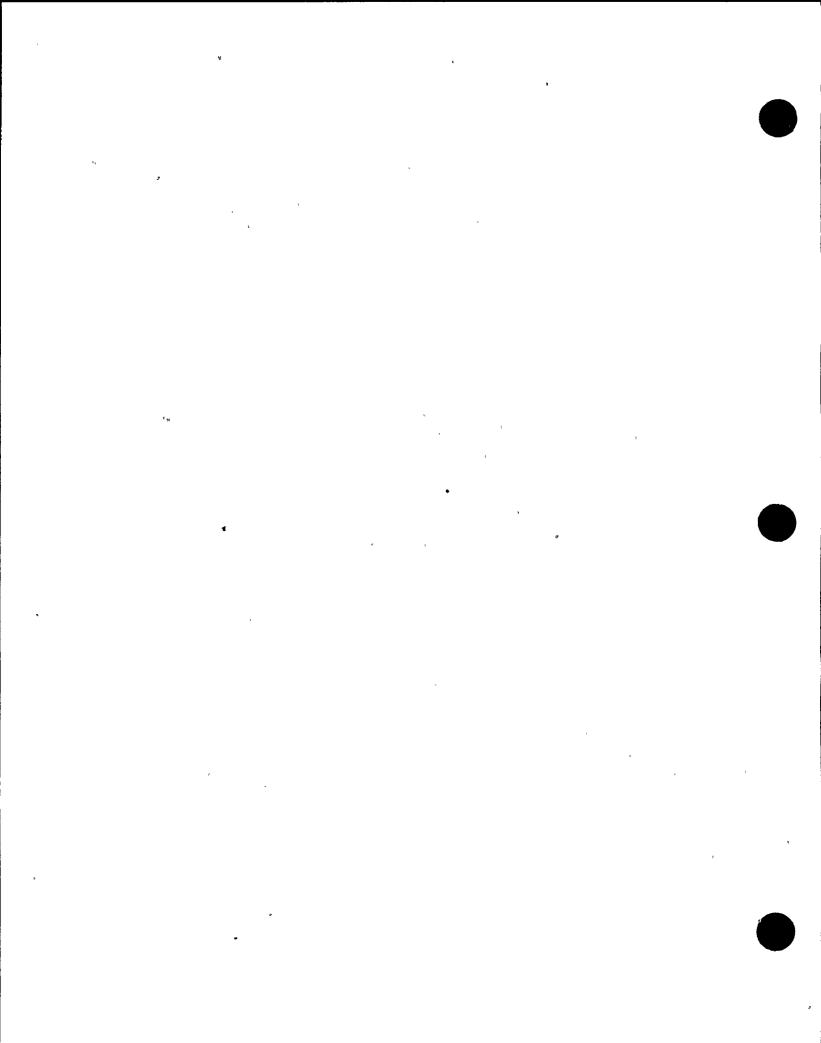
Qualification of Critical Parts Procured by PEM

| <u>Item</u> | Characteristics | How Qualified |
|-------------------|-----------------------------------|---|
| Rotor Shaft | Material Configuration | Audit/Evaluation Audit/Evaluation Source Inspection |
| | Integrity | Audit (|
| Stampings | Configuration Material | Audit Audit |
| Magnet Wire | Material Insulation | . Audit |
| | Dielectric | Audit |
| Bearing Bracket | Configuration Process Control | Audit/Evaluation Audit/Evaluation |
| Stud/Threaded Rod | Dimensions Material Welding | Audit/Evaluation Audit/Evaluation Audit/Evaluation |
| Roller Bearing | Part number Configuration | Audit/Evaluation Audit/Evaluation |
| Spider End Rings | Configuration | Audit Sample |
| Pole End Rings | Configuration Material | Audit Sample Audit Sample |



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| Item | Characteristics | How Qualified |
|--------------------|---|---|
| Short Circuit Bars | Configuration Material | Audit Sample |
| Pole Head | Configuration . | Audit Sample Source Inspection |
| Tapered Keys | Configuration Material Hardness | Audit Sample Audit Sample Audit Sample |
| Rotor Wedge | Material | Audit Sample |
| Rivets . | Configuration | Audit Sample |
| Insulating Washers | Configuration Material Dielectric Strength | Audit Sample Audit Sample Audit Sample |
| Stator Coils | Configuration Chemical Composition Coating Insulation | Audit Sample Source Inspection Audit Sample Audit Sample |
| Lead Wires | Configuration . | Audit Sample . |
| Slip Rings | Configuration Material | Audit Sample Audit Sample |
| Stator Frame | Configuration | Audit Source Inspection |



Qualification of Critical Parts Supplied by PEP

| <u>Item</u> | Characteristics | How Qualified |
|------------------------|--|--|
| Brush Holder | Configuration | Cleveland Dedication |
| Brush | Configuration | Cleveland Dedication |
| Current Transformer | Configuration Mounting Insulation Resistance Continuity | Cleveland Dedication Cleveland Dedication Cleveland Dedication Cleveland Dedication |
| Insulator | Dielectric Strength Configuration | Cleveland Dedication Cleveland Dedication |
| Bearing Seal | Configuration Felt Texture | Cleveland Dedication Cleveland Dedication |
| Bushing Insulator | Configuration | Cleveland Dedication |
| CT Test Switch | Configuration Dielectric | Cleveland Dedication |
| | Strength Continuity | Cleveland Dedication Cleveland Dedication |
| Insulation | Thickness | Cleveland Dedication |
| Adhesives | Material | Evaluation |



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Evaluation of Findings for Audits 90197S and 9003

See Attachment F for PEP's responses to AFRs 90-067 through 90-072 and PEM's responses to AFRs 9003-1 through 9003-6.

Problem: PG&E AFR 90-067 - Design Control

PEP has not documented their "Incoming Order Review" for PG&E's Job No. S-1128 (Generator for 6th Diesel). Until this review is fully documented or performed, PEP cannot assure that the design of the new generator is "like for like" with the design of the spare generator, per Purchase Order requirements. Material substitutions were not submitted to PG&E nor were drawing changes.

Resolution:

See Attachments G and U

PG&E requested that PEP submit a description of all design changes, material changes, and Discrepancy Reports since the manufacture of the original five generators (See Reference 18). The Discrepancy Reports and Design Changes have been provided by PEP, and are summarized below.

Discrepancy Report Summary:

Discrepancy Report No. 2746

The spigot diameter at the coupling end of the generator shaft was machined undersize. The drawing specifies 18.2525 to 18.25, actual size is 18.2475.

Per discussion with the engine manufacturer, "The clearance between the generator coupling and the ring gear flange will be 0.0025 inches - 0.005 inches. This undersize surface will not be a problem because we install a locating pin at assembly between these 2 parts." (See GE Locomotives fax included in Attachment G).

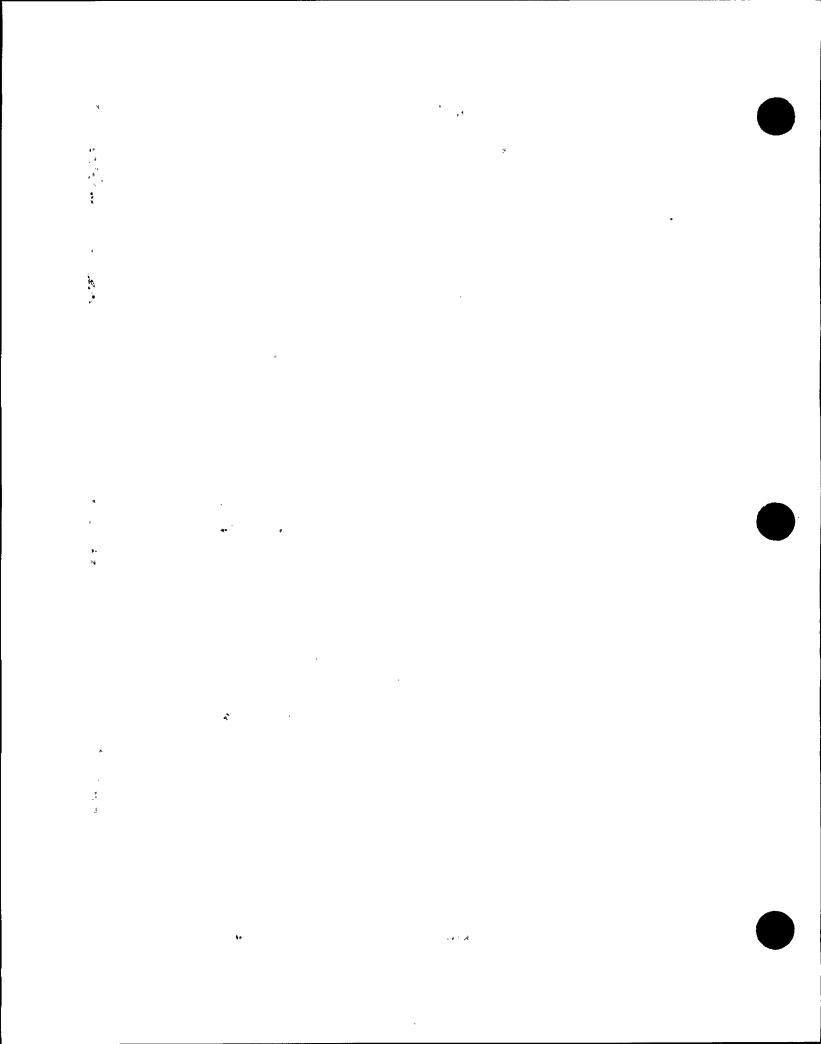
Based on contact with the engine manufacturer and a review of interface dimensions of the shaft coupling, PG&E Engineering concludes that the undersize spigot diameter is acceptable for use in our assembly.

Discrepancy Report No. 2783

PEM did not use oxygen free copper in accordance with PEP specification MC-80.5.

PEP performed an engineering evaluation based on the function of the part.



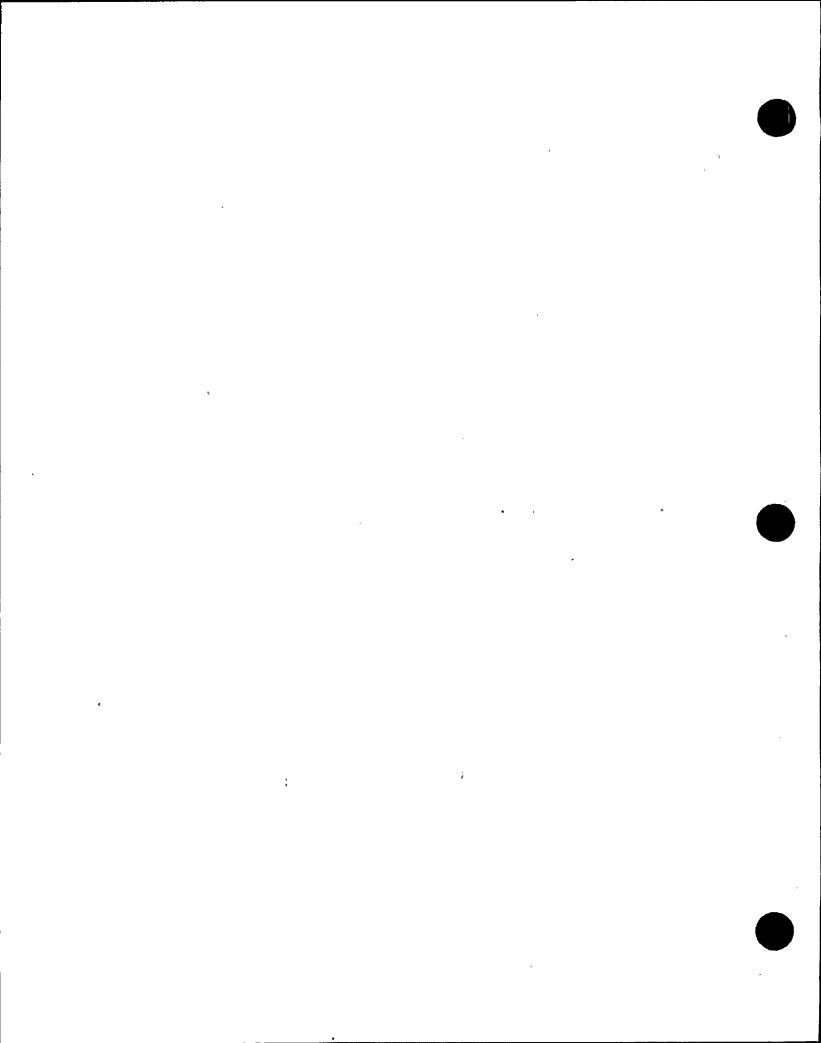


ATTACHMENT 1

NEI PEEBLES - ELECTRIC PRODUCTS, INC. LETTER TO PG&E,

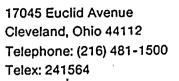
DATED JANUARY 17, 1992.

RESOLUTION OF ISSUE IN NRC IR 50-323/91-202





NEI Peebles - Electric Products, Inc.



Facsimile: (216) 481-8386

EF-3458 January 17, 1992

Pacific Gas and Electric Company NECS- Engineering Building Equipment Qualification Group

Attention: Mr. Ed Walters

Emergency Diesel Generator Subject:

Our S-1128

Dear Mr. Walters:

We wish to comment on the concerns raised in the letter to your Mr. Shiffer, which you sent to us on the 14th of January.

The rotor pole magnet wire was specified by PEP as MW 25.3 (unvarnished Dayglas to NEMA MW - 1000) the same as the original machines. PEM's Purchase Order specified it as the same, and their supplier (ISM) certified it as unvarnished. The ISM supplier (UDD) certified (in French) that it was varnished. Upon checking, PEM received confirmation that the wire was "lightly" varnished.

Both types of magnet wire have been used successfully by PEP over the years in rotating machinery. As this is slightly different than the pole wire on your original machines, however, we concluded that the critical aspect of the difference would be in its adhesive properties, and that testing of the actual wire with the pole adhesive would be prudent in order to support the acceptability of the wire. Since the machine has passed its factory tests including overspeed, we have no reason to believe that this wire will not prove to be acceptable.

The materials for test purposes have been placed on order, but the test schedule is not at this time finalized.

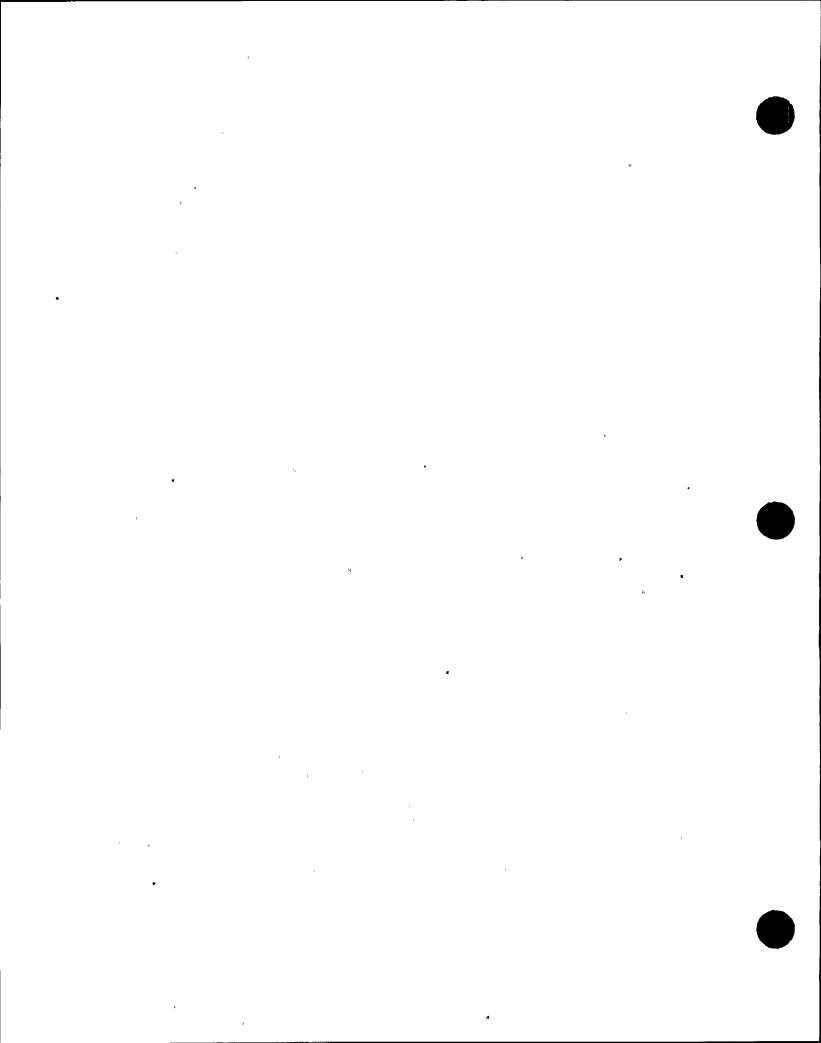
The second point raised by the NRC dealt with the bearing insulation ring (A - 64934 A), which was not identified as a Critical Component, but in their discussions at PEM was deemed to have criticality (in shear).

The ring's function is to insulate the bearing housing from the bearing bracket in order to prevent circulating currents which can pit the bearing surface and eventually lead to bearing failure.

The verification of this function is the bearing insulation test of IEEE 115 - 1983, section 3.6.

In the formal Failure Modes and Effect Analysis written by PEP in accordance with IEEE 352 to support our equipment qualification program to IEEE 323 - 1974, the credible failure mode of the

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bearing insulation was determined to be a short across the insulation due to moisture, dirt, or mechanical damage. The failure was assigned a critically of 3 (on a scale of 1 to 5) meaning that the system is degraded (not a catastrophic failure) and that adequate warning is given of an eventual failure.

The mechanical failure of the insulation had not been deemed a credible failure mode. While we would agree that the ring is part of the support system of the bearing housing, due to the sandwich design (see typical cross section attached), and lack of any known failure of this design, the mechanical strength was not considered a critical design characteristic.

As with the electrical mode, any degradation would be progressive (not catastrophic) and would reveal itself by an increase in vibration while running.

It should be noted that the design is exactly the same as the original machines. This method of bearing insulation was the standard, and was used on many machines.

The drawing (A-64934 A) specified the material to be "C. B. Bakelite" (the C.B. meaning canvas backed). Bakelite was used generically to describe phenolic based laminates. The ring for the new generator is NEMA Grade LE (NEMA LI 1 -1983, Industrial Laminated Thermosetting Products), which is, likewise, cotton fabric with phenolic resin binder.

We will, of course, notify you of the wire testing when the details are finalized.

Yours truly,

NEI Peebles - Electric Products, Inc.

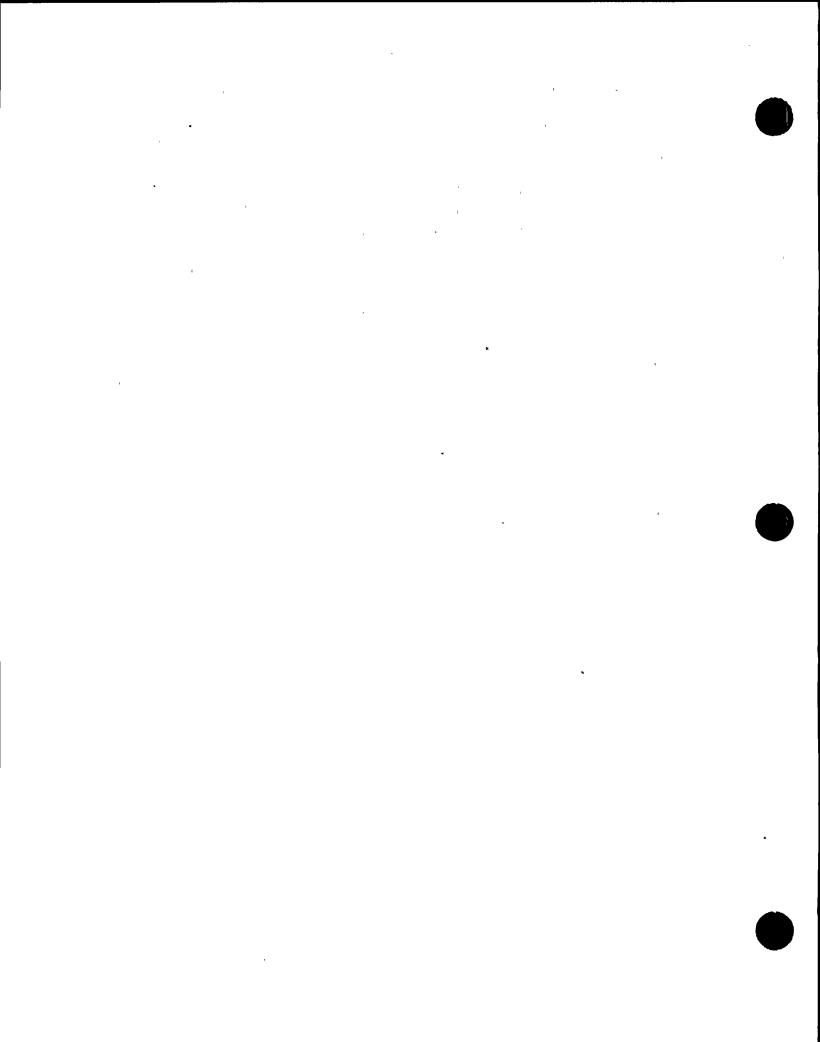
Charles Moosbrugger

Charles Moorlinger

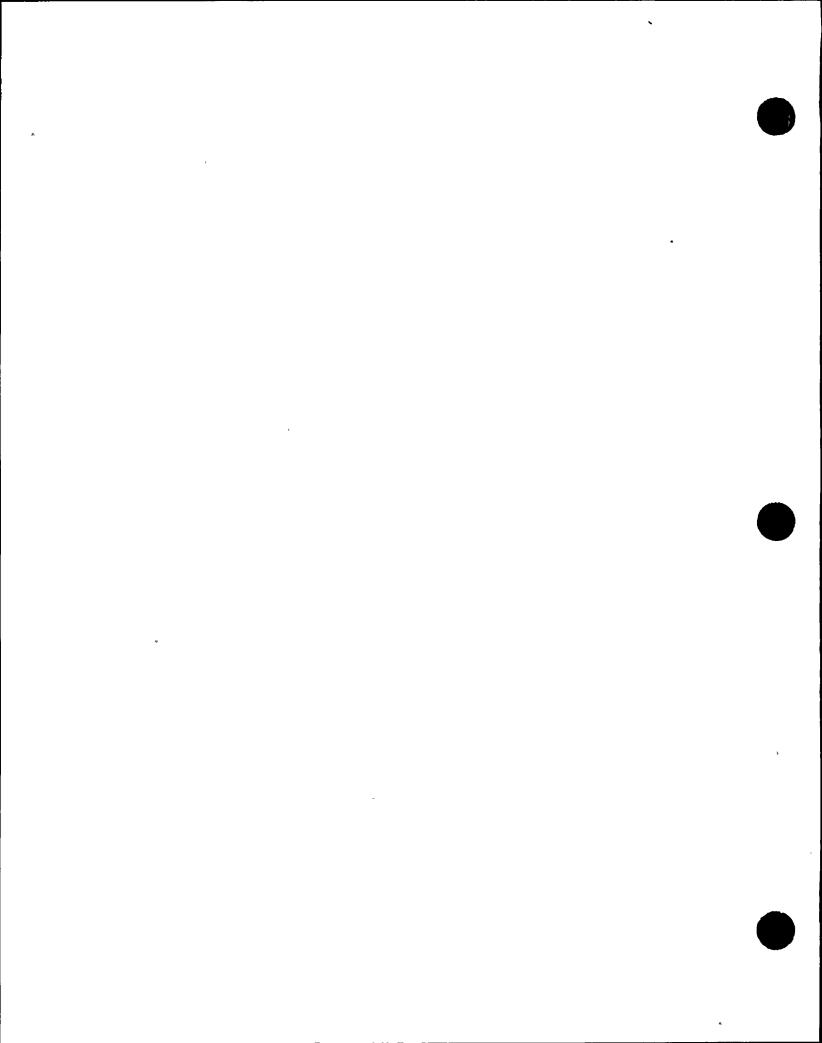
Technical Manager

encl.





ATTACHMENT 2 PG&E ENGINEERING EVALUATION OF P-EP NEMP 12.4, REVISION 1



Date:

October 31, 1991

File#: 10.20, 129.70

To:

QUALITY ASSURANCE

From:

DIABLO CANYON PROJECT ENGINEER

Subject:

Revision 1 to NEMP 12.4 Engineering Evaluation of NEI

Peebles Electric Products, Audit 90197S



JAMES A. SEXTON:

This memorandum transmits Revision 1 of the evaluation of NEI Peebles Electric Products Inc. of Cleveland, Ohio. The purpose of this revision is to incorporate the results of Audit 90197S Follow-Up Report and the additional design change and equivalency evaluations performed by the supplier.

Based on the attached evaluation, NECS Engineering recommends that all open items regarding the Qualification of the Sixth Diesel Generator purchased by order ZS-1539-AB-9 be closed.

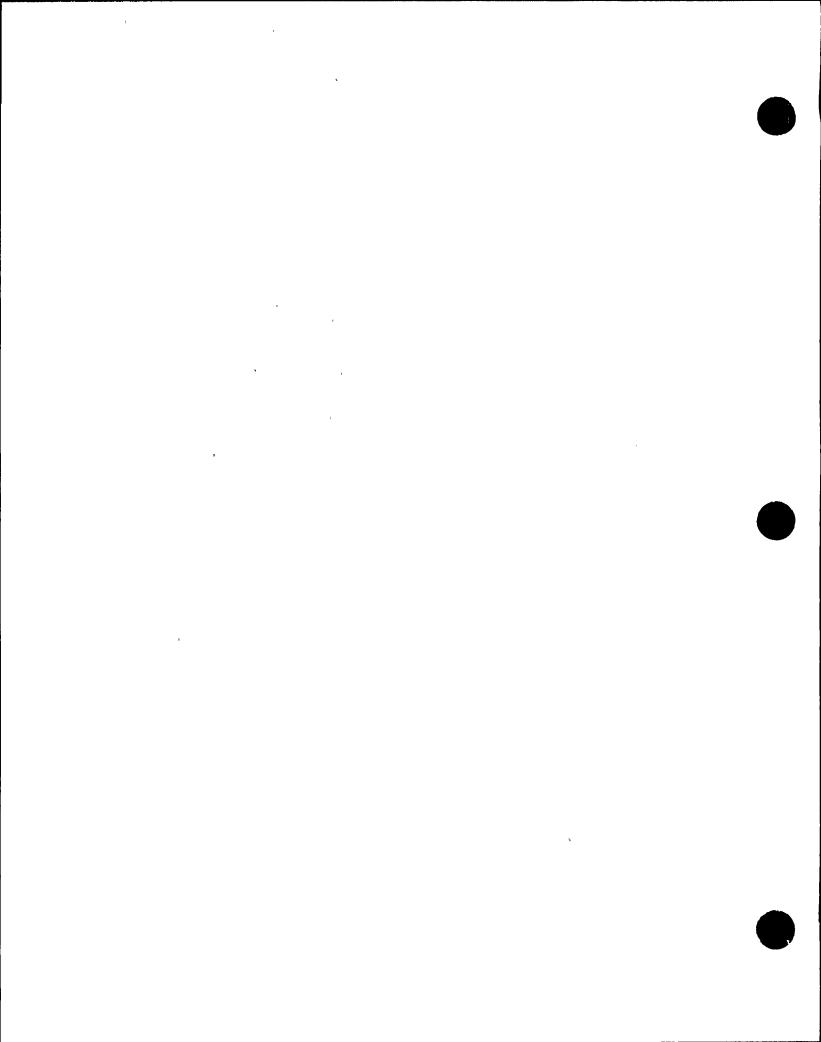
R.B. Clash

for MICHAEL R. TRESLER

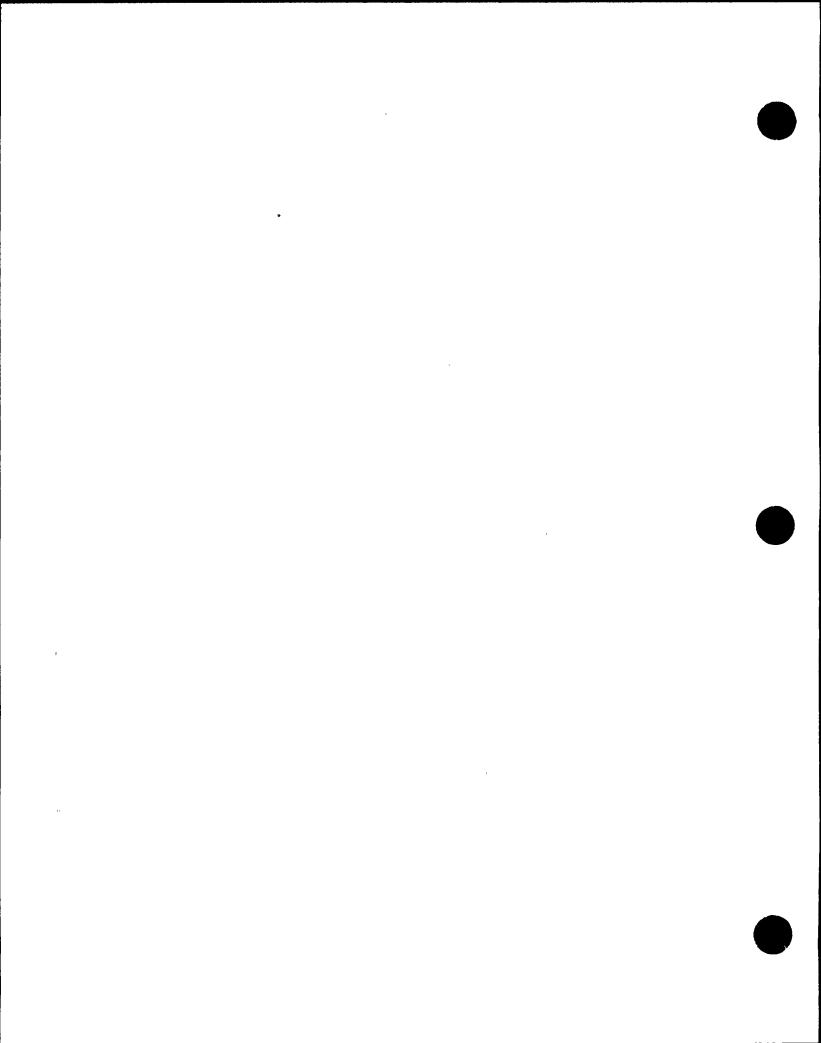
• ECWalters(3-9666):ecw

| cc: | MBasu | (w/o attachment) | 333/A9090 |
|-----|-------------|-----------------------------|------------------|
| | HHBorgard | (w/o attachment) | 1 Cal/408D |
| | RBClark | <pre>(w/o attachment)</pre> | 333/A1414 |
| | MDobrzensky | (w/o attachment) | 1 Cal/18th floor |
| | UAFarradj | | 333/A7004 |
| | TFFetterman | (w/o attachment) | 333/A9042 |
| | ERKahler | (w/o attachment) | 333/A2011 |
| | AKKar | | 333/A9088 |
| | DCTateosian | (w/o attachment) | 333/A7003 |
| | GATidrick | (w/o attachment) | 333/A2010 |
| | ECWalters | · | 333/A2007 |

Attachments

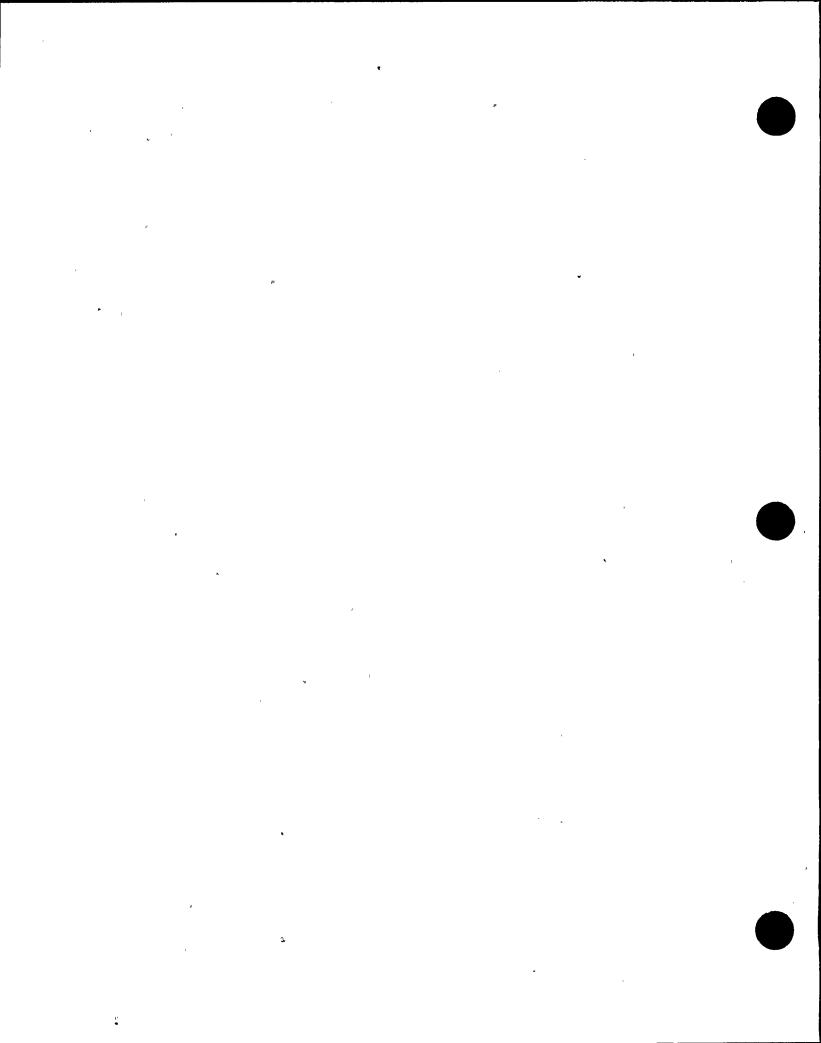


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| II. | Evaluation Results | | | |
| III. | Product Performance Evaluation | | | |
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| | - 10 CFR 21 Reports | | | |
| | NRC Information Notices, Bulletins, Letters, INPO Significant Event Reports (SER), Significant Operating Experience Reports (SOER) | | | |
| | Notepad 5-14-80, LER 335/80-13 | | | |
| ı | o Safety Review Event Follower 85-136 IN 85-68 | | | |
| | o Safety Review Event Follower 86-054 IN 86-26, SER 70-84 | ı | | |
| | Licensee Event Report No. 90-012-01 Washington Public Power Supply System | | | |
| | - Restricted Equipment List NPAP D-11 | | | |
| | - NRC Licensee Contractor and Vendor Inspection Status Report (NUREG 0040) | | | |
| | o Report 99900772/82-01 Parsons Peebles-Electric Products Cleveland, Ohio | | | |
| | o Report 99901065/86-01 Peebles Electric Machines Edinburgh, Scotland | • | | |
| | o Report 99900772/86-01 Parsons Peebles-Electric Products Cleveland, Ohio | | | |
| | - Government Industry Data Exchange Program | | | |

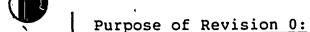


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I. OVERVIEW



Revision 0 of this document was issued to evaluate all Audit Findings for NEI Peebles Electric Products in accordance with Procedure NEMP 12.4. These findings were a result of the PG&E assessment of NEI Peebles Electric Products in Cleveland and the Cleveland assessment of their subsupplier, Peebles Electric Machines in Scotland.

Purpose of Revision 1:

Revision 1 of this document is being issued to incorporate the following:

- Recently Identified 10 CFR 21 Reports for Peebles
- Results of PG&E QA Audit 90197S Follow-Up
- Results of PG&E Independent Testing of Adhesive
- Results of Final Design Change and Procedure Equivalency Review performed by NEI Peebles.

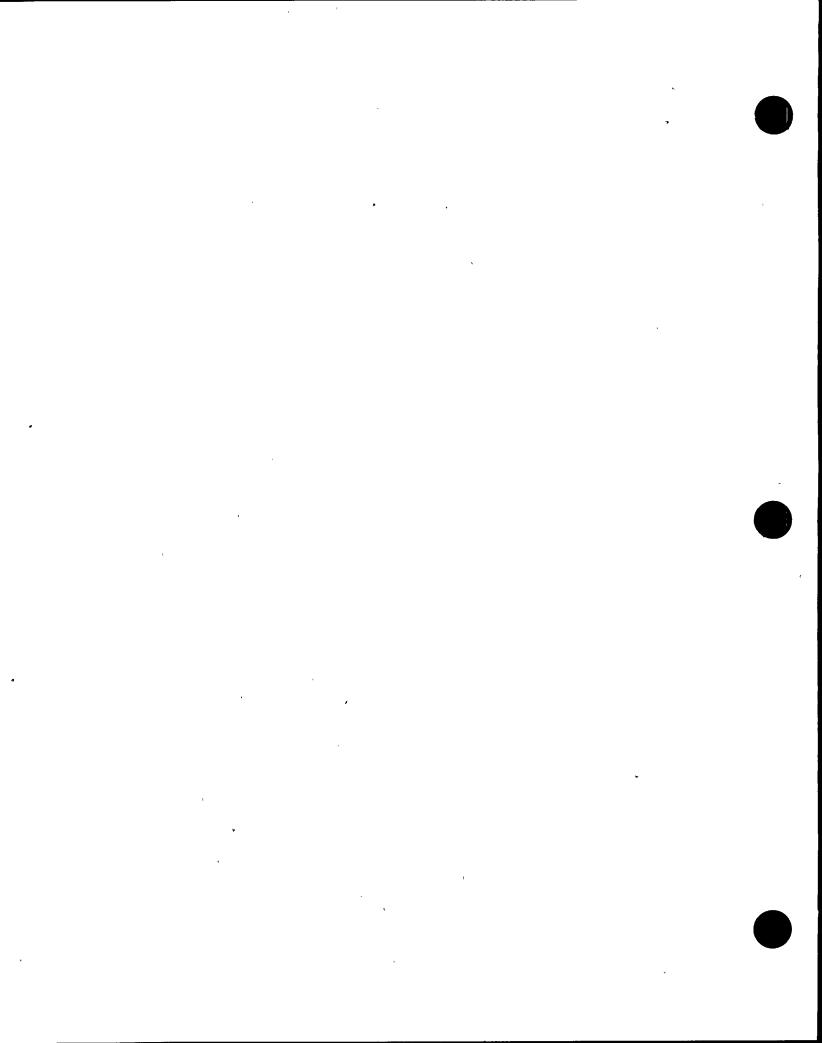
Background:

The following excerpt from NRC Vendor Inspection Report 99901065/86-01 gives a synopsis of the history of the Generator Supplier:

"The electrical generators for the emergency diesel engines installed at the Diablo Canyon Nuclear Power Plant were originally designed and manufactured by Electrical Products Incorporated (EPI) located in Cleveland, Ohio. Northern Engineering Industries Parson Peebles (NEI Parson Peebles) of Great Britain bought EPI in 1979 and renamed it Parson Peebles EPI. The manufacturing operations of Parson Peebles EPI ceased in the fall of 1984. Peebles Electrical Machines, a subsidiary of NEI Parson Peebles is currently manufacturing a spare electrical generator for the Diablo Canyon Nuclear Power Plant. Parson Peebles EPI is furnishing the design drawings and all the components available from their storage to Peebles Electrical Machines for the manufacture of an identical spare electrical generator."

*** For the purposes of this evaluation, NEI Peebles Electric Products Inc. in CLEVELAND shall be designated as "PEP", and Peebles Electric Machines in EDINBURGH Scotland shall be designated as "PEM". ***







Pacific Gas & Electric is purchasing a generator for the Sixth Diesel Installation Project. The generator will be supplied as a safety related item by PEP. Although PEP controls the design of this product, it is procured by PEP as a commercial grade item from PEM.

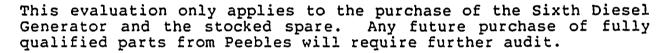
Audit 89295S was performed on PEP in December 1989. This audit resulted in PEP being placed on the QSL.

PG&E issued Purchase Order ZS-1539-AB-9 in January 1990 for the generator in accordance with QA Specification SP-D-Peebles Revision 4.

In August of 1990, Implementation Audit 90197S for PEP was conducted in accordance with QA Specification SP-D-Peebles Revision 4. This audit identified the problems which are addressed in this evaluation.

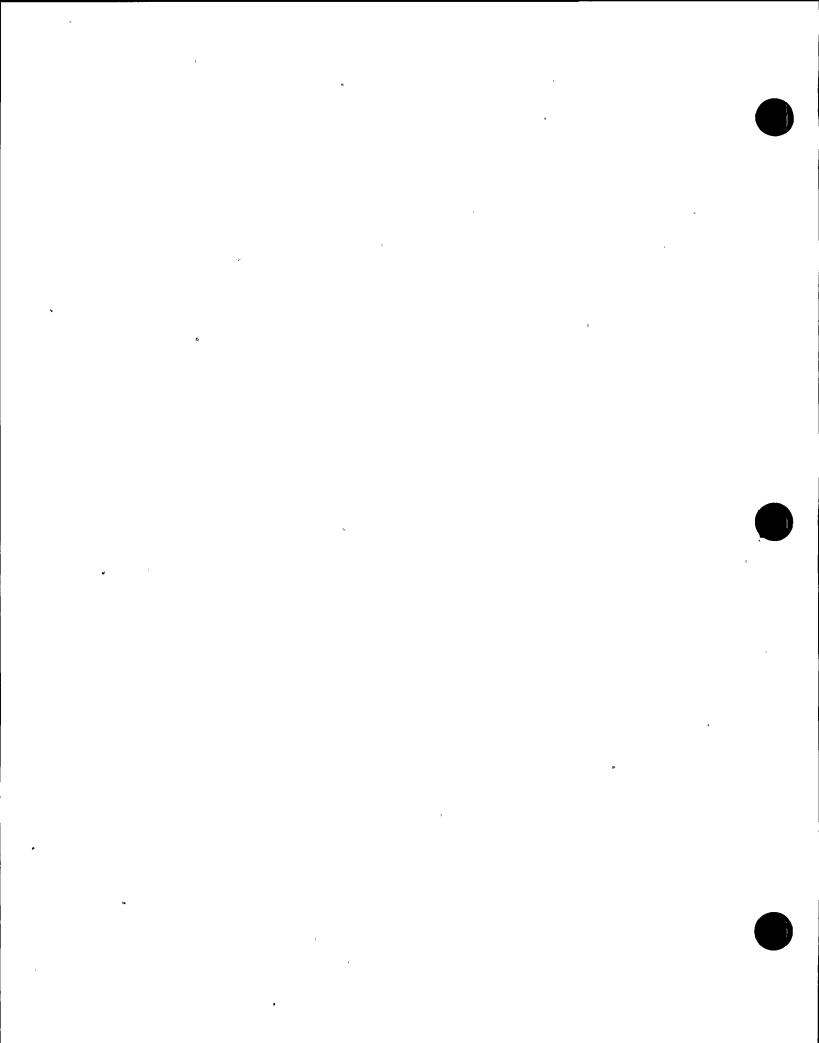
As part of the resolution of subsupplier evaluations [AFRs 90-068, 90-069 and portions of 90-072 from Implementation Audit 90197S], PG&E participated in PEP's Audit 9003 of PEM. These results are also evaluated here.

For each problem identified, this evaluation also includes a statement of impact regarding the spare generator in stock at Diablo Canyon.

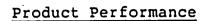








II. EVALUATION RESULTS



The following items have been reviewed to determine whether they affect the quality of the sixth diesel generator or the spare purchased from PEP:

- 74 NPRDS Reports
- 10 CFR 21 Reports and Utility Reports
- 79 Bulletins, Letters, SER, SOER
 - 1 LER 90-012-01, WPPSS
 - 1 Restricted Equipment List Revision 12
 - 3 NRC Vendor Inspection Reports
 - 1 Government Industry Data Exchange Program

Out of the 162 items, twenty required further assessment. It has been determined that none of these have an impact on the new generator or the stocked spare.

Based on review of these documents, NECS Engineering concludes that there are no related part failures that indicate PEP is not controlling the design or quality of parts. The isolated incidents do not indicate any programmatic concerns.

Supplier Qualification

All audit findings have been reviewed. Additional investigations regarding subsupplier issues have been performed as required. Also, to provide added assurance, independent testing of the adhesive and rotor shaft has been performed. Based on the enclosed evaluation, NECS Engineering concludes that PEP is qualified to supply the sixth diesel generator.

Actions to Maintain Qualification/Release Spare

NECS Engineering concludes that no additional verification or testing is required to qualify the new generator.

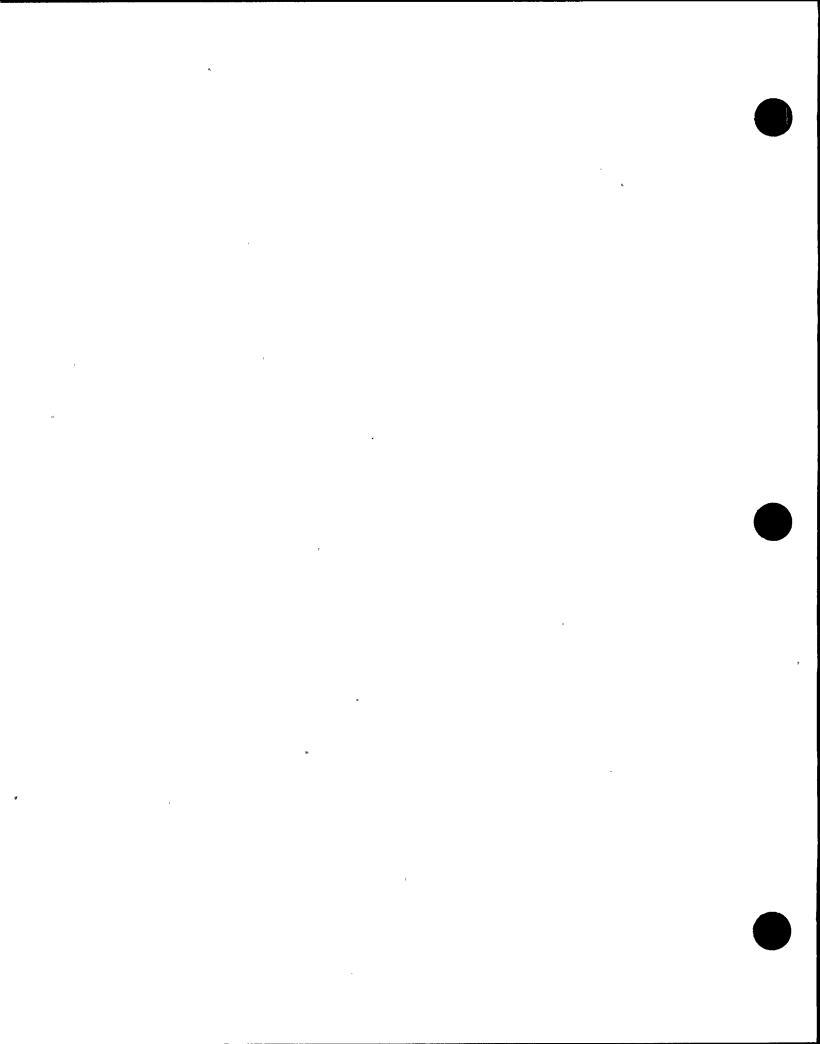
The spare generator can be released for installation (as a unit assembly) upon completion of the following design changes:

Welding of Stator Frame, see PIMS Action Request A0213896

Addition of Terminal Box Supports, see PIMS Action Request A0214809.







III. PRODUCT PERFORMANCE EVALUATION

Based on QA concerns related to the implementation of Specification SP-D-Peebles, we have reviewed the referenced documents and information to determine if there are repeated instances of questionable product performance.

Per discussions with Mr. Ron Politi of PEP [216-481-1500], PEP has supplied generators to 26 Nuclear Utilities in the past 10 years. He also stated that there are in excess of 150 PEP electric generators in operation at this time.

This review included the applicable NPRDS data, 10 CFR 21 Reports, NRC notices and bulletins, License Event Report 90-12-01, Restricted Equipment List NPAP D-11 Rev 12, NRC Vendor Inspection Reports, and the Government Industry Data Exchange Program summary of failures.

The problems identified along with NECS Engineering's resolution are summarized below. Note that PG&E's generators are Model 140, Type L-10823.

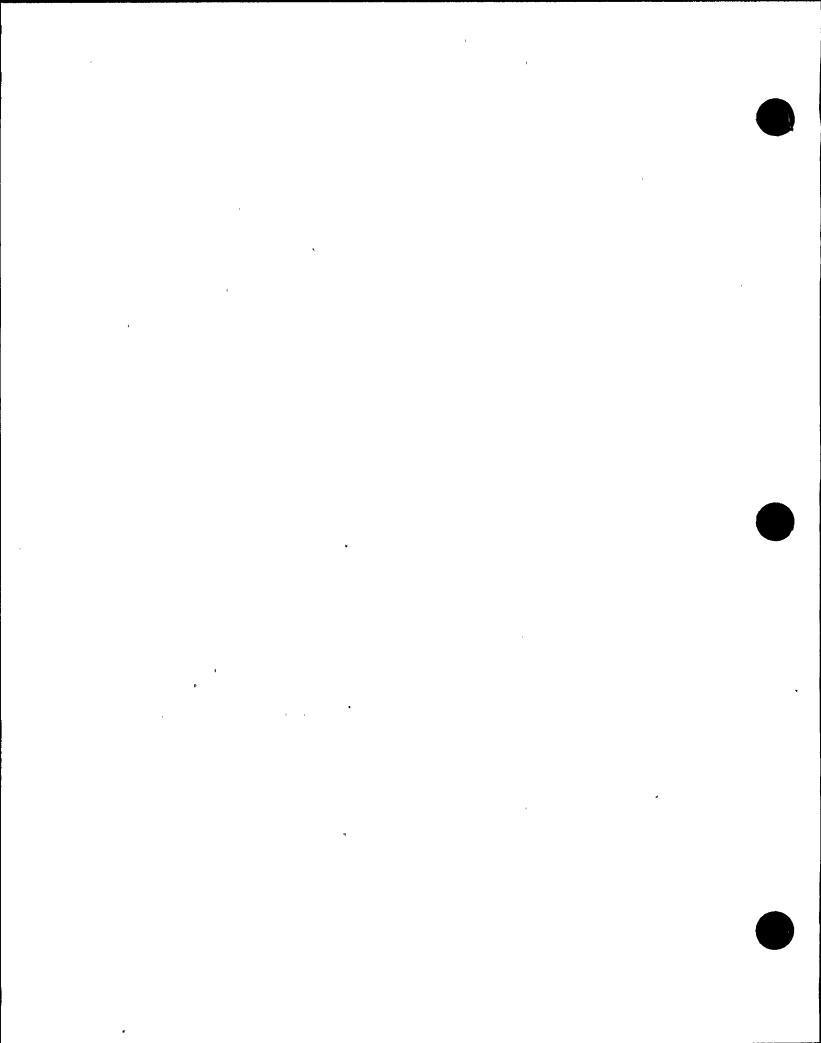
Nuclear Plant Reliability Data System

See Attachment A - This data base was searched by "Parson Peebles", "NEI Peebles", "Electric Products" and "Portec." There were twelve records found under Parson Peebles Electric Products Inc, and sixty-two records found under Portec. These records are summarized below:

- 2 Condensate booster Pump Motor
- 1 Batteries
- DG Room Exhaust Fan Relay
- 6 Diesel Engine (overspeed trip, governor, lube oil cooler gasket, turbocharger bearing, immersion heater contacts)
- 54 Control Circuitry

Excitation Panel/Field Flash (firing module, relay, resistor, diode, contacts, motor operated potentiometer, cable, fuses, saturable reactor transformer)
Generator Control Panel (diode, silicon controlled rectifier, relay, meter, load sensor module, fuse, fuse holder, speed switch, frequency module, resistor)







Voltage Regulator (relay, contacts, board, circuit breaker, amplifier module, motor operated potentiometer, surge suppressor)

Annunciator Panel (diode)

The above listed failures are not applicable to the evaluation of the generator. For the Sixth Diesel Installation, the generator control panel, excitation panel/voltage regulator and associated components are being purchased and assembled by PG&E, and are not being supplied by the generator manufacturer. These components are individually dedicated and tested in accordance with the Replacement Part Evaluation process (See Reference 8).

The remaining 10 records not shown above deal with the actual generator, and are evaluated below.

Problem: Gulf States Utilities, River Bend 1
Parson Peebles Electric Products
Generator Model L-11071

Rotor windings on number 14 pole had separated from the shaft pole washer and bowed out towards the stator.

Resolution: The probable cause was determined to be a combination of:

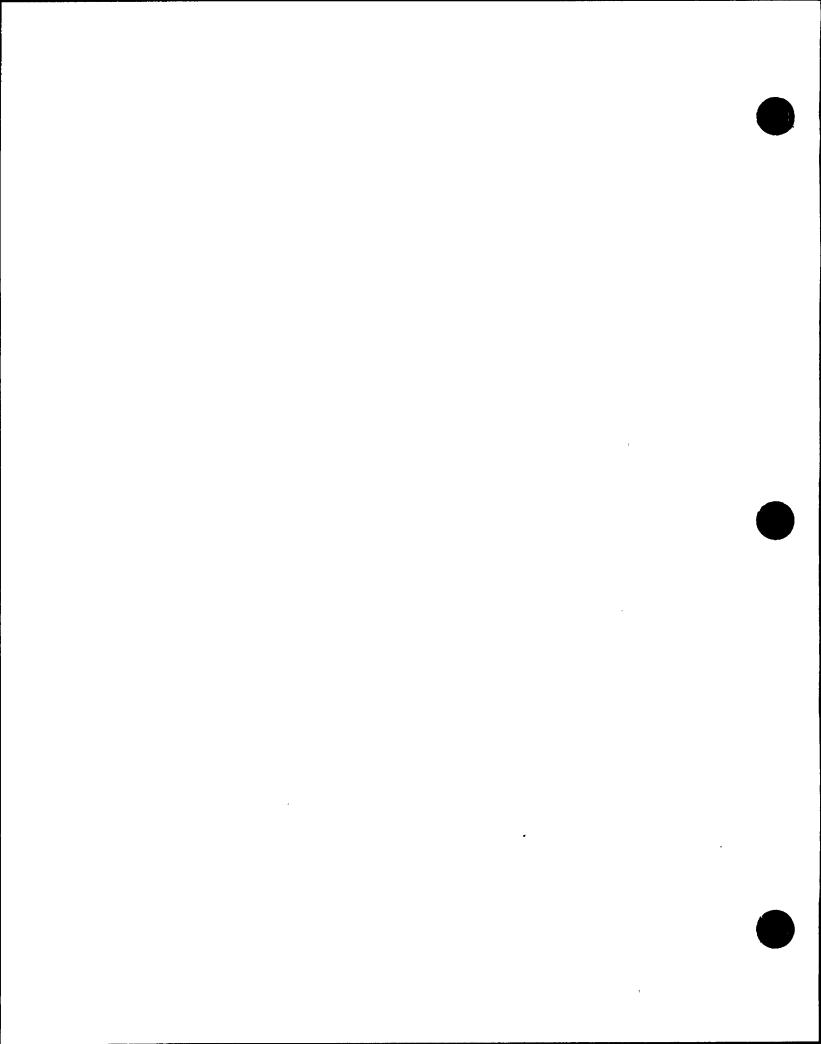
- 1) Inadequate attention to shelf life and storage conditions
- 2) resin application errors
- 3) contamination during resin application.

Per discussion with Mr. Ron Politi of PEP, this failure is not a concern for PG&E, since the engine in question is a different model/size/design than those used at Diablo Canyon. River Bend has a 450 RPM, 16 pole machine. Also, our machine design has wedges, while this one does not. He added that the adhesive used on this machine is not used on our new generator, since this product is no longer available. Mr. Politi also stated that this problem is still under investigation, but that preliminary indications are that it was not a manufacturing problem. PEP believes that the assembly was damaged on site prior to installation (dropped).

Additional justification for this view is that the separation only occurred on one out of sixteen poles, which would not be the case if the resin was installed improperly.

Problem: Pennsylvania Power & Light, Susquehanna 1
Portec
Model 170







Oil leakage from the air vent part of the generator bearing high temperature trip sensor.

The cause of the leakage was that the trip sensor Resolution: had not been properly reinstalled in its mounting hole after an 18 month diesel overhaul.

This failure is due to improper maintenance, and has no effect on the spare or new sixth diesel generator.

Pennsylvania Power & Light, Susquehanna 1 Problem: Portec Model 170

The winding resistance check (Megger) as part of the technical specification inspection did not meet the acceptance criteria.

The suspected cause of the insulation breakdown Resolution: was wear. Root cause was not clearly identified, since a subsequent megger test met the acceptance criteria.

This failure has no impact on the spare or new generator. Final testing of the new generator assembly will verify the insulation resistance. Also, the spare generator megger checks are satisfactory (See preventative maintenance work orders, Reference

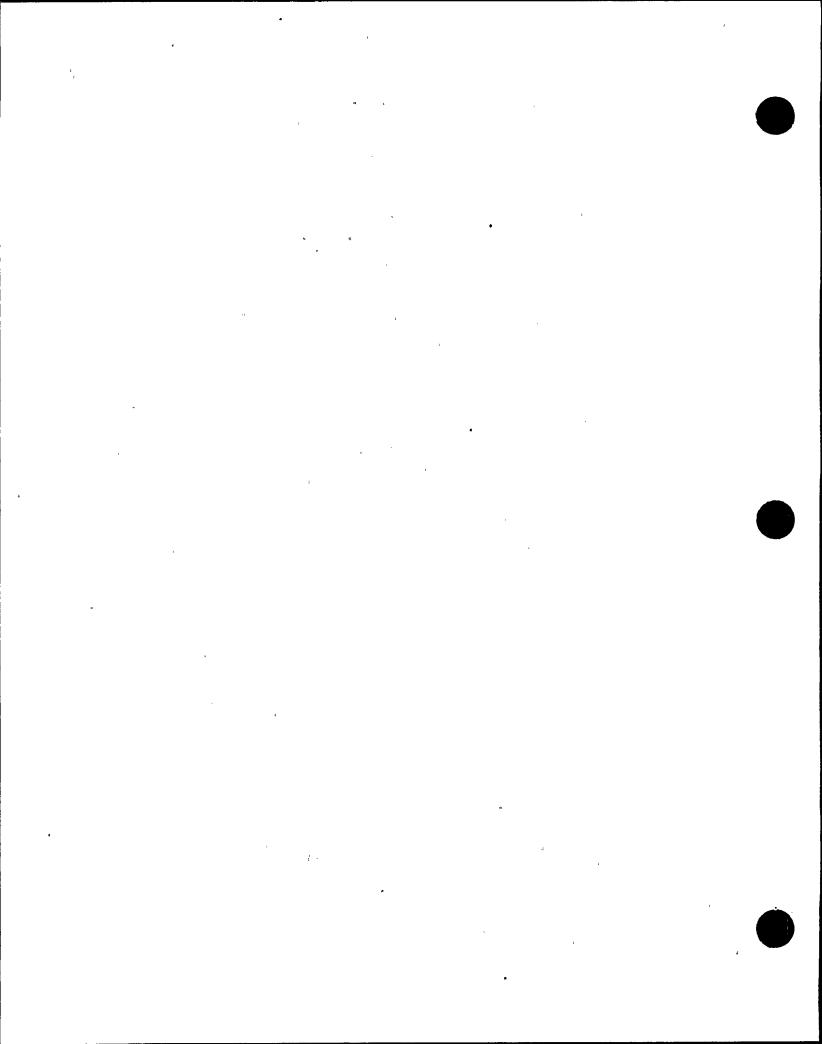
Pennsylvania Power & Light, Susquehanna 1 Problem: Portec Model 170

The surveillance test failed the megger acceptance criteria on the exciter portion of the generator. After servicing the DG for this problem the generator was operated. During this operation, the generator had an arc-over which started a fire in the main plant process computer.

The root cause of the megger test failure and Resolution: possibly the fire were from grounding of the generator. This grounding was probably caused by dirt and moisture accumulation in the generator, which was in turn due to construction on a new diesel addition. The arc-over was caused by human error because the slip ring wiring lugs were not tightened.

This failure has no impact on the spare or new generator, since the ` problem was caused by improper maintenance/cleanliness by the utility.





Problem: System Energy Resources Inc., Grand Gulf 1
Portec
Model L-11022

Sparks were observed coming from the generator bearing end cap.

Resolution:

Maintenance inspection revealed a low spot in the insulation under the generator inner race. This condition allowed excessive radial movement of the generator shaft which created circulating currents. These currents resulted in the sparks and overheating of the generator.

This bearing insulation failure is not a concern for our generators. Based on discussions with PEP in 1986, "...DCPP generators were manufactured prior to the model which incorporated the glass/resin bearing insulator. Since we are currently manufacturing a spare generator for DCPP, we recently investigated this exact topic to be certain that a design variation from the exact duplicate, as you ordered, would not be required. Previously installed DCPP E-P generators, the stocked spare, as well as the sixth generator currently in progress include a bearing support insulator and do not use the subject shaft insulator."

The insulator failure is not applicable to PG&E's new or spare generator, since they do not use this type of shaft insulator.

Note that this same failure is evaluated later in this section under SER 86-054.

Problem: System Energy Resources Inc., Grand Gulf 1
Portec
Model L-11033

The bolts in the generator termination box cover were stripped out and needed to be replaced.

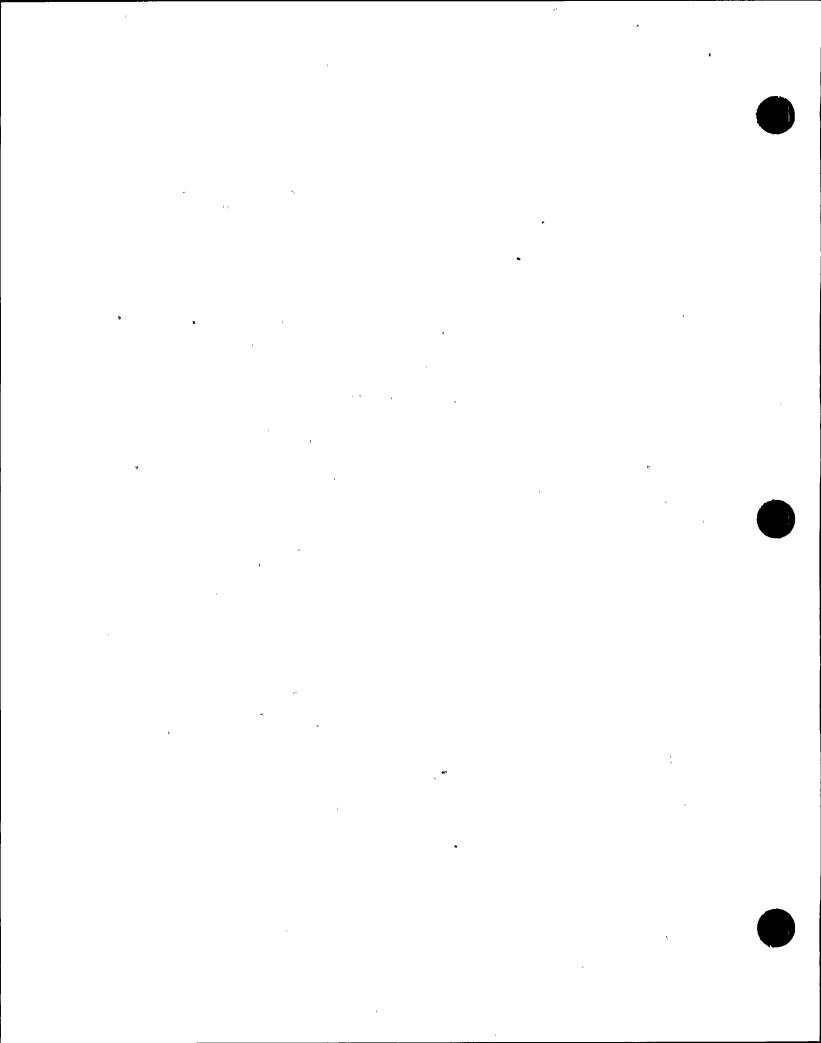
Resolution: The bolts were stripped due to misalignment between the termination box cover bolt holes and their permanent nuts tack welded to the lip of the termination box.

This failure has no impact on the spare or new generator, as the misalignment is a maintenance problem, not a manufacturing defect.

Problem: Southern California Edison, San Onofre 1
Portec
Model L-11058

Maintenance found the emergency generator lower outboard support (casting) broken at the upper outside where the dust seal sits.





Resolution:

This was caused while attempting to lift out the lower bearing half. The jack and the lift plate slipped and crushed the lower part of the generator bearing housing and broke

approximately 7 inches off the housing around the dust seal enclosure.

This failure has no impact on the spare or new generator, since the support was broken during maintenance activities.

Tennessee Valley Authority, Sequoyah 1 Problem:

Portec

Model L-10906

During plant shutdown, surveillance indicated diesel generator bottom outboard brush tension was out of adjustment.

Resolution: Root cause unknown.

This failure has no impact on the spare or new generator, since the brush adjustment indicates improper maintenance not a manufacturing defect.

Arizona Public Service Company, Palo Verde 1 Problem:

Portec

Model L-11094

Three of the top mounting bolts for the cage of the shroud assembly were stripped out. The bolts and nuts serve to hold wire mesh screen on the generator end for ventilation.

The cause was that the bolts had been over Resolution: stressed during tightening.

This failure has no impact on the spare or new generator, since the stripped bolts indicate improper maintenance not a manufacturing defect.

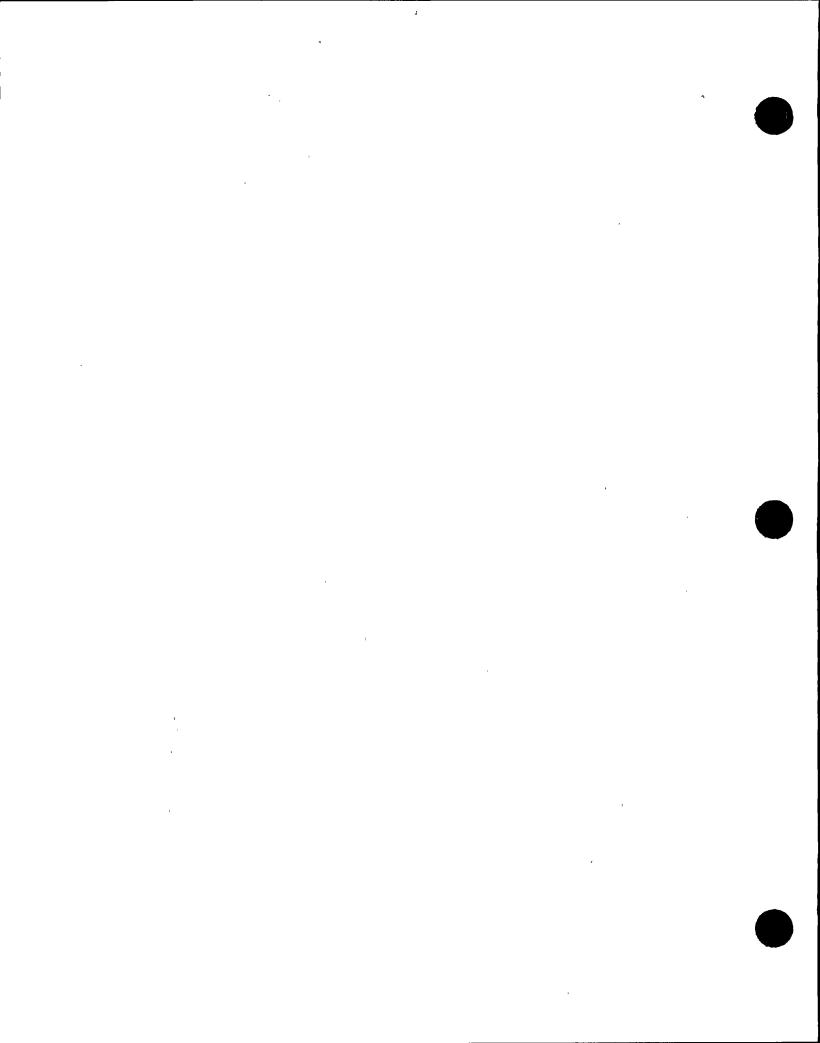
Problem: . Arizona Public Service Company. Palo Verde 2 Portec Model L-11094

During normal preventative maintenance on the diesel generator a broken brush on the top west inner ring was found.

Resolution: Root cause unknown.

This failure has no impact on the spare or new generator. The brushes are items subject to normal wear.





10 CFR 21 Reports



See Attachment B

Report: Issued by NEI Peebles, Dated November 24, 1986

Utility: Arizona Power, Palo Verde Unit 3

Customer: Cooper Energy

The problem identified in this report is that a copper winding on a pole had moved. The equipment was manufactured by Parsons Peebles Electric Products in 1980. The cause of the defect was a substandard bond of the polyester resin and the field coil conductor in certain localized areas of the wirewound rotor pole, resulting in the separation of the wire from the coil.

This separation could be brought about by: mechanical damage; improper formulation, mix, or cure of resin; or improper resin application. In this case, there is no evidence of mechanical damage. NEI Peebles performed a review of their records for rotor poles manufactured using this particular resin mix, and determined that this batch only affects the two duplicate diesel generators supplied to Palo Verde Unit 3.



NEI Peebles recommended two corrective actions: remove the rotor poles from both diesel generators and replace them with spares; perform an overspeed testing to determine the adequacy of the installed resin on the rotors and rewind the rotor if necessary.

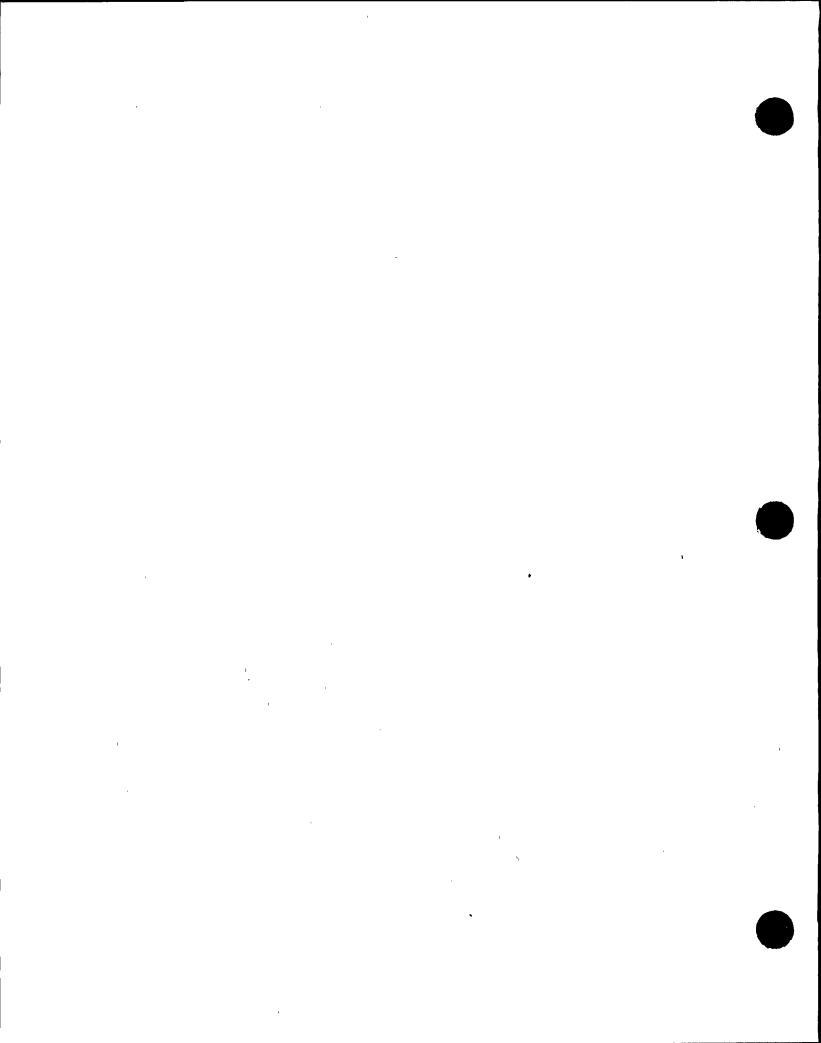
Based on the investigations and testing performed by the supplier, the most probable cause of the resin failure was improper application that resulted in a local dilution of the amount of resin applied to the rotor. These types of defects are detectable after resin curing by tapping the coils for hollow sounds in accordance with Peebles routine OC Procedures.

As described above, the subject rotors were also subjected to overspeed testing to verify that the rest of the applied resin functioned per design. The tests did not identify any other defects.

Based on the evidence and evaluation performed, NEI Peebles concluded that the improper resin application was an isolated incident with no significant generic implications.

Arizona Power also issued a Final Report (DER 86-31) to the NRC discussing the defects found in their generators for Unit 3. Two additional problems described in the utility report were a second pole separation which occurred in July of 1987, and pole piece fasteners had low torque values.







The cause of the second pole separation at Palo Verde was a mechanical shock to the generator due to an engine rod failure.

The following excerpts are taken from the conclusions drawn by Arizona Power regarding the failures:

"There are approximately 1200 poles in machines presently in service that have been encapsulated with DlllA resin. Additionally, the same rotor design, type of resin, and pole piece fasteners have been used in over fifty similar machines, some of which have been used in nuclear facilities since 1972. The first pole deficiency is the only known pole to suffer winding separation during its infancy. Since the characteristics of this deficiency are very weak adhesive bonds that fail very early in the life of the pole, this is considered to be an isolated case."

"Any rotor assembly subjected to a sudden shock during operation potentially could have winding separation on its poles."

"The first case of loose fasteners was determined to be the result of a deviation in the torque values used at the manufacturer's facility during fabrication: As mentioned above, these fasteners have been used in over fifty similar machines and none are known to have been found with loose fasteners. This deviation is considered to be an isolated event."



"As described above, any rotor assembly subjected to a sudden shock during operation , potentially could have a pole with loose fasteners."

Impact:

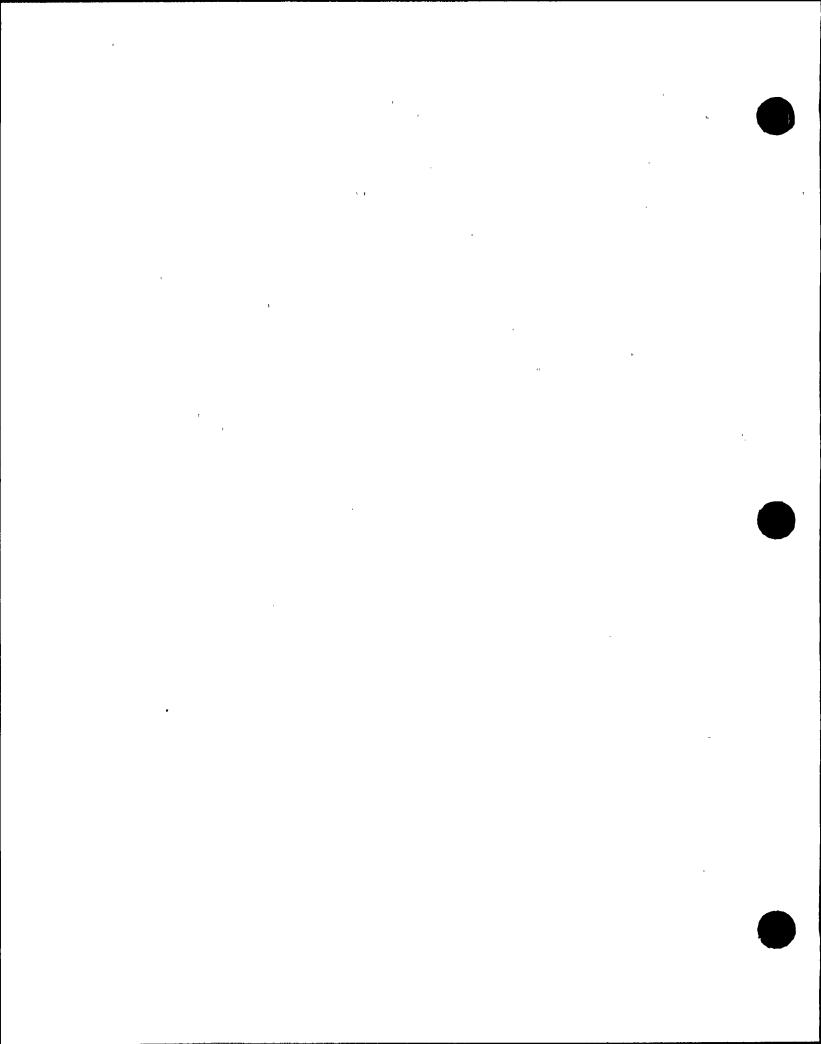
Based on the investigation and additional testing performed by NEI Peebles, the pole separation and loose pole fasteners identified at Palo Verde have no impact on PG&E's new or spare generator.

Report: Issued by Gulf States Utility, Dated November 16, 1987

On the standby generator at River Bend Station, the rotor windings on pole number 14 were found separated from the shaft pole washer and bowed toward the stator. The individual wires had delaminated and overlapped. This condition was found by visual inspection.

Per discussion with Mr. Ron Politi of NEI Peebles, although this problem is still under investigation, it has no impact on PG&E's equipment.







Impact: The delamination identified at Gulf States Utilities has no impact on PG&E's spare or sixth generator. First, the generator design that experienced the problem is different, since it does not use pole wedges in the assembly. Second, the most probable cause is the adhesive used in the rotor assembly. The Gulf States machine used a polyester type adhesive, while PG&E's new and spare generators utilized and epoxy resin.

Report: Issued by NEI Peebles, Dated January 4, 1991

Utility: Georgia Power Vogtle Plant

Customer: Cooper Enterprise Engine Division

The problem identified in this report was a failed weld on one air louver. The equipment was manufactured by Parsons Peebles Electric Products in 1981.



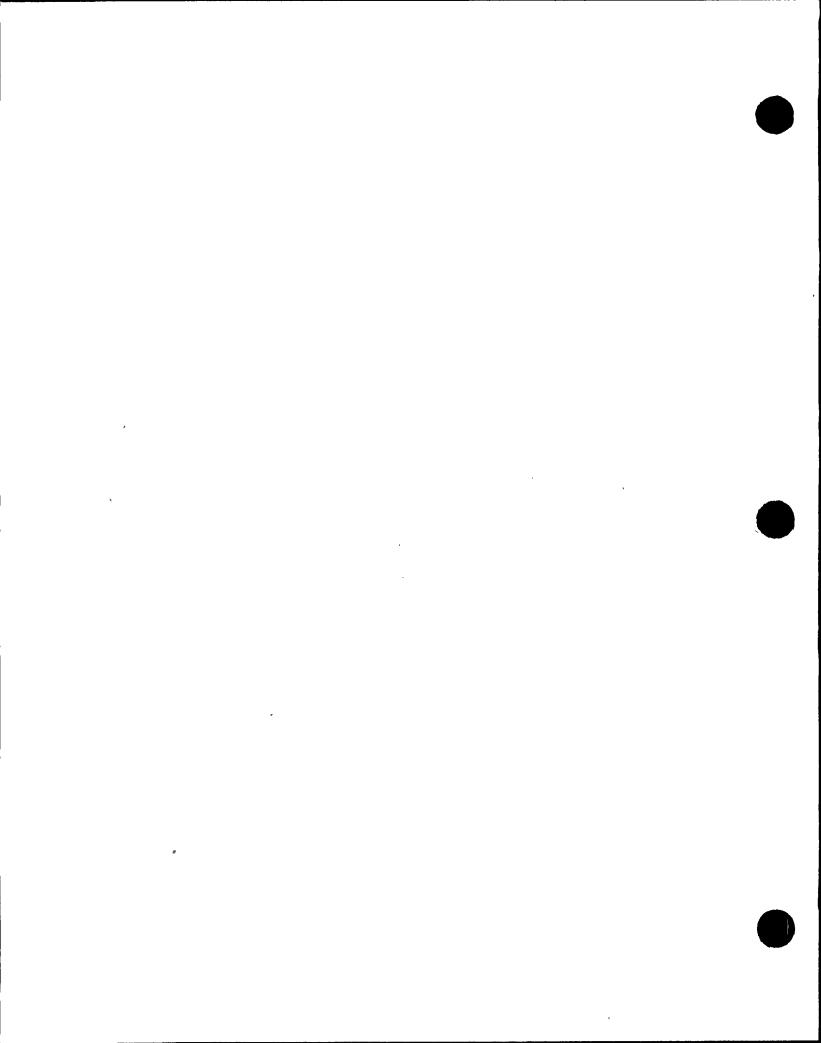
During the removal of the coil guard cover for cleaning purposes, an air baffle louver broke loose. The louver had been tack welded to the cover in three places, and two of these welds were completely rusted through. Inspection of the remaining louvers showed that ten of the twelve had been full length welded to the cover. The eleventh louver was also tack welded in three places, and these welds were intact.

NEI Peebles stated that the physical integrity of the louver is important because if all welds failed and the machine was operating, the louver could hit the rotating fan and projectiles created may damage the rotor or coil ends.

The supplier feels that this was not a design defect, but an isolated incident. They recommended that the utility incorporate inspection of these louvers as a regular maintenance activity.

Impact: This failure has no impact on PG&E's sixth or spare generator, since our design does not utilize this type of dripproof cover.







NRC Information Notices, Bulletins, Letters INPO Significant Event Reports (SER), Significant Operating Experience Reports (SOER)

See Attachment B

The documents relevant to this evaluation were determined by a review of the "System # 21, Diesel Engine Generator System (EDG)" binder maintained by the Nuclear Operations Support (NOS) Group. Attachment B pages 66-73 show a table of contents listing all of the information reviewed for applicability. The three documents summarized below were determined to have a possible impact on PG&E's purchase of a Sixth Generator and the stocked spare manufactured by PEP.

Problem: Safety Review Event Follower 80-028 - Notepad 5-14-80, LER 335/80-13

The generator failed to accept full load during a test.

Resolution: The cause was incorrect exciter leads to the generator field. The leads were undersized.

Based on the successful performance of the five generators installed at Diablo Canyon, the exciter leads to the generator field are adequate for the new generator being purchased and the stocked spare.

Problem: Safety Review Event Follower 85-136 - IN 85-68

The insulation on the stator windings had been rubbed and abraded to the point where one stator winding had been exposed.

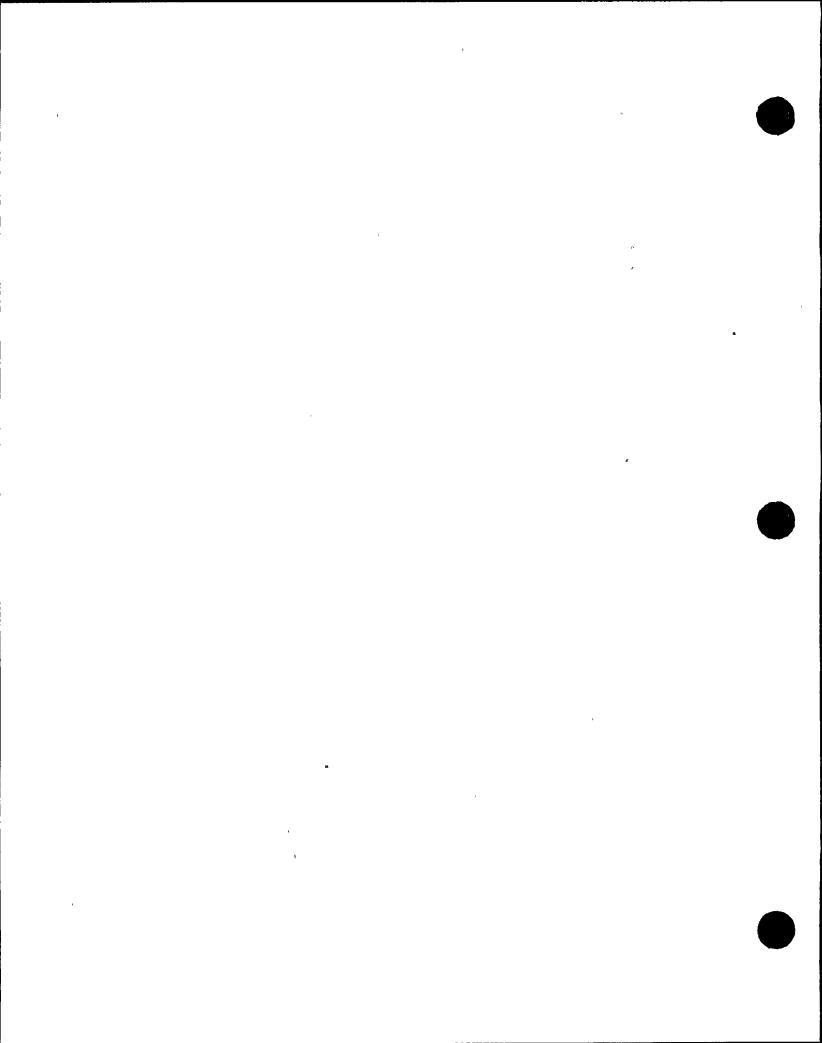
Resolution: The cause of the failure was determined to be a broken interpolar connecting bar on the rotor.

The generator with the failed connecting bars was manufactured by Louis Allis.

Based on discussions with PEP cracking interpolar connecting bars on their design are not a problem, since they "are equipped with fully interconnecting damper cages... This damper cage construction is fail-safe under centrifugal and thermal overstress. All cage components remain captive upon their (unlikely) fracture and , therefore, cannot damage the stator winding or any other generator components."

This failure is not applicable to PG&E's new or spare generator, since our design has a feature which prevents a cracked connecting bar from damaging the generator internals.





Problem: Safety Review Event Follower 86-054 - IN 86-26, SER 70-84

The notice and SER identified two major problems:

- 1. The shim required to maintain clearance at the thrust bearing was missing. As a result, high vibration levels accompanied by sparks from the rotor shaft bearing area were generated.
- 2. Electrical insulation between the rotor shaft and the slip-ring end bearing inner race had come loose. Consequently, the rotor shaft has dropped slightly and rubbed on the bearing housing. The subject insulation is utilized to prevent circulating currents through the generator shaft.

Resolution:

Item 1 above is not a concern, since the Diesel Generator history of operation at Diablo Canyon has shown no vibration problems similar to those caused by a missing shim in the thrust bearing.

Item 2 is also not a concern for our generators. Based on discussions with PEP in 1986, "...DCPP generators were manufactured prior to the model which incorporated the glass/resin bearing insulator. Since we are currently manufacturing a spare generator for DCPP, we recently investigated this exact topic to be certain that a design variation from the exact duplicate, as you ordered, would not be required. Previously installed DCPP E-P generators, the stocked spare, as well as the sixth generator currently in progress include a bearing support insulator and do not use the subject shaft insulator."

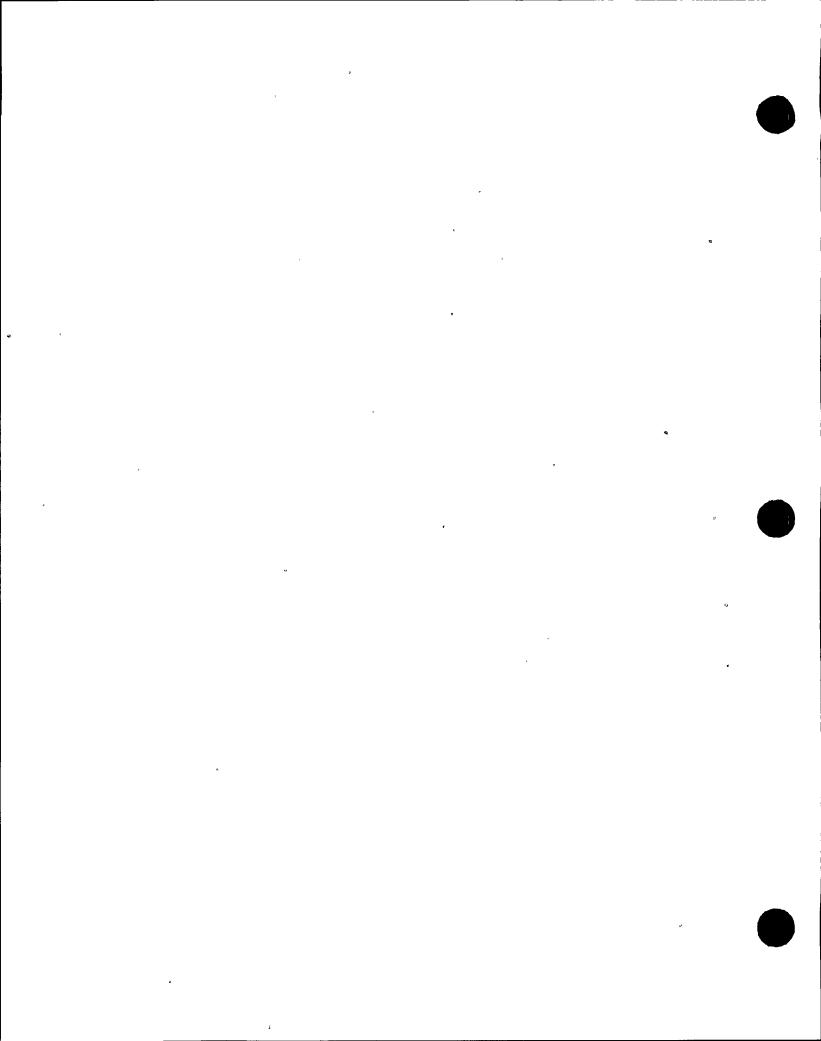
The insulator failure is not applicable to PG&E's new or spare generator, since they do not use this type of shaft insulator.

Licensee Event Report

See Attachment B

LER 90-012-01 was forwarded to PG&E by NRC Region V. It is a report issued by Washington Public Power Supply System regarding the failure of their emergency generators manufactured by PEP, and is evaluated for impact below.







Problem:

Bearing Failure -

"... failure was due to loss of lubrication to the generator thrust bearing which was caused by leakage of oil from the bearing oil reservoir which supplies the bearing. The oil leakage was caused by an inadequate O-ring seal between the walls of the thrust bearing bracket and the generator housing which form the reservoir. The inadequate O-ring seal was caused by the existence of an extra O-ring groove machined into the generator housing adjacent to the thrust bearing bracket which prevented the O-ring from being compressed to obtain a tight seal."

Shorted Field Winding -

"The original generator field pole windings were not wound in accordance with the design requirements in that a polyester resin was used to encapsulate the windings vice the required Armstrong one-part epoxy resin. The process used to wind the pole pieces also allowed bunching and abrading of the Dacron glass covering on the winding wire and did not provide adequate direction to assure proper encapsulation (wetting) by the epoxy resin. The combination of these errors resulted in two generator field poles in E-DG-1 containing shorted windings and one pole in E-DG-2 containing shorted windings."

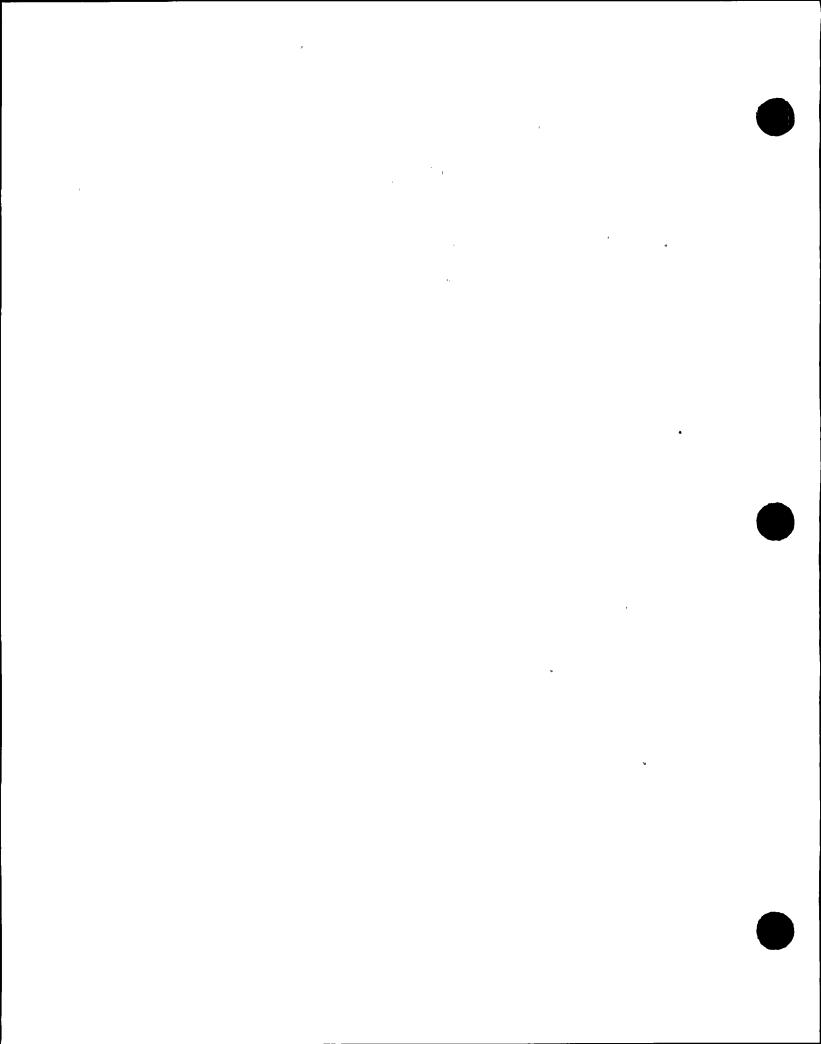
Resolution:

The generator used at this plant is a model L-11011. This particular application uses two engines, with the generator mounted between them.

Per discussions with Mr. Ron Politi of PEP, the problems identified in this report are still under investigation. However, he was able to provide the following information regarding the potential impact of these problems on our generator.

The generator design in the above case has two bearings, a roller and a tapered. The tapered bearing is the one that failed in this case. Our design does not use a tapered bearing, only the roller bearing. As discussed in the event report, the extra bearing groove does not appear on PEP design drawings. Mr. Politi did state that this utility had a conversion performed on this generator by someone besides PEP, and that may be where the groove came from. Also, this utility had extensive problems maintaining oil in this bearing.







Mr. Politi stated that they do not know where this extra groove came from, but to his knowledge this problem has not occurred on any other Peebles generator.

Based on the design difference, satisfactory operation of our generators, and the fact that this seems to be an isolated case, this failure has no impact on PG&E's installed, spare, or new generator.

For the shorted windings, the event report states that the failure was due to the improper application of the wrong resin on the windings. Per discussion with Mr. Politi, the Armstrong epoxy was not is use when this engine was manufactured. Also, this utility has had some operational problems which may have attributed to the shorted windings.

Based on the satisfactory operation of our installed generators, this failure of does not impact their operation.

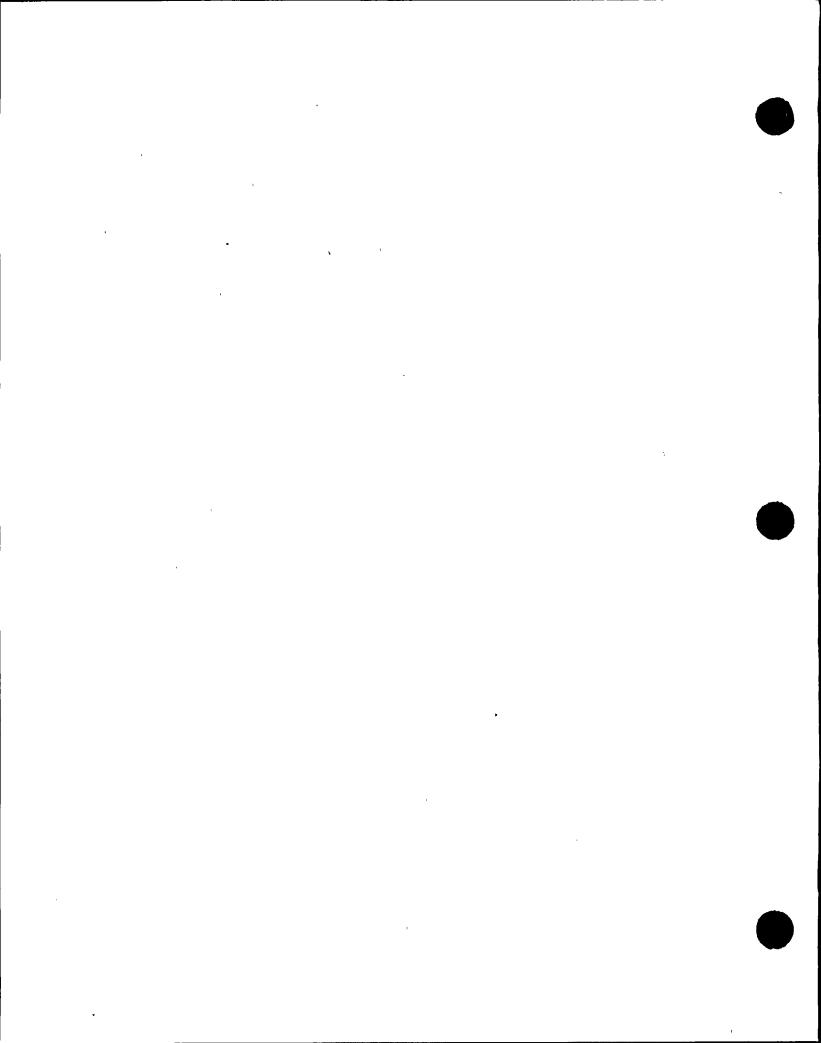
For the spare generator, shorted windings are not a problem, since the Diablo Canyon Preventive Maintenance Program performs megger checks to ensure integrity of the windings (See Reference 21).

For the new generator being purchased, the Armstrong adhesive is being used in the manufacture, and is also independently tested and evaluated in this document. This failure has no impact on this purchase.

Restricted Equipment List NPAP D-11, Revision 12

A review of NPAP D-11 Revision 12 has shown that there are no components manufactured by PEP or PEM listed.







NRC Licensee Contractor and Vendor Inspection Status Reports (NUREG 0040)

See Attachment C

The NUREG-0040 Quarterly Reports from March 1981 to December 1989 were examined for Inspections performed by the NRC on PEP/PEM. Three reports were found. The summaries below state the Inspection Scope, Problems Identified, and Impact on PG&E's new and spare generator.

Report: 99900772/82-01

Parsons Peebles-Electric Products Cleveland, Ohio

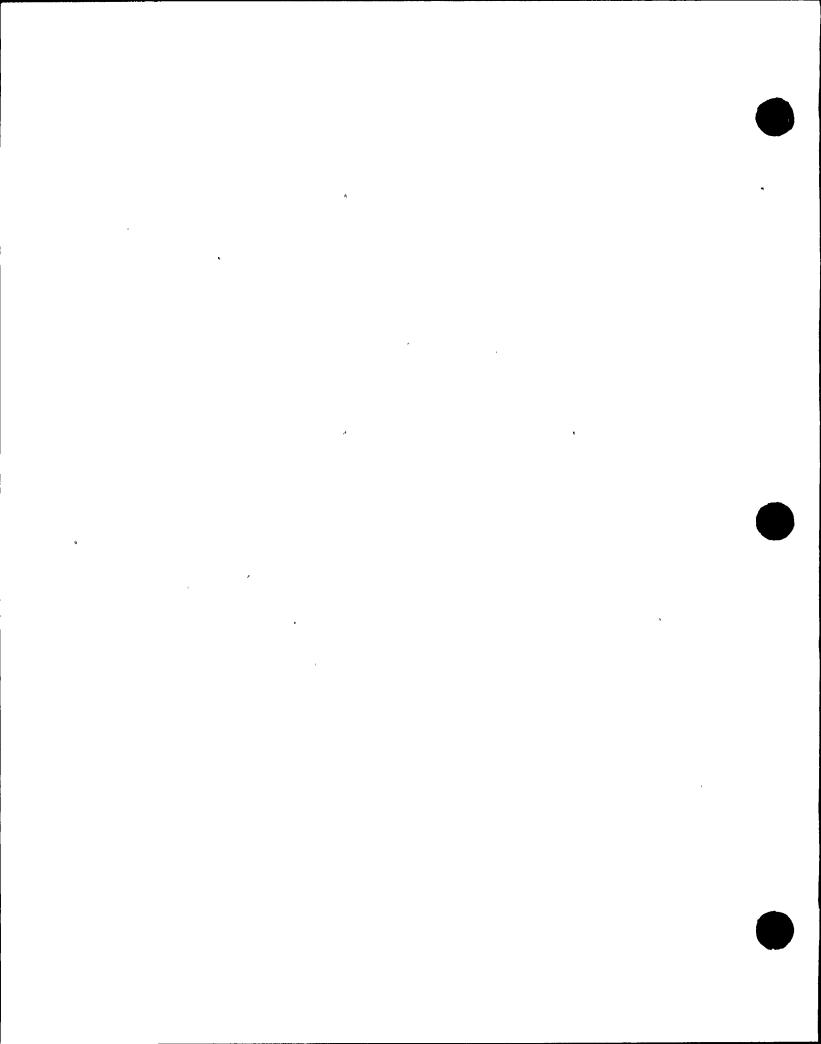
Scope: The inspection was conducted as a result of a Part 21 pertaining to the improper application of a current transformer in the exciter voltage regulator. Also, the following programmatic areas were inspected:

- initial management meeting
- initial quality assurance program
 - manufacturing process control
 - change control
 - Part 21 implementation

Problems Identified:

- 1. Posting of 10 CFR Part 21 is inadequate.
- 2. Records of evaluation for the current transformer did not meet specification.
- 3. No documented evidence that a transformer conformed to the procurement requirements.
- 4. Inspection instructions and results were not on a shop traveler.
- 5. Stator punching operations were not properly logged.
- 6. Revised product travelers and QA documents were not reviewed and approved per the QA Manual.







Impact:

This inspection was performed by the NRC in 1982. PG&E has recently performed audits on PEP and their major subsupplier PEM. These audits have reviewed, in depth, the programs examined by the NRC. Any programmatic concerns have been documented in Audit Finding Reports and are evaluated elsewhere in this document. Also, the specific problem with the current transformer is not applicable here, since it is part of the voltage regulator and not supplied as part of the new or spare generator assembly.

Report: 99901065/86-01

Peebles Electric Machines Edinburgh, Scotland

Scope: Implementation of the quality assurance program in

selected areas.

Problems Identified: None

Impact:

During this visit the NRC reviewed or witnessed:

- Parson Peebles purchase orders for the PG&E spare purchased in 1986
- incoming material inspections
- storage
- coil bending and forming operations
- insulation of windings
- calibration of test equipment

There was one inconsistency found: the components supplied to PEM by PEP lacked unique identification and could not be traced to the item numbers of the PO and subsequently the C of C's. The quality control engineer took immediate corrective action by writing deficiency reports and affixing nonconformance tags to the components as required by the quality control procedure. PEM then contacted PEP and requested they identify each item supplied with the relevant PO item number for future shipments and provide a cross reference in the C of C. This Inspection report has no impact on PG&E's new or spare generator.

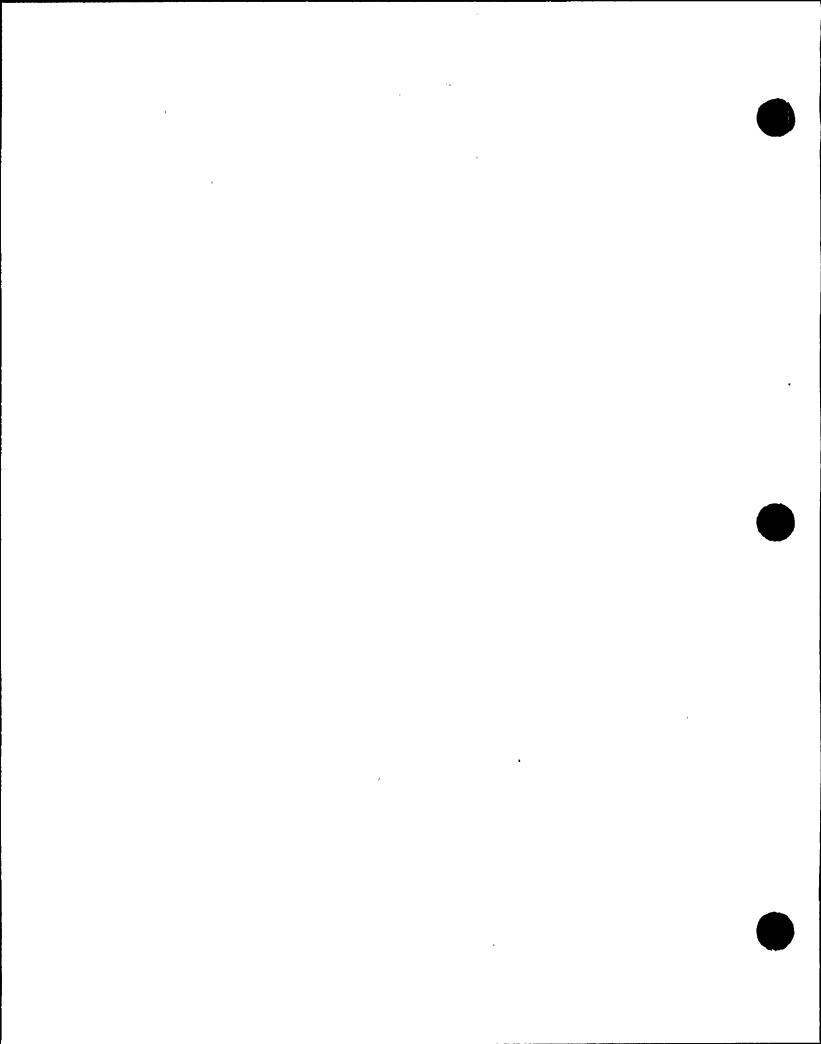
Report: 99900772/86-01

Parsons Peebles-Electric Products Cleveland, Ohio

Scope: Review actions taken on previous inspection findings,

review documentation for failures.







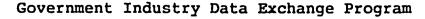
Problems Identified:

1. Parson Peebles did not indicate applicable drawings, revisions, specification or 10 CFR 50 Appendix B applicability on a purchase order to Concorde Controls for a safety related manual voltage regulator to be used at Grand Gulf Nuclear Power Station.

Impact:

- 1. PG&E's purchase order references drawings, revisions, and serial numbers. A comparison between the sixth generator and the spare has been provided by PEP/PEM to ensure that the generator design is consistent with the original five. Also, PG&E has reviewed all Design Changes and Discrepancy Notes as part of this evaluation.
- 2. 10 CFR 50 Appendix B was referenced in the purchase order to PEP. In PEP's order to PEM, 10 CFR 50 Appendix B does not apply, since PEM is a commercial grade supplier.

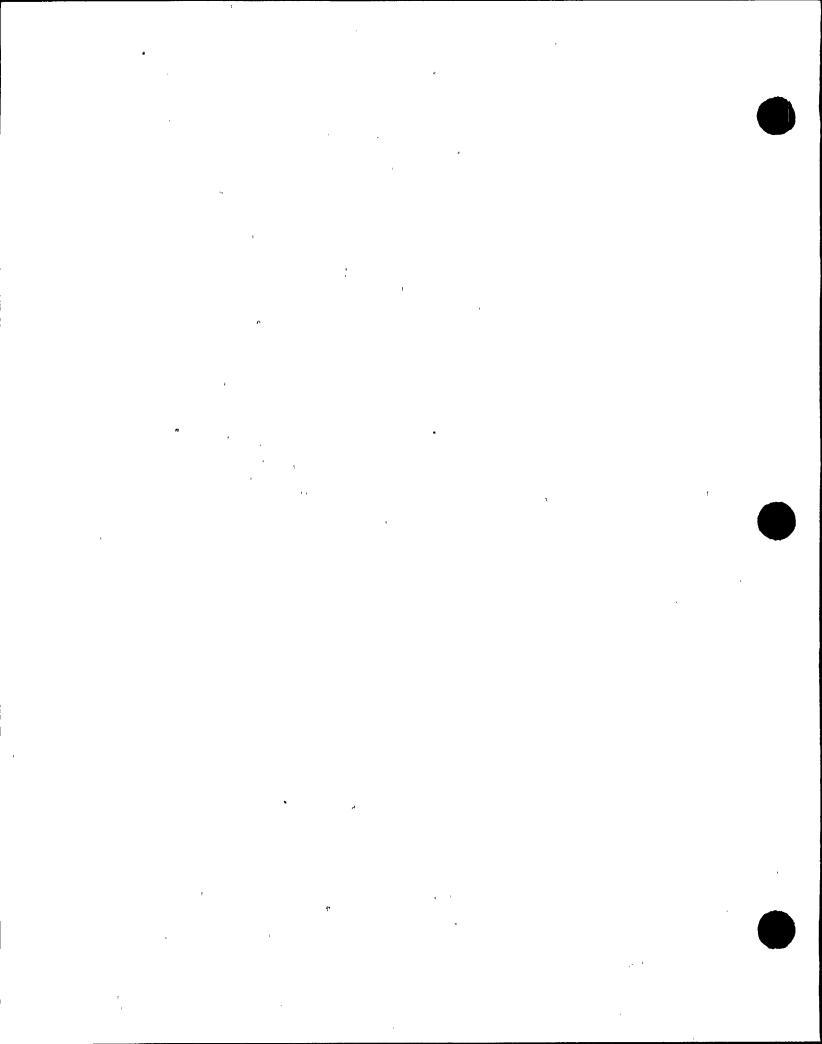
This inspection Report has no impact on the new or spare generator. Recent audits (See References 4 and 5) performed by PG&E have reviewed the procurement documents associated with this purchase, and any discrepancies have been documented in Audit Finding Reports and are evaluated elsewhere in this document.



See Attachment D

A review of this data base did not identify any failures for generators/parts manufactured by PEP/PEM.





IV. SUPPLIER QUALIFICATION REVIEW

The following numerical listing shows all Findings for PG&E Audit 90197S and PEP Audit 9003 (References 4 and 5):

| PG&E Audit 90197S | PEP Audit 9003 |
|-------------------|----------------|
| AFR 90-067 | AFR 9003-1 |
| AFR 90-068 | AFR 9003-2 |
| AFR 90-069 | AFR 9003-3 |
| AFR 90-070 | AFR 9003-4 |
| AFR 90-071 | AFR 9003-5 |
| AFR 90-072 | AFR 9003-6 |

The purpose of this section of the evaluation is to review each finding, evaluate the qualification of the new generator purchase, and determine the acceptability of the stocked spare.

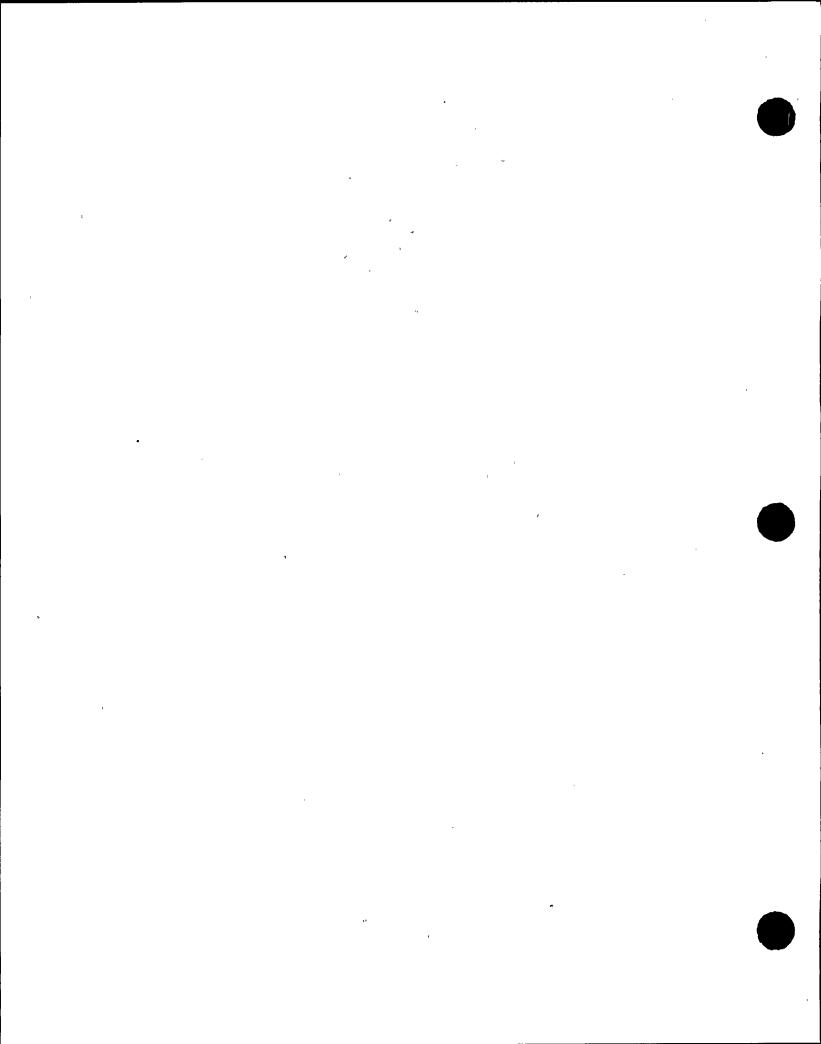
The first section shows a listing of all critical parts in the generator. The critical parts were determined jointly by PEP, PEM, and the NECS Engineering Team based on the function of the parts in the generator assembly.

Next, the basis for the determination of which critical parts procured by PEM would be evaluated during Audit 9003 is discussed.

Following the sample determination, there are two tables. The first shows the critical parts procured by PEM, their critical characteristics, and their method of qualification. The second table shows the critical parts procured by PEP, their critical characteristics, and their method of qualification. The parts are separated according to what facility procured them, because those supplied by PEM are qualified by Audit 9003/Engineering Evaluation, while those supplied by PEP are qualified by PEP Dedication/Engineering Evaluation.

Finally, each audit finding is listed, along with NECS Engineering's resolution and a statement of impact regarding the spare generator.



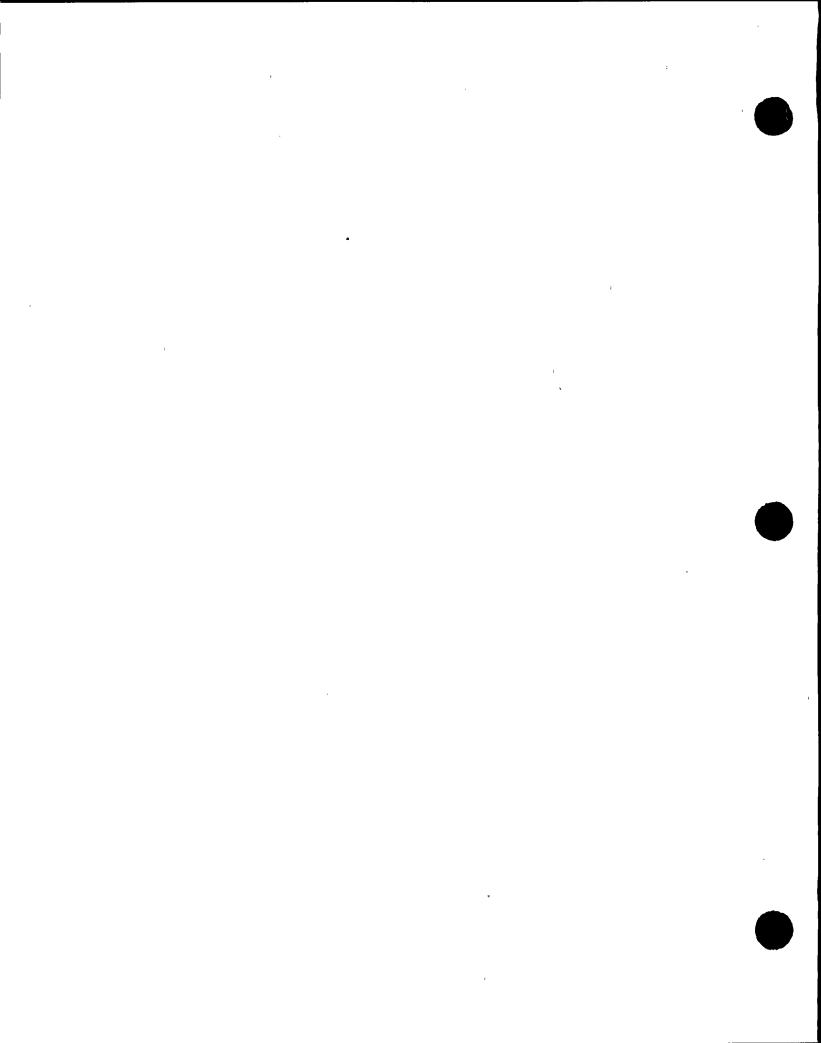




This list shows the 'twenty seven critical parts in the generator assembly (See Attachment E).

Adhesive Bearing Bracket Bearing Seal Brush Brush Holder Bushing Insulator Current Transformer CT Test Switch Insulation Insulating Washers Insulator Lead Wires Magnet Wire Pole End Rings Pole Head Rivets Roller Bearing Rotor Shaft Rotor Wedge Short Circuit Bars Slip Rings Spider End Rings Stampings Stator Coils Stator Frame Stud/Threaded Rod Tapered Keys







Representative Sample of Critical Parts Supplied by PEM for Audit 9003 ·

Eighteen of the twenty seven critical parts were purchased by PEM. Seven of these were specifically examined during Audit 9003.

In order to determine a representative sample for the performance of the audit, the critical parts were divided into product type categories based on their function in the generator assembly. The following matrix shows these categories and the associated critical parts:

| <u> </u> | |
|----------|----------------|
| Bearing | Roller Bearing |

CATEGORY

Stud/Threaded Rod Fastener

Rivets

Magnet Wire Electrical Stator Coils Lead Wires

Stampings Electro-mechanical Pole Head

Slip Rings

PART

Short Circuit Bars Insulating Washers

Rotor Shaft Mechanical Tapered Keys

Rotor Wedge

External Support Bearing Bracket

Stator Frame Structural Spider End Rings

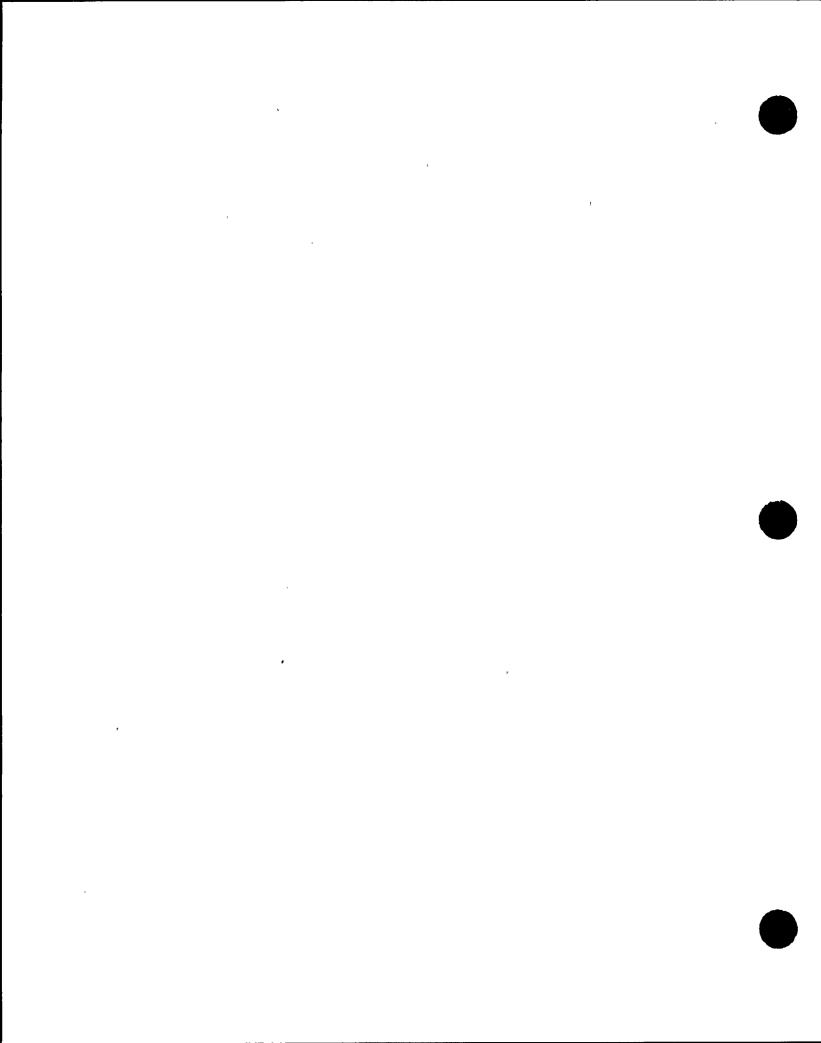
Pole End Rings

By selecting one part from each category, the following seven were chosen as the representative sample:

Roller Bearing, Studs/Rods, Magnet Wire, Stampings, Rotor Shaft, Bearing Bracket and Stator Frame.

Based on the examination of one part from each product type category, the results of Audit 9003 are representative for all critical parts procured by PEM.





Note that Audit 9003 (Reference 5 pages 27 and 28) also showed insulation and adhesives as part of the audit sample. However, Audit 9003 is not the qualification basis for these components. The insulation and adhesives were purchased by PEP. The insulation has been dedicated by PEP. The adhesive is evaluated in section V of this document.

Also, following the Audit the question was raised regarding the criticality of the stator frame material. NECS Engineering has concluded that the stator frame material is not critical (See Reference 19).

Definitions for the following TABLES:

In the How Qualified column -

"Cleveland Dedication" refers to the Dedication Evaluations performed by PEP and included as Attachment H.

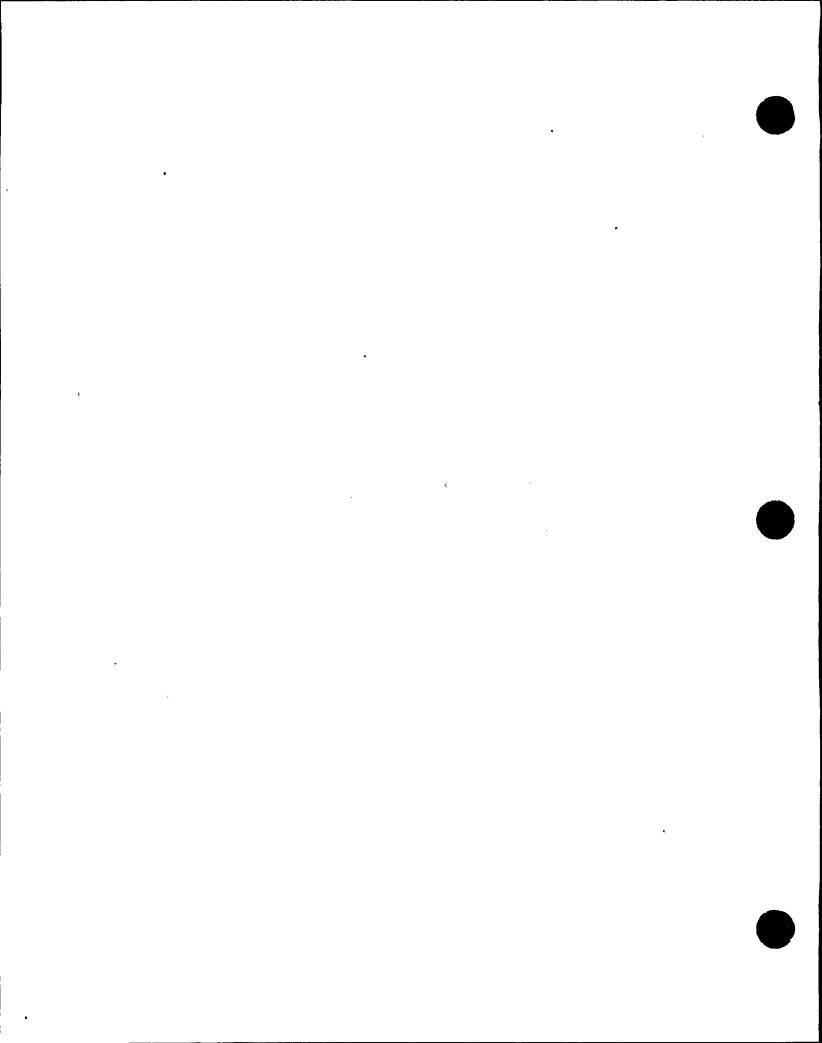
"Audit" refers to the seven parts examined during joint PEP/PG&E audit 9003 of PEM.

"Audit Sample" means that the part is qualified based on the representative sample of parts used during Audit 9003.

"Evaluation" refers to the NECS Engineering evaluation of AFRs in this document.

"Source Inspection" refers to EQS Inspection Plan DC-254.

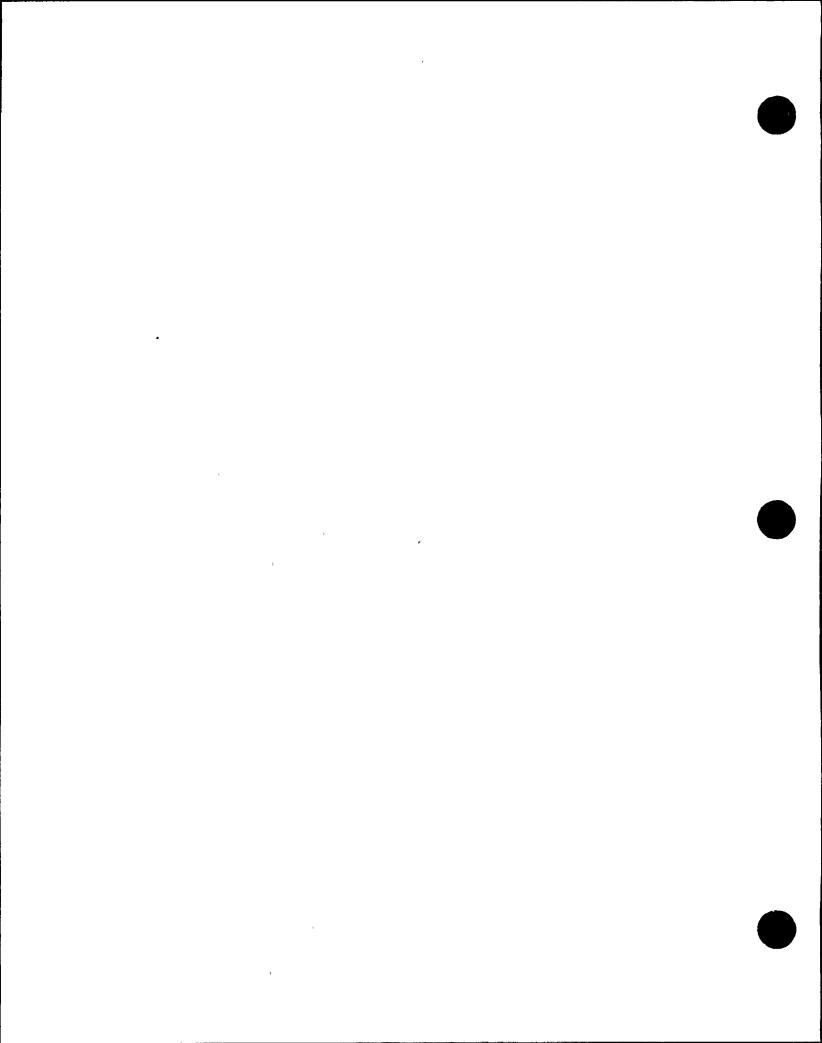






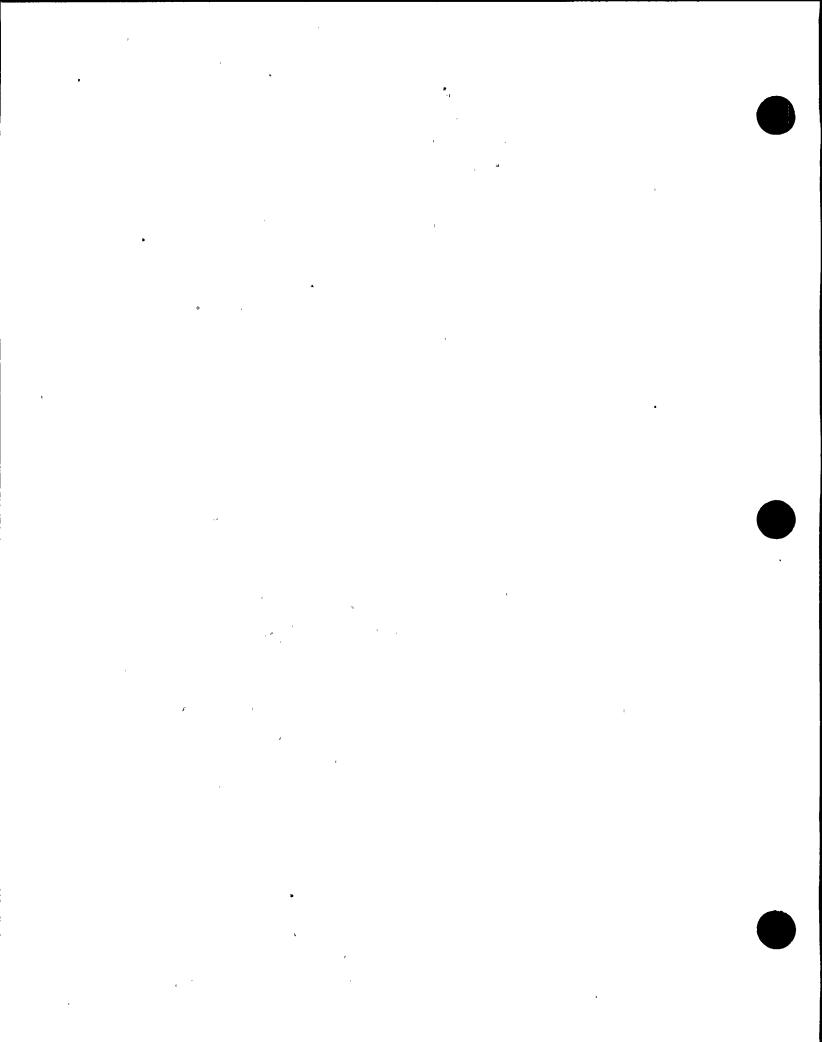
| <u>Item</u> | Characteristics | How Qualified |
|-------------------|--|--|
| Rotor Shaft | Material Configuration Integrity | Audit/Evaluation Audit/Evaluation Source Inspection Audit |
| Stampings | Configuration Material | Audit Audit |
| Magnet Wire | Material Insulation Dielectric | Audit Audit |
| Bearing Bracket | Configuration Process Control | Audit/Evaluation Audit/Evaluation |
| Stud/Threaded Rod | Dimensions Material Welding | Audit/Evaluation Audit/Evaluation Audit/Evaluation |
| Roller Bearing | Part number Configuration | Audit/Evaluation Audit/Evaluation |
| Spider End Rings | Configuration | Audit Sample |
| Pole End Rings | Configuration Material | Audit Sample Audit Sample |





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|--------------------|---|---|
| <u>Item</u> | Characteristics | How Qualified |
| Short Circuit Bars | Configuration Material | Audit Sample |
| Pole Head | Configuration | Audit Sample Source Inspection |
| Tapered Keys | Configuration Material Hardness | Audit Sample Audit Sample Audit Sample |
| Rotor Wedge | Material | Audit Sample |
| Rivets . | Configuration | Audit Sample |
| Insulating Washers | Configuration Material Dielectric Strength | Audit Sample Audit Sample Audit Sample |
| Stator Coils | Configuration Chemical Composition Coating Insulation | Audit Sample Source Inspection Audit Sample Audit Sample |
| Lead Wires | Configuration | Audit Sample |
| Slip Rings | Configuration Material | Audit Sample Audit Sample |
| Stator Frame | Configuration | Audit Source Inspection |



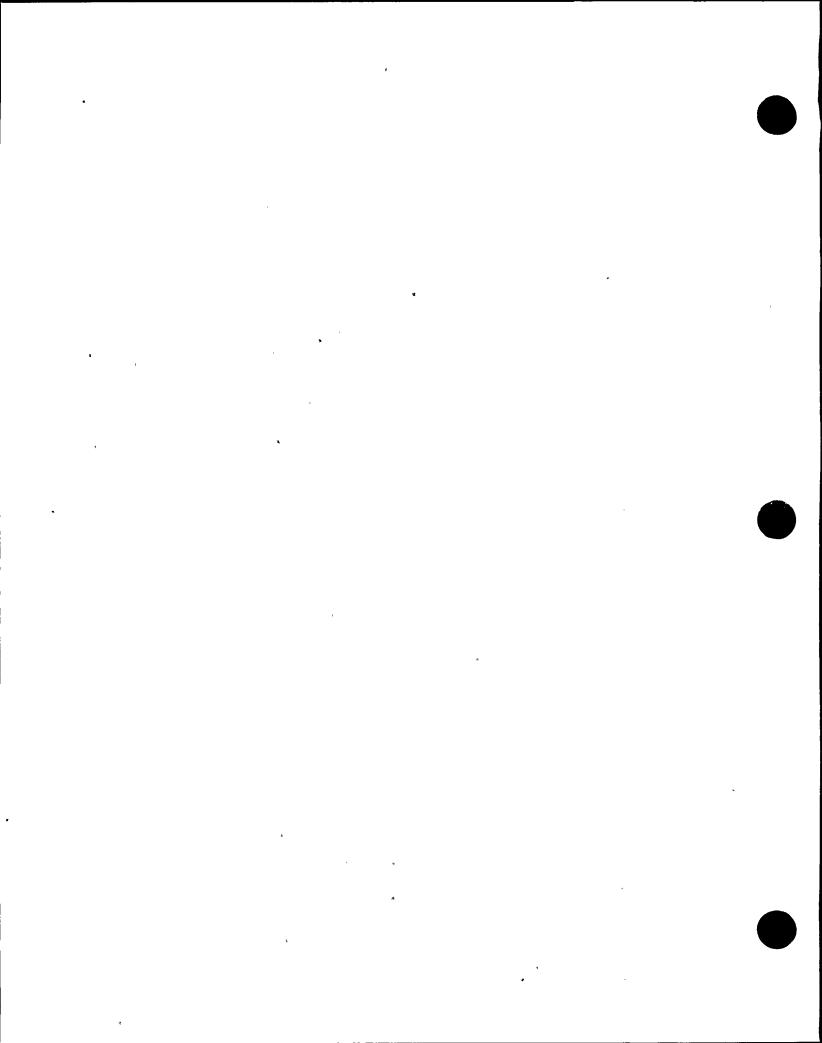


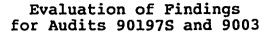


Qualification of Critical Parts Supplied by PEP

| <u>Item</u> | Characteristics | How Qualified |
|------------------------|---|--|
| Brush Holder | Configuration | Cleveland Dedication |
| Brush | Configuration | Cleveland Dedication |
| Current Transformer | Configuration Mounting Insulation Resistance Continuity | Cleveland Dedication Cleveland Dedication Cleveland Dedication Cleveland Dedication |
| Insulator | Dielectric Strength Configuration | Cleveland Dedication Cleveland Dedication |
| Bearing Seal | Configuration Felt Texture | Cleveland Dedication Cleveland Dedication . |
| Bushing Insulator | Configuration | Cleveland Dedication |
| Dielectric Strength | Configuration | Cleveland Dedication |
| | | Cleveland Dedication Cleveland Dedication |
| Insulation | Thickness | Cleveland Dedication |
| Adhesives | Material | Evaluation |







See Attachment F for PEP's responses to AFRs 90-067 through 90-072 and PEM's responses to AFRs 9003-1 through 9003-6.

Problem: PG&E AFR 90-067 - Design Control

PEP has not documented their "Incoming Order Review" for PG&E's Job No. S-1128 (Generator for 6th Diesel). Until this review is fully documented or performed, PEP cannot assure that the design of the new generator is "like for like" with the design of the spare generator, per Purchase Order requirements. Material substitutions were not submitted to PG&E nor were drawing changes.

Resolution:

See Attachments G and U

PG&E requested that PEP submit a description of all design changes, material changes, and Discrepancy Reports since the manufacture of the original five generators (See Reference 18). The Discrepancy Reports and Design Changes have been provided by PEP, and are summarized below.

Discrepancy Report Summary:

1. Discrepancy Report No. 2746

The spigot diameter at the coupling end of the generator shaft was machined undersize. The drawing specifies 18.2525 to 18.25, actual size is 18.2475.

Per discussion with the engine manufacturer, "The clearance between the generator coupling and the ring gear flange will be 0.0025 inches - 0.005 inches. This undersize surface will not be a problem because we install a locating pin at assembly between these 2 parts." (See GE Locomotives fax included in Attachment G).

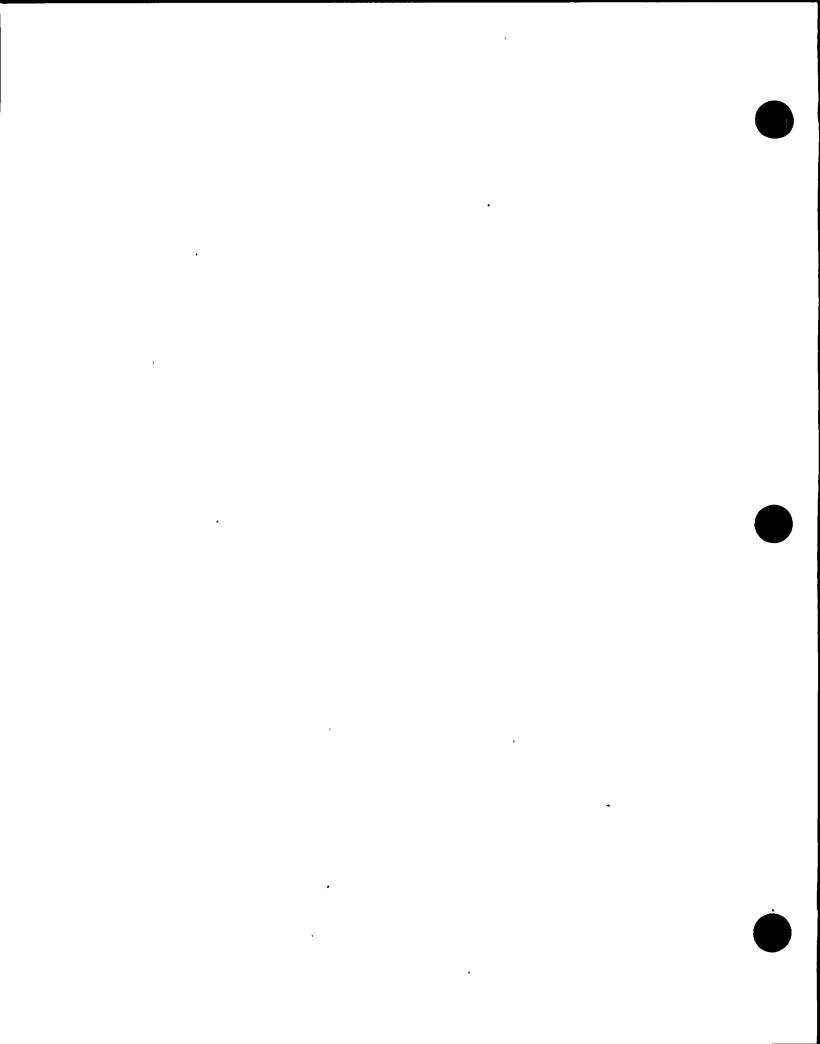
Based on contact with the engine manufacturer and a review of interface dimensions of the shaft coupling, PG&E Engineering concludes that the undersize spigot diameter is acceptable for use in our assembly.

2. Discrepancy Report No. 2783

PEM did not use oxygen free copper in accordance with PEP specification MC-80.5.

PEP performed an engineering evaluation based on the function of the part.







The application for this copper is pole end straps and rotor end rings. PEM has been using this type of copper for rings and straps in the rotor for over 25 years. The rings/straps are brazed in place, and the brazing is performed in accordance with standard PEM procedures. Also, since the straps/rings are also bolted to the assembly, the brazing does not see any significant stress. Based on the PEP evaluation, this deviation for the material specification is acceptable.

3. Discrepancy Report No. 6188

The stator frame (NEI PEM RA 14901, PEP DWG D-66825H-1) was dimensionally incorrect.

PEM initiated corrective action and informed PEP via fax. PEP approved the corrective action. This action brings the frame back to the dimensions of the drawings.



Design Change Summary:

In order to resolve this audit finding, PEP performed an initial review of design changes for PG&E's purchase. The results of this review are included as Attachment G.

PG&E performed a Follow-Up Assessment of NEI Peebles in Cleveland (See Reference 14, Report issued May 13, 1991). During this follow-up assessment by PG&E QA, some design changes that were not included in the original submittal were identified. This determination was made based on a review of Design Drawings, Scotland Engineering Change Notices, and Design Change Requests.

Before requesting further action by NEI Peebles, investigations were performed to determine the extent of review required to ensure all changes applicable to the spare and new generator were addressed. Action Request A0201157 Evaluations 2, 4, and 8 document these investigations, and concluded that the design change and equivalency reviews should cover a time frame of 1984 to the present. The basis for the selection of 1984 was the fact that during this year, the manufacturing responsibility for the product was changed from Cleveland to Scotland.

A letter was issued to NEI Peebles on May 6 (See Reference 15). This correspondence requested that Peebles reverify the Design Change reviews. It also stated that the reviews should go back to 1984, to ensure that the PG&E verification of design changes encompassed the purchase of the spare generator in 1986.



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The following summary lists all the design changes applicable to the Sixth Diesel Generator purchased from NEI Peebles. (See Attachment U):

PEP Drawing Change Request 11382

Incorporated phase sequence change per PG&E request and change in rotor insulation from PEP EI 1.5.0 (polyester based) to EI 1.5.1 (epoxy based).

2. PEP Drawing Change Request 11384

Clarified Field Lead strap location. (Reference Manufacturing Specification ET-1.1)

3. PEP Drawing Change Request 11397

AC generator lead cable was PEP MC 10.7, GE Vulkaflex, which is no longer available. Substitution of a silicone insulated type SIWO-KUL, 70 square millimeters 6.6 KV flexible strand cable meeting flame resistance requirements of IEEE 383 was approved.

4. PEP Drawing Change Request 11409

Material substitution for field lead terminals for rotor poles. Terminals per PEP ET 1.1 called for a thickness of $0.015 \times 5/8$ inch copper to be used to form the terminal. Substitution of 2 thicknesses of $0.5 \text{ mm} \times 25 \text{ mm}$ copper was approved provided that a small notch in the pole washer be expanded to accommodate the increased width of copper.

5. PEP Drawing Change Request 11410

Incorporated the use of the magnetic ink particle method for NDT inspection into PEP procedure PS-3022.

6. PEP Drawing Change Request 11411

BS 605 M35 condition T was substituted for PEP MS 70.15 steel for the rods and studs in the rotating element (PEP DWG A-66826 Item 5). The material was suitable for the application but the substitution necessitated special attention to the welding procedure. A welding procedure specific to this application was written by PEM and approved by PEP and PG&E (See section V of this document for evaluation of welding).



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PEP Drawing Change Request 11412

Material substitution of NEMA grade Gll glass reinforced laminate for GPO-1 in slot sticks. GPO-3 substituted for GPO-1 in pole washers.

PEP Drawing Change Request 11413

Based on PG&E's request, reinforcement was added to AC terminal box (PEP DWG C-60760A-7). Braces added from back of box to generator stator frame. Back covers of box also reinforced with gussets.

9. PEP Drawing Change Request 11414

Clarifies the operator qualifications for PEP Welding procedure PS-3022.

10. PEP Drawing Change Request 11415

This change is concerned with the application of NEI Standard cable for DC Field Leads. The PEM cable is qualified to IEEE 383. There is no change.

11. PEP Drawing Change Request 11416

Approved the application of an equivalent British standard material for cold rolled steel.

12. PEP Drawing Change Request 11417

Approved the application of an equivalent British standard material for steel ventilating screen.

13. PEP Drawing Change Request 11418

Approved the application of an equivalent British standard material key stock.

14. PEP Drawing Change Request 11419

Approved the application of an equivalent British standard material for hot rolled steel bars.

15. PEP Drawing Change Request 11422

Jacking screw holes added to face of shaft flange per PG&E request, reference DWG FC-M-13056 Revision 0.



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16. PEP Drawing Change Request 11424

Document the change of an incorrect hole size for a 2" conduit fitting in a terminal box. Hole size in the top of the box changed from 1-3/4" to 2-7/16".

17. PEP Drawing Change Request 11427

Approved the application of an equivalent British standard material for hot rolled steel sheet.

18. PEP Drawing Change Request 11428

Approved the application of an equivalent British standard material for mild carbon steel plate.

19. PEP Drawing Change Request 11430

Approved the application of an equivalent varnish.

20. PEP Drawing Change Request 11431

Approved the application of an equivalent enamel.

21. PEP Drawing Change Request 11432

Approved the application of an equivalent British standard material for steel sheet.

22. PEP Drawing Change Request 11433

Approved the application of an equivalent British standard material for hot rolled pole steel.

23. PEP Drawing Change Request 11434

Approved the application of an equivalent British standard material for copper shapes.

24. PEP Drawing Change Request 11435

Approved the application of an equivalent British standard material for copper shapes.

25. PEP Drawing Change Request 11440

Approval of BS 970 070M20 as equal for stator tooth supports (Reference material specification MS-70.16).



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26. PEP Drawing Change Request 11449

> Approved the application of an equivalent British standard material for expanded metal steel.

27. PEP Drawing Change Request 11450

Added reference to AMP solistrand connector part numbers.

PEP Drawing Change Request 11454 28.

> Incorporated current American standards and British standard material into material specification MN-50.1 for nuts.

29. PEP Drawing Change Request 11455

> Updates reference to current U. S. standards and includes application of British standard material for specification MN-50.2 for nuts.

The following summary lists all the design changes applicable to the spare generator which were identified during the PG&E OA assessments (See Attachment U):

1. PEP Drawing Change Request 11307

> The insulators used in the AC terminal box assembly were no longer available. The insulators used were one inch higher. This change relocated the part higher in the box.

2. PEP Drawing Change Request 11308

> The purpose of this change was to update the standards for the fan assemblies to standard materials.

3. PEP Drawing Change Request 11309

> This change corrected a typing error on the generator parts list, deleted screws.

Drawings for PG&E's Generator:

Attachment U pages 4-7 gives a complete listing of all NEI Peebles design drawings used for PG&E's generator.

In addition to the verification that a complete identification of design changes had been identified, the Quality Assurance Follow-Up Assessment Report (See Reference 16) included a summary listing of drawing changes as shown in Attachment U pages 1 and 2.

NECS Engineering has reviewed the change summary, and finds the changes acceptable.





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Conclusion:

PG&E Quality Assurance issued a final report (See Reference 16) for their follow-up assessment. This report states that the Design Change Reviews included in Attachment U to this evaluation close out the open issues associated with configuration control for the spare and Sixth Generator. This report also states that all findings relative to Audit 90197S are closed, and that NEI Peebles Electric Products is approved for a one time purchase for the Sixth Diesel Assembly.

Any new design change identified by the above Follow-up Assessments and final reviews performed by NEI Peebles have been incorporated into the Design Change Summary above.

NECS Engineering has reviewed the changes, and finds them acceptable.

Impact of AFR 90-67 on Spare: The final design change reviews have been performed back to 1984, which encompasses the design requirements when the spare was purchased in 1986. All changes have been found to be acceptable. This finding has no impact on the quality or acceptability of the spare generator.

- Problem: PG&E AFR 90-068 Subsupplier Evaluation [Includes all Audit 9003 findings]
- ITEM 1 PEP's quality assurance program does not include provisions for the dedication of commercial grade parts (i.e., Identification of critical characteristics and providing a method to verify them). As a result, items supplied under Purchase Order No. 034525 for the generators were purchased and supplied as commercial grade with no dedication activities performed.
- ITEM 2 PEP's external audit/evaluation program used to substantiate the qualification of subsuppliers is not adequate to comply with PG&E's Specification and ANSI N45.2.13 requirements.

Resolution:

ITEM 1 - To ensure no commercial grade items purchased from PEP have been installed in the plant without evaluation, PG&E has performed a search of all purchase orders from this supplier (See Action Request A0201157 AE's 03 and 04). All items, excluding the spare generator, have been evaluated by a PG&E Replacement Part Evaluation prior to installation in a safety related application.



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For this purchase, all Dedication Evaluations performed by PEP have been reviewed and approved by PG&E (See Attachment H).

ITEM 2. PEP's external audits and evaluation of subsuppliers is resolved by: PG&E review of PEP's audits of the calibration services provided by Reliance and Webber; PG&E's participation in PEP's additional audit of PEM; and an evaluation of the PEM audit findings. PEM, Reliance and Webber are the only PEP subsuppliers PG&E is concerned with for this purchase.

PEP findings from the October 1990 audit of PEM:

9003-1: Purchasing; Subsupplier evaluations, quality requirements in purchase orders, approved suppliers list not complete.

[See Items checked "NO" on Reference 5 pages 27 and 28. Note: For the insulation and adhesive, Audit 9003 is not the qualification basis. The insulation and adhesives were purchased by PEP. The insulation has been dedicated by PEP. The adhesive is evaluated in Section V of this document.]

PEM Supplier Evaluation Background:



PEM has three methods for the qualification of their subsuppliers:

Audit History - Vendor Assessment Record British Registry

The use of the British Registry of Qualified Suppliers needs additional explanation.

PG&E QA Specification SP-D-Peebles invokes British Standard 5750. This British quality standard recognizes the British Registry of Qualified Suppliers. These suppliers are endorsed based on an audit performed by the British Government. These audits are similar to the NRC's NUREG 0040 Vendor Inspections, except that there are no findings or follow-up; the supplier is just removed from the Registry. This document is utilized by the Nuclear as well as other industries in the United Kingdom.

The British Registry is similar to the following U.S. documents:

- DECAS list of suppliers used for Department of Defense contracts,
- ASME qualified suppliers and
- Quality Management Institute endorsed suppliers.





When PG&E initially reviewed these methods of supplier qualification, it was concluded that further evaluation would be needed. For that reason, an in depth review of the suppliers for those seven parts chosen as Audit 9003's representative sample was performed. Any discrepancies on supplier qualification have been expanded upon below.

Rotor Shaft - Forging:

See Attachment I

Per Reference 5 notes: A purchase order for the shaft was sent to Anderman, who subcontracted it to La Forgia Di Bollate. Then the shaft was sent to Weir Pumps for machining. When purchasing the shaft for PG&E's new generator, PEM was unable to procure it from their normal supplier. Therefore, they went to an alternate supplier. The basis for this selection was that the alternate supplier was on Northern Engineering Industries Parson Peebles (NEI Parson Peebles, PEM's parent company) Qualified Supplier List.

To ensure that this supplier provides a quality product, PG&E performed some additional investigation of La Forgia Di Bollate.

La Forgia Di Bollate has been certified by TUV Bavaria to Standard WO/TRD 100.



TUV Bavaria is an internationally recognized independent certifying agency.

The referenced standards are general requirements for the performance of the forger's certification. "WO" has requirements for Materials for Pressure Vessels, and includes guidelines on the suitability of material, testing, marking and repair welds. TRD 100 shows the Technical Rules for Steam Boilers, and includes guidelines on the testing of materials and the certification of their quality.

Based on the reputation of TUV Bavaria, and a review of the standards utilized, NECS Engineering has determined that the certification provided by TUV Bavaria is adequate to ensure La Forgia Di Bollate supplied a shaft forging meeting the PEP specification.

However, to provide added assurance, PG&E requested that PEM perform a hardness test on the shaft.

Per the attached material certification of the shaft provided by La Forgia Di Bollate, the Tensile Strength of the final shaft is 515 Newton/square millimeter. Reference 11 shows the following conversion: MULTIPLY Newton/square millimeter BY 145.0377 TO OBTAIN pounds/square inch.



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This gives an equivalent Tensile Strength of 75 KSI.

Per Reference 12, the approximate Hardness value for a tensile strength of 75 KSI is 81.5 Rockwell B.

The hardness certificate provided by Scotland and included in Attachment I shows that the overall average hardness of the generator shaft is 91.3 Rockwell B.

Although hardness is an approximation of the mechanical properties of a metallic part, the results here, which are ten points higher than the calculated minimum value, give Engineering excellent assurance that the shaft provided by La Forgia Di Bollate meets the specification.

Note that the hardness was taken at eight locations on the shaft, and was witnessed by Mr. Don Bauer of Electrical Maintenance (See Trip Report included in Attachment O).

Rotor Shaft - Machining:

See Attachment J

Per Reference 5 notes: The deficiency concerned documentation of receipt inspection, see AFR 9003-3.



The rotor shaft is processed by Weir Pump/Alloa Works. Although PEM did not have a vendor assessment record on file at the time of the survey, Weir Pumps QA Program is under Weir Pumps Glasgow, who is a British registered ASME type supplier.

Also, PG&E Source Inspection (Report #5, Attachment T) witnessed 100% of the receipt inspection activities per the drawing.

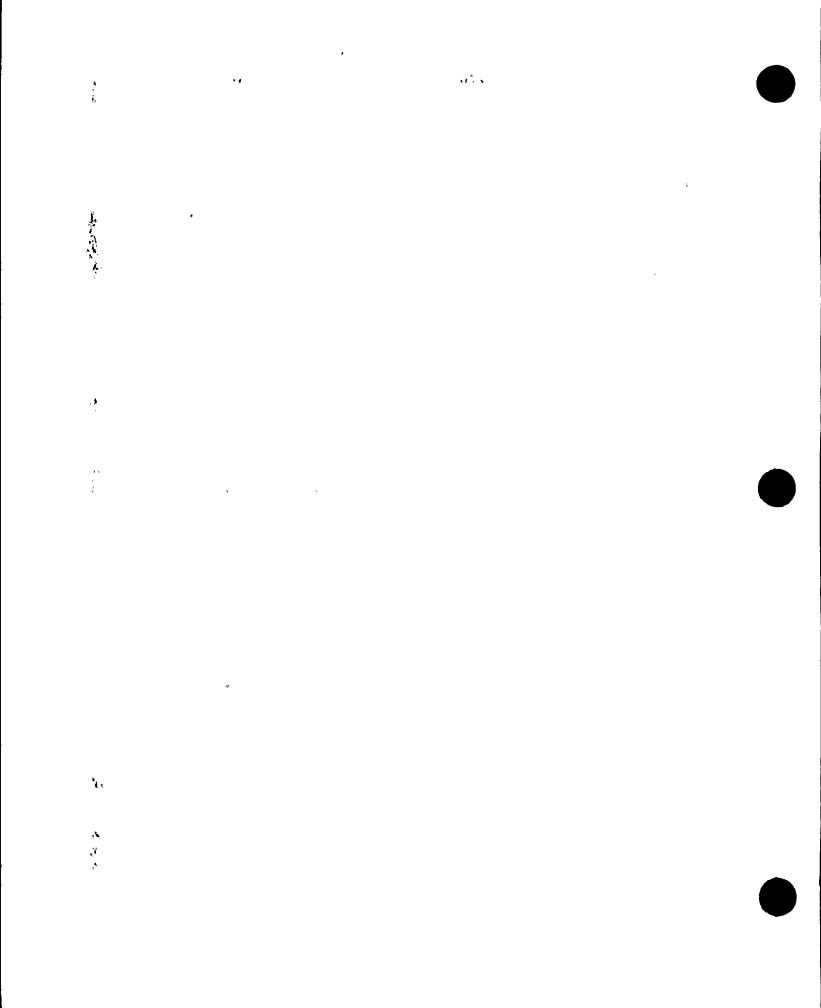
Based on a review of this suppliers Quality Assurance Manual and the British Registration requirements, and the Source verification of the dimensions of the shaft, NECS Engineering has determined that the rotor shaft machining is acceptable.

Magnet Wire:

Per Reference 5 notes: The supplier was on the Department of Trade and Industry (DTI) Registry as a stockist, but a clear understanding of the scope of this qualification was not available.

Although the wire was determined to be acceptable during the survey based on in-process and final testing, a question was raised regarding the scope of the suppliers qualification. Attachment K shows that this supplier, Insulation Systems and Machines Ltd, is in the British Registry.







NECS Engineering has concluded that the qualification of this supplier by the British government is adequate to ensure that the magnet wire meets specification.

Bearing Bracket:

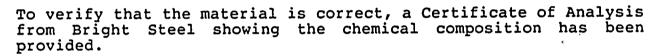
See Attachment J

The bearing bracket is processed by Weir Pump/Alloa Works. Although PEM did not have a vendor assessment record on file at the time of the survey, Weir Pumps QA Program is under Weir Pumps Glasgow, who is a British registered ASME type supplier. Based on a review of this suppliers Quality Assurance Manual and the British Registration requirements, NECS Engineering has determined that the program of this supplier is adequate to ensure a quality bracket.

Stud/Threaded Rod Material:

See Attachment R

The threaded rod for PG&E's generator was supplied by NUMAC Precision Engineering, who purchased it from Albion Steel, who in turn purchased it from Bright Steel. Both Albion and Bright Steel are listed in the British Registry.



Based on a review of this certificate NECS Engineering concludes that this supplier is qualified to supply the threaded rod material.

The questions raised regarding the weldability of the material and the weld procedures used are addressed in Section V of this evaluation.

Stator Frame:

The only problem identified in Audit 9003 for the stator frame was a deficiency concerning the documentation of receipt inspection. See the evaluation of AFR 9003-3.

Roller Bearings:

Per Reference 5 notes: No AQAP certification has been received to date for Fag (UK) Ltd.

During the survey, it was noted that an AQAP-1 Certification for the bearing supplier, Fag (UK), was not available for review. The certification in question has been provided by the supplier and is enclosed as Attachment M.



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Based on a review of the bearing certificate, NECS Engineering concludes that this supplier is qualified to supply bearings for our generator.

Impact of AFR 9003-1 on Spare Generator: The additional investigation performed by PG&E into the qualification of PEM subsuppliers has not identified any instances where that supplier was not qualified to provide the subject part. Based on this investigation, and the evaluation of recent audit results, NECS Engineering concludes that adequate supplier evaluation was performed on the critical parts of the spare generator.

9003-2: Calibration instructions and certification for the magnetic crack detector, interturn unit, and multimeter.

See Attachments N and Q

Based on discussions with Mr. Frank Marino, Quality Assurance Manager for PEP, the procedures for calibration have been issued by PEM. However, these procedures are proprietary and will not be provided to us. PEP has forwarded the certificates for the above listed instruments, and they are included in Attachment N.

Based on the review of these certificates, NECS Engineering concludes that the instruments are properly calibrated for the manufacture of our new generator.

Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes and PEP/PEM interface have not identified any deficiencies.

Also, Mr. Politi of PEP has stated that the standard practices utilized for the calibration of these instruments have not changed since 1986. The fact that these particular instruments were not calibrated in 1989 does not effect the quality or acceptability of the spare.

9003-3: Inadequate documentation of receipt inspection.

The source of this finding is that PEM did not document their receipt inspection, only stamped the packing slip. The inspections performed on non-complex items were considered adequate by the PG&E Audit Team.

The inspections for complex items were acceptable based on the receiving inspection and testing activities for the shaft, stator frame, pole assemblies and stator coils witnessed by a PG&E Source Inspector (see Report # 5, Attachment T). This finding only applies to the sixth generator purchase, and is an administrative problem only. No further Engineering evaluation is required.



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Impact on Spare: Since the audit performed on PEM determined that the receipt inspections performed were adequate, this finding has no impact on the quality or acceptability of the spare.

9003-4: Cleveland and Scotland interface.

See Attachment P

Per discussion with Mr. Politi of PEP, the PEP/PEM interface works as follows. The equivalency of PEM's procedures and specification have been verified by PEP Audit. When a purchase order is issued to PEM, PEP calls out the drawings, specifications and most critical procedures. If for any reason PEM changes to an alternate verification method or material, their engineering organization evaluates the acceptability, and notifies PEP. Then, PEP also performs an engineering evaluation to verify the adequacy of the change.

The design changes and procedure equivalency are addressed under AFR's 90-067 and 9003-6 respectively. In the letter from Mr. Moosbrugger of PEP, he states that to ensure all changes are incorporated into their system, PEM will document all changes to PEP.

Based on the review of all design and procedure changes, NECS Engineering concludes that the PEP/PEM interface is adequate to qualify PEP for this purchase.

Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes and PEP/PEM interface have not identified any deficiencies. Therefore, this finding has no impact on the quality or acceptability of the spare.

9003-5: Crimping inspection procedure.

Based on discussions with PEP, PEM has revised this procedure. To ensure that the revisions are adequate, the procedure was reviewed in Scotland by Mr. Don Bauer of DCPP Electrical Maintenance. Mr. Bauer found the procedure satisfactory (See Trip Report included in Attachment O). Also, a revision to Crimping Inspection Procedure R6081 was received and reviewed by PG&E Quality Assurance prior to their final Follow-Up Assessment (See Reference 16).



Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes and PEP/PEM interface have not identified any deficiencies. Also, Mr. Politi of PEP has stated that the standard practices utilized for crimping have not changed since 1986.



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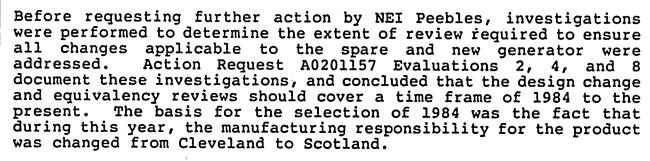


The fact that the crimping inspection procedure used in 1989 does not document all activities does not effect the acceptability of the spare, since the inspection procedure has been revised to document standard practices, and this revision was reviewed by PG&E and found to be acceptable.

9003-6: No documentation was available attesting to the equivalency of NEI Peebles Procedures and Specifications.

As discussed earlier, PEP is the responsible Design Organization for the Sixth Diesel Generator although the generator manufactured by PEM in Scotland. As a result, it is important that Scotland is utilizing specifications which are either the same as PEP's, or which have been evaluated by them to ensure their equivalency. In order to respond to this audit finding, PEP performed an initial review of differences between the material specifications and manufacturing procedures specified by PEP and those specifications and procedures used by PEM. The results of this initial review are included as Attachment P.

PG&E performed a Follow-Up Assessment of NEI Peebles in Cleveland (See Reference 14, Report issued May 13, 1991). During the follow-up assessment by PG&E QA, some changes in PEM's material and manufacturing specifications that did not have a documented review performed by PEP were identified. This determination was made based on a review of Design Drawings, Scotland Engineering Change Notices, Design Change Requests, and Material Specifications.



A letter was issued to NEI Peebles on May 6 (See Reference 15). This correspondence requested that Peebles reverify the equivalency reviews. It also stated that the reviews should go back to 1984, to ensure that the PG&E verification of design changes encompassed the purchase of the spare generator in 1986.

The following summary shows all material and manufacturing specifications used by NEI Peebles on PG&E's Sixth Diesel Generator. For those specification with a Y (Yes) in the change column, a description of the change and an Engineering Evaluation, if necessary, follows the summary.





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Definitions for Table and Evaluations:

- Material Specification based on type of component or Manufacturing Specification: EI-, EP-, EQ-, ET-, EW-, MA-, MC-, MF-, MI-, MN-, MP-, MS-, MT-, MV-, MW-, PS-.
- DCR 12345: Design Change Request
- MS 12345: Material Substitution, for a one time substitution only, does not result in a permanent design change.

| SPEC. NO. | DESCRIPTION | CHANGE Y/N |
|----------------|--|------------|
| EI-1.1.0 | STATOR, FORM COIL, OPEN | N |
| ÈI-1.5.1 | ROTOR, SYNCHRONOUS, LAYER WOUND COIL POLE | N |
| EI-3.1 | STATOR COIL INSPECTION OUTLINE | Y |
| EP-1.1.0 | STATOR, FORM COIL | N |
| EP-1.5.1 | PROCESS, LAYER WOULD COIL POLE | N |
| EQ-2.17 | FILL IN SHEET | Y |
| EQ-5.8 | ROTOR POLE ASSEMBLY, WELDING | Y |
| ET-1.1 | FIELD LEAD | Y |
| ET-2.2.1 | DIELECTRIC TEST OF AC STATOR COILS | Y |
| EW-4.1 | TAPER CUT | N |
| MA-10.2 | ADHESIVE FOR SPACERS | N |
| MC-10.7 | CABLE, 5000 VOLT CLASS B 130 C | Y |
| MC-10.10 | CABLE, 600 VOLT CLASS B 125 C | Y |
| MC-10.13 | CABLE, SPACE HEATER HOOKUP | Y |
| MC-10.15 | SOLID, 600 VOLT CLASS A . | Y |
| MC-20.1 | CONNECTOR | N |
| MC-80.1 | HARD DRAWN BARS, RODS AND SHAPES | У |
| MC-80.2 | SOFT DRAWN BARS, RODS AND SHAPES - | У |
| MC-80.5 | COPPER ANNEALED OXYGEN FREE BAR/ROD/SHAPE | s y |
| MC-80.6 | COPPER HARD DRAWN OXYGEN FREE BAR/ROD/SHAN | PES Y |
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| SPEC. NO. | DESCRIPTION | NGE Y/N |
|---------------|--|---------|
| MF-3.3 | TREATED DACRON FELT | Y |
| MI-5.1 | INSULATION, COTTON PHENOLIC SHEET | Y |
| MI-5.3 | INSULATION, COTTON BASED PHENOLIC TUBE | N |
| MI-10.1 | POLYESTER GLASS LAMINATE | Y |
| MI-25.1 | IRON CASTING, GENERAL PURPOSE | N |
| MN-50.1 | NUTS, FINISHED, HEX, PLATED | Y |
| MN-50.2 | NUTS, HEX, SEMI FINISHED, HEAVY, PLATED | Y |
| MN-50.4 | NUTS, HEX, MACHINE SCREWS, PLATED | . и |
| MP-5.8 | NOMEX ARAMID PAPER | Y |
| MR-20.1 | ROPE THERMOSETTING, FIBER GLASS | N |
| MS-25.1 | SCREWS, CAP, HEX HEAD, PLATED | Y |
| MS-25.2 | SCREWS, CAP HEX HEAD, PLATED, HI-TENSILE | Y |
| MS-25.7 | SCREWS, ROUND HEAD MACHINE, PLATED | N |
| MS-40.3 | SLEEVING, COATED ELECTRICAL, CLASS F | N |
| MS-70.12 | STEEL BARS, HOT ROLLED, LOW CARBON | Y |
| MS-70.13 | STEEL, HOT ROLLED SHEET AND STRIP, COMMERCIA | L Y |
| MS-70.14 | STEEL, MILD CARBON STEEL, PLATE | Y |
| MS-70.15 | STEEL, COLD FINISHED BARS, AISI-C-1215 | Y |
| MS-70.16 | COLD FINISHED AISI-C-1018 | Y |
| MS-70.17 | STEEL, AISI-C-1018, COLD FINISHED KEY STOCK | Y |
| MS-70.32 | FLATTENED EXPANDED METAL SCREEN | Y |
| MS-70.38 | STEEL, HOT ROLLED POLE STEEL | Y |
| MS-70.42 | SHAFT FORGING, CARBON STEEL | Y |
| MS-70.43 | STEEL, VENTILATING SPACER, AISI-C-1008 | Y |
| MS-70.46 | STEEL, SHEET, COLD ROLLED, ASTM-A-366-72 | Y |
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| SPEC. NO. | <u>DESCRIPTION</u> CHANGE | <u>Y/N</u> |
|-----------|--|------------|
| MS-70.75 | STEEL, ELECTRICAL SHEET, AISI-M36, CORE PLATED | N |
| MS-70.77 | STEEL, ELECTRICAL SHEET, FULLY PROCESSED | . Y |
| MT-10.4 | | N |
| MT-10.5 | DACRON TAPE, .005 | ¥ |
| MT-10.7 | POLYESTER CLASS BANDING TAPE | Y |
| MT-10.16 | MAT ADHESIVE TAPE | N |
| MT-10.17 | HIGH SHRINK MYLAR TAPE | N |
| MT-10.23 | VARNISH MAT TAPE | ¥ |
| MT-10.30 | COTTON TAPE | N |
| MT-10.33 | B-STAGE MICA PAPER TAPE | N |
| MT-10.37 | B-STAGE DACRON GLASS TAPE | N |
| MT-10.38 | POLYESTER GLASS TAPE | Y |
| MV-10.2 | POLYESTER INSULATING VARNISH . | Y |
| MV-10.5 | INSULATING ENAMEL, BLACK, AIR DRY | Y |
| MV-20.9 | BONDING ADHESIVE FOR ROTOR COILS | N |
| MW-5.1 | WASHERS, STEEL PLATED, ASA-B27.2-53 | Y |
| MW-5.2 | WASHERS, SPRING LOCK, PLATED | Y |
| MW-25.3 | MAGNET WIRE-ROUND, POLYESTER GLASS COVERING | N |
| MW-25.5 | MAGNET WIRE-ROUND SQUARE OR RECTANGULAR | N |
| MW-70.10 | B-STAGE MICA WRAPPER | N |
| PS-3006 | BRAZING AMORTISSEUR BARS | N |
| PS-3014 | GRINDING OF SYNCHRONOUS POLES, BOLTED ONLY | N |
| PS-3018 | SEMI-AUTOMATIC POLE WELDER SKEWED BOLT ON POLES | N |
| PS-3022 | PROCEDURE FOR WELDING ROTOR POLES, BOLTED TYPE | Y |
| PS-5004 | STAKING CORE IN MACHINED FRAME FOR SKEWED CORE SEGMENTAL LAMINATIONS | N |



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Evaluation of Equivalency Reviews Performed by PEP:

EI-3.1 STATOR COIL INSPECTION OUTLINE

EI-3.1 outlines dimensional checks to be performed at various stages of manufacture. PEM has their own procedure, R-5034, which incorporates PEP's EI-3.1 and performs the same dimensional checks.

EQ-2.17 FILL IN SHEET

This is the data sheet associated with the checks performed by EI-3.1. PEM has their own data sheet which records the same dimensions as EQ-2.17.

EQ-5.8 ROTOR POLE ASSEMBLY, WELDING

Inspection record sheet. PEM has their own data sheet which records the same inspections. Also, PEM will include a completed EQ-5.8 with the final data package.

ET-1.1 FIELD LEAD

DCR 11409 approved a change in copper thickness for use in the rotor poles. Terminals per PEP ET 1.1 called for a thickness of $0.015 \times 5/8$ inch copper to be used to form the terminal. Substitution of 2 thicknesses of $0.5 \text{ mm} \times 25 \text{ mm}$ copper was approved provided that a small notch in the pole washer be expanded to accommodate the increased width of copper.

ET-2.2.1 DIELECTRIC TEST OF AC STATOR COILS

This is a data sheet for recording voltage levels during coil testing. PEM has their own data sheet that records the same voltages as ET-2.2.1.

MC-10.7 CABLE, 5000 VOLT CLASS B 130 C

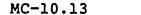
DCR 11397 approved a material change for this specification. AC generator lead cable was GE Vulkaflex, which is no longer available. Substitution of a silicone insulated type SIWO-KUL, 70 square millimeters 6.6 KV flexible strand cable meeting flame resistance requirements of IEEE 383 was approved.

MC-10.10 CABLE, 600 VOLT CLASS B 125 C

Substitution of a silicone insulated type SIWO-KUL, 16 square millimeters 3.3 KV flexible strand cable meeting flame resistance requirements of IEEE 383 was approved.



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CABLE, SPACE HEATER HOOKUP

MS 11461 approved the use of a cable that is flame retardant, halogen free, high temperature and glass braided. Equivalent to the cable specified by this material specification. This cable was used in a NON 1E circuit.

MC-10.15 SOLID, 600 VOLT CLASS A

Substitution of a silicone insulated type SIWO-KUL, 16 square millimeters 3.3 KV flexible strand cable meeting flame resistance requirements of IEEE 383 was approved.

MC-80.1 HARD DRAWN BARS, RODS AND SHAPES

This document specifies an ETP 110 bus bar material and is used in the terminal box. Stresses in this application are very low. British Material BS 2870 Grade ClOl was used and is equivalent.

MC-80.2 SOFT DRAWN BARS, RODS AND SHAPES

This material is used when bus bars are formed, and is a low stress application. British Material BS 2870 Grade Cl01 was installed and is equivalent.

MC-80.5 COPPER ANNEALED OXYGEN FREE BAR/ROD/SHAPES

DCR 11434 approved an equivalent British material. British Standard BS 1432 Grade Cl03 Condition 0 was added to this material specification. The application for this steel is pole end straps and rotor end rings. The actual material used was BS 2870 Cl01, which is not oxygen free. The use of the different material was approved by Discrepancy Report 2783 and is acceptable.

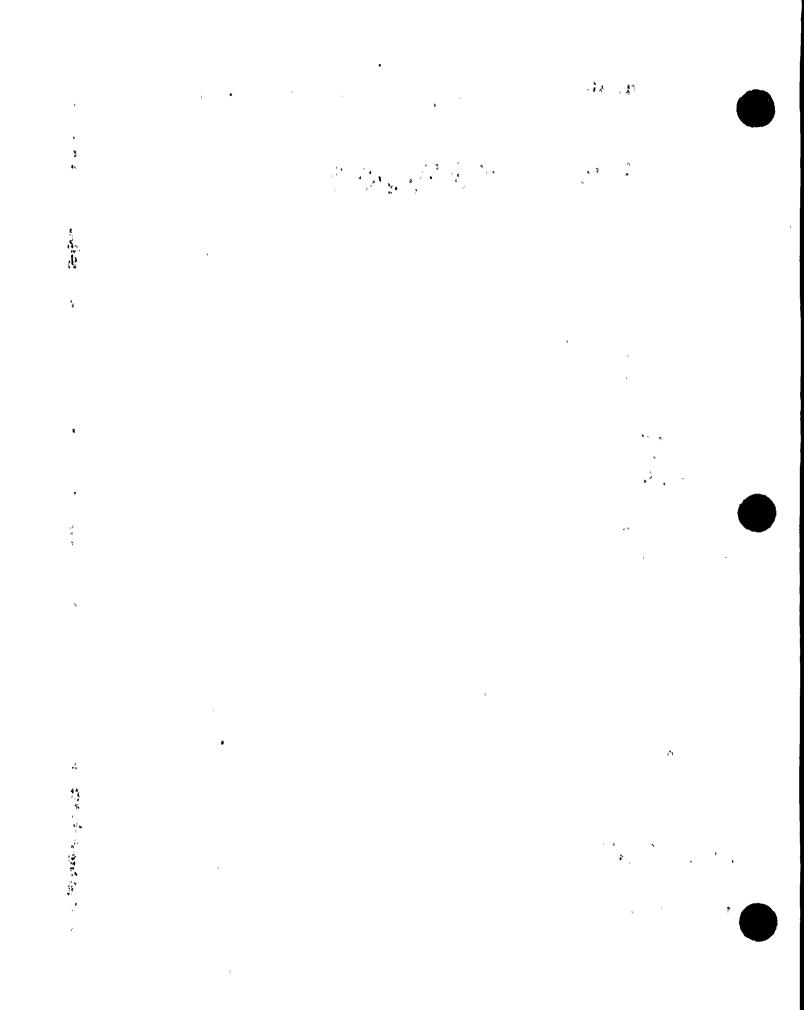
MC-80.6 COPPER HARD DRAWN OXYGEN FREE BAR/ROD/SHAPES

DCR 11435 approved incorporated British Standard BS-4608 Grade 103 Condition 1/2 N into this specification. The application is pole end punchings. The most important aspect is that the material be oxygen free. The British standard specifies freedom from hydrogen embrittlement. The British alternate has a slightly lower tensile strength.

MF-3.3 TREATED DACRON FELT

When used, this procedure is combined with MA-10.2 (ADHESIVE FOR SPACERS) to produce the treated felt. PEM uses felt with a 200% resin saturation, reference PEM Procedure R8010. This eliminates the need for this specification. The PEM procedure is on file and has been reviewed by PEP.







MI-5.1 INSULATION, COTTON PHENOLIC SHEET

MI-5.1 specifies a NEMA Grade C, which is for general purpose. NEMA grade LE was used in PG&E's generator. Both types are phenolic-cotton sheets and are approved.

MI-10.1 POLYESTER GLASS LAMINATE

MS 11412 issued by PEP approved the use of the following insulation: PEM used GOP-3 (reference specification MI-10:7) for the rotor pole washers; and G-11 (reference MI-5.5 for the stator slot sticks).

MN-50.1 NUTS, FINISHED, HEX, PLATED

DCR 11454 added British Standard BS 1768 Grade 1 to this specification. The material used complies with this British equivalent and is acceptable.

MN-50.2 NUTS, HEX, SEMI FINISHED, HEAVY, PLATED

DCR 11455 added British Standard BS 1768 Grade 3 to this specification. The material used complies with this British equivalent and is acceptable.

MP-5.8 NOMEX ARAMID PAPER

Both the material specified by PEP and the material used by PEM are NOMEX 410, uncoated.

MS-25.1 SCREWS, CAP, HEX HEAD, PLATED

MS 11463 approves the use of material per British Standard BS 1768 Grade S. This material is acceptable, since it exceeds the technical requirements of MS-25.1.

MS-25.2 SCREWS, CAP HEX HEAD, PLATED, HI-TENSILE

MS 11463 approves the use of material per British Standard BS 1768 Grade S. This material is acceptable, since it has the same proof load characteristics as MS-25.2.

MS-70.12 STEEL BARS, HOT ROLLED, LOW CARBON

DCR 11419 incorporated British Standard BS EM 100025 1990 Grade FE 430A into this material specification. PEM utilized a material that complied to this British Standard. The application is stator feet and rotor pole head. MS-70.12 references the mechanical properties of AISI 1020. The British standard specifies the properties as a function of the thickness of the material. For the thickest application, the British standard specifies 38425 PSI yield, while AISI 1020 shows 30000 PSI yield.



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DCR 11427 incorporated British Standard BS 1449 Part 1 1983 Grade CRSP4GP into this material specification. The steel used by PEM is in compliance with this British standard. The applications are panels, boxes, baffles. Material is selected on the basis of fabrication properties vice mechanical strength. The British standard meets the carbon content requirements of the PEP standard.

MS-70.14 STEEL, MILD CARBON STEEL, PLATE

DCR 11428 incorporated British Standard BS 1501 Part 1 1980 Type 161 Grade 430A into MS-70.14. The material used in PG&E's generator meets the British requirements. The applications are stator frame support ring, end brackets, fan support ring, and fan blades. Physical properties of the two standards are almost identical, and the materials are interchangeable.

MS-70.15 STEEL, COLD FINISHED BARS, AISI-C-1215

DCR 11411 approved substitution of British material BS 605 M35 condition T for the rods and studs in the rotating element (PEP DWG A-66826 Item 5). The material was suitable for the application but the substitution necessitated special attention to the welding procedure. A welding procedure specific to this application was written by PEM and approved by PEP and PG&E, see Section V for evaluation of welding issue.

MS-70.16 COLD FINISHED AISI-C-1018

DCR 11440 approved British material BS 970 070M20 as equivalent to this specification. The application is stator tooth supports and the substitution is acceptable.

MS-70.17 STEEL, AISI-C-1018, COLD FINISHED KEY STOCK

DCR 11418 incorporated British Standard BS 970 Part 1 1983 Grade 080W30 into MS70.17. Applications are slip ring and rotor spider keys. The British material has the same hardness requirements, a higher tensile strength, but has a 15% lower ultimate strength. Since the key is designed to be a softer material than the adjoining parts, this substitution is acceptable.

MS-70.32 FLATTENED EXPANDED METAL SCREEN

DCR 11449 incorporated British Standard BS 1449 Part 1 for use in the generator. The difference in the specifications is the size of the openings, which in this case is not critical to the function of the material.



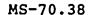
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STEEL, HOT ROLLED POLE STEEL

DCR 11433 incorporated Tensiloy 250 as an acceptable material. The application of the steel is for pole and rotor laminations. Tensiloy has higher tensile and yield strength, the same elongation, and a higher DC permeability than the originally specified material.

MS-70.42 SHAFT FORGING, CARBON STEEL

The material used by PEM complies with British Standard BS 970 080M40. This material is acceptable, since the British specification encompasses the requirements of PEP's MS-70.42.

MS-70.43 STEEL, VENTILATING SPACER, AISI-C-1008

DCR 11417 added BS 970 Part 1 1983 Grade 070M20 to the PEP material specification. The application is vent spacers. The 070M20 yield strength is 29000 PSI and is sufficient for the compression load.

MS-70.46 STEEL, SHEET, COLD ROLLED, ASTM-A-366-72

DCR 11416 added British Standard BS 1449 Part 1 1983 Grade CRSP4GP to the PEP specification. The applications are panels, boxes, and baffles. The most important aspect is weldability, not strength. MS-70.46 lists a yield of 27500 PSI. The British material has a lower physical strength. The alternate material is acceptable.

MS-70.77 STEEL, ELECTRICAL SHEET, FULLY PROCESSED

MS 11432 approved the use of British material BS 6404 Part 8 Section 8.4, Grade 310-50-A5. Application is stator laminations. The difference is that the metric laminations are 0.03 mm thicker, and the Watts/Lb loss of the British material is below the maximum allowed by the PEP standard. The substitution is acceptable.

MT-10.5 DACRON TAPE, .005

The tape used is in accordance with British Standard BS 6551, 1985. The British tape is a direct equivalent, and has the same thickness.

MT-10.7 POLYESTER CLASS BANDING TAPE

For PG&E's generator, Hyperten tape was used by PEM, and it is a direct equivalent. Note that this is for banding not insulating.

MT-10.23 VARNISH MAT TAPE

Tape in accordance with PEP specification MT-10.33 was used in the place of this tape. The change in specification was approved by PEP, and the tape actually installed was supplied by Cleveland.



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MT-10.38 POLYESTER GLASS TAPE

Glass tape meeting British Standard BS 3779, 1985 was installed. This is a direct equivalent to the PEP specified material.

MV-10.2 POLYESTER INSULATING VARNISH

DCR 11430 added Sterling 073-4951 Class A-H to this material specification as an acceptable alternate to the original. The application is insulating varnish. The British product has a higher dielectric strength when tested to ASTM D 115.

MV-10.5 INSULATING ENAMEL, BLACK, AIR DRY

DCR 11431 incorporated Sterling VA63 into specification MV-10.5 as an acceptable material. The varnish is used to spray coils or poles. The chemical resistance, abrasion resistance, and thermal class are the same. VA 63 has a slightly higher dielectric strength.

MW-5.1 WASHERS, STEEL PLATED, ASA-B27.2-53

A British equivalent fastener was used for this part. The British equivalent is equal to or better in strength.

MW-5.2 WASHERS, SPRING LOCK, PLATED

A British equivalent fastener was used for this part. The British equivalent is equal to or better in strength.

PS-3022 PROCEDURE FOR WELDING ROTOR POLES, BOLTED TYPE

The change to this procedure deals with the Non Destructive test method for detecting weld flaws. This specification was revised per DCR's 11410 and 11414 to include approval of PEM procedure R5036. The revision incorporates the magnetic ink method as an alternate to the magnetic particle inspection. Engineering has reviewed this revision and found it to be adequate.

Conclusion:

The final QA Report (See Reference 16) states that the Equivalency Reviews included in Attachment U to this evaluation close out the open issues associated with configuration control for the spare and Sixth Generator. This report also states that all findings relative to Audit 90197S are closed, and that NEI Peebles Electric Products is approved for a one time purchase for the Sixth Diesel Assembly.

Any new Material Specification or Manufacturing Procedures identified by follow-up audit which require an equivalency evaluation has been incorporated into the summary above.



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NECS Engineering has reviewed all material and manufacturing specification differences between the PEP and PEM, and concludes that the equivalency evaluations performed by the supplier are adequate.

Impact on Spare: The final equivalency reviews have been performed back to 1984, which encompasses the design requirements when the spare was purchased in 1986. All changes have been found to be acceptable. This finding has no impact on the quality or acceptability of the spare generator.

Problem: PG&E AFR 90-069 - Dedication Testing

Testing, specified in PG&E purchase order ZS-1539-AB-9 was performed by PEP without the use of approved test procedures/instructions.

Resolution:

NECS Engineering has reviewed and approved the PEP Dedication Evaluations for the following critical parts: Brush Holder, Brush, Current Transformer, Insulator, Bearing Seal, Bushing Insulator, CT Test Switch, and Insulating Tape by PEP.

Attachment H includes the original Dedication Packages, as well as the Final evaluations issued by PEP following the incorporation of PG&E's comments. Note that all the comments were either administrative, or requested supporting documentation. There has been no change in the acceptance criteria for any of the critical characteristics.

Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes/equivalency and PEP/PEM interface have not identified any deficiencies. Also, the verifications performed by PEP on the commercial grade parts used in the new generator were found to be adequate. Therefore, this finding has no impact on the quality or acceptability of the spare.

Problem: PG&E AFR 90-070

PEP has not verified the certification system of outside calibration services by audit or evaluation. M&TE program does not meet the requirements of the specification.

Resolution:

PEP has forwarded a letter stating that the audit of M&TE calibration services has been completed satisfactorily (See Attachment Q). Engineering considers this letter adequate to close this finding.



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Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes/equivalency and PEP/PEM interface have not identified any deficiencies. Also, PG&E reviewed the results of the recent PEP audits of their calibration services, and found them to be adequate. Therefore, this finding has no impact on the quality or acceptability of the spare.

Problem: AFR 90-071

PEP's Quality Assurance Record storage, handling and retrieval program is not sufficient to meet the requirements of PG&E specification and ANSI N45.2.9.

Resolution: -

The qualification of this supplier is only applicable to the purchase of the sixth diesel generator. Also, PG&E will receive all permanent records according to the purchase order requirements. Closure of this finding is administrative in nature, and no additional Engineering evaluation is required.

Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes/equivalency and PEP/PEM interface have not identified any deficiencies. The fact that record handling was not per PG&E requirements in 1989 has no effect on the quality or acceptability of the spare.

Problem: AFR 90-072

PEP's audit program (internal) is not sufficient to meet the requirements of the PG&E specification and ANSI N45.2.12.

Resolution:

This evaluation only applies to the Sixth Diesel purchase. The fact that PEP's internal audit program is not per PG&E requirements does not effect the manufacture of this generator. No additional Engineering evaluation is required.

Impact on Spare: The technical requirements called out in the purchase order for the new generator and the spare generator purchased in 1986 are the same. PG&E's review of the design changes/equivalency and PEP/PEM interface have not identified any deficiencies. The fact that internal audits were not complete during a 1989 assessment has no effect on the quality or acceptability of the spare.



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V. ADDITIONAL TECHNICAL ISSUES

Generator Studs and Threaded Rods

See Attachment R

The issue raised was whether a change in rod material for use in the armature assembly could result in cracking of the threaded portion of the rod and the end plate.

To resolve this question for the sixth diesel generator, PEP has reperformed the welding of the rods using preheat and the authorized welding procedure. This fact is documented in a letter from Peebles dated December 3, 1990.

Engineering agrees that this resolves the rod welding issue for Purchase Order ZS-1539-AB-9.

Impact on Spare: NECS Engineering has reviewed the non destructive inspections performed by PEP on the stud/rod welds in the spare (see Reference 20). No cracks were identified. Based on this review, NECS Engineering concludes that the stud/rod welding on the spare generator is adequate.

Adhesive



The adhesive used for PG&E's generator was supplied by PEP. However, PEP was not on the PEM Approved Suppliers List.

Based on discussions with PEP Design Engineering, they do not perform any special testing of this product for the following reasons:

- In addition to the adhesive, clamps are installed between the poles to ensure that the copper rotor winding is held in position. Even if the rotor winding did delaminate it would not result in an immediate failure.
- 2. When the final tests on the generator are performed, the rotor is run at 25% overspeed. During this test, the adhesive is subjected to forces well above any it will experience in its designed duty.

However, to provide added assurance, PG&E has purchased an adhesive sample of the same batch used in our generator. This sample has been tested for tensile shear strength per the manufacturers instructions, and is per specification.



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Based on PEP's explanation of the forces the adhesive must undergo, NECS Engineering concludes that the Armstrong A-701 Epoxy is adequate for the new generator, and that an adhesive failure due to long term degradation is not a concern.

Impact on Spare: Since the manufacturing and final acceptance testing of the spare has already been performed, and the adhesive was found to be acceptable on the new purchase, this issue has no impact on the quality of the spare generator.

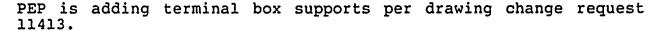
Responses to Issues Raised in NECS Letter to PEP dated October 29, 1990

Reference Attachment S

Problem:

The terminal box on the side of the "spare" generator is held to the frame of the stator by two welded steel gusset plates. During transit the top heavy terminal box tore away from the metal at the back of the box. Additional supports or bracing at the top of the terminal box to anchor it more rigidly to the frame of the stator should be provided to prevent recurrence of this problem. Please submit a drawing to PG&E proposing your resolution.

Resolution:



NECS Engineering has reviewed the change and concurs with this solution. The terminal box supports are not a concern for the existing five generators, since this is a shipping/handling issue, and the terminal boxes on the original generators were not damaged during shipment.

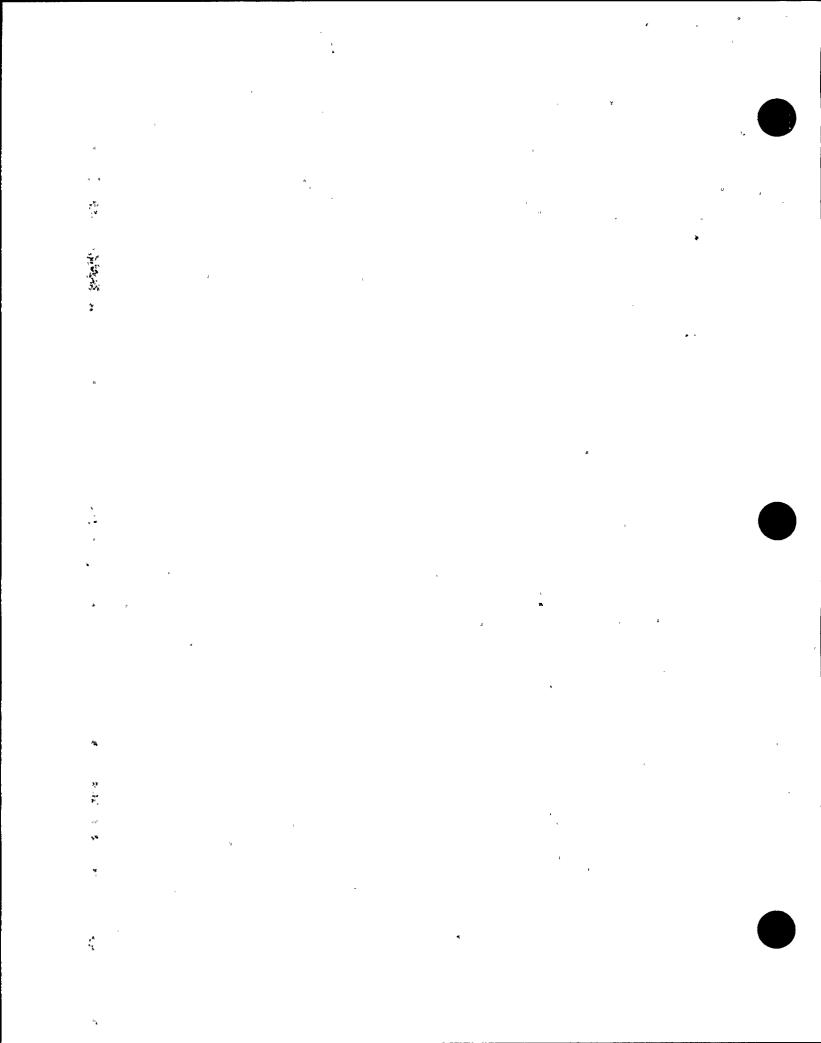
Impact on Spare: Additional terminal box supports will be added to the spare by a DCP, see Action Request A0214809.

Problem:

The space heaters on the existing generators are inaccessible. The end bells on the machine must be removed in order to provide access. Due to the close proximity of the heaters to the fibre glass stator coil shields, shield blistering has occurred. Please review your design to verify that the heaters are correctly sized. It appears that a lower heat output may be desirable.

As a minimum, the space heaters should be located further away from the fibre glass shields and the space heater accessibility improved. Please provide drawings proposing your solution.







Resolution:

PEP confirms that the space heaters are correctly sized when operated with a 480V, 3 phase, 60 Hertz supply. They do not intend to redesign/rearrange the heaters for this purchase order.

Engineering will resolve the supply power problem for the existing five generators per Action Request A0166454.

Impact on Spare: This issue has no impact on the stocked spare. Any corrective action implemented by the above mentioned Action Request will be performed at the plant, and therefore will apply when and if the spare is installed.

Problem:

The CT secondary leads between the CT output and the CT Test Switch are tight (i.e. no slack in these leads at all). There is a strain on these leads when the generator is running and therefore we request that these leads have more slack in them to provide greater flexibility and less strain on the wires and terminations when the generator is running.

Resolution:



PEP has taken appropriate measures to ensure that the CT secondary leads between the CT output and test switch have enough slack in them to prevent strain when the engine is running.

Engineering concurs with this solution for the new generator. The leads on the existing five generators have been inspected and repaired as necessary per Work Orders C0071091, C0071192, C0071196, and C0071198.

Impact on Spare: The CT leads on the spare are satisfactory, see
Action Request A0214809 AE 1.

Problem:

Welding cracks have developed where the skin or cover of the stator frame is joined to the circumferential structural members of the stator around the vent openings, on the installed generators.

Particular attention to these welds should be given during fabrication to avoid the recurrence of this problem on this generator. Previously in our handwritten transmittal it was reported that the weld cracks were in the main structural members of the stator. This is not the case, as was discovered during our recent, more thorough, investigation.



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Resolution:

PEP has taken appropriate measures to ensure that special attention is given to all welding in the areas described.

Engineering concurs with this solution of the problem for the new generator.

The stator covers on the existing five units were rewelded per DCNs 43041 and 44041.

Impact on Spare: Engineering will generate a DCN to reweld the stator covers on the spare generator. Action Request A0213896 tracks the issue of this DCN. Since the rewelding is a preventative measure, and no cracks exist in the spare now, this Action Request does not prevent release of the spare generator from stock.

Problem:

NOMEX has served well as the bonding material on top and bottom of the pole turns. Please assure that NOMEX continues to be used on this generator.

Resolution:



PEP has stated that NOMEX will continue to be used on this generator.

There is no problem and no action required for the existing five generators.

Impact on Spare: There is no problem or action required for the
spare generator.

Problem:

The bonding adhesive between conductor of the straight section of the pole coil conductors is insufficient. The adhesive used has dried out and the coil conductors chatter when the generator is running. A better adhesive with better aging properties should be used on this generator. We understand that Cleveland supplied this adhesive to Scotland and we wish to know how the adhesive selected is qualified to be appropriate for this application and how you verified that the adhesive specified is in fact the adhesive applied to the generator pole coils.

Resolution:

PEP's current standard bonding adhesive is Armstrong 701 Epoxy. NECS Engineering's basis for acceptability of this adhesive is addressed earlier in this section.



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DCPP Maintenance noted this problem on one of the existing units. The problem is not critical at this time and is being watched in case it develops. No further action is required at this time.

Impact on Spare: No action required at the present time.

Problem:

The polyester glass material used for the stator slot wedges appears to have given satisfactory service on the existing generators. We understand that Scotland has substituted a new material type GP03. Please provide us with your basis for approval of this substitution.

Resolution:

PEP has submitted a material substitution for this product.

Engineering has reviewed this and noted that approval for the change has been given by PEP to PEM.

No action is required for the existing five units.

Impact on Spare: No action required for the spare generator.

Problem:

Please ensure that the blocking and bracing at the ends of the rotor are completely "flat." We have experienced difficulty when attempting to slide out the rotor from within the stator. Due to the narrow air gap clearances, the end bracing etc. of the rotor tends to scuff the internal side of the stator.

Resolution:

PEP will take appropriate measures to ensure that the ID of the stator coil end turns are concentric, to the degree that the rotor will not rub the end turns during removal.

During a trip to Scotland 1-7-91, Mr. Don Bauer of DCPP Electrical Maintenance checked to ensure that this problem does not exist on the sixth generator (see Trip Report in Attachment O).

This issue was identified for ease of maintenance, and is not a manufacturing defect. There is no impact on the existing units.

Impact on Spare: This issue was identified for ease of maintenance, and is not a manufacturing defect. No action is required for the spare generator.



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Problem:

Slip ring run out: The slip rings, due to either incorrect machining or assembly, are not concentric with the shaft. Considerable "bounce" has been observed on the existing generators when they are running. Closer tolerances should be achieved in the machining and fit of these slip rings.

Resolution:

Factory has been notified and alerted so as not to repeat this problem during the fabrication.

Engineering agrees that closer attention during fabrication closes this issue for the new generator.

Slight eccentricity was observed on one of the five installed units. The problem is not severe and is being watched on a preventative maintenance basis. No action required at this time.

Impact on Spare: Not observed as a problem on the spare. No impact.

Problem:



We have changed the specification voltage for the space heaters from 480 VAC to 528 VAC (maximum). Please redesign the space heaters to allow for this change. If additional costs are required to implement this change, provide a quote and obtain our acceptance before proceeding with this change.

Resolution:

This change cannot be accommodated on this purchase order.

Engineering will write a design change to reduce the supply voltage to 480 VAC. See Action Request A0166454.

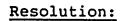
Impact on Spare: This issue has no impact on the stocked spare. Any corrective action implemented by the above mentioned Action Request will be performed at the plant, and therefore will apply when and if the spare is installed.

Problem:

Outline drawing C-0899IU Revision 1 indicated a revision to the jack screw location. What is the reason for this change?



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The generator stator frame with feet is built to manufacturing drawings which locate things like the jack screw hole. The outline was revised to reflect the equipment as built.

Since this is an interface hole and is a documentation of an as built condition, it has no impact on the existing five units.

Impact on Spare: Since this is an interface hole and is a documentation of an as built condition, it has no impact on the spare generator.



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See Attachment T

In addition to the qualification of PEP, PG&E is conducting Source Inspections in accordance with Inspection Plan DC-254 during the manufacture and testing of our generator. Witness points in the plan include:

- instrument calibration
- dimensional checks
- generator testing.

Problems/Deviations Identified in Source Inspection Reports

Report # 3 issued 5-11-90 -

Problem:

"In a letter dated 3-13-90, NEI Peebles Electric Products advised that the NEI Peebles Edinburgh weighing scales have an accuracy class of plus or minus 5%. NEI Peebles has requested confirmation that the 5% accuracy tolerance is acceptable for the stator and rotor weights being furnished to PG&E

Engineering.

Resolution: The 5% accuracy for the stator and rotor weights is acceptable to NECS Engineering.

Report # 4 issued 5-25-90 -

The inspector identified differences between the phase rotation of the spare purchased in 1896 and the new generator being manufactured now. For the spare, with the shaft rotation counterclockwise, viewed from the non-drive end, the phase rotation was A-C-B, left-to-right, when viewing the terminals from the front of the terminal box. The terminals were labeled T1-T2-T3, left-to-right.

NEI Peebles requested the following information from PG&E:

- 1. "Reconfirmation of the mechanical rotation, phase sequence, and terminal marking requirements..."
- 2. "Provide NEI Peebles with instructions about the existing generators and drawings..."



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3. "If the generator on order is not an exact duplicate of the existing in-service generators, or if the spare generator is not an exact duplicate of the original five generators, then PG&E Engineering should clarify the design parameters, so that NEI Peebles can properly word the Certificate of Conformance.

Resolution:

NECS Engineering has discussed the phase rotation issue with PEP. To clarify, the generator is manufactured with the standard T1-T2-T3 (ACB) connection. When the generator arrives on site, DCPP will connect the generator terminal leads to establish this same ACB phase rotation. The actual terminal connection is documented on a field change if the connection differs from the standard shown on the PEP drawing.

Report # 5 issued 10-12-90 -

Problem:

- 1. All design changes should be reviewed by NEI with PG&E Engineering.
- 2. Shaft nominal 18.25" dimension.
- 3. Stator frame nominal 63" opposite drive end diameter.

Resolution:

- 1. All design changes have been identified by PEP, reviewed by NECS Engineering and found to be adequate. See Section IV of this evaluation.
- 2. The variation in the shaft dimension has been documented on Discrepancy Report No. 2746 and is evaluated in Section IV of this document.
- 3. The stator frame discrepancy was documented on Discrepancy Report No. 6188. PEM has repaired the frame so that it meets the drawing dimensions.

Issues Raised in Telefax dated 10-7-90

Problem: "All design changes by NEI...even if modifications are made internal to the machine...should be reviewed with PG&E.

Resolution: Engineering has reviewed and approved all design changes. See Section IV of this evaluation.



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Problem:

"...NEI's dedication in accordance with Attachment
F to the EMM...Magnet Wire, Stator RTD's, Copper
Bus in Terminal Compartment, Bearings, Lead to Coil
Termination."

The stator RTD's and Copper Bus have been determined to be non-critical parts of the generator assembly. Attachment F to the EMM Revision 3 shows the updated list of the critical parts of the generator assembly. The Magnet Wire, Bearings, and Lead Wires do not have PEP Dedication Packages, since they were supplied by PEM. These three parts have been qualified by Audit 9003. See Section IV of this evaluation.

Problem: "According to the Inspection Plan, all drawings and procedures are to be submitted to PG&E for approval."

Resolution: Any drawings/procedures that require PG&E approval have been submitted directly to Engineering. Inspection Plan DC-254 Revision 2 has deleted this requirement.

Issues Raised in Letter dated 12-19-90

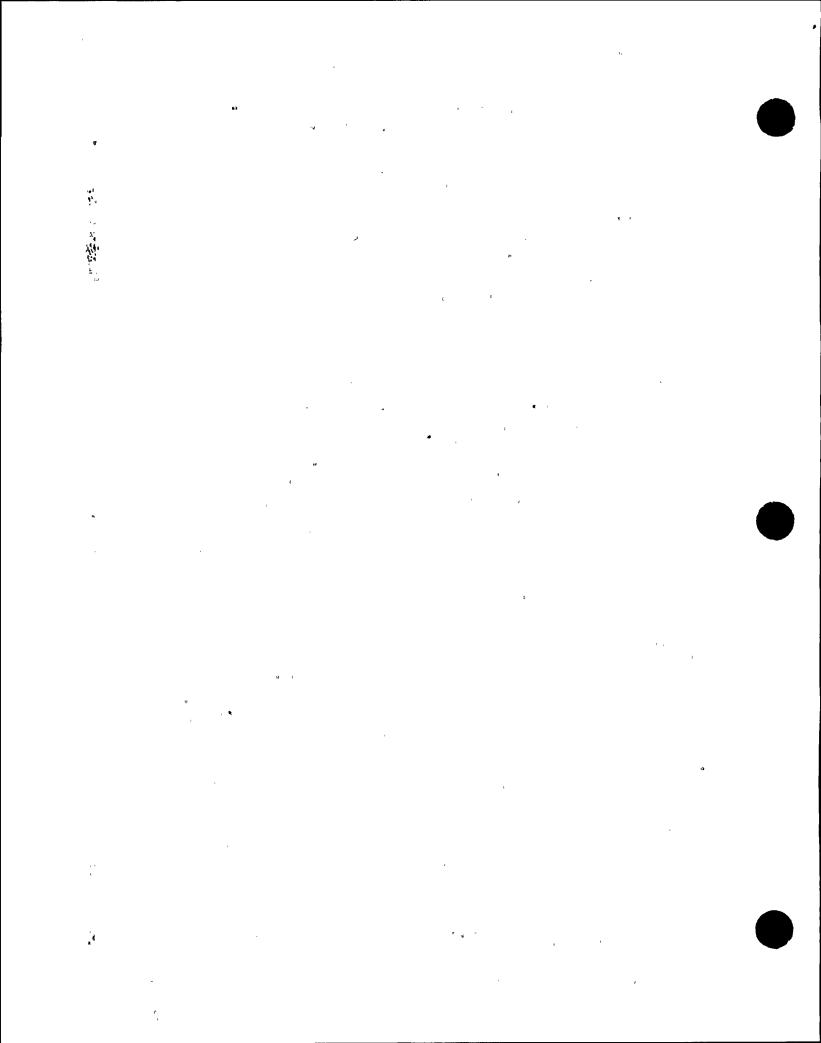
Problem: In order for the inspector to complete sections of Inspection Plan DC-254 Revision 1, the following items need resolution:

- 1. All required drawings and procedures have been approved by PG&E.
- 2. The generator will be a dimensional duplicate of Electric Products generators S/N 16908022/26, but that longer (4-1/2") bus insulators are acceptable (similar to those furnished on order 4R71595).
- 3. NEI Peebles has submitted test procedures and test results for dedicated testing as required by Attachment F to the EMM, and that the procedures and test results are acceptable to PG&E.

Resolution:

1. Any drawings/procedures that require PG&E approval have been submitted directly to Engineering. Inspection Plan DC-254 Revision 2 has deleted this requirement.





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- 2. NECS Engineering is aware of the longer bus insulators, and they are acceptable. This change in the generator dimensions has been incorporated into Inspection Plan DC-254 Revision 2.
- 3. Inspection Plan DC-254 Revision 2 has deleted all requirements for Source Inspection to verify the adequacy of the Dedication Evaluation for the critical parts in Attachment F to the EMM. NECS Engineering's review and approval of these evaluations is addressed in Section IV of this document.



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VII. ACTION REQUEST CLOSURE

This evaluation is the basis for closure or partial closure of the following PIMS Action Request Evaluations:

| AR | A0201157 | AE | 01 | Findings Audit 90197S, evaluate Parts, determine other affected purchase orders | | |
|----|----------|----|----|---|--|--|
| | | AE | 06 | Release of Hold on spare generator | | |
| | | AE | 10 | Issue Peebles NEMP 12.4 Evaluation Revision 1 | | |
| AR | A0208696 | AE | 01 | Stud/Rod Welding on spare generator | | |
| AR | A0211541 | AE | 01 | Findings for Audit 9003, determine actions to maintain qualification | | |



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VIII. REFERENCES

- 1. NEMP 12.4, "Evaluation of Supplier Quality Programs"
- 2. EMM DC2-3322-BRH-E, Purchase Order ZS-1539-AB-9
- 3. NEI Peebles Electric Products Quality Assurance Manual
- 4. Audit Report 90197S (CHRON 157900), PG&E Audit of PEP
- 5. Audit Report 9003 (CHRON 160680), PEP Audit of PEM
- 6. NPAP D-564, "Preventive Maintenance on Inventoried Materials (Spare Parts)"
- 7. NPAP D-565, "Motor/Generator Receipt Inspection, Testing and Storage Program"
- 8. NEMP 3.12. "Spare and Replacement Parts Evaluation (RPE)"
- 9. Action Request A0213896, Tracking for issue of DCN to reweld stator frame cover and modify Jacking Screw Holes on spare generator.
- 10. Action Request A0201157 Evaluation # 5 Places warehouse hold on spare generator, Stock Code 93-7558.
- 11. Machinery's Handbook, 23rd Edition, page 2421
- 12. ASTM A370, Approximate Hardness Values
- 13. Restricted Equipment List, NPAP D-11 Revision 12
- 14. Audit 90197S Follow-Up Report, 5/13/91 (CHRON 170329)
- 15. PG&E Letter to NEI Peebles, "Closeout of AFR's", Requested Addition Equivalency Reviews (CHRON 170457)
- 16. Audit 90197S Follow-Up Report, 9/5/91 (CHRON 176519)
- 17. QA Specifications SP-D-Peebles, Revisions 3, 4, 5
- 18. PG&E Letter to NEI Peebles, "Corrective Actions for Initial Audit", (CHRON 159914)
- 19. NECS Letter to QA, "Criticality of Stator Housing", (CHRON 161307)
- 20. EQS Source Inspection Plan for 1986 Purchase of Spare Generator, Plan DC-189, Reel 3436, Frame 2203
- 21. Preventive Maintenance Work Orders R0064768, R0073657.

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IX. ATTACHMENTS

- A. NPRDS Report for PEP/PEM (31 Pages)
- B. 10 CFR 21 Reports, NRC Information Notices, Bulletins, Letters, INPO Significant Event Reports (SER), Significant Operating Experience Reports (SOER) for PEP/PEM, LER 90-012-01 (116 Pages)
- C. NRC Licensee Contractor and Vendor Inspection Status Reports for PEP/PEM (22 Pages)
- D. Search of Government Industry Data Exchange Program (1 Page)
- E. Generator Critical Parts (6 Pages)
- F. PEP/PEM Responses to Audits 90197S, 9003 (26 Pages)
- G. Design Change and Discrepancy Report Summary (42 Pages)
 - Copies of Design Change Requests
 - Input from GE Locomotives regarding undersize generator shaft
 - Memo from NECS Electrical documenting input into the acceptability of material changes
- H. PEP Dedication Packages, Original and Final (90 Pages)
- I. Rotor shaft subsupplier review documentation (30 Pages)
 - PEM Certificate of Hardness Testing
 - La Forgia Di Bollate Certificates
 - German Standards WO and TRD-100
- J. Rotor machining and Bearing Bracket subsupplier review -Weir Pump (14 Pages)
- K. Magnet Wire subsupplier review Insulation Systems & Machines Ltd (4 Pages)
- L. PG&E Testing of Adhesive (60 Pages)
- M. Certification of Fag U.K., Bearing Supplier (4 Pages)
- N. Calibration Certificates for magnetic crack detector, interturn unit, and multimeter (11 Pages)
- O. Trip Report from Don Bauer, DCPP Electrical Maintenance (subjects include witness of hardness test, review of crimping procedure) (9 Pages)



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- P. Procedure Equivalency Summary (33 Pages)
 - Report Dated 1-18-91
 - Report Dated 2-7-91
 - PEP to PEM Purchase Order 16271
 - PEP Rotor Pole Welding Procedure PS 3022
- Q. PEP letter regarding audits of outside calibration services (1 Page)
- R. Stud/Rod Material Subsupplier Review and Stud/Rod Welding Evaluation for new and spare generator (31 Pages)
 - Memos from NECS Piping documenting resolution of welding issue for the new and spare generator
 - PEP Stud/Rod Welding Procedure
- S. Letter from PG&E to PEP dated 10-29-90 CHRON 160229, Technical questions to be resolved and PEP Responses (22 Pages)
 - Memo from NECS Electrical documenting input into resolution of technical issues
- T. EQS Source Inspection Plan DC-254 Revisions 1 and 2 and Source Inspection Reports (63 Pages)
- U. Final Design Change/Equivalency Review (Submitted by NEI Peebles Cleveland after PG&E Audit Follow-Up) (25 Pages)



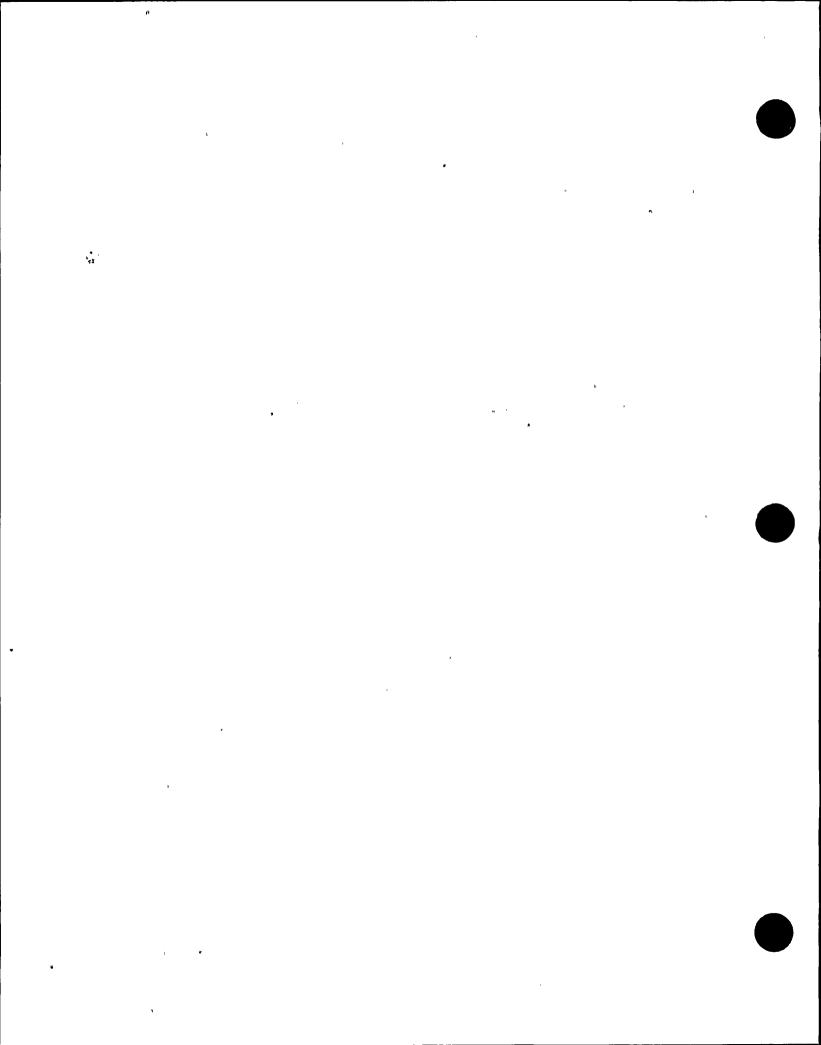
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X. APPROVAL SIGNATURES

| | | | • |
|-----------------|-------------------------------|-------|-----------------|
| Prepared by: | Ed Walters | Date: | 10-29-91 |
| Concurrence by: | Usama Farrad) | Date: | 10-29-91 |
| Concurrence by: | Anil Kar | Date: | 10-29-91 |
| Concurrence by: | Moy Basu | Date: | 10-29-9 |
| 4 | | | |
| Approved by: | GATidrick Jacka Con | Date: | 10/29/51 |
| Approved by: | Sam Westerman TFF | Date: | <u>10/31/91</u> |
| Approved by: | Lave Tateonari Dave Tateosian | Date: | 10/31/91 |
| Approved by: | Rich Clark | Date: | 10/31/91 |
| | 0 | | |

Approved by:

____ Date: 10/31/91









Nuclear Plant Reliability Data System General Report

For: Bill Hayes

Pacific Gas and Electric Company

Report-Id: NPRGQQAA

Job Number: 5018

Run Date: 12/10/90

Run Time: 12:40

Introduction:

The attached report was generated by your query of the NPRDS data base. A summary of your query is listed below.

QUERY:

You selected the following search condition(s):

Selected Manufacturer is Parsons Peebles Elect Prod Inc

There were 12 records meeting the search condition(s).

DISPLAY AND SORT:

You selected to run general report 4

Component Failure Brief Report

You chose to sort the report by:

Sort

Sequence

Field Name

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System: EEB -- Emergency Power-W

Ut1 Sys: 2403

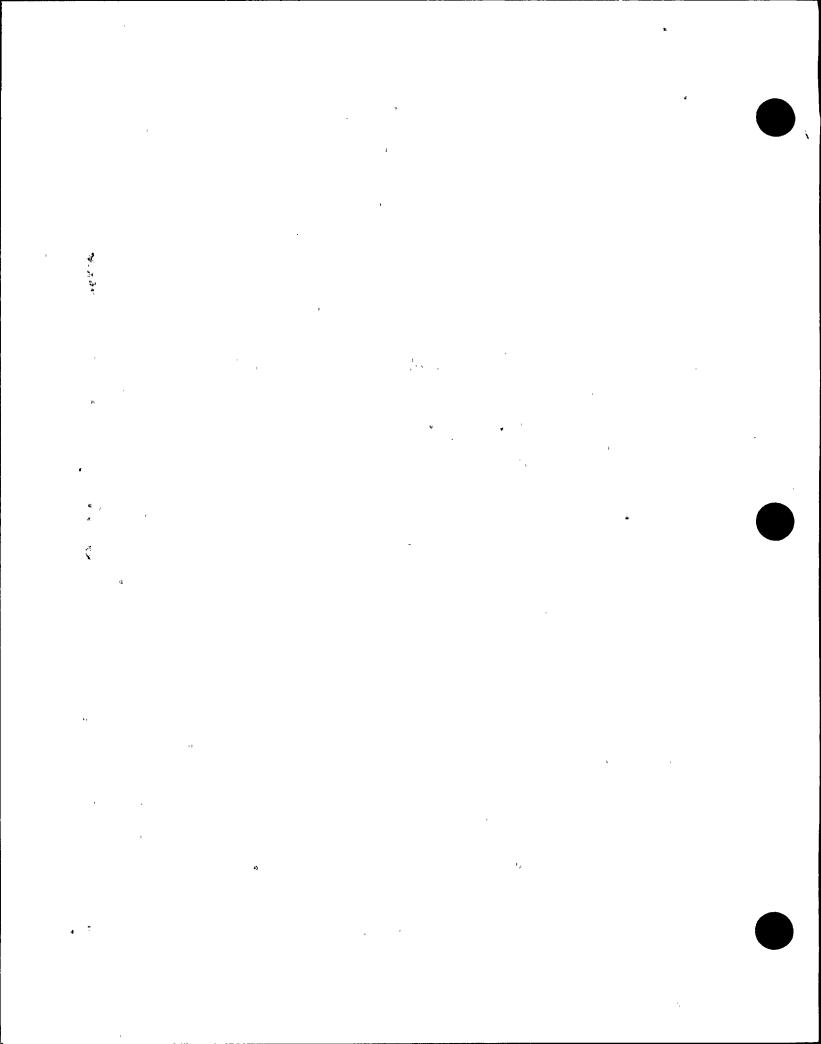




MPRG04AA . Nuclear Plant Reliability Data System - Failure Brief Report Run Date: 12/10/90 Job Number: 5018 _Unit__ _Comp_ __Utility Component Id __Dates___ Narratives GSURBSI GENERA 1EGS#EG1B Desc: WHILE PERFORMING MAINTENANCE DURING REFUELING DUTAGE , A VISUAL DD: 10/27/87 FS: 10/27/07 EXAM REVEALED THAT THE ROTOR MINDINGS ON NO . 14 POLE HAD SEPARATED Appl: EPGE 1D: 09/25/90 FROM SHAFT POLE WASHER AND BOWED OUT TOWARDS STATOR ON DELAVAL Desc: Emergency Generator EMERGENCY DIESEL GENERATOR . INDIVIDUAL MIRES IN MINDING HAD DELAMINATED AND OVERLAPPED . THE POLYESTER RESIN COATING HAD PULLED Hfr: P076 - Parsons Peebles Elect Prod Inc WAY WITH WINDING AND EXPOSED AN UNPAINTED BURFACE . Mod Nums L-11071 Cause: ENGINEERING DEPT . IN CONJUNCTION WITH SOUTHWEST RESEARCH Mod Ids INSTITUTE CONSIDERED THE PROBABLE CAUGE TO BE A COMBINATION OF THE FOLLOWING : 1) INADEQUATE ATTENTION TO SHELF LIFE AND STORAGE Systems EEA -Emergency Power-DE CONDITIONS , 2) RESIN APPLICATION ERRORS AND 3) CONTAMINATION DURING Ut1 Sys1 EH9/309 APPLICATION . ACTION: THE DAMAGED POLE WAS REMOVED , REPAIRED AND REINSTALLED . OTHER POLES WERE INSPECTED AND FOUND ACCEPTABLE . IN ADDITION , A PERIODIC GULF STATES UTILITIES RIVER BEND I VISUAL INSPECTION PROGRAM AND AN ELECTRICAL TEST PROGRAM HAVE BEEN SET UP TO MONITUR PERFORMANCE IN THE FUTURE . GPCAHVI GENERA 1240384002801 DD: 07/19/89 Desc: WHILE PERFORMING MONTHLY SURVEILLANCE OF THE EMERGENCY DIESEL GENERATOR . FLANT OFERATORS NOTICED WIDE CURRENT SHINGS ON ALL THREE F5: 07/19/07 Apple EFGE PHASES . THIS FAILURE HAD NO BIONIFICANT EFFECT TO PLANT STATUS . (ID: 06/12/90 Desc: Emergency Generator MWOW 18903108) Cause: THE CAUSE OF THE FAILURE WAS DUE TO A DEPECTIVE RENOTE SATE Hfr: P076 - Parsons Peebles Elect Prod Inc FIRING HODULE . THIS HODULE IS A PIECE PART OF THE EXCITER CIRCUIT . Mod Num: L-11117 THE CAUSE OF THE REMOTE FIRING MODULE FAILURE IS UNKNOWN . Mod Id: Action: REPLACED THE DEFECTIVE REMOTE FIRING MODULE WITH LIKE KIND FROM WARFHOUSE STOCK , PERFORMED SURVEILLANCE SATISFACTORILY , AND RETURNED System: EEB -Emergency Power-W IT TO SERVICE . Utl Sys: 2403 GPCAWV2 GENERA 2240364001601 DD: 02/01/90 Desc: THE EMERGENCY DIESEL GENERATOR MOULD NOT PICK-UP LOAD DUE TO LOW FS: 02/01/90 EXCITATION DURING THE PERFROMANCE OF THE MONTHLY SURVEILLANCE . THIS Appl: EPGE · ID: 06/12/90 FAILURE, WAS FOUND BY PLANT OPERATORS AND HAD NO SIGNIFICANT EFFECT TO Desc: Emergency Generator FLANT STATUS . (MNOW 29000281) Cause: THE CAUSE OF THE FAILURE WAS DUE TO A DEFECTIVE REMOTE FIRING Hfr: P076 - Parsons Peebles Elect Prod Inc MODULE WHICH IS A PIECE PART OF THE EXCITER CIRCUIT . THE CAUSE OF THE Mod Num: L-11117 RUMOTE FIRING MODULE FAILURE IS UNKNOWN . Mod Id: Action: REFLACED THE DEFECTIVE REMOTE FIRING MODULE WITH LIKE KIND FROM MAREHOUSE STOCK , PERFORMED SURVEILLANCE , AND RETURNED IT TO SERVICE

PEEBLES NEMP 12.4 REV 1 ATT. A

ATT. A ..lg 2 of 31







| NPRB04AA | Nuclear | Plant Reliabili | ty Data System - Failure Brief Report Run Date: 12/10/ Job Number: 5018 |
|-----------------------------|---|---|--|
| _Unit | _CompUtility Component Id | Dates | Narratives |
| DPCCNS1 | GENERA EPCGEA | DD: 04/11/86 FS: 04/09/86 1D: 09/22/88 | Desc: A LOSS OF GENERATOR FIELD MAS EXPIRENCED DURING SCHEDULED OPERABILITY TESTING OF DIESEL ENGINE 1A . LOSS OF SYSTEM REDUNDANCY . |
| Appl 1 Desc 1 | Energency Generator | | NO EFFECT ON PLANT . CAUSE: THREE SILICON CONTROLLED RECTIFIERS AND ONE DIODE HAD FAILED IN GENERATOR CONTROL PANEL . ACTUAL CAUSE OF FAILURES WAS NOT DETERMIN |
| Mfri Mod Numi Mod Idi | P076 - Parsons Peebles Elect Prod NONE | Inc | Action: REPLACED RECTIFIERS AND DIODE . PERFORMED FUNCTIONAL TEST AND RETURNED DIESEL GENERATOR TO BERVICE . SR 5 / 11 / 86 (EGL) |
| System: Utl Sys: | EEB -Emergency Power-W EPC - | | |
| GPCAWV1 Appl: | | ABOUT 900 TO 1200 AMPS . THIS FAILURE WAS FOUND DURING THE OF A SURVEILLANCE TEST AND HAD NO BIGNIFICANT EFFECT TO PLA Cause: INVESTIGATION REVEALED THAT THE CAUSE OF THE FAILURE & DEFECTIVE VOLTAGE REGULATOR . THE CAUSE OF THE VOLTAGE REGULATOR . THE CAUSE OF THE VOLTAGE REGULATOR PRODUCTS PAF 72-13000-100) Action: REFLACED DEFECTIVE VOLTAGE REGULATOR MITH LIKE KIND ACTION. | APPROXIMATELY 2000 TO 6000 KVARS AT FULL LOAD AND THE AMPS SWING FREABOUT 900 TO 1200 AMPS. THIS FAILURE WAS FOUND DURING THE PERFORMAND ON A SURVI'LLANCE TEST AND HAD NO BIUNIFICANT EFFECT TO PLANT STATU |
| | P076 - Parsons Peebles Elect Prod 12-12500-100 | | DEFECTIVE VOLTAGE REGULATOR . THE CAUSE OF THE VOLTAGE REGULATOR FAILURE IS UNYNOWN . (PARSON PEEBLES ELECTRIC PRODUCTS PART # 72-13000-100) |
| Systems Utl Syss | EEB -Emergency Power-W 2403 | | Action: REFLACED DEFECTIVE VOLTAGE REGULATOR MITH LIKE KIND FROM WAREHOUSE STOCK , RAN DIESEL AND VERIFIED CORRECT KVAR AND AME |
| | . | | THE DESIGNATION OF THE PROPERTY OF THE PROPERT |
| NH# NH# 2 Appl: Desc: | | DD: 09/30/90 FS: 09/30/90 ID: 11/14/90 | Desci With the Unit Shut down for a refueling outage, the Division I Standby Emergency Diesel Generator Output Voltage and Field Current far exceeded expected operating values when the Diesel was Stated after hajor maintenance had been performed. This degraded the Operability of the Diesel, however the Plant was not significantly |
| | P076 - Parsons Peebles Elect Prod 72 12300 100 | Inc | AFFECTED. Cause: ELECTRICAL MAINTENANCE PERSONNEL FOUND DIRTY CONNECTIONS ON THE LUAD SIDE OF THE POTENTIAL TRANSFORMERS (ASSOCIATED DEVICE) AND BEHAVE CAUSED RAD SENSING OF VOLTAGE READINGS. THE AUTO VOLTAGE |
| Systemi Utl Gysi | EEA -Emergency Power-GE EGS - | | REGULATOR WAS FOUND DEFECTIVE DURING THE PROCESS OF TROUBLESHOOTING THIS WAS NOT THE CAUSE OF THE FAILURE. ACTION: ELECTRICAL MAINTENANCE PERSONNEL REPLACED THE VOLTAGE REGULATION THE ALECTRICAL MAINTENANCE PERSONNEL REPLACED THE VOLTAGE REGULATION THIS OF THE POTENTIAL TRANSFORMER WERL CLEANED. THE DIESEL WAS SUCCESSFULLY TESTED AND WALL THRANCO TO SERVICE (WR #179303). |

PEBLES NEMP 12.4 REV. 1 ATT. A

Rg 3 of 31

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| NPRG04AA | Nuclear Plant Reliability Data System - Failure Brief Report Run Dat | | | |
|---------------------|--|--|--|--|
| _Unit | _CompUtility Component Id | Dates | Narratives | |
| Apple Desci | | DD: 03/12/89 FB: 03/09/89 ID: 11/15/90 | Desc: WITH THE UNIT IN COLD SHUTDOWN . OPERATIONS PERSONNEL MERE FERFORHING A SURVEILLANCE TEST ON THE DIVISION 1 DIESEL GENERATOR WHEN THEY ENCHANTERED AN OVERVOLTAGE CONDITION AT THE DUTPUT TERMINALS . CAUSE: THE CAUSE OF THE FAILURE WAS DETERMINED TO BE ERRATIC BEHAVIOR OF THE VOLTAGE REGULATOR . | |
| | P076 - Parsons Peebles Elect Prod 72 12300 100 | Inc | ACTION: THE AUTOMATIC VOLTAGE REGULATOR MAS REPLACED AND DIESEL GENERATOR OUTFUT VOLTAGE WAS VERIFIED TO BE APPROPRIATE . (WR 149326) | |
| Systems Utl Syss | | | | |
| APSPAV1 | ICNTRL 1JDGAB0290VRB | DD: 11/23/97 FS: 11/19/97 | Desci DURING LOAD TESTING OF EMERGENCY GENERATOR, GENERATOR MENT TO FULL LOAD OUT OF CONTROL. | |
| Appl: Desc: | | ID: 06/15/90 | Cause: CAUSE OF FAILURE DETERMINED TO BE A DEFECTIVE DIESEL GENERATOR ' A' VOLTAGE REGULATOR BRIDGE SELECTOR SWITCH (NONREPORTABLE COMPONENT ; SWITCH "S1" ON VENDOR PRINT MO18-157) . BUSPECT NORMAL / CYCLIC | |
| | P076 - Persons Peebles Elect Prod 7212201100 | Inc | WEAR . Action: SELECTOR SWITCH WAS REPLACED AND TEST RUN OF BENERATOR WAS PERFORMED . (00261667) | |
| System: Utl Sys: | | | • | |
| APSPAV1 | ICNTRL 1JDGBB0290VR | DD: 12/03/89 FS: 11/18/89 | Desc: DURING SURVIELLANCE TESTING , DIESEL GENERATOR "B" VOLTAGE | |
| Appl: Desc: | | | REGULATOR WOULD DNLY CREATE 4300VAC MAXIMUM (DEBIGN 19 TO INCREASE TO 4600VAC). THE UNIT WAS IN A REFUELING OUTGOE. Cause: THE VOLTAGE REGULATOR PRE-POSITION BOARD RELAY AND INTEGRATED CIRCUIT (IC) CHIP WERE FOUND TO BE DEFECTIVE. SUSPECT CAUSE OF BOTH | |
| | P076 - Parsons Peebles Elect Prod 7212201100 | Inc | FAILURES WAS NOWHAL COMPONENT MEAR / AGING . CAUSE UNFNOWN . ACTION: THE DEFECTIVE " POTTER-BRUMFIELD " RELAY AND IC CHIP MERE REMOVED AND REPLACED . SURVIELLANCE TESTS MERE SUCCESSFULLY UTILIZED AS RETESTING . (00395358PCM) | |
| Systems Utl Syss | | | , and the state of | |
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PEEBLES NEMP 12.4 REV. 1 ATT. A Pg 4 of 31

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Mod 1d: System: INID

Utl Sys: AD

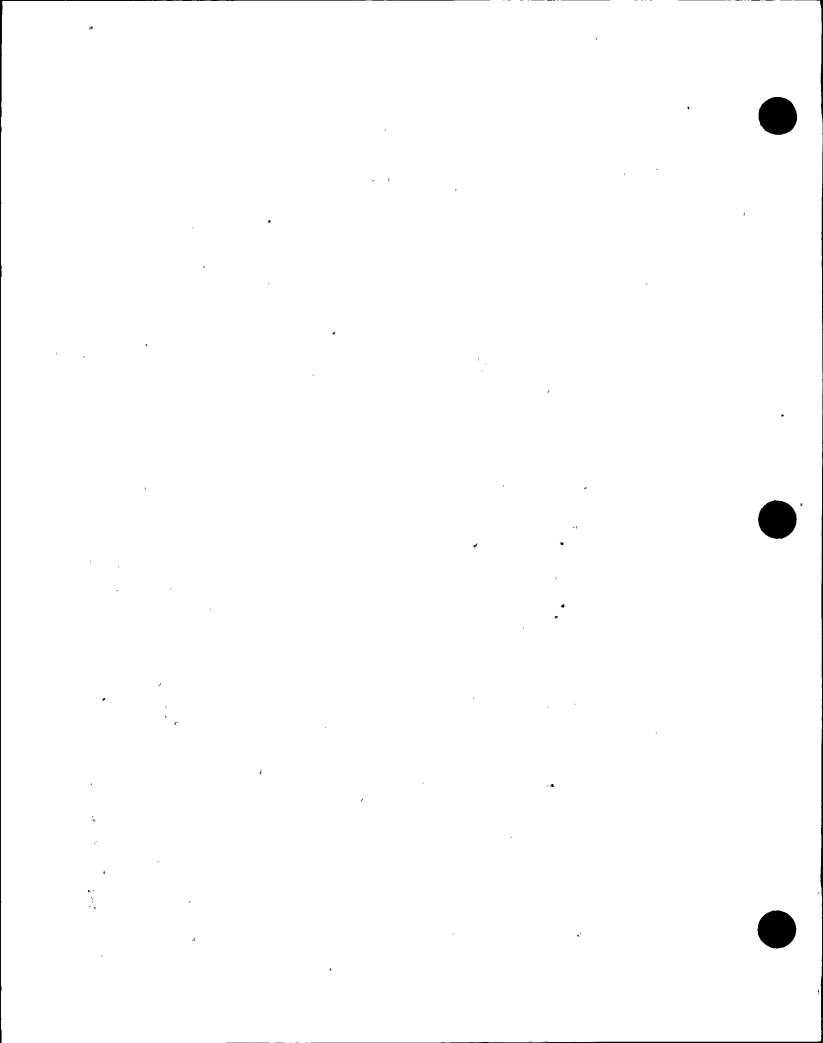
-Condensate-GE





NFRG04AA Nuclear Plant Reliability Data System - Failure Brief Report Run Date: 12/10/90 Job Number: 5018 Utility Component Id Dates Narratives Desc: EMERGENCY DIESEL GENERATOR HAD A FLUCTUATING LEADING POWER FACTOR * APSPAVI ICNTRL IJDGBB0290VR DD: 12/13/07 . THIS OCCURED DURING TEST FOLLOWING THE PARRALLELING OF THE GENERATOR FS: 11/27/07 1D: 06/15/90 Apple TO THE 4 . 16F VOLT GRID . Desci Cause: CAUSE OF ERROTIC CONDITION WAS A DIRTY POTENTIONETER ON INSTANTANEOUS PREFOSITION BOARD OF THE VOLTAGE REGULATOR . SUSPECT NORMAL WEAR / AGING (SEE VENDOR PRINT MO18-80) . Mfr: P076 - Parsons Peebles Elect Prod Inc Hod Num: 7212201100 ACLINIE FOTENTIOMETER WAS WIFED (CLEANED) ; FLUCTUATIONS STOPPED . (Mod Id: 00264801) System: EED -Emergency Power-CE Utl Sys: DG Desc: WHILE IN SERVICE THE SECONDARY CONDENSATE PUMP TRIPPED OFF LINE . FEGHCS1 HOTOR 18-P-137 DD: 02/15/87 FB: 02/15/87 Cause: THROUGH AN INVESTIGATION IT WAS FOUND THAT THE PUMP'S MOTOR HAD Appl: CN90PUMO ID: 11/02/90 AN OPEN CIRCUIT IN THE STATOR FIELD . Desc: Cond Booster Pump Motor ACTION: HUTOR WAS REPLACED WHICH NECESSITATED REDUCED POWER OPERATION . Mfr: P076 - Parsons Peebles Elect Prod Inc Mod Num: C5009J Mod Id: System: IND -Condensate-GE Utl Sys: AD PEGHCS1 MOTOR 1C-P-137 DD: 07/15/88 Desc: Wo-880714115 - DURING NORMAL PLANT OPERATIONS AN OPERATOR OBSERVED F6: 07/15/89 OIL LEAFING FROM OIL LINE CONNECTIONS TO THE SECONDARY CONDENSATE PUMP Appl: CNROPUMO ID: 11/02/90 (1C-P-137) MOTOR OIL COOLER . Causes GASELTS HAD INSEN REUSED , BECAME MORN AND DETERIORATED . Desc: Cond Pooster Pump Motor ACTIONS CONNECTIONS WERE TIGHTENED AND LATER GASKETS WERE REPLACED . THE Hfr: F076 - Pagsons Peebles Elect Frod Inc LINES TESTED SATISFACTORIALLY AND THE MOTOR RETURNED TO SERVICE . Holf Num: C5009J

PEEBLES NEMP 12.4 REV. 1 ATT. 19
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NO VENDOR CODE FOR ELECTRIC PRODUCTS ONLY

```
1.02/2212
               NPRDS - Mfr Search Condition Table
                                                             Row 0001 of 1609
Command===>
                    ** ELECTRIC PRODUCTS NOT FOUND. PRESS <F1> FOR HELP. **
Select Mfr(s) by typing S next to the Mfr(s) to be included, OR
Exclude Mfr(s) by typing X next to the Mfr(s) to be excluded.
Press <F2> to end selection. (F1=Table Usage Help,F3=Prev Menu,F4=Primary Menu,
F6=Query Summary, F7=Up, F8=Down, F12=Report, ?=Field Help)
  To find a specific Mfr, enter all or part of name:
  and press <ENTER> . Press <F5> to repeat find. . Type S or X by selection(s).
    Code
           Manufacturer Name
    A536
           Abbeone Cal Inc
    A516
           Abbott Heat Exchanger Corp
    A048
           Abbott Power Corp
    A021
           Abbott Transformer Div / Abbott Transis Labs
    A567
           Abernathy : Thomas and Gauggel
    A030
           Accurate Air Engineering Inc
    A028
           Ace Controls Inc
    A701
           Acme Elec Corp
   A597
           Acme Structural Inc
    A058
           Acopian
   10042
           Acro-Mag Inc
    AQ51
           Action Instrument Co Inc/ Action-Fak TM
    A569
           Acurex Corp
             PEEBLES NEMP 12.4 REV. 1 ATT. A.
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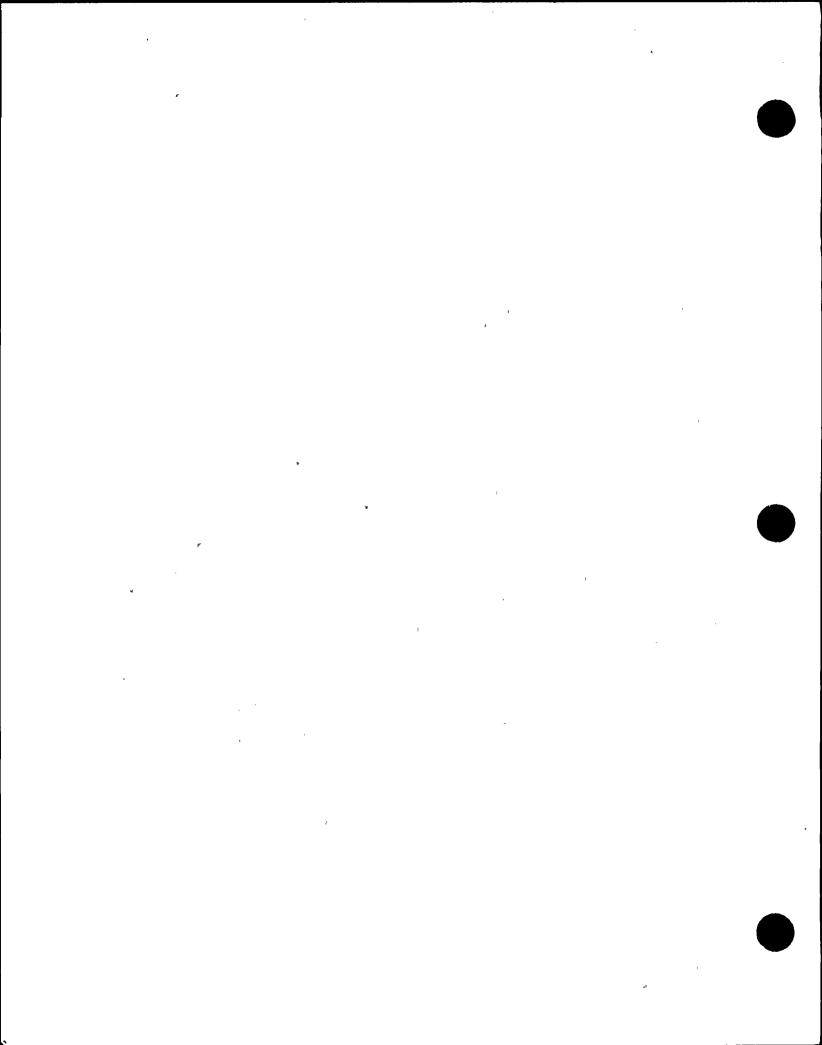
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NO VENDOR CODE FOR NEI PEEBLES

Row 1016 of 1609 NFRDS - Mfr Search Condition Table 1.02/2212 Command===> ** NAMCO FOUND ** Select Mfr(s) by typing S next to the Mfr(s) to be included, OR Exclude Mfr(s) by typing X next to the Mfr(s) to be excluded. Press <F2> to end selection. (F1=Table Usage Help,F3=Prev Menu,F4=Primary Menu, F6=Query Summary, F7=Up, F8=Down, F12=Report, ?=Field Help) To find a specific Mfr, enter all or part of name: _ and press <ENTER> . Press <F5> to repeat find. Type S or X by selection(s). Manufacturer Name Code N005 Nalco Chem Corp N007 Namco Controls Nash Engg Co The N010 National Acme Div / Acme Cleveland N015 N020 National Annealing Box Co NO24 National Brd N040 National Forge Co National Sonics Corp / Sensall TM N051 N055 National Tank & Manufacturing Co National Valve & Mfg Co N060 N023 Natkin & Co Neci-Nuclear Engg & Components Inc Neles-Jamesbury/formerly Jamesbury N070 J010 PEEBLES NEMP 12.4 REV. 1 ATT. A

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179824









Muclear Plant Reliability Data System General Report

For: Brian Steen-Larsen

Pacific Gas and Electric Company

Report-Id: MPRG00AA

Job Number: 8275

Run Date: 01/17/91

Run Time: 13:20

Introduction:

The attached report was generated by your query of the NPRDS data base. A summary of your query is listed below.

QUERY:

You selected the following search condition(s):

Selected Manufacturer is Portec Inc

There were 62 records meeting the search condition(s).

DISPLAY AND SORT:

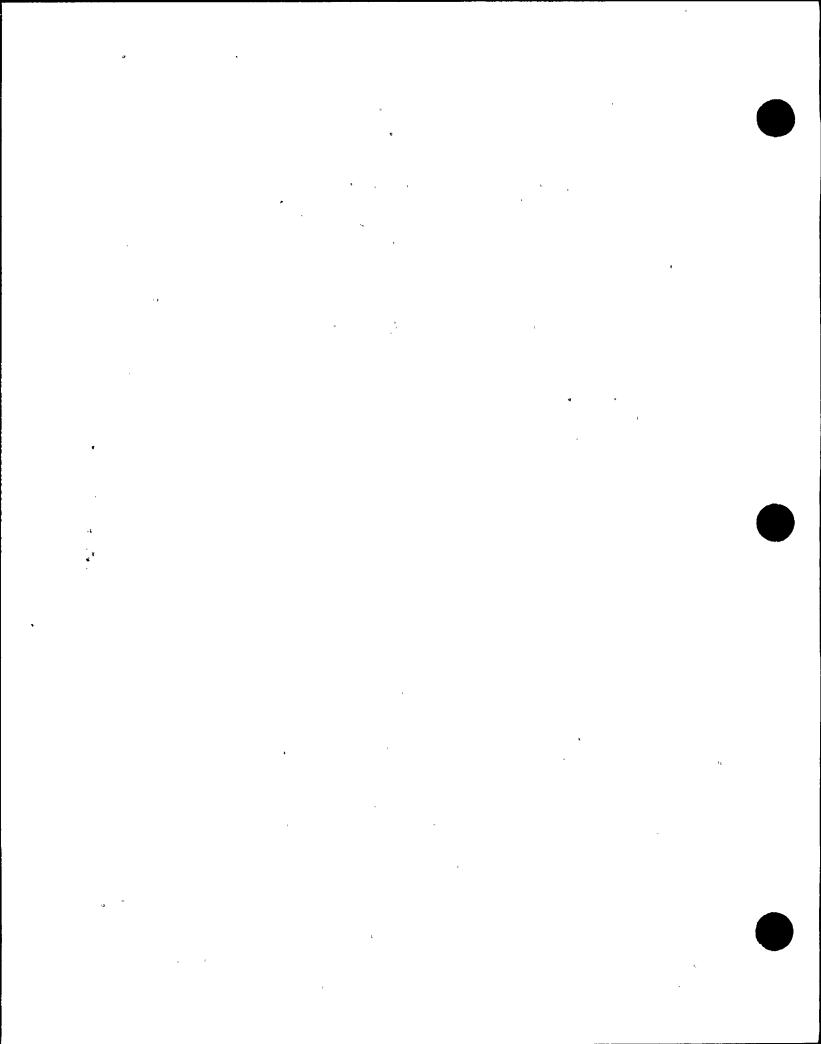
You selected to run general report 4

Component Failure Brief Report

You chose to sort the report by:

| 1 | Manufacturer Model Number |
|---|---------------------------|
| 2 | Manufacturer Hodel ID |

PEEBLES NEMP 12.4 REV. 1
ATT. A
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NPRG04AA

Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Kumber: 8275

| _Unit | _CompUtility Component Id | _Dates | Marratives |
|----------|---------------------------|---------------|---|
| PPLSES1 | GENERA OG-501C | DO: 05/04/90 | Desc: WITH THE UNIT AT 100 PERCENT POWER , A MAINTENANCE MECHANIC |
| | | FS: 04/10/90 | NOTICED OIL LEAKING FROM THE AIR VENT PART OF THE GENERATOR BEARING |
| App1: | | ID: 09/10/90. | HIGH TEMPERATURE TRIP SENSOR. THE HIGH TEMPERATURE TRIP SENSOR IS A |
| | Emergency Generator | | PIECE PART OF THE GENERATOR. THIS DEGRADED THE TRAIN. THE DIESEL WOULD HAVE STARTED AND RUN UNDER AN EMERGENCY START BUT NOT UNDER TEST |
| | P292 - Portec Inc | | CONDITIONS . PLANT OPERATION WAS UNAFFECTED . |
| Mod Num: | ₽170 | | Cause: INVESTIGATION REVEALED THAT THE TRIP SENSOR HAD NOT BEEN PROPERLY |
| Mod Id: | | | REINSTALLED IN ITS MOUNTING HOLE AFTER AN 18 MONTH DIESEL OVERHAUL . MAINTENANCE HAD ANTICIPATED INSTALLING A REPLACEMENT BUT HAD NOT DONE |
| System: | EEA -Emergency Power-GE | | SO . |
| Utl Sys: | | | Action: THE TRIP SENSOR WAS PROPERLY MOUNTED. THE FITTINGS WERE RECONNECTED AND THE LOCK NUT TIGHTENED. THE TRIP SENSOR WAS RECALIBRATED AND PUT BACK INTO SERVICE. |
| n | ALCOLO MANAGEMENTA | T- | KECHTIONALED WAD ALL BUCK THIN 25KAICE . |
| ישא | NSYLVANIA POWER & LIGH | ין Susqui | EHANNA I |
| | | | < |
| PPLSES1 | GENERA OG-501D | DO: 01/25/89 | Desc: WITH THE UNIT AT 100% POWER MAINTENANCE WAS PERFORMING THE |
| | | FS: 04/25/88 | EHERGENCY DIESEL GENERATOR (D / G) WINDING INSULATION RESISTANCE |
| Appl: | EPGE | ID: 06/29/89 | CHECK (MEGGER) AS PART OF TECHNICAL SPECIFICATION 18 HONTH D / G "D" |
| Desc: | Emergency Generator | | INSPECTION (SURVEILLANCE NUMBER SM-024-D01) . THE MEGGER TEST DONE |
| | | | AS PART OF THIS HAS ACCEPTANCE CRITERIA AROUND 10000 MEGOHNS AT 500YDC |
| Mfr: | P292 - Portec Inc | | . THE GENERATOR FAILED THIS TEST BY GIVING ONLY 10000 |
| Mod Num: | #170 | | Cause: OHHS AT 500VDC. THE CAUSE OF THIS IS THE INSULATION BREAKDOWN |
| Hod Id: | | | DUE TO MEARING OUT. THE INSULATION BREAKDOWN THEN CAUSES A SHORTED |
| | | | CONDITION BETWEEN WINDINGS . THE ROOT CAUSE OF THIS EVENT COULD NOT BE |
| System: | EEA -Emergency Power-GE | | FOUND BECAUSE THE MEGGER TEST FINALLY INCREASSED WITHOUT MAINTENANCE |
| Utl Sys: | • • | • | FINDING THE SHORTED WIRE . THE GROUND COIL WAS ISOLATED AND ALL THE |
| • | | | SOLDERED CONNECTIONS OF THE WINDINGS WERE CLEANED WITH A |
| | | | Action: MAGNET . THE COILS WERE BLOWN OUT WITH AIR AND 10 TO 13 AMP OF |
| | | 4 | CURRENT WAS RUN THROUGH THE COIL GROUPS TO WARM THEM UP FOR 22 HOURS : |
| | | | THIS HELPS TO SOFTEN THE INSULATION SO THAT THIN SPOTS WILL THICKEN. |
| | | - | MAINTENANCE OBSERVED POOR RESISTANCE TESTS THROUGHOUT THE REPAIR |
| | | | EFFORTS (A TEMPORARY FIX) SO THE WINDING IS SCHEDULED TO BE REPLACED |
| i | | | CLICALD (W ICHLOWKI LIV) ON THE MINNING TO OCHEROFFE IN BE KELFUER |

PEEBLES NEMP 12.4 REV. 1 ATT. A Pg 7 of 31

IF THE FINAL MEGGER TRENDS DOWN DURING THE NEXT TEST .

• **%** .** 3.41 ,





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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Humber: 8275

| _Unit | _CompUtility Component Id | _Dates | Marratives |
|---------------------|---------------------------|------------------------------|---|
| PPLSES1 | GENERA OG-501D | DO: 05/21/86 FS: 08/19/85 | Desc: WITH THE PLANT NEAR 100% POWER, MAINTENANCE PERSONNEL WERE PERFORMING THE DIESEL GENERATOR (D / G) 18 MONTH INSPECTION (|
| App1: | EPGE | ID: 09/18/86 | SM-024-001) . THE SURVEILLANCE FAILED THE MEGGER TEST'S ACCEPTANCE |
| Desc: | Emergency Generator | - | CRITERIA ON THE EXCITER PORTION OF THE GENERATOR. AFTER SERVICING THE D / G FOR THIS PROBLEM IT WAS RUN. UPON DOING SO THE GENERATOR HAD AN |
| Mfr: | P292 - Portec Inc | | ARC-OVER WHICH STARTED A FIRE IN THE MAIN PLANT PROCESS COMPUTER. |
| Mod Num: | ≢ 170 | | Cause: THE ROOT CAUSE OF THE HEGGER FAILURE AND POSSIBLY THE FIRE WERE |
| Hod Id: | | | DUE FROM GROUNDING OF THE GENERATOR . THIS GROUNDING WAS PROBABLY CAUSED BY DIRT AND MOISTURE ACCUMULATION IN THE GENERATOR . THIS IN |
| System: Utl Sys: | 024 | • | TURN MAS PROBABLY DUE FROM THE MAINTENANCE AND CONSTRUCTION ACTIVITY FOR THE NEW (5TH) D / G ADDITION . THE ARC-OVER WAS CAUSED BY HUMAN ERROR BECAUSE THE SLIP RING WIRING LUGS WERE NOT TIGHTENED Action: SUCH THAT THEY WERE PULLED OFF OF THE SLIP RINGS THUS CAUSING THE ARC-OVER . BECAUSE OF THE ARC-OVER , CURRENT WAS ALLOWED TO REACH THE INPUT CARDS OF PLANT COMPUTER THAT MONITORS THE D / G (THE |
| pen | IN PUR SLIGHT SU | S I | COMPUTER IS SOME DISTANCE FROM THE D $\!\!\!/$ G) . THE D $\!\!\!\!/$ G WAS CLEANED AND TERMINAL LUGS WERE REPAIRED AND REPLACED . |

PPLSES1 GENERA OG-501A

DO: 05/21/86

FS: 05/21/86

ID: 02/19/87

Desc: Emergency Generator

Mfr: P292 - Portec Inc

Mod Num: #170

App1: EPGE

Mod Id:

System: EEA -Emergency Power-GE

Ut1 Sys: 024

Desc: ON MAY 21 , 1986 DURING THE PERFORMANCE OF THE DIESEL GENERATOR START SURVEILLANCE THE 'A' DIESEL GENERATOR OG-501A DID NOT ACHIEVE THE REQUIRED VOLTAGE OF 4160 PLUS OR MINUS 400 VOLTS . AFTER STARTING . DIESEL FREQUENCY WAS APPROXIMATELY 59 . 2 HZ AND VOLTAGE WAS APPROXIMATELY 2700 VOLTS . ATTEMPTS BY THE CONTROL ROOM OPERATOR TO INCREASE VOLTAGE.WERE UNSUCCESSFUL .

Cause: UNIT 1 AT 100%, UNIT 2 AT 93%. INVESTIGATION DETERMINED THE MOST LIKELY CAUSE OF THE EVENT WAS MISOPERATION OF THE 'VR' RELAY IN THE VOLTAGE REGULATOR. THE RELAY MISOPERATION CAUSED THE FIELD FLASHING CIRCUIT TO REMAIN ON, PREVENTING VOLTAGE FROM INCREASING. OPERATIONS' ATTEMPT TO INCREASE VOLTAGE INCREASED THE VOLTAGE SETTING ON THE MOTOR OPERATED POTENTIOMETER (MOP). AFTER

ACTION: AN UNEXPECTED TIME DELAY THE 'VR' RELAY ACTUATED. THE GENERATOR VOLTAGE INCREASED TO THE VALUE SET ON THE MOP CAUSING THE OVERVOLTAGE RELAYS TO ACTUATE. THE 'A' DIESEL GENERATOR HAS BEEN RUN SIX TIMES SUCCESSFULLY SINCE 5 / 21 / 86 WITH MO DUPLICATION OF THE EVENT. THE RELAY WAS TESTED AND OPERATIONS HAVE BEEN TRAINED TO PREVENT THE VOLTAGE REGULATOR SETTING FROM BEING SET ABOVE RATED VOLTAGE

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Desc: Emergency Generator

Mfr: P292 - Portec Inc



Cause: THE OVER-EXCITATION ALARM RELAY ACTUATED PREMATURELY : PROBABLE

Action: REPLACED OVER-EXCITATION RELAY AND TESTED FOR PROPER OPERATION .

CAUSE DUE TO DEFECTIVE RELAY CIRCUITRY .

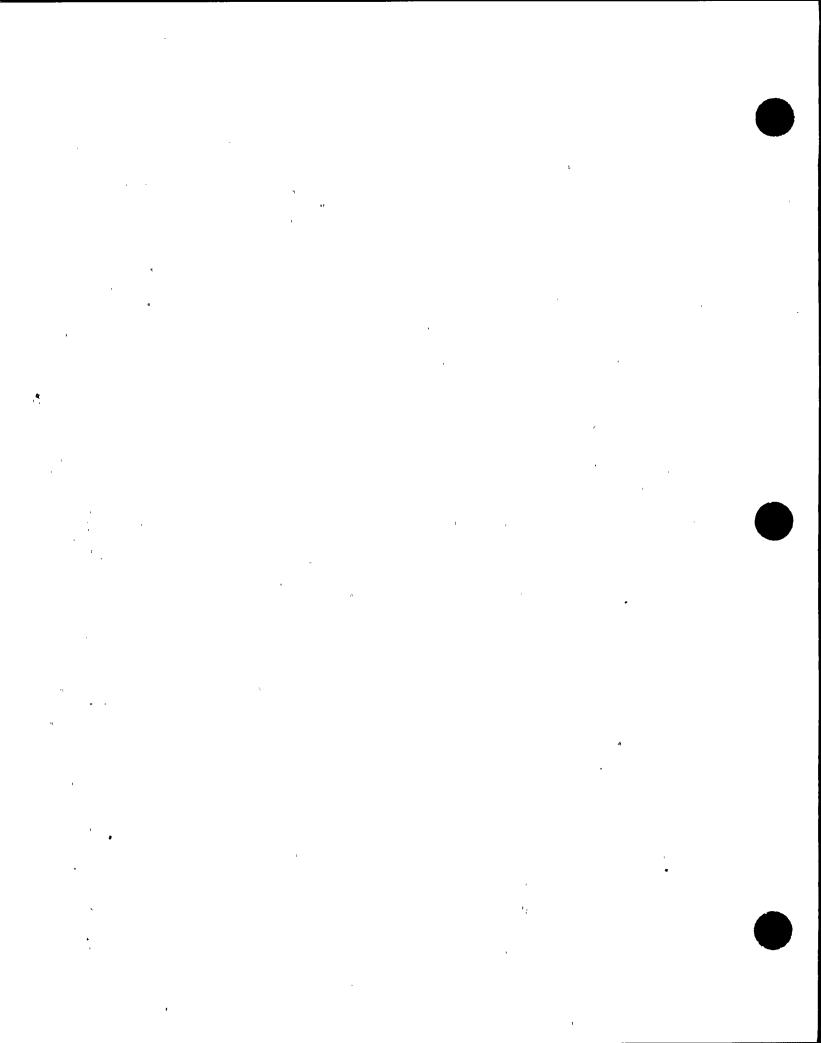
Nuclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91

Job Number: 8275

Unit Comp Utility Component Id Dates **Narratives** Desc: ON 8 / 22 / 86 , WITH UNIT ONE AT 100% POWER AND UNIT 2 IN PPLSES1 GENERA OG-501A, DO: 08/22/86 FS: 08/22/86 REFUELING OUTAGE, THE 'A' DIESEL GENERATOR WAS REMOVED FROM SERVICE App1: EPGE ID: 03/06/87 TO TEST FOR VOLTAGE REGULATOR PROBLEMS (REFERENCE FAILURE REPORT Desc: Emergency Generator DATED 860521) IN THE GENERATOR OG-501A . ON THE FIRST ATTEMPT TO START . THE GENERATOR DID NOT ACHIEVE REQUIRED VOLTAGE . AND TRIPPED . Mfr: P292 - Portec Inc Cause: THE TRIP SYMPTOMS INDICATED VOLTAGE REGULATOR PROBLEMS . Mod Num: #170 CHATTERING OF THE 'VR' RELAY CONTACTS, WHICH TRANSFERS THE GENERATOR FROM FIELD FLASH TO SELF EXCITATION . HAD CAUSED THE FIELD TO COLLASPE Mod Id: WHILE THE GENERATOR TERMINAL VOLTAGE REMAINED CONSTANT. THIS WAS System: EEA ATTRIBUTED TO A DESIGN PROBLEM WITH THE 120 / 24 VOLT STEP DOWN -Emergency Power-GE Ut1 Sys: 024 TRANSFORMER AND RETIFIER ASSEMBLY. Action: AN 'URGENT' DESIGN MODIFICATION WAS INITIATED TO INSTALL A CAPACITOR IN THE BRIDGE THAT SUPPLIES THE 'VR' RELAY COIL . BENCH TEST SHOWED THIS TO GREATLY REDUCE CHATTER. ALLOWING THE RELAY TO ACTUATE CLEANLY. AFTER INSTALLATION, TESTING SHOWED CHATTER, THOUGH REDUCED . STILL EXISTED . INVESTIGATION TO RESOLVE THE PROBLEM PERMANENTLY CONTINUES . PGCTNP1 GENERA K-106A DO: 01/10/83 Desc: DURING NORMAL OPERATIONS AND SURVEILLANCE TESTING, THE VOLTAGE FS: 01/10/83 CUTOUT FAILED TO WORK WHEN THE EDG RPM DROPPED TO < 690 RPM . Cause: STICKY AND DAMAGED AUXILIARY CONTACTS. NO EFFECT ON AUTO OR App1: EPGE ID: 04/25/90 Desc: Emergency Generator MANUAL DIESEL STARTING OR LOADING FUNCTIONS . Action: REPAIRED , CLEANED , AND ADJUSTED AUXILIARY CONTACTS . TESTED Mfr: P292 - Portec Inc SYSTEM FOR PROPER OPERATION . MR-83-0156 . Mod Num: L-10927 Hod Id: System: EEB -Emergency Power-W Ut1 Sys: EDG PGCTNP1 GENERA K-106A Desc: DURING NORMAL SHUTDOWN OPERATIONS . THE OVER-EXCITATION ALARM WAS DO: 06/10/83 ACTUATED ON THE WEST (A) EDG UNIT WHILE TESTING. NO EFFECT ON PLANT FS: 06/10/83 App1: EPGE OPERATIONS . ID: 04/25/90

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NPRG04AA

Hod 1d:

System: EEB

Utl Sys: EDG

-Emergency Power-W

Nuclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Number: 8275

Utility Component Id __Dates Marratives PGCTNP1 GENERA K-106A 00: 03/28/85 Desc: DURING INSPECTION AT FULL PLANT POWER, THE FIELD FLASHING RESISTORS FOR THE EMERGENCY DIESEL GENERATOR WERE FOUND TO SHOW SIGNS FS: 03/28/85 App1: EPGE ID: 04/25/90 OF HAVING OVERHEATED. BUT CIRCUIT REMAINED FUNCTIONAL. Desc: Emergency Generator Cause: OVERHEATING OF THE RESISTORS, PROBABLY DUE TO ELECTRICAL OVERLOAD . Mfr: P292 - Portec Inc. Action: REPLACED TWO FIELD FLASHING RESISTORS . Mod Num: L-10927 Hod Id: System: EEB -Emergency Power-W Utl Sys: EDG PGCTNP1 GENERA K-106A DD: 07/20/83 Desc: DURING NORMAL POWER OPERATIONS , THE 'A' TRAIN EMERGENCY DIESEL FS: 07/20/83 GENERATOR (EDG) DID NOT OPERATE CORRECTLY . NO EFFECT ON PLANT Appl: EPGE ID: 04/25/90 OPERATIONS . Desc: Emergency Generator Cause: THE EDG SPEED SWITCH WAS FOUND OUT OF ADJUSTMENT AND DEFECTIVE. CAUSING A FALSE SPEED SIGNAL WHEN THE DIESEL WAS SECURED . Mfr: P292 - Portec Inc Action: REPLACED SPEED SWITCH: ADJUSTED SPEED SWITCH FOR PROPER OUTPUT Mod Num: L-10927 : AND TESTED THE EDG UNIT FOR PROPER OPERATION . MR-83-2747 . Hod Id: System: EEB -Emergency Power-W Utl Sys: EDG PGCTNP1 GENERA K-106A 00: 09/16/83 Desc: DURING NORMAL POWER OPERATIONS . THE FIELD FLASH RELAY ON THE 'A' FS: 09/16/83 TRAIN EDG WAS OBSERVED TO FAIL DURING SURVEILLANCE TESTING . App1: EPGE ID: 04/25/90 Cause: A COIL IN THE FIELD FLASH RELAY UNLATCHING MECHANISM FAILED Desc: Emergency Generator PREVENTING THE FIELD FLASH FROM DE-ENERGIZING AND CAUSING OVERHEATING IN THE CIRCUIT . Mfr: P292 - Portec Inc Action: REPAIRED EDG FIELD FLASH CIRCUIT AND ADJUSTED SPEED SWITCH . Hod Num: L-10927 TESTED EDG FOR PROPER OPERATION . MR-83-3744 .

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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Number: 8275

Comp Utility Component Id Dates **Marratives** Desc: DURING A DIVISION III STANDBY DIESEL GENERATOR FUNCTIONAL TEST. MPLGGS1 GENERA 01E22S001 DO: 07/13/85 OPERATORS SHUT DOWN THE DIESEL GENERATOR WHEN SPARKS WERE OBSERVED FS: 07/05/85 Appl: HPGE ID: 08/05/85 COMING FROM THE GENERATOR BEARING END CAP. THE PLANT WAS AT Desc: HPCS Emerg Pwr Generator APPROXIMATELY 65% POWER . Cause: MAINTENANCE INSPECTION REVEALED A LOW SPOT IN THE INSULATION UNDER THE GENERATOR BEARING INNER RACE. THIS COMDITION ALLOWED Mfr: P292 - Portec Inc Mod Num: L-11022 EXCESSIVE RADIAL MOVEMENT OF THE GENERATOR SHAFT WHICH CREATED Mod Id: CIRCULATING CURRENTS. THESE CURRENTS RESULTED IN THE SPARKS AND OVERHEATING OF THE GENERATOR. ACTUAL CAUSE OF THE INSULATION LOW SPOT IS UNKNOWN . System: EEE -High Pressure Core Spray Power-GE Utl Sys: E22 Action: THE DAMAGED GENERATOR WAS REPLACED WITH THE DIVISION III GENERATOR FROM UNIT 2. THE DAMAGED GENERATOR WAS SHIPPED TO THE VENDOR FOR INSPECTION AND REPAIR. MAINTENANCE RETEST WAS SATISFACTORY SYSTEM ENERGY RESOURCES AN . (E54336) GRAND GULF 1 MPLGGS1 GENERA 01E22S001 DO: 04/03/89 FS: 03/20/89 DROPPED 10 - 15 % WHEN THE ENGINE WAS LOADED DURING A SURVEILLANCE Appl: HPGE ID: 12/04/89

Desc: HPCS Emerg Pwr Generator

Hfr: P292 - Portec Inc

Mod Num: L-11022

Hod Id:

System: EEE -High Pressure Core Spray Power-GE

Utl Sys: E22

Desc: DIVISION III DIESEL GENERATOR SOO1 EXCITER VOLTS . AMPS . AND VARS TEST. THERE WAS NO SIGNIFICANT EFFECT ON THE PLANT, WHICH WAS SHUT DOWN FOR REFUELING OUTAGE 3.

Cause: THE FAILURE WAS ATTRIBUTED TO THREE FAILED SILICOME RECTIFIERS IN THE GENERATOR, AND TO A HIGH RESISTANCE ACROSS THE CONTACTS OF THE RELAYS WHICH PROVIDE FEEDBACK TO THE VOLTAGE REGULATOR ON DIVISION III DIESEL GENERATOR SOOI .

Action: REPLACED THE THREE FAILED RECTIFIERS AND CLEANED THE K2 AND K3 RELAY CONTACTS IN THE VOLTAGE REGULATOR CIRCUIT ON DIVISION III DIESEL GENERATOR SOOL . A FUNCTIONAL RETEST WAS COMPLETED WITH SATISFACTORY **RESULTS** . (E92165)

MPLGGS1 GENERA 01P75E001A

DD: 12/19/89 FS: 12/18/89

ID: 10/27/90 App1: EPGE

Desc: Emergency Generator

Mfr: P292 - Portec Inc

Mod Num: L-11033

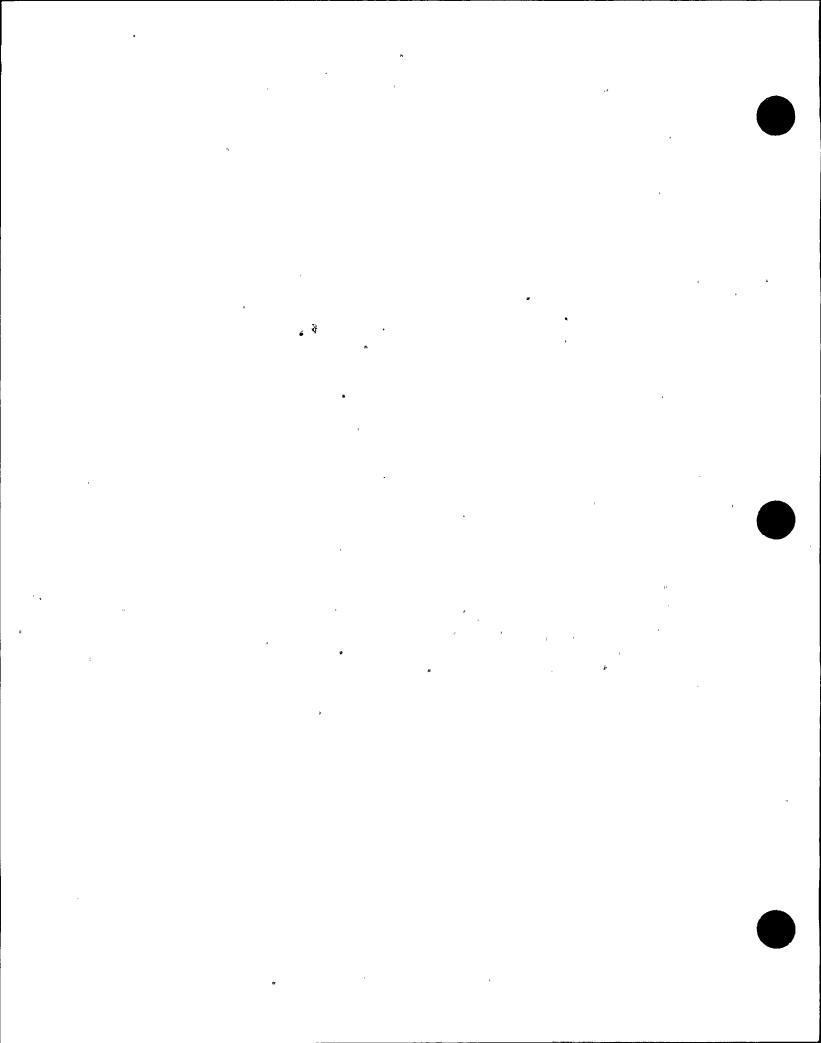
Mod Id:

CYS ENER RES GRAND GULF 1

Desc: DURING NORMAL MAINTENANCE ACTIVITIES , IT WAS OBSERVED THAT BOLTS IN THE GENERATOR TERMINATION BOX COVER FOR THE DIVISION I DIESEL GENERATOR WERE STRIPPED OUT AND NEEDED TO BE REPLACED. THERE WAS NO SIGNIFICANT EFFECT ON THE PLANT, WHICH WAS OPERATING AT 100 PERCENT POWER. THE DIVISION I DIESEL GENERATOR WAS NOT EFFECTED BY THIS FAILURE .

Cause: THE BOLTS IN THE GENERATOR TERMINATION BOX FOR THE DIVISION I DIESEL GENERATOR WERE STRIPPED DUE TO MISALIGNMENT BETWEEN THE

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System: EEA -Emergency Power-GE

Utl Sys: P75



TERMINATION BOX COVER BOLT HOLES AND THER PERMANENT NUTS TACK WELDED TO THE LIP OF THE TERMINATION BOX .

Action: THE DIVISION I DIESEL GENERATOR TERMINATION BOX WAS REPAIRED BY REMOVING THE EXISTING NUTS ON THE TERMINATION BOX , STRENGTHENING THE LIP OF THE BOX , AND ATTACHING NEW NUTS . NEW BOLTS WERE ALSO INSTALLED . A MAINTENANCE RETEST VERIFIED PROPER OPERATION . (WOO6228)

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NPRG04AA



Run Date: 01/17/91 Job Number: 8275

Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

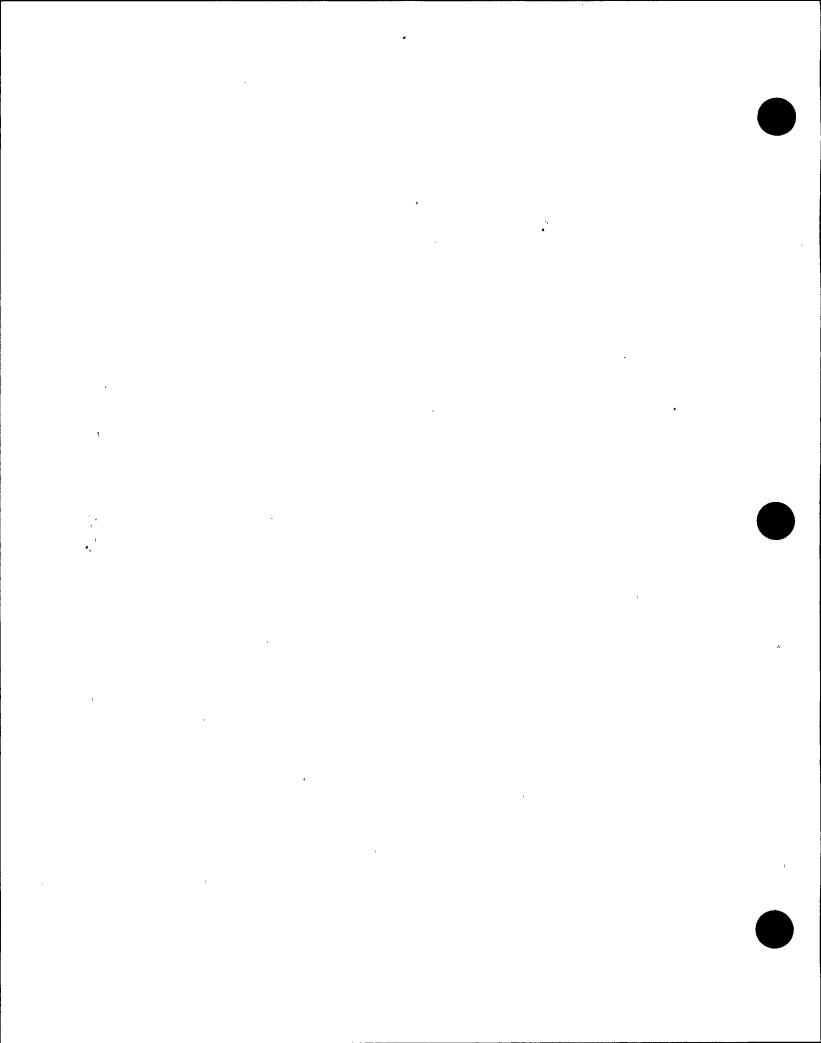
| _UnitCompUtility Component Id | Dates | Marratives | | |
|---|------------------------------|---|--|--|
| MPLGGS1 GENERA Q1P75E001A | DO: 12/18/88 FS: 12/04/88 | Desc: DURING SURVEILLANCE TESTING , THE OUTPUT OF DIESEL GENERATOR EOOIA WAS OSCILLATING . THERE WAS NO SIGNIFICANT EFFECT ON THE PLANT , WHICH | | |
| App1: EPGE | 10: 05/22/89 | WAS OPERATING AT 100% POWER. | | |
| Desc: Emergency Generator | | Cause: THE OSCILLATION IN THE OUTPUT OF DIESEL GENERATOR EOOIA WAS CAUSED BY FAULTY DIODES IN EXCITATION RECTIFIER BRIDGE #1. | | |
| Mfr: P292 - Portec Inc | • | Action: THE FAULTY DIODES IN THE EXCITATION RECTIFIER BRIDGE WERE | | |
| Mod Hum: L-11033 | | REPLACED. DIESEL GENERATOR EDOIA WAS RUN AND THE OUTPUT WAS MONITORED | | |
| Mod Id: | | TO VERIFY PROPER , STEADY OUTPUT . (E86400) | | |
| System: EEA -Emergency Power-GE Utl Sys: P75 | | | | |
| MPLGGS1 GENERA Q1P75E001B | DO: 07/11/86 FS: 07/11/86 | Desc: THE DIVISION II DIESEL GENERATOR TRIPPED WHILE FULLY LOADED DURING A MONTHLY SURVEILLANCE TEST. THERE WAS NO SIGNIFICANT EFFECT ON THE | | |
| App1: EPGE | ID: 07/29/86 | PLANT , THE PLANT WAS OPERATING AT 86% POWER . | | |
| Desc: Emergency Generator | | Cause: THE EXACT CAUSE OF THE GENERATOR TRIP IS UNKNOWN . AN ANNUNCIATOR FLAG INDICATED THAT THE VOLTAGE BALANCE RELAY MIGHT HAVE CAUSED THE | | |
| Mfr: P292 - Portec Inc | | TRIP BUT SUBSEQUENT INVESTIGATION BY MAINTENANCE PERSONNEL DETERMINED | | |
| Mod Num: L-11033 | | THAT THE VOLTAGE BALANCE RELAY WOULD NOT TRIP THE GENERATOR . | | |
| Mod 1d: | - | Action: AFTER MAINTENANCE PERSONNEL FOUND NO PROBLEM WITH THE VOLTAGE BALANCE RELAY A SECOND SURVEILLANCE TEST OF DIVISION II DIESEL | | |
| System: EEA -Emergency Power-GE | | GENERATOR WAS COMPLETED SATSIFACTORILY. REVEIW OF THE INCIDENT IS | | |
| Utl Sys: P75 | | CONTINUING . (E64051) | | |
| SCESOS1 GENERA D/GI | 00: 11/23/82 | Desc: D / G1 FIELD FLASH RELAY R-13 FAILED TO PICK UP WHEN THE DIESEL WAS STARTED FOR TESTING . R-13 PREVENTS THE DIESEL OUTPUT BREAKER FROM | | |
| Amala FOCE | FS: 11/08/82 | | | |
| Appl: EPGE Desc: Emergency Generator | ID: 06/27/89 | CLOSING . **Cause: RANDOM FAILURE . 12 SUBSEQUENT STARTS RESULTED IN NO FAILURES . | | |
| oeses the gency benefator | | Action: CLEANED ALL RELAY CONTACTS . | | |
| Mfr: P292 - Portec Inc | | | | |
| Hod Num: L-11058 | • | | | |
| Hod Id: | | 10 12 4 REV. 1 A | | |
| | | | | |

PEEBLES NEMP 12.4 REV. 1 ATT. A

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System: EEB Utl Sys: DG1

-Emergency Power-W





Muclear Plant Reliability Data System - Failure Brief Report

Run Date: 01/17/91

| By: Manufacturer Model Number, Manufacturer Model ID Job Number: | | | |
|--|--------------------------|------------------------------|--|
| _UnitComp_ | Utility Component Id | Dates | Narratives |
| SCESOS1 GENERA | D/G1 | DO: 02/06/89 FS: 02/06/89 | Desc: WITH THE UNIT REFUELING , ENGINEERING WAS FOLLOWING A POSTMAINTENANCE TEST ON THE DIESEL ENGINE AND THE GENERATOR EXHIBITED |
| App1: EPGE | | ID: 06/27/89 | WIDE VOLTAGE SHINGS WHILE IT WAS ON LINE . |
| Desc: Emergen | cy Gene rator | | Cause: INVESTIGATION BY THERMOGRAPHY REVEALED SEVERAL LOOSE CONNECTIONS IN THE EXCITER CONTROL PANEL. ALSO NOTED SOME PHASE IMBALANCE ON THE |
| Mfr: P292 - | Portec Inc | | BRIDGE CIRCUIT . EXACT CAUSE OF FLUCTUATIONS OF VOLTAGE WAS NOT |
| Mod Num: L-11058 | | | DETERMINED . REFERENCE : NCR1-P-7032 |
| Hod Id: | | | Action: TIGHTENED ALL CONNECTIONS FOUND LOOSE OR INDICATED HOT ON THERMOGRAPHY TEST. MADE PAHSE BALANCE ADJUSTMENTS AND RETURNED |
| System: EEB - | Emergency Power-W | | GENERATOR AND EXCITATION CIRCUITRY TO SERVICE . |
| Utl Sys: DG1 | | | |
| SCESOS1 GENERA | D/G1 | 00: 01/28/89 | Desc: WITH THE UNIT REFUELING . MAINTENANCE FOUND THE EMERGENCY |
| | | FS: 01/28/89 | GENERATOR LOWER OUTBOARD SUPPORT (CASTING) BROKEN AT THE UPPER |
| Appl: EPGE | | ID: 06/27/89 | OUTSIDE . WHERE THE DUST SEAL SITS . |
| | | | |

Mfr: P292 - Portec Inc

Desc: Emergency Generator

Mod Num: L-11058

Hod Id:

System: EEB -Emergency Power-W

Ut1 Sys: DG1

Cause: THIS WAS CAUSED WHILE ATTEMPTING TO LIFT OUT THE LOWER BEARING HALF. THE JACK AND THE LIFT PLATE SLIPPED AND CRUSHED THE LOWER PART OF THE GENERATOR BEARING HOUSING AND BROKE APPROXIMATELY 7 INCHES OFF THE HOUSING AROUND THE DUST SEAL ENCLOSURE. HAINTENANCE ERROR.

REFERENCE: NCR1-P-7002

Action: REPAIRED THE DAMAGED AREA USING " DEVCON " TITANIUM PUTTY ON THE FRACTURED FACE. OPERATING EXPERIENCE HAD SHOWN THAT THIS TYPE OF REPAIR WITH OVER 40 STARTS / STOP CYCLES HAS PROVED DURABLE AND CAN BE CONSIDERED PERMANENT REPAIR. RETURNED ENGINE / GENERATOR TO SERVICE.

SOUTHERN CALIFORNIA EDIGIN CO.

SAN ONOFRE 1

APLANO1 GENERA K-4A

Desc: SPORADIC TROUBLE ALARM . DD: 03/31/75

Appl: EPGE

FS: 03/31/75

Cause: DEFECTIVE TIME DELAY RELAY .

ID: 07/20/85 Action: REPLACED PARTS .

Desc: Emergency Generator

Mfr: P292 - Portec Inc

PREBLES NEMP 12.4 REV. 1 ATT. A

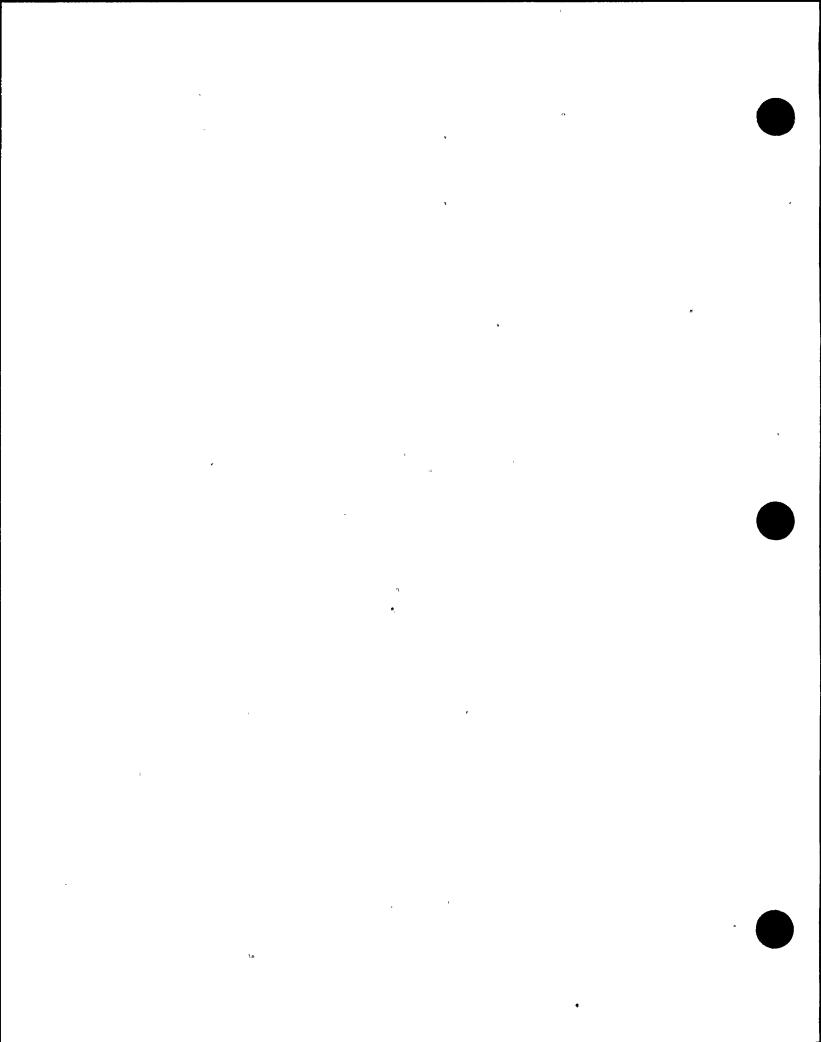
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Mod Num: L10823

Hod Id:

-Emergency Power-BW System: EEC

Utl Sys: EDG





System: EEC -Emergency Power-BW

Uti Sys: EDG



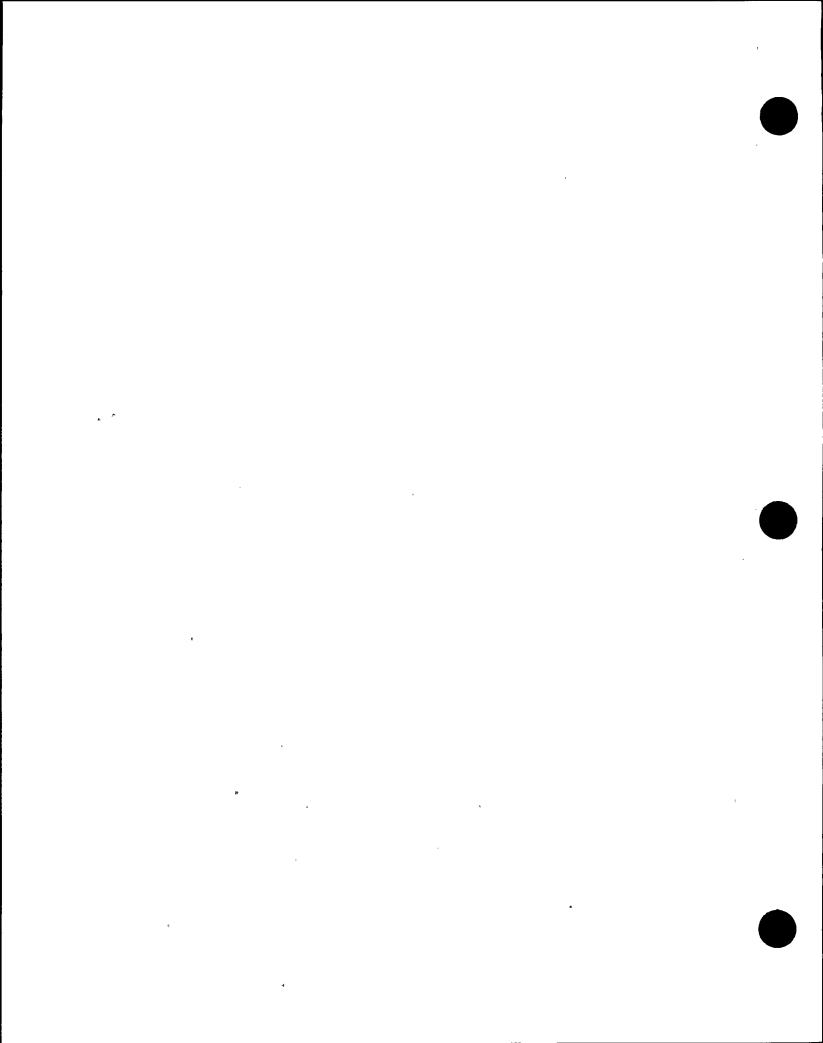


Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model 1D

Run Date: 01/17/91 Job Number: 8275

_Unit__ _Comp __Utility Component Id Dates **Marratives** APLANOI GENERA K-4A DO: 04/23/75 Desc: BLOW PT FUSE ALARM . FS: 04/23/75 Cause: CFVB RELAY MALFUNCTION . Appl: EPGE ID: 07/20/85 Action: REPAIRED SPRING HOLDER ON RELAY . Desc: Emergency Generator Mfr: P292 - Portec Inc Mod Nura: L10823 Mod Id: System: EEC -Emergency Power-BW Utl Sys: EDG APLANOI GENERA K-4A DO: 05/11/76 Desc: DIESEL NO. 1 FAILED TO START ON SIMULATED E.S. ACTUATION FS: 05/11/76 Cause: FAILED DIODE IN THE DIESEL AUTO-START CIRCUIT Appl: EPGE ID: 07/20/85 Action: REPLACED DEFECTIVE DIODE Desc: Emergency Generator Mfr: P292 - Portec Inc Mod Num: L10823 Hod Id: System: EEC -Emergency Power-BW Utl Sys: EDG APLANO1 GENERA K-4A 00: 01/30/78 Desc: DURING INSPECTION MEGGERED GENERATOR WINDING CHECKED SLIP RINGS. FS: 01/30/78 IDENTIFIED BAD VOLTAGE BOARD Appl: EPGE 10: 07/20/85 Cause: UNKNOWN Desc: Emergency Generator Action: REPLACED VOLTAGE BOARD Mfr: P292 - Portec Inc PEEBLES NEMP 12.4 REV. 1 ATT. A

Pg 17 of 31 Mod Num: L10823 Hod Id:





Hod Id:

System: EEC

Utl Sys: EDG

-Emergency Power-BW

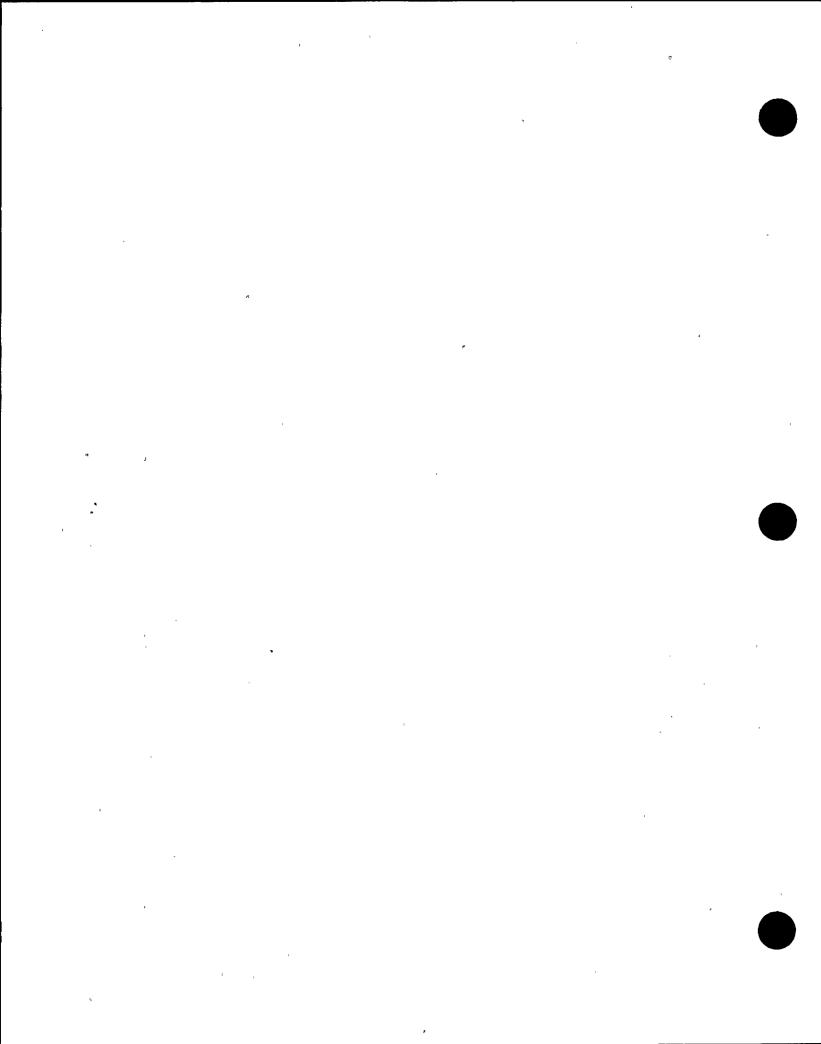


Run Date: 01/17/91 Job Number: 8275

Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Comp _Utility Component Id__ Dates -**Marratives** APLANOI GENERA K-4A DO: 07/25/78 Desc: DIESEL GENERATOR RUN TIME METER FAILURE PIECEPART-TIME CLOCK . FS: 07/25/78 NUMECHRON-TYMETER . GMT HODEL ADD1: EPGE ID: 07/20/85 Cause: ELAPSED TIME METER BAD Desc: Emergency Generator Action: REPLACED ELAPSED TIME METER Mfr: P292 - Portec Inc Mod Num: L10823 Hod 1d: System: EEC -Emergency Power-BW Utl Sys: EDG APLANOI GENERA K-4A DO: 02/08/83 Desc: WHILE PERFORMING OVER-SPEED TEST ON K-4A, THE DIESEL ENGINE FS: 02/08/83 OVERSPEED WAS HIGHER THAN SET POINT BY (3) RPM THAN HAX PERMITTED . Appl: EPGE Cause: SET POINT DRIFT FOR UNKNOWN REASON , OR POSSIBLY IMPROPER SETTING ID: 07/20/85 Desc: Emergency Generator BY PREVIOUS GROUP . Action: ADJUSTED OVERSPEED TRIP MECHANISM TO PROPER SET POINT PER VENDER Mfr: P292 - Portec Inc INSTRUCTIONS . Mod Num: L10823 Hod Id: System: EEC -Emergency Power-BW Utl Sys: EDG APLANOI GENERA K-4A DO: 04/13/83 Desc: VOLTAGE REGULATOR WILL NOT CONTROL GENERATOR OUTPUT DURING MONTHLY FS: 04/13/83 SURVEILLANCE TESTING . Appl: EPGE 1D: 07/20/85 Cause: FAILED SOURCE CIRCUIT BREAKER IN PANEL MD11 . FAILURE OF 120 VOLT Desc: Emergency Generator AC . BREAKER COULD NOT BE DETERMINED . Action: REPLACED BREAKER AT PANEL (WDII) . NEW BREAKER IS 30 AMP 2 Mfr: P292 - Portec Inc POLE O BREAKER . Mod Num: L10823

PEEBLES NEMP 12.4 REV. 1 ATT. A
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Mfr: P292 - Portec Inc

-Emergency Power-BW

Mod Num: L10823

System: EEC

Utl Sys: EDG

Hod Id:



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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

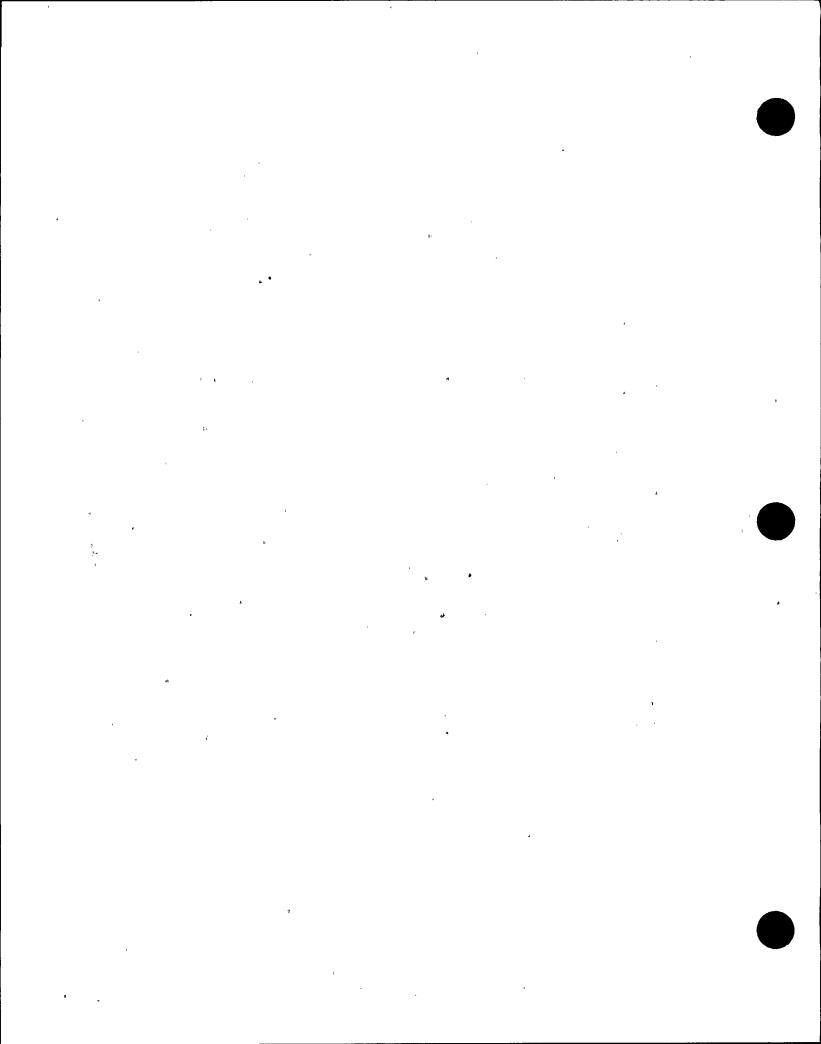
Run Date: 01/17/91 Job Number: 8275

| _Unit | _CompUtility Component Id | _Dates | Marratives |
|----------|--|--|--|
| APLANO1 | GENERA K-4A : EPGE : Emergency Generator | 00: 01/21/85 FS: 01/06/85 10: 07/20/85 | |
| App1: | | | POTENTIOMETER (MOP) TO BE INOPERABLE . |
| | | | Cause: INVESTIGATION REVEALED A BLOWN FUSE AND A FAILED MOP. THE ROOT CAUSE MAS THE INPUT DIODES PART OF MOP SHORTED. CAUSING THE FUES TO |
| Mfr: | P292 - Portec Inc | | BLOW . MODIFIED THE CIRCUIT AND REMOVED THE DIODE . |
| Mod Num: | : L10823 | | Action: REPLACED FUSES AND HODIFIED HOP CIRCUIT BY REMOVING THE DIODES |
| Mod Id: | | | RAC 1-85-034 . |
| System: | EEC -Emergency Power-BW | | |
| Utl Sys: | EDG | | |
| APLANO1 | GENERA K-4B | 00: 11/25/75 | Desc: INLET AND OUTLET FLANGES ON LUBE OIL SIDE OF COOLER LEAKING |
| | · | | Cause: GASKET DETERIORATION |
| App1: | EPGE | ID: 07/20/85 | Action: REPLACED GASKETS |
| Desc: | Emergency Generator | | |
| Hfr: | P292 - Portec Inc | | |
| Hod Num: | L10823 | | 5 |
| Mod Id: | | • | • |
| System: | EEC -Emergency Power-BW | | |
| Utl Sys: | EDG | | • |
| | | • | |
| APLAN01 | GENERA K-4B | DO: 03/20/78 | Desc: DISEL GENERATOR #2 WAS MANUALLY TRIPPED DUE TO ABNORMAL |
| | | FS: 03/20/78 | INDICATIONS . FIRE FROM EXHAUST STACK WAS NOTED . FIRE INSIDE TURBO |
| App1: | | ID: 07/20/85 | CHARGER . |
| Desc: | Emergency Generator | | Cause: FAILURE OF THE BEARING BETWEEN THE A&- INLET BLADING & EXHAUST TURBINE BLADING OF THE DIESEL ENGINE TURBO CHARGER . FAILURE ALLOWED |
| | | | |

PREBLES NGMP 12.4 REV. 1 ATT. A
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Action: FIRE TEAM RESPONDED . TURBO CHARGER REPLACED .

OIL INTO EXHAUST WHICH IGNITED .







Run Date: 01/17/91

Job Number: 8275



Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

__Unit___Comp___Utility Component Id____Dates____ Marratives_____

TVASNP1 GENERA EKDG0004406 DD: 12/06/83 Desc: DURING A ROUTINE SURVEILLANCE . WHILE THE SYSTEM WAS OPERATING THE

ASNPI GENERA EKDGO004406 DD: 12/06/83 Desc: DURING A ROUTINE SURVEILLANCE, WHILE THE SYSTEM WAS OPERATING THE FS: 12/06/83 INABILITY TO CONTROL SPEED OF DIESEL GENERATOR 1A-A WAS DETECTED.

App1: EPGE ID: 03/28/84 Cause: DRIVE MOTOR FOR SPEED CONTROL POT HAD OPEN WINDING.

Desc: Emergency Generator Action: REPLACED MOTOR AND CHECKED FOR PROPER OPERATION . MR A-248074

Mfr: P292 - Portec Inc

Mod Num: L10906

Mod Id:

System: EEB -Emergency Power-W

Ut1 Sys: 082

TVASNP1 GENERA EKDG0004406

App1: EPGE

Desc: Emergency Generator

Mfr: P292 - Portec Inc

Mod Num: L10906

Mod Id:

System: EEB -Emergency Power-W

Ut1 Sys: 082

DO: 12/11/83

ID: 03/28/84

Desc: DURING ROUTINE CHECK IT WAS FOUND THAT DIESEL GENERATOR 1A-A WILL

FS: 12/11/83 NOT LOAD.

Cause: BREAKER 1-BCTA-202-CM16-A 1912 EMER SUPPLY FOR 6 . 9 KV SDBD 1A-A

HAD A SCREW MISSING ON THE LEVER THAT MAKES UP THE A FINGER . THIS

PREVENTED RELAY 62K FROM PERFORMING .

Action: REPLACED SCREW AND CHECKED FOR PROPER OPERATION . MR A-103876

TVASNP1 GENERA EKDG0004406

Appl: EPGE

Desc: Emergency Generator

Mfr: P292 - Portec Inc

Mod Num: L10906

Hod Id:

System: EEB -Emergency Power-W

Ut1 Sys: 082

00: 12/29/83

Desc: DURING THE PERFORMANCE OF A SURVEILLANCE TEST GOVERNOR LOAD /

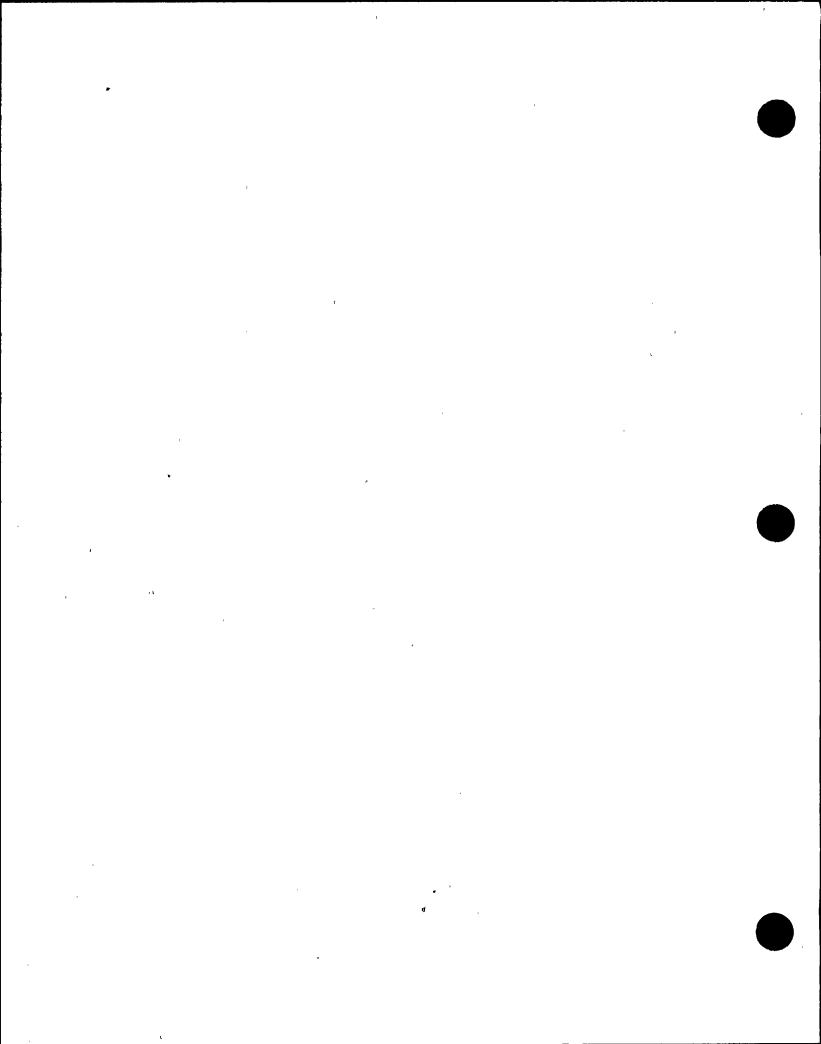
FS: 12/29/83 SPEED PROBLEM WAS FOUND IN THE DIESEL GEN 1A-A.

ID: 03/28/84 Cause: PROBABLE CAUSE WAS A LOOSE CONNECTOR ON ENGINE MOUNTED WOODWARD

GOVERNOR AND A TRACE OF GOVERNOR OIL WAS FOUND INSIDE THE CONNECTOR COULD ALSO HAVE CAUSED PROBLEM .

Action: TIGHTENED AND CLEANED PLUG . REVISED SURVEILLANCE INSTRUCTION TO CHECK TIGHTNESS OF PLUG . MR A-100496

PEEBLES NEMP 12.4 REV. 1 ATT. A.
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System: EEB

Ut1 Sys: 082

-Emergency Power-W



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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91

Job Number: 8275

_Unit__ _Comp_ __Utility Component Id Dates Marratives Desc: DIESEL GENERATOR 1A-A FAILED TO LOAD UP TO FOUR MEGAWATTS DO: 08/01/84 TVASNP1 GENERA EKDG0004406 ELECTRICAL IN 60 SECONDS PER SURVEILLANCE INSTRUCTION 7 . PROBLEM FS: 08/01/84 CLEARED WHEN OPERATOR WENT TO MANUAL MODE OF OPERATION . ID: 10/30/89 Appl: EPGE Cause: OPEN LOAD GAIN ON POTENTIONMETER CAUSED BY BAD LOAD SENSOR MODULE Desc: Emergency Generator Action: REPLACED LOAD SENSOR HODULE . HR A-285909 Mfr: P292 - Portec Inc Mod Num: L10906 Mod Id: -Emergency Power-W System: EEB Ut1 Sys: 082 Desc: DURING NORMAL UNIT OPERATION . A SURVEILLANCE TEST ON DIESEL DO: 11/23/84 TVASNP1 GENERA EKDG0004406 GENERATOR 1A-A INDICATED DIESEL WAS LOADING AND UNLOADING ERRATICALLY FS: 08/20/84 ID: 10/30/89 Appl: EPGE Cause: ELECTROMAGNETIC RELAYS 62X AND G52934 . IN THE CONTROL CIRCUIT . Desc: Emergency Generator PROBABLY HAD AN OPEN CIRCUIT . Action: REPLACED RELAYS 62X AND G52934 . HR A-121921 Mfr: P292 - Portec Inc Mod Num: L10906 Hod Id: System: EEB -Emergency Power-W Ut1 Sys: 082 DD: 01/17/86 Desc: DURING UNIT 1 REFUELING OUTAGE WHILE PERFORMING A SURVEILLANCE TVASNP1 GENERA EKDG0004406 INSPECTION ON DIESEL GENERATOR 1A-A, THE VOLTAGE AND FREQUENCY WAS FS: 12/06/85 NOT WITHIN TECHNICAL SPECIFICATION . Appl: EPGE ID: 10/30/89 Cause: 1-GENB-82-1A-A EXCITATION CONTROL TIME DELAY TRIP CURRENT LEVEL Desc: Emergency Generator WAS OUT OF ADJUSTMENT . Action: ADJUSTED THE HINIHUM-MAXIMUM EXCITATION CONTROL TIME DELAY TRIP Mfr: P292 - Portec Inc CURRENT LEVEL TO MINIMUM SET POINT PER VALIDATED VENOOR INSTRUCTION Mod Num: L10906 Mod Id: MANUAL . WR B-105470

PEEBLES NEMP 12.4 REV. 1 ATT. A

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• •



Ut1 Sys: 082





Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

ort Rum Date: 01/17/91 - Job Humber: 8275

| _Unit | _CompUtility Component Id | Dates | Marratives |
|---------------------|----------------------------|------------------------------|---|
| TVASNP2 | GENERA EKDGO012801 | 00: 11/05/86 FS: 04/15/86 | Desc: DURING PLANT OUTAGE A SURVEILLANCE TEST INDICATED DIESEL GENERATO 2A-A HAD A VOLTAGE SWING PRIOR TO LOADING . |
| App1: | EPGE | ID: 10/30/89 | Cause: POSSIBLY , THE 86LOR RELAY CONTACT ASSOCIATED WITH THE AUTO |
| Desc: | Emergency Generator | | VOLTAGE REGULATOR . OPERATION WAS INTERMITTENT ALLOWING ZERO INPUT TO THE VOLTAGE REGULATOR CAUSING A VOLTAGE SWING . REF . WR B-202709 . |
| Hfr: | P292 - Portec Inc | | Action: INSTALLED THE AUTO VOLTAGE CONTROL MOTOR OPERATED POTENTIOMETER |
| Mod Num: | L10906 | | FROM DIESEL GENERATOR 1A-A ONTO 2A-A. REPLACED THE VOLTAGE REGULATOR |
| Mod Id: | | | AND OFF-MANUAL-AUTO HAND SWITCH . WR B-208401 |
| System: Utl Sys: | EEB -Emergency Power-W 082 | | |
| | | | · |
| TVASNP2 | GENERA EKDG0012801 | DO: 05/18/86 FS: 05/18/86 | Desc: DURING UNIT 2 OUTAGE , AN AUDIOVISUAL ALARM INDICATED A 30 VOLT NEGATIVE GROUND GENERATOR 2A-A . |
| App1: | EPGE | ID: 09/17/86 | |
| | Emergency Generator | | Action: CLEANED BATTERIES WITH SODA AND WATER CLEARING GROUND , AND RETURNED TO SERVICE . WR B-115335 |
| Mfr: | P292 - Portec Inc | | , |
| dod Num: | L10906 | | |
| Mod Id: | • | | |
| System: | EEB -Emergency Power-W | | |
| Jtl Sys: | 082 | | |
| | | • | • |
| VASNP2 | GENERA EKDG0012802 | DO: 10/17/87 | Desc: DURING PLANT SHUTDOWN , WHILE PERFORMING SURVEILLANCE INSTRUCTION |
| | | FS: 01/10/87 | (SI) -26 , THE ELECTROMAGNETIC RELAY , FOR DIESEL GENERATOR 2B-B |
| App1: | | ID: 10/30/89 | EXHAUST FAM , DID NOT ENERGIZE . |
| Desc: | Emergency Generator | | Cause: THE RELAY BASE CONTACTS WERE LOOSE POSSIBLY DUE TO VIBRATION. THE EXHAUST FANS MUST BE ABLE TO RUN OR CAN CAUSE A DIFFERENTIAL |
| | P292 - Portec Inc | • | PRESSURE WHICH CAN TRIP THE DIESEL GENERATORS. |
| Hod Num: Hod Id: | | - | Action: REPLACED RELAY AND PLUG-IN RELAY BASE . (WR B-276869) |
| System: | EEB -Emergency Power-W | PEEBL | LES NEMP 12.4 REV. 1 ATT. A |

PEEBLES NEMP 12.4 REV. 1 ATT. A

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Nuclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91

Job Number: 8275

| _ | _CompUtility Component Id | Dates DO: 08/20/86 FS: 07/16/86 | Marratives | | |
|---------------------|---------------------------|---------------------------------------|--|--|--|
| | GENERA EKDGO012802 | | Desc: DURING UNIT 2 OUTAGE . WHILE PERFORMING A SURVEILLANCE TEST . DIESEL GENERATOR 28-B DID NOT LOAD TO ACCEPTABLE SURVEILLANCE CRITERIA | | |
| App1: | EPGE | ID: 10/09/86 | • | | |
| Desc: | Emergency Generator | | Cause: FUSE HOLDER WAS NOT GRIPPING THE FUSE TIGHT ENOUGH TO MAINTAIN PROPER AMPERAGE. | | |
| Hfr: | P292 - Portec Inc | | Action: ADJUSTED FUSE HOLDER TO GRIP FUSE TIGHTER . WR B-126286 | | |
| Mod Num: | L10906 | | | | |
| Mod Id: | | | F | | |
| System: Utl Sys: | EEB -Emergency Power-W | | • | | |
| 51. 5 ,5. | | | | | |
| TVASNP2 | GENERA EKDG0012802 | DO: 04/01/87 | Desc: DURING PLANT SHUTDOWN WHILE PERFORMING SURVEILLANCE INSTRUCTION (| | |
| , | | FS: 03/05/87 | SI) 102E / H . DIESEL GENERATOR 2B-B DROPPED FROM 4000 KILOWATTS TO | | |
| App1: | | 10: 01/25/88 | 2000 KILOWATTS . Cause: THE FUSE CLIP TENSION (HOLDING THE FUSE IN PLACE) HAD BROKEN | | |
| Desc: | Emergency Generator | | DOWN PREVENTING THE FUSES FROM MAKING GOOD CONTACT . ROOT CAUSE | | |
| Mfr: | P292 - Portec Inc | | UNKNOWN . | | |
| Mod Num: | : L10906 | • | Action: REPLACED THE LOAD SENSOR CARD THICE FAILING TO RESOLVE THE | | |
| Hod Id: | • | | PROBLEM . REMOVED FUSE BLOCK IN DIESEL GENERATOR 2B-B WITH FUSE BLOCK FROM THE FIFTH DIESEL GENERATOR ON WR B-227954 . (WR B-222643) | | |
| System: | : EEB -Emergency Power-W | | | | |
| Utl Sys: | : 082 | | | | |
| | t | • | | | |
| TUACNDI | GENERA EKDGOOO4406 | DO: 06/30/86 | Desc: DURING UNIT 1 REFUELING OUTAGE WHILE PERFORMING A SURVEILLANCE | | |
| IANOULT | CENTER ENDOVOUTION | FS: 01/30/86 | TEST . DIESEL GENERATOR IA-A INHERSION HEATER CONTACTS WERE FOUND | | |
| Annl | : EPGE | ID: 10/30/89 | PITTED . | | |
| | : Emergency Generator | 100 10. 00. 00 | Cause: IMMERSION HEATER CONTACTS WERE PITTED DUE TO MORMAL WEAR . | | |
| 0030 | - and gainsy senior agor | | Action: REPLACED CONTACTS AND TOOK AMPERAGE READINGS . MR B-120624 | | |

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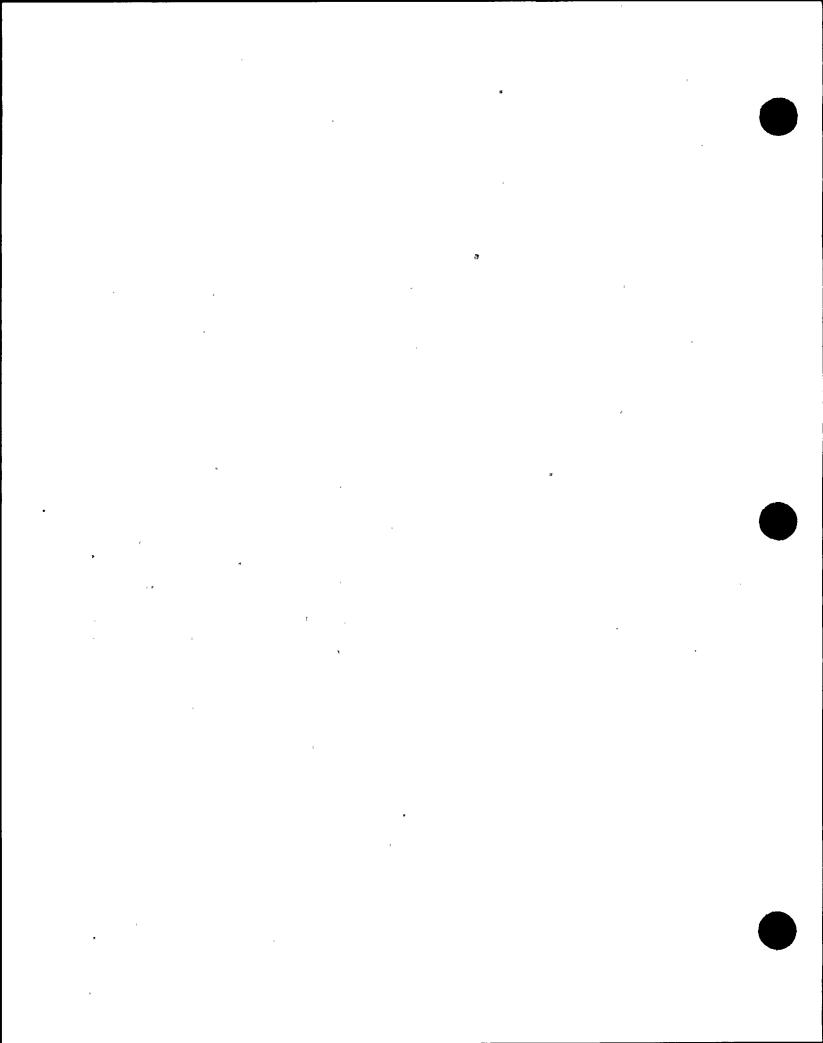
Mfr: P292 - Portec Inc

Mod Num: L10906

Mod Id:

System: EEB -Emergency Power-W

Ut1 Sys: 082







Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Humber: 8275

_Unit___Comp __Utility Component Id Dates **Narratives** TVASNP1 GENERA EKDG0004406 Desc: DURING PLANT SHUTDOWN . A SURVEILLANCE TEST INDICATED DIESEL DD: 10/24/86 FS: 01/15/86 GENERATOR 1A-A DID NOT MEET ACCEPTABLE CRITERIA . ADD1: EPGE ID: 10/30/89 Cause: TIME DELAY RELAY #9 POSSIBLY HAD DUST IN ORIFICE . Desc: Emergency Generator Action: REPLACED TIME DELAY RELAY #9 . WR B-203827 Mfr: P292 - Portec Inc Mod Num: L10906 Mod Id: System: EEB -Emergency Power-W Ut1 Sys: 082 TVASNP1 GENERA EKDG0004406 DD: 07/06/87 Desc: DURING PLANT SHUTDOWN WHILE PERFORMING SURVEILLANCE INSTRUCTION FS: 07/03/87 SI-26 , DIESEL GENERATOR 1A-A TRIPPED . Appl: EPGE ID: 10/30/89 Cause: "B" PHASE SATURABLE REACTOR TRANSFORMER (T52) HAD A GROUND . ROOT CAUSE WAS UNKNOWN . ALSO "A" PHASE SATURABLE TRANSFORMER (T53) Desc: Emergency Generator FAILED THE HAINTENANCE INSTRUCTION 10 . 39 LEAKAGE CURRENT TEST . (Mfr: P292 - Portec Inc T51 AT 13 KILOVOLTS AND T53 AT 11 KILOVOLTS) . Mod Num: L10906 Action: REPLACED SATURABLE REACTOR TRANSFORMER T51 , T52 AMD T53 . Hod 1d: RETESTED TRANSFORMERS AND RETERMINATED CABLES . (WR B-276251) System: EEB -Emergency Power-W Ut1 Sys: 082 TEWNESSEE VALLEY AUTHORITY SE QUOYAH I TVASNP1 GENERA EKDG0004407 Desc: DIESEL GENERATOR 1B-B ALARM LIGHTS WERE ALL BURNING WHILE DIESEL DO: 03/21/84 FS: 02/21/84 WAS IN IDLE HODE . Cause: DIODE IN GENERATOR TROUBLE ANNUNCIATOR CIRCUIT FAILED DUE TO AGE ID: 10/30/89

Appl: EPGE
Desc: Emergency Generator

Mfr: P292 - Portec Inc

Mod Num: L10906

Mod Id:

System: EEB -Emergency Power-W

Ut1 Sys: 082

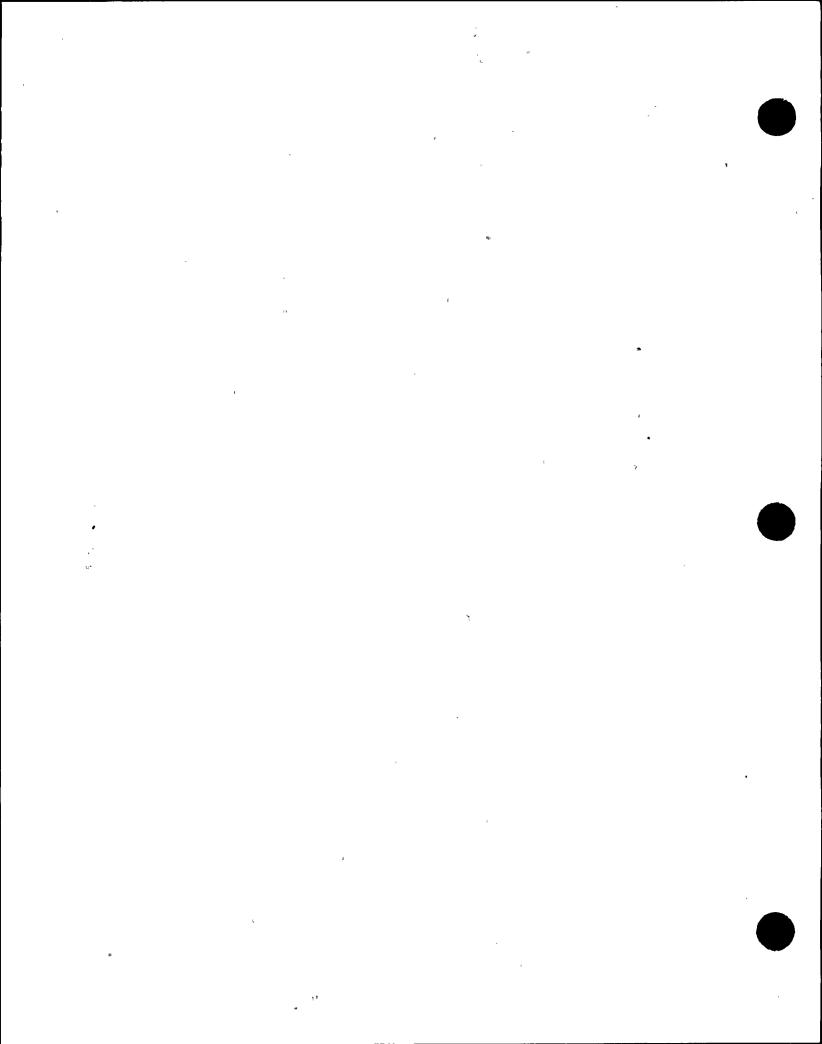
PEEBLES NEMP 12.4 REV. 1 ATT. A
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OPERATION . HR A-243904

Action: REPLACED DIODE IN ANNUNCIATOR CIRCUIT AND CHECKED FOR PROPER

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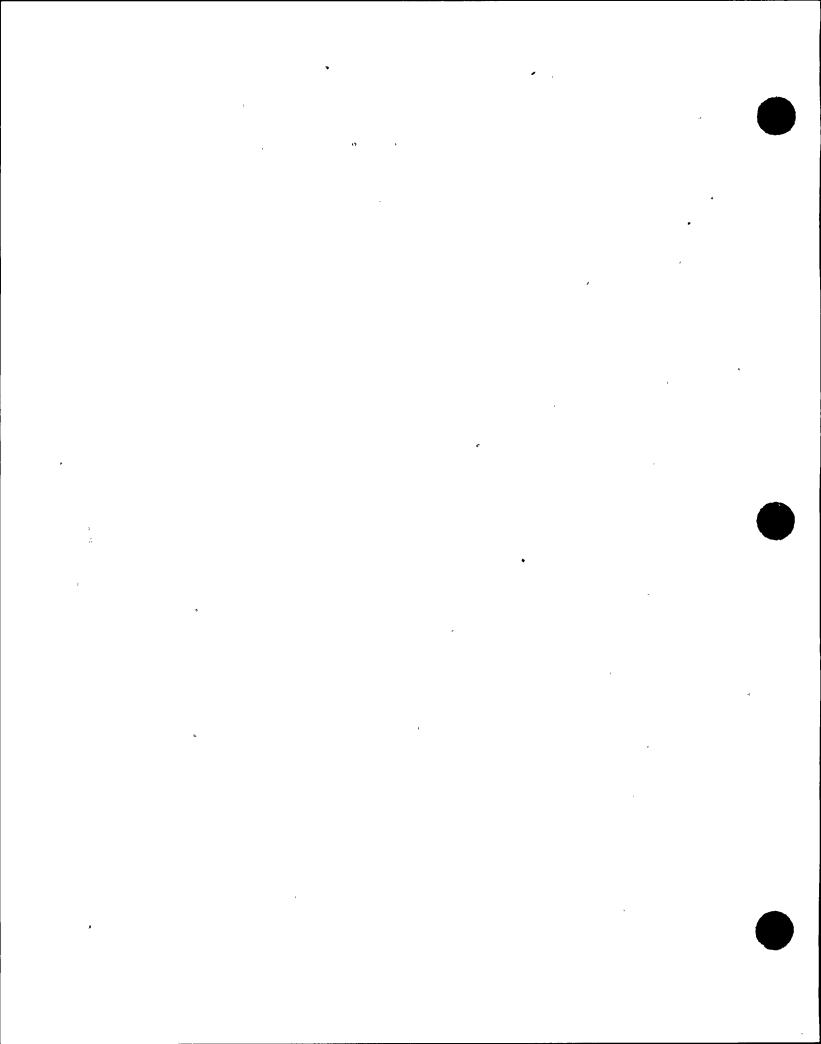
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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Hodel Number, Manufacturer Hodel ID

| K | UΠ | vate: | 01/1// | 3 |
|------|----|-------|--------|---|
| .lob | Kı | mber: | 8275 | |

| | _CompUtility Component Id | Dates | Marratives |
|---------------------|-------------------------------|------------------------------|---|
| | GENERA EKDGO004407 | 00: 08/28/85 FS: 10/20/84 | Desc: DURING UNIT 1 REFUELING OUTAGE, WHILE PERFORMING A SURVEILLANCE TEST ON DIESEL GENERATOR 18-B, EXCITER CUBICLE HAD DEFECTIVE |
| Appl: | Emergency Generator | 1D: 07/11/86 | COMPONENTS. Cause: DIRT ACCUMULATION CAUSED ARCING WHEN TRACKING BETWEEN PHASES, |
| Desc. | cmergency denerator | | RESULTING IN A PHASE A & B FAULT. |
| Hfr: | P292 - Portec Inc | | Action: LIFTED ALL BURNED AND BAD CABLE FOR REPLACEMENT . REPLACED BAD |
| Mod Num: | L10906 | | INNER PANEL WIRING . REPLACED TWO SUTURABLE REACTORS AND REPLACED |
| Mod Id: | - | | PARTS DAMAGED ON CT1 & CT2 WITH-PARTS TAKEN FROM SPARE CT . MR A-518232 |
| System: Utl Sys: | EEB -Emergency Power-W 082 | | • |
| TVASNP1 | GENERA EKDG0004407 | 00: 04/17/87 FS: 04/17/87 | Desc: DURING PLANT SHUTDOWN , SURVEILLANCE INSTRUCTION (SI) 102 INDICATED DIESEL GENERATOR 1B-B BOTTOM OUTBOARD BRUSH TENSION WAS OUT |
| Appl: | EPGE | ID: 07/17/87 | OF ADJUSTMENT. |
| | Emergency Generator | | Cause: BOTTOM OUTBOARD BRUSH SPRING TENSION WAS OUT OF ADJUSTMENT, ROO CAUSE UNKNOWN. |
| Hfr: | P292 - Portec Inc | | Action: ADJUSTED SPRING TENSION TO READ 3 LBS . PERFORMED STEP 6 . 2 . |
| Mod Num: Mod Id: | | • | ON SI 102 AND RETURNED TO SERVICE . (WR B-225507) |
| System: Utl Sys: | EEB -Emergency Power-W 082 | | • |
| TE | ENWESSEE VALLEY A | UTHOR MY | SEQUOYAH 1 |
| TVASNP1 | GENERA EKDGO004407 | DO: 09/06/85 | Desc: DURING UNIT 1 REFUELING OUTAGE, WHILE PERFORMING A SURVEILLANCE |
| | | FS: 06/14/85 | TEST , DIESEL GENERATOR 1B-B START UP TOOK APPROXIMATELY 11 . 5 |
| | EPGE | ID: 10/30/89 | SECONDS TO COME UP TO 6 . 9KV , EXCEEDING THE REQUIRED TIME . |
| Desc: | Emergency Generator | | Cause: RELAY KIA CONTACTS WERE PROBABLY BURNED OR CORRODED . |
| Wfm. | P292 - Portec Inc | | ACTION: CHECKED FIELD FLASH FUSES AND CIRCUIT, AND CHECKED CANNON PLUG INSULATION ON THE GOVERNOR. REPLACED THE BAD RELAY. GENERATOR |
| Hod Num: | L10906 | • | STARTED UP AT 7 . 01 SECONDS . HR A-536288 |
| Mod Id: | | | |





Mod Num: L10906

System: EEB

Ut1 Sys: 082

-Emergency Power-W

Hod Id:



Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Number: 8275

| _Unit | _CompUtility Component Id | Dates | Marratives |
|----------|---------------------------------------|------------------------------|--|
| TVASNP1 | GENERA EKDG0004407 | DO: 01/09/86 FS: 11/22/85 | Desc: DURING UNIT 1 REFUELING OUTAGE WHILE PERFORMING A SURVEILLANCE TEST , DIESEL GENERATOR 18-8 DID NOT MEET TECHNICAL SPECIFICATION |
| App1: | EPGE | 10: 10/30/89 | CRITERIA OF REACHING 60 HZ + OR - 1 . 2 IN TEN SECONDS . |
| Desc: | Emergency Generator | * | Cause: 1-GEMB-82-1B-B IDLE SPEED SETTING WAS SET TOO LOW TO MEET TEST CRITERIA. |
| Mfr: | P292 - Portec Inc | | Action: ADJUSTED PNEUMATIC BOOSTER AND IDLE SPEED SETTING PER THE |
| Mod Num: | L10906 | | VENDORS INSTRUCTIONS, ALSO ADJUSTED HINIMUM-MAXIMUM EXCITATION |
| Hod Id: | | | CURRENT LEVEL POINT PER VENDORS MANUAL . WR B-105193 |
| System: | EEB -Emergency Power-W | | |
| Utl Sys: | 082 | | |
| TVASNP1 | GENERA EKDG0004407 | DO: 05/06/86 FS: 01/16/86 | Desc: DURING UNIT 1 REFUELING OUTAGE, A SURVEILLANCE TEST INDICATED DIESEL GENERATOR 18-B FREQUENCY HODULE WAS OUT OF ADJUSTMENT. |
| Appl: | FDCF | ID: 10/30/89 | Cause: THE FREQUENCY HODULE WAS OUT OF CALIBRATION . |
| | Emergency Generator | 10. 10/30/09 | Action: ADJUSTED FREQUENCY HODULE TO . 120 OHHS . WR B-124786 |
| Hfr: | P292 - Portec Inc | | |
| Mod Num: | L10906 | | • • |
| Hod Id: | | | |
| System: | EEBEmergency Power-W | | |
| Utl Sys: | | | |
| | · · · · · · · · · · · · · · · · · · · | • | |
| TVASNP1 | GENERA EKDG0004407 | DO: 06/13/86 FS: 05/02/86 | Desc: DURING UNIT 1 REFUELING OUTAGE WHILE PERFORMING A SURVEILLANCE TEST , DIESEL GENERATOR 18-B LOADED TO 4000 KW AND DRIFTED DOWN UNTIL |
| App1: | EPGE | ID: 10/30/89 | LOAD CONTROL BECAME ERRATIC . |
| | Emergency Generator | 10, 50, 03 | Cause: BLOWN FUSE IN THE LOAD SENSOR POTENTIAL TRANSFORMER CIRCUIT . |
| | | | Action: REPLACED FUSE (BAF-3) AND ADJUSTED THE LOAD GAIN AND DE-DROOP |
| Hfr: | P292 - Portec Inc | | POINTS . WR B-121314 |
| | | | |

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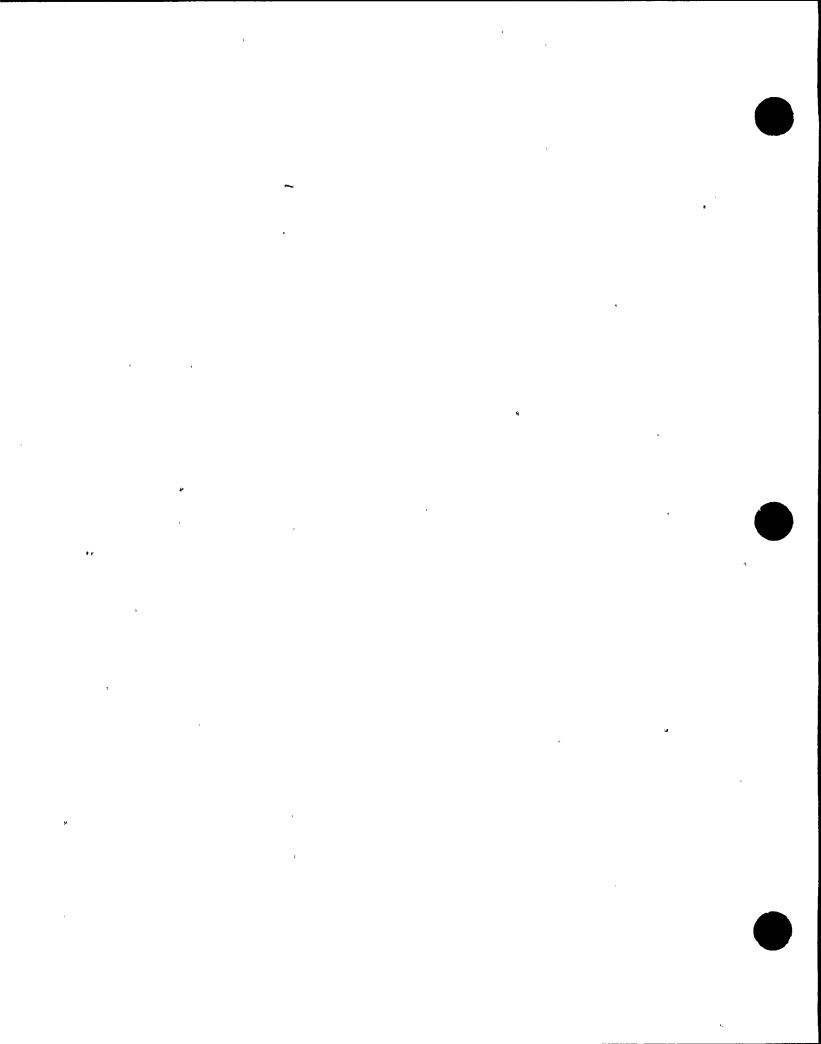


Run Date: 01/17/91

Job Number: 8275

Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

| _Unit | _CompUtility Component Id | _Dates | Marratives |
|-----------------------------|--|--|--|
| App1: | GEMERA EKDG0004407 EPGE Emergency Generator | DO: 08/27/86 FS: 07/25/85 ID: 10/30/89 | Desc: DURING UNIT 1 REFUELING OUTAGE . A SURVEILLANCE TEST ON DIESEL GENERATOR 1B-B INDICATED AN ERRATIC LOAD CONTROL . Cause: LOAD GAIN AND STABILITY POTENTIONETER WAS OUT OF ADJUSTMENT . Action: Adjusted Potentioneter for Proper Load Gain . WR B-126068 |
| Mfr: Mod Num: Mod Id: | P292 - Portec Inc L10906 | | |
| System: Utl Sys: | EEB -Emergency Power-W 082 | | |
| TVASHP1 | GENERA EKDGO004407 | DO: 08/27/86 FS: 07/25/85 | Desc: DURING UNIT 1 REFUELING OUTAGE . A SURVEILLANCE TEST INDICATED DIESEL GENERATOR 1B-B STABILIZE FREQUENCY WAS OUT OF SPECIFICATION . |
| App1: Desc: | Emergency Generator | ID: 10/30/89 | Cause: THE FREQUENCY RESISTOR WAS OUT OF ADJUSTMENT. Action: ADJUSTED THE FREQUENCY RESISTOR TO OBTAIN 60 HZ AND RETURNED TO SERVICE. WR B-202103 |
| Mfr: Mod Num: Mod Id: | • | | - |
| System: Utl Sys: | EEB -Emergency Power-W 082 | | |
| TVASNP1 | GENERA EKDG0004407 | DO: 01/21/87 FS: 04/10/86 | Desc: DURING PLANT SHUTDOWN . WHILE PERFORMING A SURVEILLANCE TEST . DIESEL GENERATOR 1B-B HAD A VOLTAGE SWING . |
| • • | EPGE Emergency Generator | ID: 10/30/89 | Cause: AMPLIFIER MODULE WAS BAD POSSIBLY DUE TO MORMAL MEAR. Action: REPLACED MODEL 2301 AMPLIFIER MODULE. CLEANED CONNECTORS ON BOTH ENGINES. ADJUSTED DROOP SETTING POTENTIONETER TO DECREASE |
| Mfr: Mod Num: Mod Id: | 4 | | LOADING TIME AND RETURNED TO SERVICE . WR 8-218959 |
| System: Utl Sys: | EEB -Emergency Power-W 082 | PEEBL | ES NEMP 12.4 REV. 1 ATT. A Pa 27 of 31 |









Run Date: 01/17/91 Job Humber: 8275

| _Unit | _CompUtility Component Id | Dates | Marratives |
|----------|---------------------------|------------------------------|---|
| TVASNP1 | GENERA EKDGO004407 | 00: 04/20/87 FS: 03/15/87 | Desc: DURING PLANT SHUTDOWN WHILE PERFORMING SURVEILLANCE INSTRUCTION (SI) 7 . DIESEL GENERATOR 18-8 DID NOT MEET ACCEPTANCE CRITERIA . |
| Appl: | EPGE | ID: 10/30/89 | Cause: DIESEL GENERATOR 18-B , WHEN STARTED FROM A SAFETY INJECTION |
| Desc: | Emergency Generator | | SIGNAL FOR SI-7 , FAILED TO ACHIEVE 58 . 8 HERTZ (HZ) . DIESEL CAME UP TO 57 HZ . |
| Mfr: | P292 - Portec Inc | | Action: OPERATIONS STARTED DIESEL GENERATOR 18-8 . ELECTRIC MAINTENANCE |
| Mod Num: | L10906 | • | SET FREQUENCY TO 60 HZ. MEASURED THE MOTOR OPERATED POTENTIONETER |
| Mod Id: | | | RESISTANCE FOR VALUE AND SET RATED FREQUENCY RESISTOR (FRR) FOR 47 & 88 OHMS . (WR B-223548) |
| System: | EEB -Emergency Power-W | | • |
| Utl Sys: | 082 | | • |
| TVASNP2 | GENERA EKDG0012801 | DO: 09/24/84 FS: 09/24/84 | Desc: FUSES ON EXCITATION PANEL OF UNIT 2 DIESEL GENERATOR 2A-A KEEPS BLOWING AFTER FUSES HAVE BEEN REPLACED ON FV-3 AND FV-4. |
| App1: | FDCF | ID: 10/30/89 | Cause: 24 VOLT DC DRIVE MOTOR WAS BURNED OUT. |
| | Emergency Generator | 10: 10/30/69 | Action: REPLACED 24 VOLT DC DRIVE MOTOR AND ADJUSTED CAM LIMITS . MR A-284804 |
| Hfr: | P292 - Portec Inc | | |
| Mod Num: | L10906 | | - |
| Hod Id: | | • | |
| System | EEB -Emergency Power-W | | |
| Utl Sys: | • • | | |
| TVACND2 | GENERA EKDG0012801 | 00. 09/22/06 | Desce Dining that 2 Oliver A Convertible Test Impression Diesel |
| IANDULE | AFUELO EVANANTSOAT | DO: 08/27/86 FS: 02/15/86 | Desc: DURING UNIT 2 OUTAGE , A SURVEILLANCE TEST INDICATED DIESEL GENERATOR 2A-A WOULD NOT LOAD UP OVER 1800 KW . |
| Appl: | EPGE | ID: 10/30/89 | Cause: SPEED SETTING KNOB WAS BINDING ON THE FACE PLATE . |
| Desc: | Emergency Generator | | Action: ADJUSTED THE FACE PLATE TO RELIEVE BINDING . WR B-126067 |
| Hfr: | P292 - Portec Inc | | |

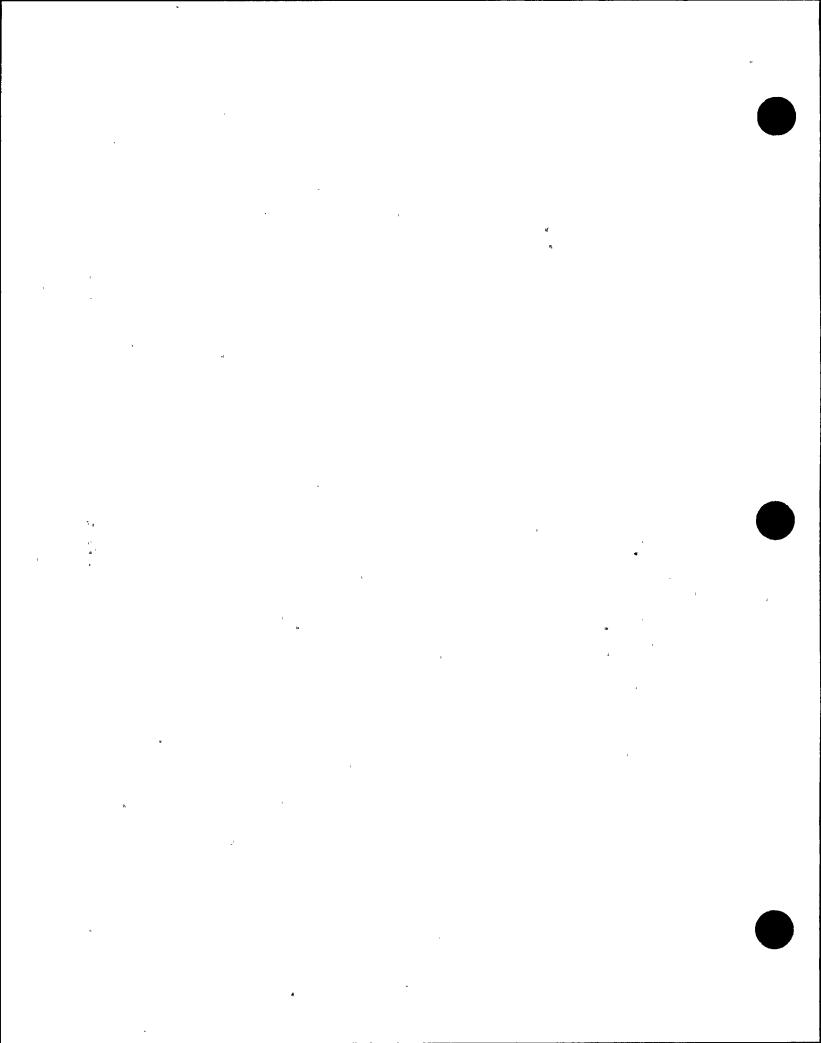
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System: EEB -Emergency Power-W

Ut1 Sys: 082

Mod Num: L10906 Hod Id:





Utl Sys: PE

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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Humber: 8275

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|---|------------------------------|---|
| _UnitCompUtility Component Id | Dates | Marratives |
| HLPSTN1 GENERA 3Q151MDG0134-GEN | DD: 04/04/89 FS: 04/04/89 | Desc: WITH UNIT 1 SHUTDOWN AND WITH THE STANDBY DIESEL #11 OPERATING AT FULL LOAD . THE HIGH PRESSURE FUEL LINE ON CYLINDER 2R PUMP WAS |
| App1: EPGE | ID: 06/13/90 | LEAKING ~2 DROPS PER SECOND . DG-76166 |
| Desc: Emergency Generator | | Cause: ROOT CAUSE IS UNKNOWN . |
| | | Action: REPLACED HIGH PRESSURE FUEL LINE TO INJECTOR AND RETURNED TO |
| Mfr: P292 - Portec Inc | | SERVICE . |
| Mod Num: L11102 | | |
| Hod Id: | | · · |
| System: EEB -Emergency Power-W Utl Sys: DG | - | • |
| APSPAVI GENERA 1EPEAGO1 | DO: 04/01/90 FS: 04/01/90 | Desc: DURING A CORRECTIVE MAINTENANCE ACTIVITY ON THE TRAIN " A " EMERGENCY DIESEL GENERATOR, THREE (3) OF THE TOP MOUNTING BOLTS FOR |
| App1: EPGE | ID: 11/13/90 | THE CAGE OF THE SHROUD ASSEMBLY MERE STRIPPED OUT . THE BOLTS AND MUTS |
| Desc: Emergency Generator | | SERVE ONLY TO HOLD WIRE HESH SCREEN ON GENERATOR END FOR VENTILATION . |
| = | | OF GENERATOR. THE FASTNERS AND SCREEN SERVE ONLY FOR PERSONNEL SAFETY |
| Mfr: P292 - Portec Inc | | . GENERATOR WAS DECLARED INOPERABLE DURING SCREEN REPAIR |
| Hod Num: TYPE L-11094 | | Cause: THE CAUSE WAS DUE TO THE BOLTS BEING OVER STRESSED DURING |
| Hod Id: | | TIGHTENING . THE CAUSE OF FAILURE WAS DUE TO HUMAN ERROR . THE SHROUD |
| | | ASSEMBLY IS A PIECE PART OF THE GENERATOR. THE TRAIN WAS DEGRADED BUT |
| System: EED -Emergency Power-CE | | DID NOT AFFECT SYSTEM OPERATION . |
| Ut1 Sys: PE | | Action: THE WELD SHOP INSTALLED NEW RETAINING NUTS . THE COVERS WERE |
| • | • | INSTALLED WITH NEW BOLTING BEING OF LIKE KIND . (00434898 RF) |
| ARIZONA PUBLIC SER | VICE CO. | PALO VERBE 1 |
| | | |
| APSPAV2 GENERA 2EPEBG02 | DO: 05/28/87 | Desc: UNIT WAS AT NORMAL OPERATING POWER . DURING NORMAL PREVENTIVE |
| | FS: 05/28/87 | MAINTENANCE ON THE DIESEL GENERATOR A BROKEN BRUSH ON THE TOP WEST |
| App1: EPGE | 1D: 09/12/87 | INNER RING WAS FOUND . |
| Desc: Emergency Generator | | Cause: UNKNOWN . |
| M6 0202 - David 1 | | Action: REPLACED THE BROKEN BRUSH WITH ONE FROM UNIT 3. |
| Hfr: P292 - Portec Inc | | |
| Hod Num: TYPE L-11094 Hod Id: | | A IN U POUL ATT |
| uon fa: | | PEEBLES NEMP 12.4 REV. I ATT. |
| System: EED -Emergency Power-CE | | |
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Mod Id:

System: EED -Emergency Power-CE



Run Date: 01/17/91 Job Number: 8275

Nuclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Comp _Utility Component Id Dates **Marratives** Desc: WHILE UNIT 1 WAS AT 100% POWER AND UNIT 2 IN REFUELING . THE PPLSESI ICMTRL 0C5198 DO: 09/28/86 SURVEILLANCE TEST " OFFSITE POWER SOURCE AND ONSITE CLASS 1E FS: 09/28/86 Appl: ID: 01/10/90 OPERABILITY TEST " SO-024-013 WAS BEING PERFORMED . THE OPERATOR WAS UNABLE TO ADJUST THE VOLT-AMPERES REACTIVE THUS HAVING TO SHUT THE "B" Desc: DIESEL DOWN . Cause: MOTOR DRIVEN POTENTIONETER MODEL #PDP-4 VDC MOTOR COUPLING HAD Mfr: P292 - Portec Inc Mod Num: 72-10400-100 BECOME LOOSE . THE ROOT CAUSE WAS DETERMINED TO BE THE DESIGN OF THE SET SCREW AND SHAFT MATING JUNCTION (THE SHAFT SURFACE IS TOO ROUNDED Hod Id: FOR A GOOD TIGHT FIT) . Action: THE TEMPORARY FIX WAS TO TIGHTEN THE SET SCREWS ON THE COUPLING System: EEA -Emergency Power-GE Ut1 Sys: 024 BUT THE REPLACEMENT EQUIPMENT FOR THE PDP-4 WILL HAVE THE SHAFT HODIFIED SUCH THAT THE SHAFT WILL HAVE A FLAT NOTCH MADE FOR THE SET SCREW TO MATE WITH . Desc: WHILE UNIT I WAS AT 100% AND UNIT 2 WAS AT 0% POWER THE PPLSESI ICNTRL OC519B 00: 01/18/86 FS: 01/03/86 SURVEILLANCE TEST " OFFSITE POWER SOURCE AND ONSITE CLASS 1E OPERABILITY TEST " SO-024-013 WAS BEING PERFORMED . THE OPERATOR WAS Appl: ID: 01/10/90 UNABLE TO ADJUST THE VOLTS AMPERES REACTIVE THUS HAVING TO SHUT THE Desc: "C" DIESEL DOWN . Cause: THE GENERATOR VOLTAGE REGULATOR MOTOR DRIVEN POTENTIOMETER'S Mfr: P292 - Portec Inc MODEL #PDP-4 MOTOR COUPLING HAD DISCONNECTED FROM THE POTENTIONETER . Mod Num: 72-10400-100 Hod Id: IT IS BELIEVED THAT THE COUPLING CAME LOOSE DURING THIS TEST. Action: TEMPORARILY THE COUPLING SET SCREW WAS TIGHTENED . AS SOON AS System: EEA -Emergency Power-GE POSSIBLE. THE PDP-4 UNIT WILL BE REPLACED. Ut1 Sys: 024 DD: 12/25/89 Desc: THE CONTROL ROOM REPORTED THAT THE 2A DIESEL GENERATOR (DG) WAS FPLSLS2 ICHTRL 2A-VAR OUT OF SERVICE DUE TO FLUCTUATIONS IN THE VOLTAGE REGULATOR CONTROLLER FS: 12/25/89 . NO IMMEDIATE EFFECT ON PLANT . App1: ID: 03/09/90 Cause: IT WAS DETERHINED THAT COMPONENT "IR" ON THE MAIN PRINTED CIRCUIT Desc: BOARD WAS LOOSE . CAUSE UNKNOWN . Action: "IR" WAS RESEATED AND THE DG WAS RETURNED TO SEVICE . PNO#7484 Mfr: P292 - Portec Inc Mod Num: 721140010

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Muclear Plant Reliability Data System - Failure Brief Report By: Manufacturer Model Number, Manufacturer Model ID

Run Date: 01/17/91 Job Humber: 8275

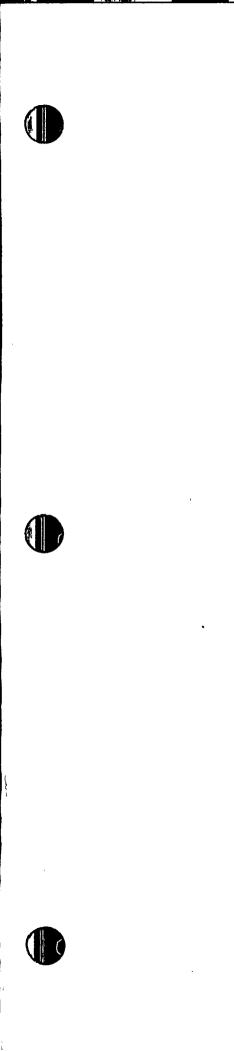
| שוינים | compUtility Component Id | Dates | Marratives |
|----------|--------------------------|--------------|---|
| SURBS1 | ICHTRL 1EGS*VR1B | 00: 10/21/90 | Desc: DURING REFUELING OUTAGE 3 , AFTER COMPLETION OF OUTAGE MAINTENANCE |
| | | FS: 10/21/90 | , 'B' DIESEL GENERATOR WAS STARTED FOR A TEST RUN . REGULATOR SURGE |
| App1: | | ID: 11/28/90 | SUPPRESSOR (PIECE PART) BURNED DUE TO HIGH CURRENT FLOM . THIS |
| Desc: | | | RESULTED IN A LOSS OF THE TRAIN BECAUSE THE REGULATOR WAS UNABLE TO |
| | | | PROVIDE FIELD EXCITATION WHICH PREVENTS THE DIESEL GENERATOR FROM |
| Hfr: | P292 - Portec Inc | | SUPPLYING THE 'B' EMERGENCY AC ELECTRICAL BUS . NO PLANT EFFECT . |
| lod Num: | 7213000100 | | Cause: OPERATOR SHUT DIESEL GENERATOR 'B' OUTPUT BREAKER APPROXIMATELY |
| Mod Id: | | | 90 DEGREES OUT OF PHASE WHICH, CAUSED EXCESSIVE CURRENT FLOW IN THE REGULATOR CIRCUIT. BURNING THE SURGE SUPPRESSOR. THIS FAILURE WAS |
| System: | EEA -Emergency Power-GE | | DUE TO OPERATOR ERROR . |
| tl Sys: | EHS/309 | | Action: THE SURGE SUPPRESSOR WAS REPLACED WITH A DIFFERENT MODEL . (|
| | | | SINCE A LIKE FOR LIKE COULD NOT BE FOUND WITHIN A ACCEPTABLE TIME |
| | | | FRAME) FROM THE ORIGINAL VENDOR . WHICH HAS SIMILAR OPERATING |
| | | * | CHARACTERISTICS . A HODIFICATION (MR 90-0137) WAS APPROVED TO |
| | | | PROCURE . INSTALL AND TEST THE NEW SURGE SUPPRESSOR . THE DIESEL |
| | | | GENERATOR 'B' WAS FUNCTIONALLY TESTED SATISFACTORILY . (R056635) |
| | - | • | |

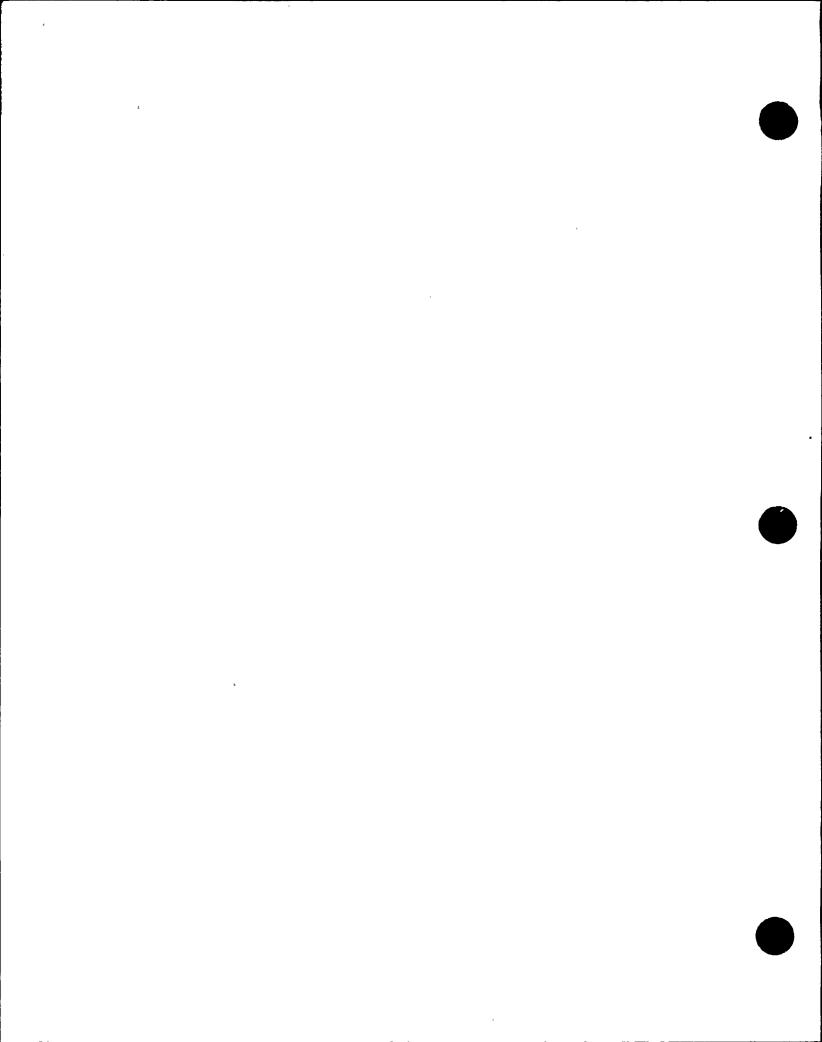
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10 CFR 21 NOTIFICATION FROM PEEBLES DATED NOVEMBER 24, 1986 ARIZONA POWER, PALO VERDE UNIT 3

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