

U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V

Report of Inspection

CO Report Nos. 50-275/69-3
50-237/69-5

Licensee: Pacific Gas & Electric Company
Diablo Canyon No. I
Construction Permit No. CPPR-39
Category A

Commonwealth Edison Company
Dresden II
Construction Permit No. CPPR-18
Category B

Date of Inspection: March 28, 1969

Date of Previous Inspection: March 11, 1969 (Diablo Canyon site)

Inspected by: *A. D. Johnson* *4/11/69*
A. D. Johnson
Reactor Inspector (Diablo I)

W. F. Vetter *4-11-69*
W. F. Vetter
Reactor Inspector
(Assist Inspection - Dresden II)

Reviewed by: *G. S. Spencer* *4/14/69*
G. S. Spencer
Senior Reactor Inspector

Proprietary Information: None

SUMMARY

1. The contract between Westinghouse and ESCO for the purchase of the Diablo Canyon primary coolant system fittings contained the necessary conditions to assure that the manufactured fittings would be consistent with the requirements contained in the PSAR.
2. Quality control requirements for the Diablo Canyon fittings were found to be consistent with those outlined in the PSAR. The requirements have been included as conditions in the purchase order agreement.
3. Appropriate documentation of the work performed by ESCO is generated to show that the fittings have been manufactured in conformance with the purchase order specifications.
4. ESCO's quality control programs include provisions for testing materials obtained from other firms.
5. Both PG&E and Westinghouse conduct inspection programs to assure themselves that the fittings produced by ESCO are of the quality specified in the purchase order agreement. The Westinghouse inspection activities appeared to be comprehensive. PG&E's activities appeared to be more of an audit type nature.
6. The ESCO data package covering the manufacture of the Dresden II recirculation pump suction covers was found to be adequately informative and indicated desirable product quality (see Section D. of this report).
7. Our review of ESCO's Quality Assurance (QA) program produced gratifying results in that the program appears to be up-to-date, comprehensive and consistent with good QA program criteria (see Appendix A of this report).

DETAILS

I. Scope

The Electric Steel Company (ESCO) Corporation, located in Portland, Oregon was visited on March 28, 1969. The purpose of the visit was to:

1. Evaluate the ESCO Quality Assurance Program relative to primary coolant system components for the Diablo Canyon No. I and Dresden II reactors.

2. Review ESCO's Quality Control efforts related to the primary coolant system components for the Diablo Canyon No. I reactor.
3. Review ESCO's Quality Control efforts related to the primary coolant pump suction covers provided for the Dresden II reactor.

The principal persons contacted during the visit included the following:

Mr. B. Kirby	- Vice President, ESCO
Mr. R. Groshart	- Manager, Quality Control and Inspection, ESCO
Mr. Phil Schwab	- Manager, Atomic Power Department, ESCO
Mr. R. E. Richmond	- Senior Product Engineer, ESCO
Mr. J. Waters	- Quality Assurance Supervisor, ESCO
Mr. G. W. Oldham	- Quality Assurance Supervisor, ESCO
Mr. W. R. Forbes	- Supervising Inspection Engineer, PG&E
Mr. N. S. Roose	- Senior Quality Control Engineer, Westinghouse
Mr. R. D. Page	- Quality Control Engineer, Westinghouse
Mr. E. W. Ziebell	- Quality Control Engineer, General Electric

II. Results of Visit

A. ESCO Quality Assurance Programs

Mr. Robert Groshart, Manager, Quality Control and Inspection, ESCO, presented a 45 minute, prepared talk which was developed to provide information relative to the general aspects of the plant QA-QC programmatic efforts. An analysis and evaluation of the QA program, prepared by W. E. Vetter, is shown in Appendix A to this report. The analysis and evaluation are based on the information provided in Mr. Groshart's presentation, his response to questions posed by the inspector following the presentation, and later meetings with ESCO QA-QC personnel.

B. ESCO Quality Control and Inspection Organization

The following information was obtained during discussions relating to the status, responsibilities and activities of the Quality Control and Inspection Unit at ESCO.

- i. The Quality Control and Inspection Unit enjoys Departmental status within the Company. Mr. Groshart, the Manager of the Department, reports directly to a Vice President of the Company.

2. The Department's current complement of personnel consists of three quality control engineers and three clerks.
3. Primarily the responsibility of the Department is to review all purchase orders and determine the requirements involved to fulfill the orders. These requirements relate to:
 - a. Personnel qualification.
 - b. Applicable standards; whether commercial or military.
 - c. Material requirements.
 - d. Inspections.
 - e. Acceptance standards.
 - f. Welding requirements.
 - g. Cleaning.
 - h. Heat treatments.
 - i. Packaging and storage.
 - j. Documentation.
 - k. Manufacturing procedures - determine whether ESCO's standard procedures are adequate and, if not, generate appropriate ones to manufacture the component as prescribed. All procedures are approved by Vice Presidents or Division Heads. All standard procedures are reviewed annually by management personnel.
 - l. Assure that manufacturing procedures are consistent with all code or purchase order specifications.
4. Department personnel follow ESCO's manufacturing processes to assure that work is being performed in accordance with the appropriate designated procedures. Subsequent to completion of the product, the records which provide the documentation to show that it has been manufactured as specified by the particular contract are reviewed by a representative of the Department. After approval of the documentation, the product is delivered to the purchaser along with a data package consisting of the supportive documentation relating to the article.

C. Diablo Canyon No. 1 Primary Coolant Fittings

The quality control effort related to the manufacture of the Diablo Canyon No. 1 primary coolant system fittings was reviewed by A. D. Johnson and determined to be as follows:

1. Relationship of Parties

By contract, Westinghouse is responsible for supplying the piping for the primary coolant system of PG&E's Diablo Canyon Unit No. 1 nuclear plant. Westinghouse, in turn, has contracted to purchase the fittings to be used in the system from Electric Steel Company (ESCO) located in Portland, Oregon. ESCO operates a foundry wherein such components are cast and fabricated.

When a particular component has been accepted by Westinghouse from ESCO, the component is tentatively assigned to a specific project. However, Westinghouse reserves the right to reassign components to other projects. Therefore, it cannot be stated with certainty that a particular component leaving ESCO will be unconditionally appropriated to the contract existing between PG&E and Westinghouse for the primary piping system of Diablo Canyon Nuclear Plant No. 1.

2. Purchase Order Specifications

The inspector reviewed the purchase order given to ESCO by Westinghouse for fittings to be used in fabricating the primary piping system for the Diablo Canyon nuclear plant. The order imposes upon ESCO, conditions relative to design, materials, applicable codes, quality control, nondestructive testing and documentation to show that the conditions have been performed. The following information was obtained from the review of the purchase order

a. Specification of Fittings

The purchase order specifications for the fittings were consistent with the requirements prescribed in Section 4 of the Preliminary Safety Analysis Report for Diablo Canyon Nuclear Plant No. 1. Specifically, the design stipulated to be 2485 psig and 650 °F, respectively. The order also prescribed the dimensions of the fittings and that the fittings be cast of material conforming to the standards of ASTM-351-CFSM with a maximum cobalt content of 0.2%.

b. Quality Control Requirements

The specifications of the purchase order concerning quality control requirements were observed to be consistent with the requirements of the preliminary safety analysis report for Diablo Canyon No. 1 nuclear plant in that:

- (1) The design analysis was specified to require compliance with the requirements of USA S.I. B31.1 code for pressure piping.
- (2) The specified nondestructive inspection requirements included dye penetrant and radiographic testing.
- (3) Conditions were included which require that ESCO submit the manufacturing procedures (e.g. welding, heat treatment, cleaning and inspection) to Westinghouse for review and approval.
- (4) Provisions have been included whereby Westinghouse has the right of inspection and in certain areas the duty to inspect and approve recorded results of tests.
- (5) Repair of defects are required to be approved by Westinghouse.

3. Component Quality

To determine whether or not ESCO is properly implementing the Quality Control Program to assure that the pipe fittings are manufactured in accordance with the purchase order specifications, the inspector reviewed available documentation concerning a 90° fitting currently assigned to PG&E's nuclear plant. At the present time, one 90° and four 40° fittings have been tentatively assigned to the Diablo Canyon project, according to Mr. Page of Westinghouse. From the review of the documentation and discussions with Messrs. Roose, Page and Waters, the following information was obtained.

a. Material Identification

All components are identified by heat numbers. A particular number is assigned a particular heat of metal. The number is provided for in the molds and thereby cast directly into both the component and corresponding test coupons when the metal is poured. This heat number is later included on an information plate which is later welded to the component. All information concerning a particular component can only be traced through the heat number.

b. Design Analysis

A stress analysis of the fitting was performed by ESCO personnel. According to Page, the analysis report contained in the data package has been reviewed and approved by competent Westinghouse design personnel.

c. Casting

The 90° fittings are cast in horizontal halves and later welded together. The casting molds are of selective sand.

d. Material Specification

Prior to pouring a particular heat of metal a mass spectrographic analysis is performed of the metal to ascertain whether or not the chemical composition conforms with the prescribed specifications. Later, after casting, additional analysis of the metal is performed to determine the chemical composition of the material. The red test coupons are also tested to determine the mechanical properties of the metal.

For the particular fitting under review by the inspector, the information contained in ESCO's metallurgical report of analyses showed that the material conformed to the contract specifications as to both chemical and mechanical properties.

e. Heat Treatment

Subsequent to welding and repairs, the entire fitting is subjected to heat treatment at temperatures of approximately 2000°F for a duration of approximately four hours. The specifications required heat treatment at a temperature in excess of 1950°F for a duration of one hour per inch of thickness. Recordings of the heat treatments were identified by an appropriate stamp with provisions included to show that the treatments had been reviewed and approved by Westinghouse. Mr. Page stated that the ESCO heat treatment procedures have been approved by Westinghouse.

f. Welding Procedure

The procedure used for welding the components is an ESCO standard procedure. Mr. Page stated that as per the contract provision, Westinghouse has reviewed and approved the procedure. Also, of note, Mr. Waters stated that ESCO manufactures components for the U. S. Navy to be used in nuclear systems and that the procedure also conforms to the requirements of the Navy for like work.

g. Welders

Welding personnel are qualified for certain work by ESCO as per Section IX of ASME Boiler and Pressure Vessel Code. The qualifications are reviewed by the Defense Contract Administrative Services Office (DCASO) located in Portland, Oregon. According to Mr. Waters, welders carry a card showing their qualifications. He added, however, that the welding supervisor is responsible to assure that only qualified welders work on the particular material in question. Welders are requalified quarterly, according to Mr. Waters. Mr. Page stated that the welders qualifications are reviewed by Westinghouse. Also, welders are identified in the records as to the work performed.

h. Welding Rod

Mr. Waters stated that due to previous problems of controlling welding rod material, strict administrative controls have been implemented. All rod material is stored in a separate room and only the welding supervisor may authorize withdrawal of rods from storage. The rods are given an ESCO identification number which is then used to identify the welding rod to be used on a particular job. Waters added that when a welder completes his work, he is required to return all unused material.

According to Waters, instances have occurred where the welding material has been other than stipulated when obtained from the manufacturer of the rod. To eliminate this possible gap in control, a sample of rod material is now analyzed when received from the vendor to assure that the rod material is properly identified.

i. Nondestructive Testing

The records of nondestructive testing of the primary system fittings indicated 100% coverage by both liquid penetrants and radiography.

Subsequent to repair of defects and heat treatment, the repaired areas were rechecked. Mr. Waters stated that the records contain the complete history of all repairs and tests.

The radiographs are read by two individual ESCO employees and then viewed by a Westinghouse inspector who signs the record indicating approval and acceptance of the product. These radiographs are then viewed by a PG&E inspector according to Forbes.

The contract specifications require that the radiographs be made in accordance with the provisions of ASTM E94-62T and accepted in accordance with ASTM E-186-65T, severity level 2 except that categories D & E are unacceptable. The radiographs are produced using type AA film with a cobalt-60 source. According to a report of PG&E's inspector, "the radiographs were of reasonably good quality with the 3.0 penetrament easily readable."

The records and certifications by ESCO and Westinghouse showed that the above requirements have been complied with before the fittings have been accepted by Westinghouse. Although records concerning the radiographs are transmitted to Westinghouse, the film itself is retained by ESCO.

j. Cleaning

Mr. Waters stated that a cleaning solution had been used to clean the fitting followed by rinsing with demineralized water. However, the cleaning solution now being used is Igepal which is an organic cleaning solvent according to Waters. The cleaning specifications required concentrations of chloride ions in the cleaning solution to be less than 10 ppm.

k. Pickling

According to both Westinghouse and ESCO personnel pickling of the component is excluded from the manufacturing process.

l. Storage

Fittings were observed to be stored on wooden plates in the storage yard. All fittings were wrapped in plastic.

m. Shipping

Mr. Page stated that the fittings will be shipped in a closed gondola car and that the components will be appropriately secured to prevent damage in transit. Some fittings have, in the past however, been shipped via flatbed cars according to Page.

n. Documentation

Based on the inspector's review all of ESCO's documentation pertaining to nuclear plant fittings manufactured for Westinghouse appeared to adequately show that the component had been manufactured as prescribed by the conditions of the contract. The contract between Westinghouse and ESCO provides that copies of all documentation concerning the fittings pass with delivery of the components to Westinghouse. Mr. Roose stated that copies of the documents related to a particular fitting pass to PG&E when appropriate as per the conditions of the Westinghouse and PG&E agreement.

o. Westinghouse Inspections

Mr. Page stated that under the Westinghouse-ESCO contract, Westinghouse has the right to enter at any time to observe work in process, and that all documentation is reviewed by a representative of Westinghouse to determine ESCO's performance of the conditions contained in the agreement.

p. PG&E's Inspections

Mr. Forbes informed the inspector that representatives of PG&E have audited documentation and test results at ESCO on two separate occasions prior to the current visit. He added that no significant deficiencies had been identified by the PG&E inspectors. He also showed the inspector the reports prepared by the PG&E inspectors subsequent to the visits. No deficiencies concerning ESCO's activities were identified in the reports.

D. Dresden II Recirculation Pump Suction Covers

W. E. Vetter met with Messrs. Grashart, Oldham and Ziebell, for a review of records associated with the three primary recirculation system pump suction covers which were manufactured for the Dresden II reactor. The significant results of the review are as follows:

1. The three covers were identified as P.O. No. V-48666 (GE to Byron Jackson) and P.O. No. 615313 (Byron Jackson to ESCO).
2. They were manufactured during July-August, 1966.
3. Two of the covers are identified as heat numbers 5114-1 and 2 and the third as heat number 5147-1.
4. The base material was certified (mill certification) as conforming, per purchase order requirements, to ASTM-A315 and CF6M.
5. Nondestructive test (radiograph and dye penetrant) reports and repair charts disclosed that one major and one minor casting defect (sand inclusions) were detected and repaired... on each of two of the covers... The repair charts and inspection sign-off sheets indicate that, as required, radiographs were used to verify proper weld repair after the first weld pass and half way through completed repair weld in the case of the single major defect.
6. The purchase order called for, and inspection sign-off verified, welding activities consistent with the requirements of ASME, Section IX. The records also indicated that the weld repair work was performed in a manner consistent with ASME, Section III.

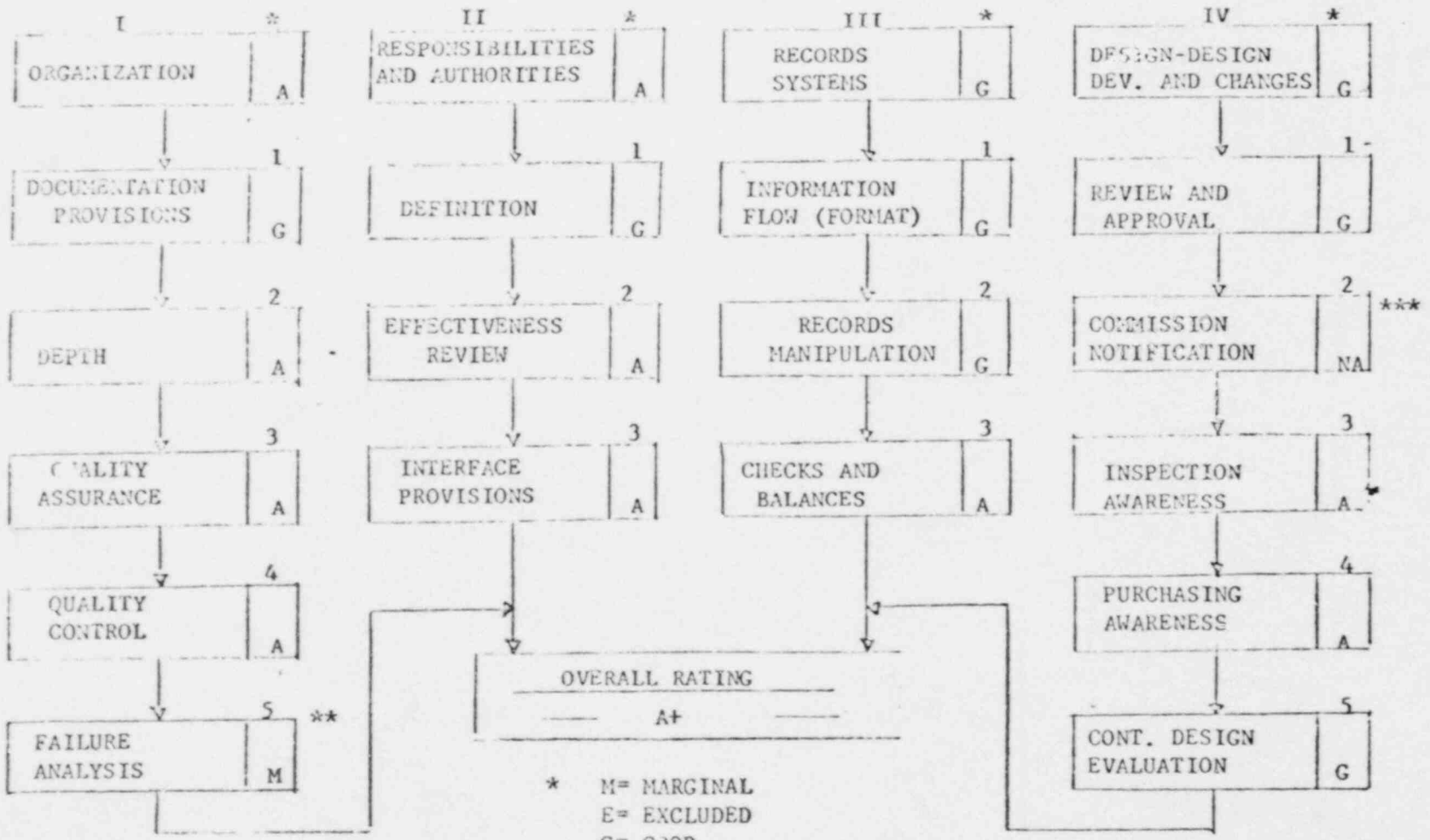
7. Although the suction covers were made of austenetic steel, outside storage was not a problem because the covers were shipped from the plant floor one day after final acceptance by GE-Byron Jackson inspection personnel.
8. Records of weld (filler) material control and usage were not available for review. Mr. Groshart explained that such records were not generated as far back as 1966. He added, however, that current QA-QC procedures provide for "High Performance Product" processing and that the subject records would have been maintained for the suction covers under the current procedures.
9. The available records established that the two suction covers requiring weld repair were subject to post-weld heat treatment according to code requirements.
10. Radiographs were not available for review, due to the elapsed time since manufacture of the suction covers, but Mr. Zeibell stated that the quality of ESCO radiographs is excellent.

E. Management Interview

The inspectors met with Mr. Kirby and members of his staff along with the Westinghouse and PG&E representatives at the conclusion of the visit. Subsequent to an explanation of the responsibility of the regulatory arm of the Commission in connection with PG&E's proposed nuclear plant, a brief summary was provided of the inspectors' activities during the visit. Mr. Kirby stated that he welcomed the visit indicating that ESCO gains from such visits in that outsiders many times see deficiencies not apparent to personnel close to the operation. He added that ESCO had been in the business of supplying products for nuclear applications for about 15 years and that it was the company's intention to stay in the field.

VENDOR/LICENSEE: ESCO CORPORATION - PORTLAND, OREGON

QUALITY ASSURANCE - QUALITY CONTROL PROGRAMS EFFECTIVENESS ANALYSIS



**Marginal in the "classical sense" but currently adequate (see App. A I.5.1.)

***NA = Not applicable

* M= MARGINAL
E= EXCLUDED
G= GOOD
A= ADEQUATE

(A) I. ORGANIZATION

- (A) 1.1. Documentation availability was considered to be adequate in that organization charts were made available to all key personnel.
- (G) 1.2. The scope and responsibilities of QA personnel were clearly documented.
- (A) 2.1. Personnel backgrounds were evaluated by reference to documented minimum requirements for each position. The requirements were found to provide for a top quality QA program.
- (A) 3.1. Staffing for QA functions...broad programs... appears to be quite adequate in the form of Mr. Groshart and two assistants.
- (A) 3.2. QA-QC liaison functions are maintained on the basis of a relatively "small organization--almost hourly contact" type of operation.
- (A) 4.1. Staffing for QC functions appears to be more than adequate. In addition to an adequate inspection team, Mr. Groshart's staff includes three QC engineers, three QC technicians and stenographic personnel..
- (A) 4.2. See comment under 3.2., above.
- (M) 5.1. Failure, performance analysis program personnel are not formally included into the QA programs. According to Mr. Groshart, a complete absence of field failures and the lack of on plant performance test requirements for most of the ESCO products, has precluded the need for a formal failure analysis program. However, a program was initiated to study failures, extended to the phase of the program as a whole, is "documented" and studied with an eye to reducing defect frequency.

(A) II. RESPONSIBILITIES AND AUTHORITY

- (G) 1.1. Quality of definition (scope-clarity). The QA program responsibilities and authority are well established by the conventional methods (organization charts and position descriptions.
- (G) 1.2. Responsibilities appear to be adequately commensurate with authority. Each position in the QA program is assigned full authority to function in a manner consistent with established responsibilities.

- (A) 2.1. Program effectiveness review provisions are thoroughly provided for in the form of QA programs and management appraisal...once each year, by a corporate level review committee.
 - (A) 2.2. Morale, quality inculcation programs (e.g.: Zero defect) are not provided on a formal, sophisticated basis. However, a strong motivation for manufacturing high quality products exists in that, once each year, one-third of the company profit is passed on to the employees in the form of a cash bonus.
 - (M) 2.3. Failure analysis programs are nonexistent, per se, except in an abstract form (see I 5.1. above).
 - (A) 3.1. Program interface and overlap considerations appear to be more than adequate...primarily due to a relatively small, harmoniously oriented, organization structure.
- (G) III. RECORDS SYSTEMS
- (G) 1.1. A system to control and implement the flow of information between QC, purchasing and inspection personnel has been provided. This system is conventional in that all information requires "reply by endorsement".
 - (G) 1.2. The information criteria and format design includes up-to-date standards and rendition techniques. For example, all weld repair efforts include "before and after" drawings showing the scope and location of repairs.
 - (G) 1.3. The scope of records appeared to be adequate in that enough information was available whereas the inclusion of extraneous information appeared to have been avoided.
 - (A) 1.4. Records cataloging was demonstrated to be excellent in that all records are indexed and are readily available by reference to purchase order - job order cross indexing.
 - (G) 2.1. Records location provisions were found to be more than adequate in that all pertinent information is maintained on plant.
 - (A) 2.2. Records availability was found to be adequate (see III 1.4., above).*

*This comment reflects current practices and should not be related to an earlier comment relative to the Dresden II recirculation pump suction covers.

- (G) 2.3. Records disposition presented no problems in view of the fact that all QC records are retained for at least ten years.
- (A) 3.1. Format check and balance provisions are provided in the form of flow and inspection sheet "stop and go" control on a basis of multiple sign off requirements.
- (G) IV DESIGN, DESIGN DEVIATION AND DESIGN CHANGES
 - (G) 1.1. QA-QC personnel review original design and all changes to assure that design characteristics will not adversely affect product quality.
 - (G) 1.2. Purchasing personnel review original design and all changes to assure design compatibility with material and/or equipment purchasing requirements.
 - (NA) 2.1. Commission notification procedures are NA.
 - (NA) 2.2. Commission notification lead time provisions are NA.
 - (A) 3.1. Inspection QA-QC notification of "change-change progress" is provided for in an adequate manner on the basis of a relatively small, close-knit, QA-QC organization structure as well as by review acknowledgment sign-off requirements.
 - (A) 4.1. Purchasing notification of "change-change progress" is adequately provided for as above.
 - (G) 5.1. A program for continuing design evaluation (systems, procedures and components) is provided and appears to be very dynamic. Any and all design weaknesses (characteristics noted during components manufacturing which might compromise quality) are called to the customers attention for consideration.