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ACTIVITY REPORT
QUALITY CONTROL INVESTIGATION
OF
CRITICAL PIPING SYSTEMS
FOR
OYSTER CREEK BWR
FOR
JERSEY CENTRAL POWER & LIGHT

No. DC-14 December 18, 1967

ACTIVITY REPORT

QUALITY CONTROL INVESTIGATION OF CRITICAL PIPING SYSTEMS FOR OYSTER CREEK BWR FOR JERSEY CENTRAL POWER & LIGHT

Period 11/27/67 thru 12/9/67

No. DC-14 December 18, 1967

(10 pages, 62 pages with Appendices)

AEC Contract No. AT(11-1)-1658
PARAMETER No. 67-68, Task A

Richard A. Lofy, P.E.
PARAMETER, Inc.
Consulting Engineers
Elm Grove, Wisconsin

Distribution:	Copies:
AEC Regulatory Organization	
Division of Compliance L. Kornblith - G. W. Reinmuth - H. R. Denton	(2)
AEC Contracts Division	
Chicago Operations Office H. N. Miller, D. Dixon	(1)
PARAMETER, Inc.	(1)
J. J. Chyle	(1)

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Introduction:

At the request of the Division of Compliance (Mr. H. Denton and Mr. G. W. Reinmuth), the writer participated in inspection and evaluation of the Recirculating Piping System for the Oyster Creek Station, Unit No. 1. This effort was part of a larger program by Compliance personnel to perform a quality control audit on construction of all critical piping systems for a report to the Advisory Committee for Reactor Safeguards.

The immediate objective of the work was to report on the status and effectiveness of the contractor's implementation of a quality control program. Early results of this work are reported in the writer's Interim Report of 12/5/67 (Appendix "A") and a verbal report to the ACRS on 12/9/67 which is summarized later in this report. Salient items requiring resolution are reported in these areas. The following sections of this report are intended to record chronologically the various related meetings and activities, and provide a format for comments and recommendations which might be considered for

incorporation in a final report by the Division of Compliance.

November 27, 1967, Monday: Bethesda

A general meeting and work session was conducted at Bethesda. Participating were Mr. Harold R. Denton, Mr. G. W. Reinmuth, Mr. L. Kornblith (part time), Mr. M. Ernst (part time), Mr. J. O'Reilly (part time) of the Division of Compliance Staff and the writer.

Mr. Denton presented the general plan-of-attack; using General Electric Specifications for a guide-line, to write Inspection Items Tables for each of the major components of the system.

After a review of the specification contents for the Recirculation System, Inspection Tables were prepared for the Shop Assembled Pipe, Site pre-assembly and Final Assembly stages. (Appendices B, C and D). These tables were to be used as a guide in obtaining information on construction of the system in an inspection trip to Oyster Creek scheduled Wednesday and Thursday, November 29th and 30th. Particular attention was given to those items which would bring

out the field erection history of the system. Other areas to be reviewed were materials certifications and nondestructive test records.

November 28, 1967, Thursday: Bethesda

During the morning a meeting was held with Dr. P. Morris, Director of the Division of Liscensing. Messers. Denton, Reinmuth, DeYoung, Liederbach, Englegen, O'Reilly and others were in attendance. Mr. Denton explained the plan for inspection of the Oyster Creek facility to include the following systems which were considered critical from a safety point-of-view:

1. The Main Recirculation Piping
2. The Primary Steam System thru the Isolation Valve outside of the containment
3. The Core Spray System
4. Control Rod Housings and Feed water Systems
5. The Automatic Depressurization System
6. The Containment

Dr. Morris expressed the need to learn whether conventional construction practices were going to be adequate for nuclear plants and if an effective quality control system were possible under present conditions.

The remainder of the morning was spent with Mr. Denton in discussing the quality control plan-of-attack for systems other than the recirculation piping.

During the afternoon, the writer completed an Inspection Items check list for the Main Recirculation Pumps (Table IV - See Appendix "E").

A specification for the two main shut-off valves in each recirculation loop was not available. Some time was spent studying the GE specification for the Steam Isolation Valves as it typified the ordering data prepared for cast valve bodies.

A meeting for the following week (Tuesday, December 5th) was planned to review proposed system inspection with other Division of Compliance personnel. These representatives of the various regions would be assigned to the remaining systems to conduct a quality audit similar to that planned for the recirculation system. (See Outline - Appendix "G").

November 29-30, 1967, Wednesday & Thursday - Oyster Creek, N.J.

Mr. G. W. Reinmuth, Mr. Cecil Jones, and the writer

visited the Oyster Creek site to conduct the above planned inspection. The writer's record of this visit and initial comments are contained in the Interim Report (Appendix "A") which was completed and transmitted to Mr. Denton in draft form on December 5th.

The Inspection Items Tables were used as an initial outline in interviewing the General Electric site personnel relative to field erection history and availability of records. Replies to most of these inquiries were recorded [illegible] and have been left as notations in the margins on copies of the Inspection Items Tables included with this report. (See Appendices B, C, D & E). General comments and recommendations will be made in the conclusion to this report.

December 5, 1967, Tuesday: Bethesda

A meeting was held on Tuesday morning at Bethesda to review the quality audit program for all critical systems at Oyster Creek. The writer's participation consisted of a verbal report to the group on the results of the previous week's inspection of the Recirculation System. He engaged in further discussions with the group on the other systems in an

effort to direct inspection effort to the most important areas and to the most likely sources of information at the site.

Participating in this meeting and subsequent conferences held during the day were the following Division of Compliance personnel:

Mr. L. Kornblith, Division of Compliance Hq.
Mr. H. R. Denton, " "
Mr. H. L. Denton " "
Mr. G. W. Reinmuth "
Mr. R. T. Dodds, San Francisco Region
Mr. W. D. Vetter " " "
Mr. J. Flora, Denver Region
Mr. J. Crews, " "
Mr. L. D. Low, Director, Division of Compliance

To outline the quality control program to the group, Mr. Reinmuth used a series of flip charts in his initial presentation. This outline is partially contained in Appendix "G". He explained the premises that quality of the primary system and the engineered safeguards was essential. Proof tests of the systems were not entirely adequate measures of integrity. Quality must be "built- in". Aside from visual

inspections, the principle methods available to the commission to assess built-in quality were through the "paper work" process -- that is via material certifications, nondestructive test reports, procedure and welder qualifications, and of course radiographs.

Following Mr. Reinmuth's presentation, the writer gave a short verbal report on our inspection of the recirculation loops at Oyster Creek during the previous week.

Ensuing discussions were concerned with definition of the other critical systems. The GE-P&ID Schematics were used to establish the boundaries of these systems generally as follows:

1. Recirculation Piping - (covered in Interim Report dated December 5, 1967 - Appendix "A")

2. Steam System - Piping and two isolation valves, one inside and one outside the containment vessel.

3. Automatic Depressurization - this system is comprised of four (4) valves attached to the main steam piping and vented to the suppression chamber. The vent lines are not considered part of the critical system.

4. Cores Spray System - Includes suction header, piping to booster pumps, piping to main pumps, piping to reactor vessel, internal piping and spray rings and associated pumps, valves and fittings.

5. Feed water System - During the meeting this system was identified by Mr. Denton as a separate item. It had previously been listed together with the control rod hydraulic systems. The feed water system would presumably consist of the piping and associated valves from the feed water pumps through the inlet to the pressure vessel.

6. Control Rod Housings & Hydraulic Lines - After review of the flow path followed by the control rod operating water and the potential leak path in case of failure of these lines, it was decided that this would not be considered a critical loss-of-coolant system. If the operating water lines failed, leakage from within the vessel would limited to that which passed a series of seals within the mechanism itself.

   The Control Rod housing itself however, is part of the fluid boundary and should be subjected the same type of review as other primary system components. The housings are a purchased item supplied to the site where they are field welded into the bottom head stub tubes. Materials, NDT, and fabrication records generated by the supplier should be available for these housings and should be reviewed as part of the program.

7. Containment - Drywell, Supression Chamber and interconnecting ducts.

   The fabrication of this system by Chicago Bridge and Iron Company was being reviewed by Mr. C. Jones of the Chicago Region Office.

The GE-P&ID schematics for the Oyster Creek plant were turned over to Mr. R. Dodds for use in his subsequent site inspection.

Mr. Low joined the meeting for a short time and brought out two procedural points regarding the Compliance QC inspection program. They were: (1) Scope - to include evaluation of conformance to specifications but not to include evaluation of specifications per se in meeting performance or design criteria; and (2) Reports - to be written in an objective a manner as possible to allow independent evaluation.

In further discussion of the program for inspection of the above defined systems, the writer explained the role of the different contractors in fabricating the systems as we had found it on site. Essentially these were:

Burns & Roe, Inc. - Overall responsibility for detail design and procurement of all systems except the main recirculation loops for which GE retained responsibility. Maintenance of procedure and welder qualification records for all on site work.

Almirall-Doyle Corporation (joint venture)

1. Field sub-assembly and final assembly of recirculation loops.

2. Core Spray System

3. Rod Hydraulic System (would probably not include housings)

4. Automatic Depressurization Valves

Almirall Corporation

1. Main Stem System

Chicago Bridge & Iron

1. Containment (no longer on-site)

Mr. Dodd's and Mr. Vetter reported on their inspection trip to GE-APED at San Jose. Manufacturing and test procedures, inspections and test records and materials records for control rods and the recirculation system were reviewed in considerable detail. (See Draft Report of Appendix "F").

In the General Electric specifications for the recirculation piping the attachment of internal flow restricter nozzles was mentioned. Design information on the nozzles or their method of attachment to the recirculation piping was not given. Mr. Vetter indicated that they did not learn any additional information about these connections.

Mr. Vetter mentioned that he was surprised to learn

that for purchased parts, GE depends more on an inspection procedure "audit" concept than on actual inspection. They do however witness many inspections.

Mr. Denton suggested that reports on systems to be inspected be as detailed as possible. The type and extent of the records review should be stated. In other words --what was looked at, percentage sampling taken, what questions were asked and what were the replies.

Mr. Dodds explained a real problem in following up records for items procured in quantity by GE. A production lot would include duplicate items going to a number of different reactor sites. The problem is how to find out which individual inspection records apply to the items which went to a certain site. This could be important; if deviations occurred during manufacture of an item, its final location would not be recorded.

During the afternoon, the writer discussed general details of our piping inspection with Mr. Flora and Mr. Crews. A suggestion by Mr. Flora that cloride

content of insulation applied to stainless steel piping should be followed.

December 7, 8, 9, 1967 - AEC Headquarters, Washington, D. C.

The writer was asked to attend meetings held at AEC Headquarters on the above dates and to be available to present results of our quality control inspection at Oyster Creek to the ACRS committee which was meeting concurrently.

As the presentation of the Division of Compliance was delayed on Thursday afternoon, the 7th, the onportunity was taken to discuss various details of the Oyster Creek inspection with Compliance personnel.

Mr. Reinmuth talked to GE personnel from the Oyster Creek site about the practice of stud welding pins to the cast SS pump and valve bodies. GE confirmed that this was not an approved practice. The pins will probably have to be removed and surface inspection performed to be sure that no damage has occurred. Mr. J. Chyle concurred in the opinion that the stud welding could cause cracking and provide a crevice susceptible to corrosion. This item should be followed up and GE's technical disposition reviewed.

A general discussion on electroslag welding was held in anticipation of this subject being heard by the ACRS. AEC Regulatory Organization personnel who participated were: Mr. L. Porse, Mr. S. Levine, Mr. SS Pawicki, Mr. DeYoung and Mr. A. Holt.

The writer reviewed a copy of Amendment No. 28 to the Licensee's Application which described the Quality Control plan at Oyster Creek in between meetings.

On Friday, December 8th, additional informal discussions were held with Compliance personnel. Participating at various times in these discussions were Mr. J. O'Reilly, Mr. Robert Carlson and Mr. Glen Madsen of the New York region, Mr. Denton, Mr. Reinmuth and Mr. J. Chyle.

Mr. J. Chyle and Mr. Carlson discussed their inspection of the Niagara Mohawk reactor vessel on December 4th. Mr. Chyle is summarizing his observations on this trip ina separate report. (PARAMETER Report No. DC-16).

The weld process for controlled shrinkage of the closure seams in the recirculation piping at Oyster

Creek was discussed. (This process uses TIG and SMA welding selectively to control shrinkage.) Mr. Chyle concurred in the opinion that changing the proportions of the weld metal deposited by the different processes would not affect the integrity of the all stainless steel weld. It was noted that the weld was finished by the TIG process to obtain a smooth surface for radiography with a minimum of grinding. Mr. Chyle was of the opinion that this change in process would require a new procedure qualification. Our interviews at Oyster Creek would indicate that the process was not requalified.

Late in the day on Friday, December 8th, the presentation by Compliance personnel was made to the ACRS. Mr. G. W. Reinmuth outlined the plan as described earlier in this report. The writer summarized the salient factors resulting from our inspection of the Recirculating Piping at Oyster Creek for the group. His comments are generally contained in the interim report (Appendix "A"). There were no questions requiring additional explanation made by the committee.

On Saturday, December 9th, the ACRS committee made inquiries into the stub tube problem at Oyster Creek. Mr. Chyle represented PARAMETER, Inc. in rendering his opinions regarding welding and welding metallurgy. The writer represented our interest in the design-analysis considerations. Results of our study on this subject and any technical recommendations will be treated in another report.

It is recommended that the design criteria and analyses prepared by GE for the Main Recirculation System piping be reviewed. The effect of piping misalignment and cold pull-up on piping operating stresses can then be evaluated more thoroughly, and a qualitative technical opinion rendered. As back-check on the alignment of the piping or pumps, the built-in "tilt" of the pumps could again be measured for all loops in the field. The effect of moment reaction of the tilted pump body upon righting itself under operating conditions on the pipe should be determined.

Review of Materials Certifications and Nondestructive Test records for all critical system components should

be followed up for two reasons. First, to verify the quality control of the items and secondly, to determine if the proposed record keeping system can be made to work.

Richard A. Lofy, P.E.

PARAMETER, Inc.
Consulting Engineers
Elm Grove, Wisconsin

12/5/67

AEC-No. AT(11-1)-1658
Parameter, Inc-67-68
Task A, Compliance
December 4, 1967

Interim Report: Inspection of Main Recirculation System - Oyster Creek Station No. 1, Jersey Central Power and Light Company, General Electric Company - BWR; Architect Engineer - Burns and Roe, New York
November 29-30, 1967

Introduction:

The writer accompanied Mr. G. W. Reinmuth, AEC Division of Compliance Head-Quarters, and Mr. Cecil Jones, AEC Chicago Region Office on the subject inspection trip to the Oyster Creek plant.

The primary purpose of this trip was to conduct Quality Control "audit" of the construction practices and supporting records pertaining to the main recirculation loops for the reactor. Of primary interest were the non-destructive test inspection records and practices, material records, welder and weld procedure qualifications and installation procedures.

The secondary purpose of the visit was to ascertain the availability of similar information for subsequent inspection of other critical systems by AEC personnel. These systems are:

The containment,

(Inspection of the containment was performed by Mr. Jones),

(continued)

The Core Spray System,

The Control Rod Hydraulic System,

The Main Steam System thru the second isolation valves, and

The Automatic Depressurization System.

Personnel contacted during the course of our tour and discussion of those systems were:

General Electric Company APED

Mr. William Royce

Mr. Charles Smith

Admiral Doyle Corporation

Mr. Len Wasson

Mr. W. Taylor

Discussion:

Upon arriving at the site on Thursday morning, in overall tour of the plant was made including a detailed inspection of the recirculation piping. Particular attention was focused on the recirculation pipe to nozzle welds, and the pipe to pump and valve connections, the hanger support system, and the construction of the valves and pumps.

During the afternoon, in a meeting with Messrs. Royce and Smith, the extent and availability of records was reviewed and the general site fabrication history was discussed. To act as a guide in this discussion, TABLES I thru IV of "Inspection Items" which were prepared at Bethesda on Monday and Tuesday were used. These tables were prepared from the General Electric specifications

(continued)

for the various components and fabrication stages required to complete the recirculation loops. These were:

1) "Shop Fabricated Stainless Steel Piping of the Reactor Recirculation System." Ref. G-E Specification 21A2104, Rev. 1, Table I of Inspection Items.

2) "Recirculation Piping installed (or subassembled) prior to vessel erection." REF. G-E Specification 22A2102, Rev. 1 - Table II of Inspection Items.

3) "Recirculation System Piping Installed after Vessel Erection." Ref. G-E Specification 22A2107, Rev. 0 - Table III of Inspection Items.

4) "Recirculation Pumps." Ref. G-E Specification 21A1202, Rev. 1 - Table IV of Inspection Items.

5) "Reactor Recirculation System Valves". Ref. G-E Specification 21A2305, Rev. 1. (Note: The specification was received at the site and thus an "Inspection Items" TABLE had not been prepared. However, as a main component of the system, it will be treated similarly to the other elements in this discussion).

The general correspondence and receiving records folders for these components were made available to us for study on Wednesday evening. From review of these records and discussion with Mr. Smith, Mr. Royce, and Admiral Doyle

(continued)

personnel, the following background history and status of information envolved:

A. Recirculation Piping. - Shop Fabrication

1) Straight sections of pipe were formed, welded, and heat treated by National Annealing Box Company under subcontract to Grinnell Manufacturing Company. Material certifications and radiographs for longitudinal seems are presumably on file with NABCO and duplicated at ~~GE~~ G-E-APED, San Jose.

2) Pipe formed elbows were made by Crane Company. Records on longitudinal weld seams would be maintained by Crane and similarly forwarded to G-E, San Jose through the fabrication contractor.

3) Grinnell Manufacturing prepared and subassembled the straight sections and elbows into the shipping pieces. Records (radiographs, weld material certifications, and welder qualifications would be expected to be maintained by Grinnell for the 5-year period required by ASME Code and also duplicated at San Jose).

a) Grinnell was responsible for the Code calculations for pipe sizing and reinforcement. Some of the reinforcement calculations were performed by Pipe Fabrication Institute in Pittsburgh. Calculations required by the fabricator were of a routine Code nature, taking into account pressure and steady state temperature only. The flexibility analysis and the thermal transient work (if any) were by G-E.

(continued)

4) Most piping was 316 SS. The type of SS - for individual pieces can be ascertained from Grinnell sketches which were for the most part included in the job folders.

5) Conformance of all material to chemistry and physical requirements would have to be ascertained through mill reports. No mill reports were currently available at the site.

NOTE: General Electric plans to move copies of all records to the site within the next few weeks. There is a question of whether they will be able to get copies of all radiographs due to ASME requirement that fabricator retain these. It could be recommended that, in the interest of an effective safety program, an ASME ruling be obtained to allow maintenance of all radiographs of plant components at the site.

6) With regard to minimum ferrite composition of weld metal, G-E (Mr. Smith) indicated that material was not accepted at the site unless it met specifications as tested by the supplier.

7) Records of repairs to components are maintained by G-E, San Jose.

8) Detailed drawings of the recirculation loop fabrication were not available. Thus it was not possible to review the attachment of the flow restrictor nozzles on thermal sleeves.

(continued)

9) Receiving reports consisted of routine acknowledgement of delivery. A visual inspection for damage was made at the site. We did not get a good feel for how the components were protected during shipment or storage. As-built dimensional records are apparently available at San Jose.

B. Recirculation Piping. - Field Fabrication

1) This work was performed by Admiral-Doyle on-site. The breakdown of work indicated by Part I and Part II (work before and after vessel installation was not always followed. They tried to do as much work "on the floor" as possible. We see nothing wrong with this practice.)

2) Early in the erection process, they found that they could get a man inside the recirculation pipe for its entire length. Thus, the need for the elaborate blind welding, baffling, and inspection procedures was voided. Visual inspection could be performed on all main welds. (access was allowed ~~xxxxx~~ when pump rotors were removed). This is a definite benefit to process control

3) There was an issue within G-E as to the desireability of using the peening process to influence joint shrinkage and subsequent alignment. Thus the field representatives chose not to use peening. Minor control over alignment was accomplished, by

(continued)

selective application of TIG and Metal Arc weld and by varying weld depth around the circumference of a groove. We believe this to be the preferred method.

4) Weld historys were being prepared by Admiral-Doyle for transmittal to G-E and were in good shape. We asked that an entry be made to the effect that peening was not performed and selective welding used for dimensional control where allowed by the specification.

5) Welder qualification records were being maintained by Burns and Roe on site. We did not review these records, but it is suggested that they be spot checked in the future.

6) From discussion with Mr. Smith, it was concluded that they approached fit-up and final closure welding of the loops very cautiously. They met all alignment tolerances and had no real trouble. Again, this is an operation which should be documented in the future as it affects the installed stress condition of the loop.

7) It was noted that some hangers supporting the pumps were disconnected. Mr. Smith explained that on these pumps, the motors had not been installed and thus the hangers were relieved to more accurately simulate the load on the loop.

8) It was learned that the main loop hangers must be blocked when the pipes are empty. They are designed to support the pipe

(continued)

full of water and will over stress the empty pipe. (If this is true, can such adjustments be made if it required to drain the loop after operation?)

9) The suction and discharge lines are approximately 10-11 feet different in length. To accommodate the differential thermal expansion resulting, the pump is cocked about 1/16" when the closure welds are made. It was indicated that this procedure was followed carefully and the fitup tolerence was met on all loops. Initial deflection was maintained during welding of the closure seams by selective weld deposit. (The preset described above should minimize stresses with the loop hot, However, it would be expected that some bending moment would be transmitted through the pump as the expansion occurred. Such a moment was not specified in the pump design requirements. It should be determined if this moment is a factor in pump performance.)

10) Only stainless steel wire brushes were allowed for cleaning of welds.

C. Recirculation Pumps

1) Files reviewed contained general assembly drawing of the pumps, performance specifications and test results.

(continued)

2) The pump drawings showed detailed end preparations for welding to the pipe. By visual inspection it was noted that the 3/4" blend radius and tapers specified were not held. On some pumps, sharp tocled corners existed at the transitions of the weld prep to the taper and from one taper to another. General Electric has taken action to grind these transitions on the basis of comments during a previous AEC inspection trip. This should be followed-up.

3) Pumps were manufactured by Bylon-Jackson. Housings were cast by General Electric in Schenectady. Only one set of radiographs for the pump castings are maintained at Byron-Jackson.

4) The correspondence files reviewed at the site included many trip reports on in-process inspection of the pumps. Approval of radiography, and penetrant inspection by GE-APED was recorded in the reports. Close follow-up of these units by G-E was in evidence.

5) During inspection of the pumps, it was noted that many pins were stud-welded to the casing to hold insulation in place. It should be determined if this weld could possibly be a crack starter on the casing itself.

(continued)

D. Recirculation System Valves

1) Valves were made by Chapman. Bodies are cast stainless SA-351 similar to the pump bodies.

2) The above comments of paragraph C-2 on abrupt transition sections mentioned ~~of~~ for the pumps also apply to the valves.

3) It was noted in the correspondence that some deviation from 100% radiography was considered on the valve bodies. The extent of this lack of coverage and significance, if any, should be determined.

4) The location of records for the valves was not determined.

General

General Electric has started to assemble all records on site by system. We were given a copy of the index to this filing system as it has progressed to date. None of the ~~files~~ on the six critical systems are yet in process. After learning which systems the AEC will be interested in, G-E personnel indicated they would work on these first.

Although records on the recirculation system were at a minimum, we were able to get a good feel for how the job was handled. Subject ~~to~~ future spot checking of records and correction or resolution of the items listed above, it can be concluded that the components were built and system assembled in good agreement with the General Electric Specifications.

(continued)

Probably the most important question to be answered is "are the specifications adequate for the operational requirements?" The primary considerations in design of the reactor itself are thermal transient conditions. These cycles limit the life of the vessel. The design rules are spelled out in Section III of the ASME Code and well accepted. This Code does not apply to the recirculation piping. Our review of the specifications for the pipe, valves, pumps and appurtenances show no consideration for thermal stresses or fatigue life. Service under these conditions can only be based on thermal analysis or on operation controls which preclude severe transient conditions. We recommend that the design basis be investigated for assessment of this plant and for informational value in future applications.

Richard A. Lofy, P.E.
Parameter, Inc.

DRAFT

TABLE I

INSPECTION ITEMS TENTATIVELY SELECTED FOR THE SHOP FABRICATED STAINLESS STEEL PIPING OF THE REACTOR RECIRCULATION SYSTEM

Reference: "Specification For Reactor Recirculation System Piping"; 21A2104, Rev. 1, dated January 9, 1965.

1. Sheet 1 of 1; Section 3.4 - Is shop a ASME code certified shop? yes "GRINNELL"

2. Sheet 1 of 1; Section 3.1 - Establish who was responsible for detail design, G-E or vendor? GRINNELL - Shop Drawings - Check on Code Design

3. Sheet 2 of 15; Section 3.3.5 - Establish that flexibility stress analysis and weight balance calculations were performed. (Tentative: To be reviewed for adequacy by Parameter, Inc.) by GE-APED (at San Jose)

4. Sheet 2 of 15; Section 4.1 - Establish which editions of Section I and which revision and addenda used. not determined

5. Sheet 3 of 15; Section 5.1 - Review representative mill reports from each supplier to ensure a minimum carbon content of 0.04% (Code would allow 0.08% - lower requirement reduces susceptability to sensitization). Records at San Jose

6. Sheet 3 of 15; Section 5.1.1 - Establish type of material, type 304 316 SS. or 316, used in all parts of system. Perhaps indicate on drawing. most pipings Mill Certs at San Jose.

7. Sheet 3 of 15; Section 5.1.2 - Establish compliance with Section I, including acceptance standards and sensitivity level. Radiographs - one set at Grinnell - one set at San Jose (at present - no plans to maintain at the Site

8. Sheet 3 of 15; Section 5.2 - Review representative mill reports from each supplier to ensure a minimum carbon content of 0.04%. Establish for each fitting whether wrought, forged or cast, and the availability of radiographs if cast. Welder qualification if welding employed. Records at San Jose and/or supplier

(continued)

9. Sheet 3 of 15; Section 5.2.2 - Establish whether G-E or vendor responsible for detail design.

See item no. 2 above

10. Sheet 4 of 15; Section 5.2.2.3 - Review representative mill certifications to ensure that chrome-nickel ratio is a minimum of 1.9 to 1 (affects weldability).

Records at San Jose

11. Sheet 4 of 15; Section 5.3.1 to 5.3.5 - Tentative review of drawings by Parameter, Inc., to ensure that drawings conform to design requirements. Compliance to determine if equipment conforms to drawing.

Piping "spool" dwgs. in file were incomplete. Should review GE-Spec dwgs

12. Sheet 4 of 15; Section 5.4 to 5.4.2 - Tentative review of drawing and weld procedure by Parameter, Inc., to establish effect, if any, of flow nozzle attachment on pipe integrity.

Same as above. No info on flow nozzle avail

13. Sheet 5 of 15; Section 5.7.1 - Review dimensional records, or certified drawings, to ensure compliance with requirements (See ASA B 31.1-1955, Appendix D to Section 6, page 125).

Supposed to be at San Jose

14. Sheet 6 of 15; Section 5.7.2 - Review dimensional records of cast fittings to ensure compliance with plus 3/16" or minus 1/8" from nominal wall thickness.

Controlled by Source inspect. by GE personnel. Should be on record in trip reports.

Inspection at Site is for obvious damage only.

(continued)

15. Sheet 6 of 15; Section 5.8.1 - Review certification records to ensure required heat treatment.(Essential for proper material properties). At San Jose and/or vendor shops

16. Sheet 6 of 15; Section 5.8.2 - Review fabricator records to ensure that either pickling or passivation operations performed (Sand blasting alone prevents successful liquid penetrant tests). at San Jose

17. Sheet 6 of 15; Section 5.9 - Review records of all repairs which required G-E approval for type and extent of defeats. At San Jose.

18. Sheet 7 of 15; Section 5.10 - Review records of all repairs which required G-E approval.

19 Sheet 8 of 15; Section 6.1 - Review all reports of substitutions, modifications, and relaxations of specified materials, procedures, and design for type and extent. At San Jose.

20. Sheet 9 of 15; Section 6.4.3 - Review representative records of ferrite tests to ensure ferrite content requirements met. (For clarification see Section 6.4.4 of "Reactor Recirculation Piping Installation Part II, Work After Vessel Erection," dated April 27, 1967). At San Jose

(continued)

21. Sheet 10 of 15; Section 6.4.5 - Review records of repairs requiring G-E approval for type and extent of defects. At San Jose

22. Sheet 10 of 15; Section 6.5.4 - Review of drawings by Parameter, Inc., to determine effect of thermal sleeve installation on pipe integrity (Thermal sleeves a priori evidence of high thermal stresses). see item No. 11 above.

23. Sheet 11 of 15; Section 7.2.1 - Tentative: Review representative number of radiographs to ascertain compliance with sensitivity requirement and certification. Radiographs at Grinnell and San Jose

24. Sheet 12 of 15; Section 7.4.1.2 - Review drawings to establish that films identified for each length of pipe. San Jose

25. Sheet 13 of 15; Section 8.0 - Review receiving reports to determine condition of pipe and fittings upon arrival and during on-site storage. Some receiving reports in folders - routine damage insp. only Burns & Roe signs off for receiving insp. at Site

Dimensional Records at Burns & Roe or San Jose.

26. Sheet 14 of 15; Section 10.2 - Audit drawings and determine low compliance with drawings established. San Jose

27. Sheet 14 of 15; Section 10.3, 10.3.1, 10.3.2, and 10.3.3 - Review all items listed to determine type and extent of all specification deviations and, tentatively, adequacy of code calculations. Info at San Jose

28. Sheet 14 of 15; Section 10.4 - If not covered above review records for completeness and adequacy.

APPENDIX "C"

TABLE II

INSPECTION TOPICS TENTATIVELY SELECTED FOR RECIRCULATION SYSTEM PIPING INSTALLED PRIOR TO VESSEL ERECTION

Reference: "Reactor Recirculation Piping Installation, Part I, Work Prior To Vessel Erection," 22A2102, Rev. 1, dated May 10, 1967.

1. Sheet 5 of 22; Section 6.3.1 - Review representative number of weldor's certificates of qualification. Records being organized in Almirall-Doyle field shop office

2. Sheet 5 of 22; Section 6.3.2 - Establish that written and approved procedures were used for all welding. Weld History records avail in A-D shop offic Procedure Qual. with Burns & Roe

3. Sheet 6 of 22; Section 6.3.4 - Review representative results of tests (for filler wire), to establish that weld deposits meet requirements. Identify any welds for which chemical analysis of wire or rod substituted for weld deposit analysis. GE Site Rep. would not accept rod unless accompanied by analysis and meeting spec.

4. Sheet 6 of 22; Section 6.3.6 - Establish which method used to determine adequacy of purge and type of problems encountered, if any. Mostly Oxygen Analyzer - 6X Volumetric Purge on some systems

5. Sheet 7 of 22; Section 6.3.7 - Visually inspect for compliance with surface requirements. See Appendix "A"

6. Sheet 7 of 22; Section 6.3.8 - Verify that peening was not used for dimensional control (Peening is expressed prohibited here but is required in Section 6.2.4 of Part II of the specification). No peening at all used. Controlled by adjusting TIG-SMA ratio

7. Sheet 7 of 22; Section 6.3.9 - Verify by visual inspection where possible that coated electrodes were not used on inside surfaces. (would not be a concern except for blind welds) They had good visual access to all welds for final inspect

8. Sheet 8 of 22; Section 6.5 - Establish whether any solvents other than acetone used in cleaning.

(continued)

9. Sheet 8 of 22; Section 6.6.3 - Determine whether brushes used in cleaning intermediate weld pases were of stainless steel. yes - SS

10. Sheet 9 of 22; Section 7.1 - Review procedures and acceptance standards to ensure compliance with PW-51, Section I. Review representative number of films for sensitivity and weld identification. films not reviewed this trip -

11. Sheet 9 of 22; Section 7.2 - Review procedure to determine compliance with acceptance standards. Determine whether standards comparable to Section III Code requirements.

12. Sheet 9 of 22; Section 7.3 - Identify the welds subjected to 5X visual examination in lieu of a liquid penetrant test. Used both methods on most welds (because welds were accessable this way)

13. Sheet 10 of 22; Section 3.2 - Review representative records to determine compliance.

14. Sheet 10 of 22, Section 3.3 - Determine that each weld history signed by APED representative. Review type and extent of all repairs and re-inspections.

Spot checked some Almirall-Doyle weld Histories — were generally complete. (when they are finished setting up files - good correlation to identification of welds should exist.)

TABLE III

INSPECTION TOPICS TENTATIVELY SELECTED FOR RECIRCULATION SYSTEM PIPING INSTALLED AFTER VESSEL ERECTION

Reference: "Reactor Recirculation Piping Installation, Part II, Work After Vessel Erection," 22A2107, Rev. 0, dated April 27, 1967.

1. Sheet 4 of 43; Section 6.1 - Review records to determine type and extent of each modification. At San Jose

2. Sheet 6 of 43; Section 6.2.3 - Determine if discharge and suction riser pipes installed within tolerances shown in Figure G. Identify any pipes for which G-E reviewed and approved deviations. met tolerances per interview with C. Smith

3. Sheet 7 of 43; Section 6.2.4 - Determine if pump casing flanges were installed within tolerance of Figure 7. Identify any instances in which peening was necessary. Verified - by interview - no records avail.

4. Sheet 7 of 43; Section 6.2.5 - Verify on at least one hanger that tolerance requirement is met. same

5. Sheet 9 of 43; Section 6.3 - Identify any deviations from sequence procedure specified in Appendix A. See Appendix "A"

6. Sheet 10 of 43; Section 6.4 - Items listed in Sections 6.3, 6.4, 6.5, 6.6, and 6.7, of CO Table II are applicable. In addition, determine that pipe has minimum engagement in the socket as specified in Figure 15.

7. Sheet 17 of 43; Section 6.7.1 - Identify any detergent used and its chemical composition.

8. Sheet 19 of 43; Section 7.0 - Items listed in Section 7 of CO Table II are applicable.

(continued)

(See Appendix "A" Interim Report freezing field installation)

9. Sheet 19 of 43; Section 7.3 - Identify method used for inspecting loop closure joints and type and extent of any defects found. Visual, PT and Radiograph.

10. Sheet 20 of 43; Section 8.0 - Items listed in Section 8 of CO Table II are applicable. In addition, determine if record of peening included in weld joint history. — Peening not used — they will so record in weld histories.

11. Appendix A - Identify procedural controls used to assure Compliance with requirements.

APPENDIX - "E"

DRAFT
11-28-67

TABLE IV

INSPECTION ITEMS TENTATIVELY SELECTED
FOR SHOP FABRICATED RECIRCULATING PUMPS

Reference: G.E. Spec. 21A1203, Rev. 1, "Specification for Recirculating Pumps and Drives with Mechanical Seals," dated October 22, 1964

Section 4.0 Codes

4.1 Determine certification of design, construction and test to applicable codes:

- Standards of the Hydraulic Institute
- Section VIII - ASME Code
- ASA - Pressure Piping Code

Section 8.0 Design Analysis - Review calculations to insure that requirements of 7.1.4 (earthquake acceleration) and 7.2.5 (design pressure rating) have been met.

Section 10.0 Materials

10.1 Determine that approved materials were used. Check chemical analysis - verify solution heat treatment of castings and forgings.

Section 11.0 Fabrication

Review - Weld Procedure Qualifications

Welder Qualifications

Heat Treating Procedures

Repair Procedures

Cleaning Procedures

Section 12.0 Inspec tion and Tests

Review dimensional record sheets on as-built drawings for conformity to product drawings.

Confirm inspection of pump after test.

12.1.4 Review certifications of compliance with all construction codes.

12.4.1 Review liquid penetrant inspection procedure. Determine that acceptance standards were met.

12.4.2 Verify that ultrasonic testing was performed. Determine procedure used and acceptance standards.

12.5.1 Determine that pump castings were 100% radiographed <u>after</u> heat treatment. Verify conformance to ASTM E71, Standards for Class 2 castings and 2% sensitivity level.

12.5.2 Review radiographs of pressure containing welds per parg. UW-51, Section VIII, ASME Code.

12.6 Verify hydrostatic test.

Section 13.0 Verify cleaning and packaging in accordance with specification.

Section 14.0 Review those submittal items of this section necessary to ascertain conformance to above listed requirements.

This data is required by the buyer and includes the following:

- Drawings
- Deviations from Specification
- Design Analysis Calculations
- Material Deviations or Substitutions
- Heat Treatment Procedures
- Welding and Weld Repair Procedures
- Weld and Welder Qualification Procedures
- Cleaning and Preserving Procedures (with chemical composition of solutions or agents)
- Ultrasonic Test Procedures
- Magnetic Particle Test Procedures
- Liquid Penetrant Test Procedures
- Radiographic Examination Procedure
- Hydrostatic Test Procedure

DRAFT
WEVetter
12/5/67

I. SCOPE

The General Electric Atomic Products Equipment Department (APED) plant, located at San Jose, California, was visited by R. T. Dodds and W. E. Vetter on November 21, 22, 27, 28 and 29, 1967. The purpose of the visits was to (1) review G-E's quality assurance efforts as they relate to the Oyster Creek reactor core sprey control rod and recirculation systems and (2) review G-E's APED "purchased material" and "on-site fabrication" quality control programs in detail.

II. SUMMARY

One area of the quality assurance program, in the opinion of the writer, appeared to justify criticism. As far as could be determined during the visit, a formalized failure analysis program was nonexistent.

The flow diagram shown on Figure I was formulated by the writer. It is based on discussions with the Managers of each of the six Quality Control groups shown and a review of program procedures. The flow diagram has not been reviewed by G-E.

In any case, the net results of the visits indicated that the APED Quality Assurance Programs, both with regard to structure and staffing, are adequate. (See Figure I, attached.)

III. DETAILS

The mechanisms, procedures, plans, etc., listed below are the primary constituents of the G-E APED Quality Assurance Programs. For additional information with regard to the control rod drive systems, see R. T. Dodds' report, that subject, dated 1967. For more detailed information

with regard to the core spray and recirculation systems, see W.E. Vatter's report, that subject, dated 1967.

A. Quality Control Direct-To-Site Procurement

1. Material and/or Equipment Request Forms (M&ERF)

These forms are issued by the Managers, as applicable, of the Product and Mechanical Engineering Groups. The forms contain all of the information and instructions considered necessary for processing by the Quality Control Subsection and Purchasing Operation, i.e., specifications, special instructions, etc.

The M&ERF's are reviewed by the Quality Control Direct-to-Site Procurement Group engineers. The engineer determines the adequacy of the M&ERF's. If they are found to be inadequate, they are returned to the initiator with appropriate comments. For example, if the specifications appear to pre-empt a satisfactory quality control program, Engineering and Quality Control personnel meet to make the required adjustments.

2. Quality Control Inspection Instructions (QCII)

QCII's are prepared by Quality Control Engineers in the Quality Control Direct-to-Site Group. The QCII's are prepared for the exclusive use of the vendor. The G-E field inspector only audits the vendor's performance - he does not make physical inspections, only audits, by observation.

The QCII's contain:

a. A scope section.

b. A process specification section.

c. Code requirements.

d. Defect classification section.

3. Quality Control Test Instructions (QCTI)

The QCTI's are similar to the QCII's except that they are concerned with product and equipment testing procedures and requirements.

4. Acceptable Quality Level Plans (AQL)

When appropriate, the Quality Control engineer designs and AWL plan which is to be followed by the vendor. The Quality Control Direct-to-Site Procurement field inspector audits the vendor's operation to insure conformance to the AQL plan.

5. Trip Reports - Communications

The results of inspection-audit visits to the vendor's plant by the field inspector are sent to the Quality Control engineer. These reports, plus telephone conversations between the field inspector and the Quality Control engineer and occasional visits to the vendor's plant by the Quality Control engineer, are the methods to insure a satisfactory end product.

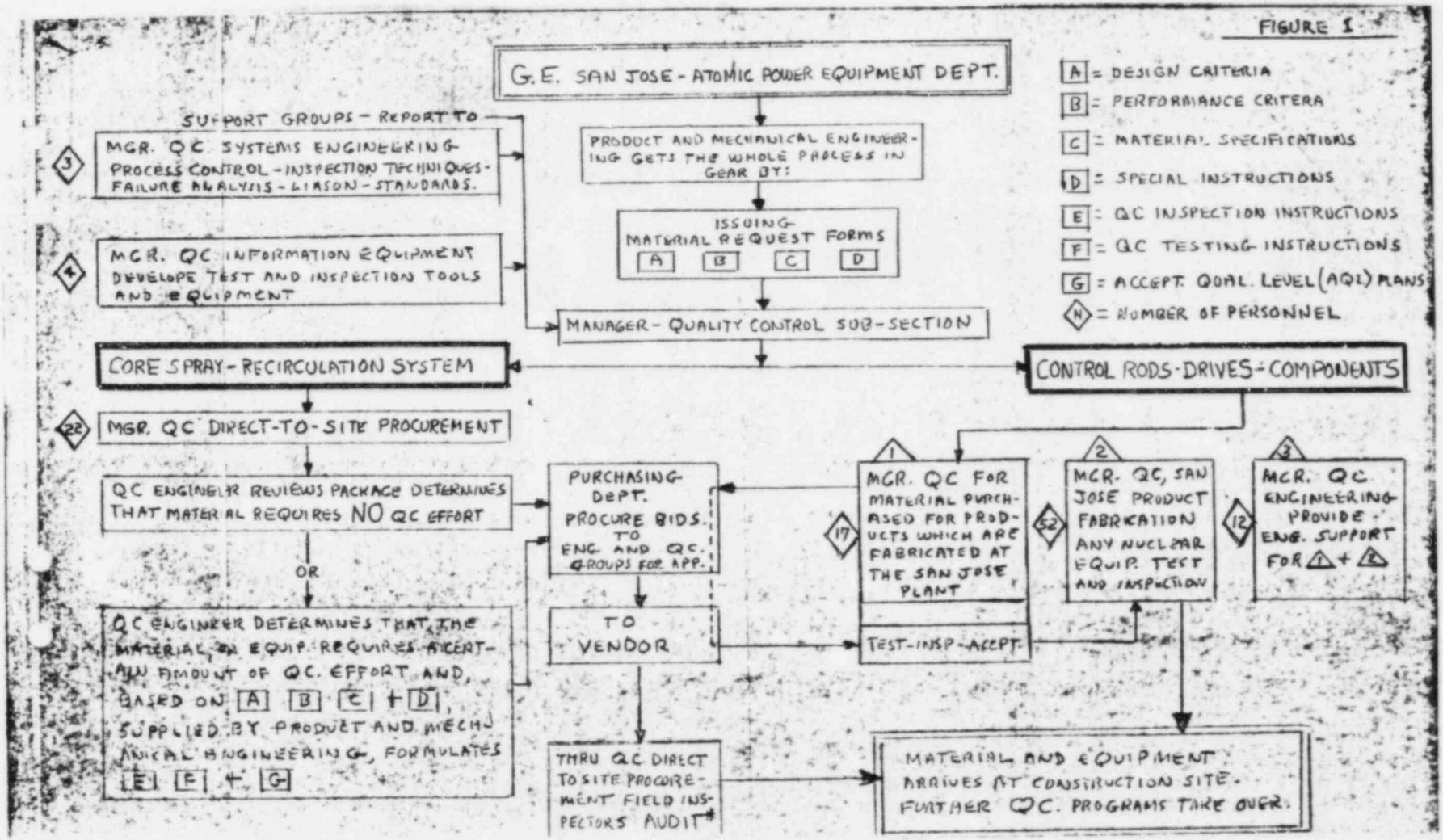
B. Quality Control San Jose Manufacturing

The Quality Control Programs associated with products manufactured at APED San Jose are essentially the same as those discussed under A above, for the Quality Control Direct-to-Site Procurement.

Attachment:

Figure I

FIGURE 1


G.E. SAN JOSE - ATOMIC POWER EQUIPMENT DEPT.
A = DESIGN CRITERIA
B = PERFORMANCE CRITERA
C = MATERIAL SPECIFICATIONS
D = SPECIAL INSTRUCTIONS
E = QC INSPECTION INSTRUCTIONS
F = QC TESTING INSTRUCTIONS
G = ACCEPT. QUAL. LEVEL (AQL) PLANS
N = NUMBER OF PERSONNEL
SUPPORT GROUPS - REPORT TO
3 MGR. QC SYSTEMS ENGINEERING - PROCESS CONTROL - INSPECTION TECHNIQUES - FAILURE ANALYSIS - LIASON - STANDARDS.
4 MGR. QC INFORMATION EQUIPMENT DEVELOPE TEST AND INSPECTION TOOLS AND EQUIPMENT
PRODUCT AND MECHANICAL ENGINEERING GETS THE WHOLE PROCESS IN GEAR BY:
ISSUING MATERIAL REQUEST FORMS A B C D
MANAGER - QUALITY CONTROL SUB-SECTION
CORE SPRAY - RECIRCULATION SYSTEM
CONTROL RODS - DRIVES - COMPONENTS
22 MGR. QC DIRECT-TO-SITE PROCUREMENT
QC ENGINEER REVIEWS PACKAGE DETERMINES THAT MATERIAL REQUIRES NO QC EFFORT
OR
QC ENGINEER DETERMINES THAT THE MATERIAL OR EQUIP. REQUIRES ASCERTAIN AMOUNT OF QC. EFFORT AND, BASED ON A B C + D, SUPPLIED BY PRODUCT AND MECHANICAL ENGINEERING, FORMULATES E F + G
PURCHASING DEPT. PROCURE BIDS TO ENG. AND QC. GROUPS FOR APP.
TO VENDOR
THRU QC DIRECT TO SITE PROCUREMENT FIELD INSPECTORS AUDIT*
1 MGR. QC FOR MATERIAL PURCHASED FOR PRODUCTS WHICH ARE FABRICATED AT THE SAN JOSE PLANT
17
TEST - INSP - ACCEPT.
2 MGR. QC, SAN JOSE PRODUCT FABRICATION ANY NUCLEAR EQUIP. TEST AND INSPECTION
52
3 MGR. QC ENGINEERING PROVIDE ENG. SUPPORT FOR 1 + 2
12
MATERIAL AND EQUIPMENT ARRIVES AT CONSTRUCTION SITE. FURTHER QC. PROGRAMS TAKE OVER.

letter

RECIRCULATION SYSTEM - NOTES - MATERIAL

1. Piping - Grinnel Co., Warren, Ohio

Reviewed Grinnel final report of all of the required mill tests and material certifications and other tests as required by the purchase order for all of the piping. This included:

a. Chemical Analysis

b. Mechanical Properties

(1) Tensile (91,000)

(2) Yield (53,800)

(3) Elongation (67%)

(4) Flattening (OK) (ASTM Code)

(5) Hydrostatic (2500 # - ASTM - OK)

c. Inspection Reports

(1) Heat

(2) Chemical-Physical properties

(3) X-Ray results

(4) Welding material analysis

(5) Hartford Boiler Inspection reports

d. Inspection Instructions

Quality Control Inspection Instruction

Quality Control Test Instructions

e. Trip Reports

(1) Indicate pipe pc. by drawing no. and whether accepted or rejected.

(2) Copies of inspection results slips which authorize shipment to site.

(3) Indicate unacceptable material by drawing/SN, reason unacceptable and required degree and type of rework needed.

2. Valves - Chapman, Division of Crane Co.

a. Spindles

All spindles were 100% tested for flaws with an Echo Ultrasonic instrument. The tests were made by the Magnaflux Corp.

b. Records Reviewed

Records of tests and inspection, as shown in 1, a, b, c, and d above were reviewed in detail.

c. Casings (Bodies) Bonnets, Discs, Radiography

(1) Total of 15 valves

Five suction

Five discharge

Five bypass

(2) Reviewed radiographic results

Radiography was performed using 1 Mev X-Ray - 1000 KV. X-Ray No. is stamped in casing and appears on X-Ray film for identification purposes.

(3) Material - Grade, cast type 316 stainless steel (CF8M).

(4) Acceptable standard for reading film - ASTM E71 - CL.II (Kodak).

(5) Technique - Double (two film covering total area).

(6) Radiography covered:

. All bodies

. All bonnets

. All discs

(7) Final Radiography Reports

. Showed no rejects

. Of 452 films, the following acceptable defects were noted:

(a) San inclusions - ~ 140

(b) Gas inclusions - ~ 78

(c) Surface defects - ~ 45

(d) Shrinks (Class II ASTM) - 5

d. Material Certifications

The material certifications for each of the 15 valves were reviewed. Typical certifications are attached.

e. Trip Reports

A review of the trip reports disclosed that the inspector witnessed various in-process tests and all final performance tests.

3. Pumps and Pump Motors - Byron Jackson

a. Run-in, Reliability, Performance Tests were performed on each of the 5 recirculation pumps. The run-in test procedures called for a 500 hour-test on the first of 5 pumps and a 200-hour test on the balance. According to the review of records,

10 pumps were purchased by the same purchase order - 5 for Oyster Creek and 5 for Nine Mile Point. My QC contact stated that only the first of 10 pumps received the 500-hour run-in test and the rest were subject to a 200-hour test. My QC contact said that the change in test procedure was approved by all of the required personnel.

b. Location of Pump Tests

The pump run-in tests were performed at the Los Angeles, Byron Jackson plant. Typical results of tests performed on two of the pumps are attached. Also attached is a diagram showing the test setup.

c. Purchase Specifications

The purchase specifications were reviewed and noted to be typical of G-E NED purchase specs. The specs include:

1. Scope
2. Responsibilities
3. General description of material
4. Applicable codes
5. System arrangement
6. System head loss
7. Design requirements
8. Design analysis
9. Construction requirements

10. Material identification

11. Fabrication requirements

12. Inspection and test requirements

13. Cleaning - shipping instructions

14. Submittals

The pump casting material tests, chemical analysis tests, radiographic, process line and penetration test results were not available for review at San Jose. My contact, however, said that the test results had been ordered as a result of my visit and that they would be stored at San Jose. He said that he had witnessed several of the tests and that this and other contacts with the vendor indicated a completely satisfactory product.

d. Trip Reports

A review of the inspection trip reports indicated that the field inspector observed:

(1) Radiographic and dye penetrant testing of the pump castings.

(2) Audited physical and chemical test data.

(3) Audited test reports of welding mediums and observed welding operations to insure that techniques matched requirements.

4. Motor Generators

a. Purchase Specifications

The purchase specifications were noted to be typically comprehensive.

b. Trip Reports

The trip reports were unusually informative and indicated adequate observation and followup by the inspector. The test results are on file at G-E's Motor Generator plant in Schenectady, New York.

5. Pipe Hangers - Grinnel Co. Warren, Ohio

a. Purchase Specifications

A review of the purchase specs, copy attached, and a review of a complete set of design drawings, indicated full compliance to the design criteria as described in the PHSR.

b. Trip Reports

The inspector's trip reports indicated full compliance with the Quality Control inspection instruction.

OUTLINE

PREMISES

SYSTEM SELECTION

INSPECTION ITEMS

SCHEDULE

CURRENT PROBLEMS

PREMISES

QUALITY OF PRIMARY SYSTEM AND ENGINEERED SAFETY FEATURES ESSENTIAL

NON-DESTRUCTIVE INSPECTION AND HYDROSTATIC TEST INADEQUATE ASSURANCE

CONTROL OF MATERIALS AND FABRICATION PROCESSES NECESSARY

RECORDS PRINCIPAL FORM OF EVIDENCE OF QUALITY

SYSTEM SELECTION

RECIRCULATION SYSTEM	-	G. W. Reinmuth M. L. Ernst M. R. Denton
STEAM SYSTEM AUTO. DEPRESS. SYSTEM	-	J. W. Flora
CORE SPRAY SYSTEM FEEDWATER SYSTEM C. R. HOUSINGS	-	R. T. Dodds W. E. Vetter
CONTAINMENT	-	C. E. Jones

INSPECTION ITEMS

I. MATERIALS

II. DESIGN

III. FABRICATION AND ERECTION

IV. INSPECTION

V. TESTS

VI. HANDLING AND STORAGE

TOPICAL OUTLINE OF CQ PROGRAM

I. MATERIALS

- MILL CERTIFICATES
  - CHEMICAL ANALYSES
  - MECHANICAL PROPERTIES
- CHECK ANALYSES
- HEAT TREATMENT HISTORIES

II. DESIGN

- ENGINEERING SPECIFICATIONS
- FABRICATION DRAWINGS
- DESIGN ANALYSES
  - CODE CALCULATIONS
  - FLEXIBILITY ANALYSIS
  - WEIGHT BALANCE CALCULATIONS
  - DEVIATION ANALYSES

III. FABRICATION AND ERECTION

- WELDING
  - PROCEDURE QUALIFICATIONS
  - WELDOR QUALIFICATIONS
  - WELD HISTORIES
  - REPAIRS
- ASSEMBLY PROCEDURES FITUP RECORDS

IV. INSPECTION

DIMENSIONAL

RECORD SHEETS

CERTIFIED DRAWINGS

FIELD CHECKS

NONDESTRUCTIVE TESTS

RADIOGRAPHS & PROCEDURES

LIQUID PENETRANT PROCEDURES

VISUAL INSPECTION

DEVIATIONS AND REPAIRS

V. TESTS

HYDROSTATIC PRESSURE TESTS

VI. HANDLING AND STORAGE

RECEIVING REPORTS

IDENTIFICATION PROCEDURES

PACKAGING AND STORAGE

PRE-ASSEMBLY EXAMINATION

DETERIORATION

CLEANLINESS

DIMENSIONS

SCHEDULE

ITEM	DATES	MAN-DAYS (not including report writing)
INSPECTION OF RECIR. S.	11/29-30	4
VISUAL INS. OF CONT.	11/29-30	2
MEETING WITH PARAMETER ON REMAINING SYSTEMS	12/5	6
INSPECTION OF CORE SPRAY, FEEDWATER, C.R.	12/6-7	4
REVIEW OF CB&I RECORDS ON CONTAINMENT	12/6-7	2
INSPECTION OF STEAM SYSTEM AND A.D.S.	12/11-12	2
REPORT ON RECIR. & POSSIBLY OTHER SYSTEMS	12/13	

CURRENT PROBLEMS

STUB TUBE CRACKS

FIELD WELD POROSITY

ARC STRIKES

PIPE TO FITTING WELDS

RADIOGRAPHS WITHOUT PENETRAMETERS

UPPER GRID PLATE EXPOSURE