TVA 64 (08-9-80)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

GNS 810908 051

TO : J. L. Williams, Jr., Director of Purchasing, 100 CUBB-C

FROM : H. N. Culver, Director of Nuclear Safety Review Staff, 249A HBB-K

DATE : September 8, 1981

SUBJECT: NUCLEAR SAFETY REVIEW STAFF MAJOR MANAGEMENT REVIEW OF THE DIVISION OF PURCHASING - NUCLEAR SAFETY REVIEW STAFF REPORT NO. R-81-15-PURCH(BLN)

Attached is the NSRS report of a major management review conducted of PURCH during the period May 11-14, 1981. PURCH's overall management controls system as it is related to nuclear safety and the adequacy of its interface controls with OEDC as applicable to the Bellefonte project was reviewed. This report is the result of our review intentions described in my earlier memorandum to you dated March 19, 1981 (GNS 810319 001).

We believe this comprehensive management review has indicated that the Division of Purchasing should have a formal QA program as required by regulatory requirements and commitments to cover the quality achieving functions it performs. Presently, PURCH is using its Procurement Manual to handle both its QA and non-QA procurement responsibilities. This presents a conflict whereby the manual specifically indicates it is basically a reference document for providing internal guidance for PURCH employees to carry out their delegated procurement functions. Yet, it goes on to require mandatory compliance with any QA requirements contained therein. This duality presents some difficulty for PURCH employees who must comply with this document. Breakout of these procedures into a separate QA program document is considered by NSRS as the best resolution to this problem.

The report also indicates other areas where NSRS believes meaningful programs have been established, where programs need improvement, and where programs appear to be adequate but improved implementation is required.

The report contains six recommendations covering findings in six functional areas. In the course of the review, programs were primarily examined against NRC requirements. However, in some cases recommendations resulted from subjective judgment rather than specific requirements identified by the NRC. A bracketed R or E has been placed at the end of each recommendation. The [R] indicates that NSRS has concluded that the recommendation is based on regulatory requirements. The [E] indicates that NSRS has determined that the recommendation has no regulatory basis. It is considered an enhancement and is based on subjective judgment. You are requested to provide us with your plan for resolving all the recommendations within 30 days of the date of this memorandum. It is expected that appropriate action to correct the conditions associated with the recommendations based on regulatory requirements will be completed in a timely manner.

NUCLEAR SAFETY REVIEW STAFF MAJOR MANAGEMENT REVIEW OF THE DIVISION OF PURCHASING - NUCLEAR SAFETY REVIEW STAFF REPORT NO. R-81-15-PURCH(BLN)

This review has involved a significant number of your key staff and has required a closely coordinated effort by your staff. This review could not have been completed in a meaningful manner had it not been for the excellent cooperation and professional attitude of your staff. This consideration is greatly appreciated.

If you have any questions concerning the report, please contact M. V. Sinkule at extension 6620 in Knoxville.

H. N. Culver

RCS:LML
Attachment
CC (Attachment):
G. H. Kimmons, W12A9 C-K
MEDS, 100 UB-K

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

REVIEW

NSRS REPORT NO. R-81-15-PURCH(BLN)

SUBJECT: MAJOR MANAGEMENT REVIEW OF THE DIVISION OF PURCHASING MANAGEMENT CONTROLS AFFECTING BELLEFONTE NUCLEAR PLANT

DATES OF REVIEW: MAY 11-14, 1981

TEAM LEADER: Robert C. Sauer — ROBERT C. SAUER — 8 Sept 81 — DATE

REVIEWER: John W. Mashburn — JOHN W. MASHBURN — 8 Sept 81 — DATE

REVIEWER: M V Sinkule for — BRUCE F. SIEFKEN — 9/8/81 — DATE

APPROVED BY: M V Sinkule — MARVIN V. SINKULE — 9/8/81 — DATE

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I. BACKGROUND

The basis for the establishment of the Nuclear Safety Review Staff (NSRS) was to provide an independent group to advise the General Manager and the Board on nuclear safety policy and to assist in making decisions affecting the safety of TVA nuclear plants. The need for this type of staff was established on the premise that nuclear safety questions should be reviewed independently of the normal engineering and operating divisions of TVA, and that this review should be incorporated into the decisionmaking process.

In order to fulfill its stated purpose, NSRS must independently assess all phases of TVA's nuclear program. Investigations and reviews are the two basic activities performed by NSRS in the assessment of the program. Investigations are usually reserved for employee concerns and significant events relating to safety. The reviews cover a large variety of activities and may involve an indepth evaluation of a very small area or the scope may be greatly expanded with a corresponding reduction in depth.

The review of the Division of Purchasing (PURCH) as reported herein was not as broad in scope as our current Office of Engineering Design and Construction (OEDC) and previous Office of Power (POWER) [GNS 810515 001] reviews and was significantly limited in its depth due to the limited quality assurance (QA) functions PURCH performs. The purpose of the PURCH review therefore was to assess the overall management controls system throughout the division as they are related to nuclear safety and the interfaces with OEDC as applicable to the Bellefonte (BLN) project. It was this interface activity that prompted our decision to review PURCH concurrently with the OEDC review. In addition, since PURCH performs only a limited QA function, it was decided that this aspect of the review could be reported separately to facilitate earlier reporting and a better understanding by PURCH of our concerns.

II. SCOPE

This review of PURCH has been classified by NSRS as a major management review since:

A. It is part of a companion effort to the NSRS major management review of OEDC management controls for activities affecting nuclear safety, and

B. This review was designed to cover essentially all aspects of the management controls system associated with quality assurance involving PURCH.

To accomplish this task, the program for management control of equipment, materials, nuclear and open market procurement in PURCH were reviewed for compliance with regulatory requirements and commitments; to the latest standards which relate to management controls; and to good quality or safety practices established by industry.

the review was limited to some degree because it was directed only toward BLN. The major difference between this plant and others, so far as PURCH is concerned, is the scope of QA related work PURCH is involved with. For STRIDE contracts, the scope of QA related work is much larger. BLN is representative of the non-STRIDE plants, however. The review was intended to be broad enough in scope and of a depth only adequate to determine whether:

-written policies, procedures, or instructions which provide guidance in the management of the NSRS determined functional review areas have been established;

-the policies, procedures, and instructions established by management are adequate to assure management that their activities for TVA nuclear plants are performed within regulatory requirements, TVA commitments, and accepted industry practices;

-personnel who have responsibilities important to nuclear safety or quality are adequately trained and qualified and have an understanding as to their role in the accomplishment of their responsibilities; and

-the requirements delineated in the policies, procedures, or instructions have been implemented.

The overall goal of the review therefore was to formulate a composite assessment of the PURCH management controls over the activities described above through the individual review of the following six functional areas:

1. Quality Assurance Controls/Responsibilities
2. Records and Document Control
3. Personnel Qualification and Training
4. Procurement of Materials and Nonpersonal Services
5. Corrective Action Controls
6. Interface Controls

III. MANAGEMENT OVERVIEW

The management review of PURCH has been conducted by NSRS to provide an independent assessment of the procurement phase of TVA's nuclear programs and to determine the adequacy level of PURCH's safety (quality) policy in accomplishing its activities. This review is commensurate with the chartered responsibilities of NSRS detailed under the Office of the General Manager section in the TVA General Releases Manual.

In addition, this review is part of a general assignment directed by the General Manager (GNS 810206 105) in an effort for NSRS to overview

TVA's activities in the area of quality assurance. This directive was issued in order that an assessment be made as to the adequacy and effectiveness of the present nuclear quality assurance system and to recommend any changes deemed necessary to achieve the level of quality that the TVA Board has mandated by its safety-first policy.

The results of this review have shown that PURCH has not established a formal QA program as required by regulatory requirements and commitments to cover the quality achieving activities it performs. PURCH had opted instead, to incorporate into its Procurement Manual its interdivisional responsibilities for quality assurance such as those contained in ID-QAP-4.1 and 4.2. This presents a problem for regulating and reviewing agencies who review PURCH's quality assurance program since the Procurement Manual is a nonbinding and subject-to-change-without-written-notice document. In addition, it had been determined by the Office of the General Counsel that the Procurement Manual contained no "matters of interdivisional significance." Incorporation therefore, of its QA responsibilities into the Procurement Manual effectively negated any obligation to adhere to those requirements.

NSRS cannot in any manner say that PURCH had avoided any of its known QA responsibilities. Quite the contrary. NSRS found that PURCH had established an active commitment to QA by its methods of internal auditing and direct supervision of its procurement activities. Further, PURCH has demonstrated that it invites and welcomes quality assuring agencies (e.g., EN DES QAB) to give lectures on QA or to independently review its activities. In addition, NSRS found the Procurement Manual to be of exceptional detail quality and considered it an excellent source document for the training of PURCH personnel, one of the stated purposes of the manual.

NSRS believes the incorporation of the six recommendations provided in this report will definitely strengthen an already strong PURCH organization and will enable them to comply with regulatory and TVA requirements.

IV. SUMMARY AND CONCLUSIONS/RECOMMENDATIONS

The management review of PURCH has been conducted by NSRS to provide an independent assessment of the adequacy of the procurement QA program established by the division and to assure an adequate level of safety (quality) in the activities assigned has been achieved.

The findings of this review were formulated by observation, review of events, review of records, discussions with personnel, and review of outside activities directly affected by or related to PURCH. The most effective method for any review organization to assess program implementation is through observation. It is also the most time consuming and controversial, therefore, the use of this review method was extremely limited and all of the other processes mentioned above were utilized in varying degrees and form the basis for the following findings:

A. R-81-15-PURCH(BLN)-01, Establishment of a Distinct, Documented QA Program

PURCH was found to have its QA interface and internal responsibilities detailed in its nonbinding, uncontrolled Procurement Manual.

Recommendation

PURCH should separate out QA procedures detailed in its Procurement Manual and incorporate the information, along with other procedures to meet applicable 10CFR50, Appendix B, requirements, into a separate and controlled QA document. (See paragraph V.A.1 for details.) [R]

B. R-18-15-PURCH(BLN)-02, Resolution of QA Reviews for X and Z Type IQT or BPA Requisitions

ID-QAP-4.2 provided in the Procurement Manual as exhibit 30-9.1.0 contains language requiring the purchasing employee to make a determination as to whether material to be furnished under an IQT or BPA contract is safety related.

Recommendation

Change the wording of attachment 5, note 8, of this exhibit to reflect the actual method utilized in handling X or Z type IQT or BPA contracts. (See paragraph V.A.2 for details.) [E]

C. R-81-15-PURCH(BLN)-03, QA Approval to Extend IQT or BPA Contracts Missing

PM 20-5.1.5 contains requirements for the purchasing agent to follow in extending contract terms of existing X or Z type IQT or BPA contracts which contain QA requirements. These requirements were found not being followed by the NSRS reviewers.

Recommendation

PURCH should incorporate a transmittal request into ID-QAP-4.2 for the requisitioning organization and its associated QA group to document their request for extension and for QA acceptability or refrain from extending these contracts altogether. (See paragraph V.B.2 for details.) [R]

D. R-81-15-PURCH(BLN)-04, Failure of Invitation to Bid (I/B) or Request for Quote (RFQ's) to Receive Supervisory Review Prior to Document Transmittal

ID-QAP-4.2 requires the section supervisor to review the I/B or RFQ to assure that all quality assurance requirements contained in the purchase requisition are included. NSRS review discovered that supervisors were reviewing the requisition files used by the Contracts Unit to prepare the original invitation versus the actual prepared invitation.

Recommendation

When the I/B or RFQ worksheet is made up for a QA invitation, the "PA review" block should be checked thereby allowing the section supervisor the ability to review its contents prior to document transmittal. (See paragraph V.B.3 for details.) [R]

E. R-81-15-PURCH(BLN)-05, Program to Evaluate Vendor Historical Quality Performance

TVA and regulatory doctrine provide the option to the purchaser to use the manufacturer's performance on its previous contracts as a viable procurement source selection factor. TVA presently does not have this capability, but it may be forced upon the contracting officer should draft revision to 48CFR46, section 46.407(e) become effective.

Recommendation

PURCH should establish a centralized computer system to document supplier performance history in meeting contractual and product commitments specified in its previous dealings with this supplier. This information should be made available to all requisitioners for their use in recommending award of contract. (See paragraph V.D.1 for details.) [E]

F. R-81-15-PURCH(BLN)-06, Need to Alert Vendors on Repair Items that Contract Provisions are Still in Effect

NSRS found a potential exists whereby vendors repairing or reworking items found defective upon receipt at a TVA construction or operating nuclear project may ship back the repaired item without completing all of its contractural commitments such as source inspection by QEB prior to shipment.

Recommendation

PURCH should provide a reminder statement in its transmittal letter to the vendor that his contractual obligations are still in effect. For example, TVA inspection requirements must be adhered to prior to reshipment of the commodity back to the project (See paragraph V.D.2 for details.) [E]

G. PURCH has an adequate internal auditing program and it is considered a positive factor in assuring quality in its activities. (See paragraph V.A.3 for details.)

H. The PURCH Procurement Manual was found out of date; however, PURCH is taking action to revise this document. (See paragraph V.B.1 for details.)

I. Program awareness by management was determined to be good. Subordinate personnel appeared to be hesitant as to what their QA responsibilities were. Other than QA, all personnel interviewed

had a clear understanding of their assigned responsibilities and how they relate functionally with interfacing internal groups and outside organizations. (See paragraph V.C for details.)

J. PURCH personnel were not aware of their regulatory reporting obligations and were only knowledgeable of supplier reporting responsibilities. (See paragraph V.E for details.)

V. DETAILS

A. Quality Assuring Controls/Responsibilities

The Bellefonte Final Safety Analysis Report (SAR), chapter 17, section 17.1A.1.4, appoints PURCH as the administrator of all TVA procurements. The specific technical and quality requirements of the intended procurement are to be obtained or established and administered by the organization initiating the procurement. These requirements are provided in the form of a procurement request and sent along to PURCH for processing. PURCH's administrative function then begins by translating the procurement request into an I/B or RFQ. The invitation is then transmitted to prospective bidders in accordance with the type of mailing lists maintained for the commodity desired. After checking for commercial responsiveness, the resultant bid submittals are forwarded to the requisitioner. Once notified of an acceptable bidder through the recommendation for award (RA) letter sent by the requisitioner, the purchasing agent obtains necessary approvals and awards the contract using the supplier's bid submittal as the acceptance agreement. From this point on, PURCH's responsibility lies in the handling of all subsequent contractual matters associated with the contract. PURCH is also required to document all communications with the vendor excluding those related to shop surveillance and vendor auditing which is handled by QEB and the Quality Assurance Branch (QAB) of the Division of Engineering Design (EN DES), respectively; selected matters relating to the SAR and licensing which are handled by the Regulatory Branch of POWER; and NSSS and GE-STRIDE communications with the vendor. PURCH also particpates in post-award meetings with the vendor and has the capabilities of reviewing and evaluating vendor performance towards fulfilling contract requirements and the reporting to appropriate levels of management the areas where vendor performance is determined inadequate (e.g., INRYCO tendon installation at Bellefonte).

NSRS review of the activities described above found the knowledge, performance, and dedication of the purchasing agents and expeditors to accomplish their assigned tasks in a quality manner to be expectional. This may be due in part to the self-auditing concept each branch displays and supervisory review of all work accomplished.

The only significant concern noted by the NSRS reviewers in their interviews with PURCH personnel was their hesitancy in what was expected of them related to quality assurance. This may be due,

in part, on the PURCH Procurement Manual. The preamble to this manual identifies its purpose as only providing internal guidance for PURCH employees to carry out their delegated procurement functions. The contents are not to be considered regulations, nor binding in any way. This portion of the preamble is consistent with the letter written by H. S. Sanger to R. H. Sunderland dated April 13, 1978 in response to an OEDC QA audit deficiency (H78-3, deficiency No. 5, reference VII.D.3.b). NSRS concurs with this judgment on non-QA items, however, our concern occurs when the preamble goes on to discuss purchases subject to quality assurance requi ents. Here TVA employees are directed not to vary from the manual's guidance and to strictly adhere to the QA procedures addressed in part 9, section 30 of the Procurement Manual. Any variations to these procedures are to be approved by the same organizations which were responsible for the original procedures and, in addition, be documented by the Office of the Director of PURCH. These procedures are considered by NSRS to be the policy guidelines for PURCH employees in performing quality assuring functions. The actual implementing procedures for accomplishing these quality assuring controls are found scattered among the various nonbinding sections of the Procurement Manual-the subject of our concern.

This dual policy of mandatory and nonmandatory requirements is both confusing to PURCH personnel and contrary to H. S. Sanger's memorandum. In addition, H. S. Sanger has determined that the Procurement Manual contains by definition no "matters of interdivisional significance." Therefore the manual, including its QA commitments, may be changed without notice as determined by the director, or those to whom he may have delegated the responsibility to approve such changes and is not enforceable by persons outside TVA. Without proper maintenance, revision, and enforcement controls the Procurement Manual cannot be considered a QA document.

NSRS review of this concern and other PURCH established quality assuring controls are more specifically identified in the following discussions/comments:

1. R-81-15-PURCH(BLN)-01, <u>Establishment of a Distinct, Documented QA Program</u>

   Criterion II of Appendix B to 10CFR50 requires the operator of nuclear power plants to establish at the earliest practical time, consistent with the schedule for operating the plants, a QA program which complies with the requirements of Appendix B. Criterion I of Appendix B requires the authority and duties of persons and organizations performing activities affecting the safety-related functions of structures, systems, and components to be clearly established and delineated in writing. These activities include both the performing function of attaining quality objectives and the QA functions. The QA functions are those of (a) assuring that an appropriate QA program is established and effectively executed and (b) verifying, such as checking, auditing, and inspection, that activities affecting the safety-related

functions have been correctly performed. The persons and organizations performing QA functions shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solution. Such persons and organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety conditions, is provided.

Chapter 17 of the BLN FSAR describes the TVA QA program designed to satisfy the Appendix B requirements. The TVA QA Topical Report which contains the same information will some day be applicable to all TVA nuclear plants. To implement these requirements, OEDC and POWER have delineated their QA program responsibilities as required by Appendix B, into the OEDC QA Program Requirements Manual and the POWER Quality Assurance Manuals respectively. Further implementation of the responsibilities was then established through a family of QA procedures. PURCH did not take the road of developing its own QA program requirements manual, nor generation of detailed internal implementing QA procedures. Instead, PURCH's QA responsibilities were documented in ID-QAP-4.1 and -4.2 and incorporated into its Procurement Manual as part 9 to section 30. These documented responsibilities met TVA's commitment to ANSI N45.2.13-1976, sections 3.3, 3.4, 4.2, 5.2, 5.4, and 6.4. However, as previously discussed, the Procurement Manual does not constitute a QA document and therefore cannot be considered as meeting regulatory intent.

In order to meet the requirements of Appendix B as it applies to them, PURCH needs to separate out the QA information contained in the ID-QAP's and Procurement Manual and to add applicable Appendix B criteria, some of which will be discussed in this report, to distinctly identify to its personnel their QA obligations and responsibilities. (For additional details, see also paragraphs V.B, V.C, and V.E.)

2. R-81-15-PURCH(BLN)-02, Resolution of QA Review for X or Z Type IQT or BPA Requisitions

NSRS' review of ID-QAP-4.2, "Procurement Document Control by the Division of Purchasing," revision 2, and the Procurement Manual, identified a conflict in the handling of X or Z type IQT or BPA requisitions. Attachment 5, note 8 of ID-QAP-4.2, required that "all safety-related IQT or BPA requisitions which are initiated by PURCH will receive a technical and quality assurance review by either OEDC or POWER before issuance of the request for quotation or invitation to bid." Paragraph 5.1.5, part 5 of section 20, to the Procurement Manual specified that the purchasing agents (PA) should send or arrange for the sending of IQT or BPA PURCH originated requisitions to one of the QA groups to assure proper QA

review is received. However, for those cases where the commodity appears to be obviously not safety related, the PA may verify that QA review is not necessary by telephone. This informal verification is to be confirmed by form 45D from the QA receiving group.

NSRS review found that PA's were not aware of, nor could a PURCH definition be found, as to what a "safety related" commodity was. In actual practice, all X and Z type requisitions which were initiated by PURCH were automatically sent to the applicable cognizant QA group for their review rather than determining if it was a safety-related requisition and forwarding it on or calling to find out if a QA review is required. Resolution of this conflict is required.

3. QA Auditing

NSRS reviewed management's controls for assuring that quality assurance practices established in part 9, section 30, of the PURCH Procurement Manual were being periodically reviewed. It was found that PURCH had established an internal audit program whereby each section supervisor, using a checklist, would select at random either open or closed, four or five contracts from each PA's files quarterly to verify adequacy or completeness. The results of the audit are documented and discussed with each applicable PA reviewed. In addition, procurement branches such as the Materials Procurement Branch had been auditing each of their sections monthly (effective May 1980). In this case, only one contract file is selected at random with the results of the audit discussed with the section supervisor. In both cases, the audits were used to review adherence to established purchasing policies and procedures, evaluate judgmental decisions, and ensure that good business practices were being followed. NSRS considers the internal audit program a positive factor in assuring quality since the audit reports are detailed, of substantive nature, and contained complementary as well as a critical evaluation of the PA's work per contract.

External auditing of PURCH is performed by the Division of Finance (FIN) and jointly by POWER and OEDC. Audit reports references VII.D.1 through VII.D.3 were reviewed for substance and field of review. No comments resulted.

Records and Document Control

Procurement Manual maintenance (section 10, part 1); contract filing (section 30, part 11); and records generation, receipt, processing, storage, and protection (section 10, part 2, Administrative Policy A-2 and applicable sections of the Procurement Manual) were reviewed for compliance with regulatory requirements and commitments. NSRS found the detail in instruction and process flow within the Procurement Manual to be of exceptional quality, however, a few conflicts/concerns/ comments were noted and are discussed below:

1. Out-of-Date Procurement Manual Content

The Procurement Manual was originally issued in October 1977 and describes the policies and procedures used by PURCH in procuring materials, equipment, supplies, and nonpersonal services. The Systems and Procedures Section under the Procurement Systems Staff has been delegated the responsibility to maintain the material in the Procurement Manual. NSRS review of the Procurement Manual showed revisions have occurred to document administrative changes, etc., however, several conflicts still exist in the manual, such as:

a. Inaccurate Organizational Bulletin Information

Review of section 10, part 2, subpart 3, which contains organizational information about PURCH from the TVA General Releases Manual, identified several out-of-date conflicts.

-Responsibilities of the Open Market Procurement Branch were not discussed.

-The Petro Chemical Unit was not illustrated under the Materials Procurement Branch.

-The Open Market Branch showed series downfeeding of information between the sections when in actuality it is parallel feeding/interaction.

b. Inadequate P-Memo Maintenance

The table of contents in the Procurement Manual and the P-Memo index, section 10, part 3, are not consistent with each other, and both indicate that P-Memos 1 and 4 have expired yet are being maintained in the manual.

Other administrative conflicts, such as out-of-date Related Administrative Releases (section 10, part 4) were noted. PURCH identified that it is undertaking a major revision of the Procurement Manual scheduled to be issued late summer 1981. NSRS will follow this item as part of item R-81-15-PURCH(BLN)-01 discussed in paragraph V.A.1.

No additional action will be requested on this item.

2. R-81-15-PURCH(BLN)-03, QA Approval to Extend IQT or BPA Contracts Missing

Topic 5, subpart 1, part 5, section 20 (PM 20-5.1.5), of the Procurement Manual contained requirements for the PA to follow in extending terms to existing X- or Z-type IQT or BPA contracts which contain QA requirements. The PA was to informally verify with the appropriate QA reviewing group that existing contract QA requirements had not changed since

the last review. The informal telephone verification should then be confirmed by form TVA 45D from the QA reviewing group.

PA's interviewed by NSRS which are involved in these activities were not fully aware of this requirement. Normally, the process flow for extension was accomplished by the PA in the following manner. Thirty days prior to contract expiration, the PA pulls the contract and forwards a reminder memorandum to the requisitioner to alert him of the impending expiration and asks if extension was necessary. If extension was required, the vendor was notified by telephone; and if agreement was reached, the contract was extended only after written correspondence from the vendor and requisitioner was received. QA approval is not normally requested. NSRS review of selected IQT records (77K71-543351, 78K71-543371, and 79KA1-589860) revealed the vendor and requisitioner's concurrence letters for extensions were filed with the contract. No 45D's were located denoting QA approval.

PURCH should incorporate a transmittal request into ID-QAP-4.2 when revised as requested in paragraph V.A.2. This action should alert the requisitioning organization's QA group of their responsibility and the need by PURCH to document their request for extension and for QA acceptability. As an alternative to revising ID-QAP-4.2, PURCH could refrain from extending these contracts and request issuance of another requisition as administered through the normal channels of process control.

3. R-81-15-PURCH(BLN)-04, Failure of I/B or RFQ's to Receive Supervisory Review Prior to Document Transmittal

As required by paragraph 3.3.a of ANSI N45.2.13-1976, procurement documents are to be reviewed prior to release for bid or contract award to assure the documents transmitted to the prospective suppliers for bid or contract purposes include appropriate provisions to assure items or services meet the specified requirements. ID-QAP-4.2 (exhibit 30-9.1.0) implements this requirement through attachments 2 through 5. Note 2, attachment 5, requires the section supervisor to perform a review of the I/B or RFQ prior to document transmittal, and attachments 2 through 4 show the PA performing the review prior to contract award.

Contrary to these requirements, the section supervisor is not performing his review prior to I/B or RFQ transmittal. PM 20-3.1.1 specifies in part that the section supervisor is only to review the requisition file containing correspondence, the Invitation to Bid worksheet-TVA 411, and attachments prior to sending it to the Contracts Unit where the original invitation is prepared and transmitted to meet mailing list and intra-TVA distribution needs. The original invitation is not reviewed by the section supervisor again until the

requisition file is returned. If no significant errors are discovered, the section supervisor returns the file to the PA; otherwise, an addenda would have to be issued revising the invitation.

This item can easily be rectified by PURCH since the Invitation to Bid worksheet (exhibit 30-3.3.0) presently contains a provision whereby if checked, the Contracts Unit would send the I/B or RFQ back to the PA for his review prior to transmittal. At this point the section supervisor could initial the actual invitation to denote his review and order its subsequent transmission. This provision should be used for all QA invitations.

C. Personnel Qualification and Training

Review of PURCH personnel indoctrination and training activities indicated that no formalized training program had been established and that the principle sources of information gathering for these personnel was from:

1. Branch technical and administrative training sessions (approximately once per month)

2. QA seminars conducted by OEDC (EN DES-QAB) and POWER QA staffs (approximately on an annual basis)

3. On-the-job training (continuing basis)

4. New procedure issuance training

5. Review of work by supervisory personnel

6. Courses administered by UT-Chattanooga, such as on letter writing

In addition to the above training, purchasing agents must have a degree in a technical, business, or management field from an accredited college or university or the equivalent in training and work experience prior to appointment. Though none of the above information can be located in the Procurement Manual, NSRS concludes that personnel interviewed were found to be generally qualified by education and experience for their respective assignments. However, since ANSI N45.2, Section 2, "Quality Assurance Program," requires, "The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained;" and since a QA training program has not been established in the ID-QAP's, this item is not considered closed and will be followed as part of item R-81-15-PURCH(BLN)-01 (paragraph V.A.1) for resolution.

D. Procurement of Materials and Nonpersonnel Services

Procurement control activities involving PURCH were reviewed to determine if safety-related concerns could result from PURCH activities or could be detected or controlled at this level of procurement processing. NSRS discovered that two such issues could be lessened through interaction of PURCH with outside agencies. They are:

1. R-81-15-PURCH(BLN)-05, Program to Evaluate Vendor Historical Quality Performance

BLN FSAR chapter 17, Section 17.1A.7.1, "Source Evaluation and Selection," specifies that the determination that a manufacturer is qualified is normally based on evaluation of the manufacturer's performance on previous TVA contracts. However, when a prospective contractor has had no previous contracts with TVA, a review may be made by TVA of his experience, capability, manufacturing facilities, QA program, and previous performance. These options have been provided as viable procurement source selection measure alternatives in accordance with section 4.2 of ANSI N45.2.13-1976. These measures are also contained in Office of Power Quality Assurance Procedure QAP 7.1 and EN DES-EP 5.01. Needless to say, knowledge of the vendor's performance history with TVA contracts is considered the most valuable tool in determining his capability.

Presently, TVA does not have a "master" history file of vendor performance on previous TVA contracts. EN DES-QAB maintains a limited file of vendor history, for the purpose of determining when QA audits of a particular vendor should be scheduled. NSRS considers from interviews and contract files reviewed, that PURCH has the capability and is the best equipped to retrieve vendor history information related to supplier performance on previous contracts and input the necessary data into a central computer system, preferably MAMS, for requisitioner use. This system would fulfill the option, previously not utilized, of using vendor history to award contracts.

In addition, NSRS review of a draft segment to the Federal Acquisition Regulation (FAR), Title 48 Code of Federal Regulations, part 46, section 46.407(e), indicated that if the proposed change were to become official, it would require the contracting officers to discourage the repeated use of nonconforming suppliers or services, including those with only minor nonconformances, by appropriate action, such as rejection whenever feasible and by documenting the contractor's performance record. Since TVA policy is to adhere to Federal Government procurement practices to the extent practicable, NSRS considers implementation of this requirement necessary and best suited to be located with Purchasing.

2. R-81-15-PURCH(BLN)-06, Need to Alert Vendors on Repair Items that Contract Provisions are Still in Effect

NSRS review of a QEB-QC field inspection report issued against TVA contract 76K38-86163-1 involving Atwood & Morrill swing check valves (QEB 810504 511) indicated a need exists for PURCH to alert vendors of their contractual obligations when reworking or repairing items sent back from TVA projects under the heading of an OSSD or D item.

In the case presented above, a swing check valve was discovered to have a surface crack in its upper body. An OSSD or D report was written, and Purchasing was notified. The PA, after notifying the vendor, authorized shipment of the valve back to the vendor for rework and repair. No dispositioning instructions were provided to the vendor to notify TVA of the repair results or any other potential contractual commitment. This discrepancy was subsequently identified by an NRC inspector visiting the Atwood & Morrill complex.

NSRS does not consider this item to be an isolated case and feels the potential exists where rework or repair items may be sent back to the projects without all necessary contract requirements being accomplished, e.g., failure to notify QEB for field inspection of the commodity prior to shipment. NSRS considers that when the OSSD or D form and its attachments are forwarded by the purchasing agent, Expediting Services Section, or Traffic Branch back to the vendor or carrier in accordance with PM 50-2.14.0 for vendor disposition instructions, the vendor should be reminded in the cover letter of his contractual obligations. This is considered most applicable to items requiring repair after being found defective several years after initial shipment.

E. Corrective Action Controls

NSRS review of this area involved nonconformance reporting (NCR). 10CFR50.55(e) requires reporting to the NRC of deficiencies found in the design and construction, which, "were it to have remained uncorrected, could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant, and which represents: (i) A significant breakdown in any portion of the quality assurance program conducted in accordance with the requirements of Appendix B; or . . . ."

Because certain procurement quality assurance control functions are performed by PURCH as described in this report and the BLN FSAR, it was determined by NSRS that PURCH is required to have a QA program (see paragraph V.A.1). As part of this QA program, nonconformance reporting is required as identified in (i) above and in sections 1 and 16 of ANSI N45.2-1971. The Procurement Manual does cover reporting of defects and noncompliances in part 13, section 30; however, this section involves the suppliers reporting obligations and does not acknowledge its own QA program obligations.

NSRS intends to follow this item as part of the action required for resolution to item R-81-15-PURCH(BLN)-01 (paragraph V.A.1).

F. Interface Controls

This section has been set aside to compile interface problems/concerns/comments noted by the NSRS staff during its review of PURCH activities. In general, PURCH has established well-defined internal and external interfaces controlled by the ID-QAP's, the Procurement Manual, the OEDC Section III QA Manual (NCM) and embodied in printed forms such as TVA 201, "Purchase Requisition." In addition, PURCH has taken independent initiatives for self-improvement such as seeking early awareness of potential vendor interface problems by requesting vendors to submit to PURCH a copy of all NCR's submitted to TVA. This is considered a good practice and is indicative of an organization responsive to its chartered responsibilities.

Interface items discussed under other topic areas in this report which represent possible needs for interface improvements include:

1. Formalizing arrangements for reviews of IQT and BPA contract renewals by EN DES QAB and OPQA (paragraph V.B.2).

2. The provision of a vendor history information sytstem to aid requisitioners in evaluating bids (paragraph V.D.1).

3. Tighter administration of OSSD or D materials or equipment which are returned to the vendor and then not handled by him in conformance with the original contract commitments (paragraph V.D.2).

No separate action is requested on these items.

VI. PERSONNEL CONTACTED

J. M. Anderson, PA, Nuclear Equipment Section
S. A. Anderson, PA, Mechanical Plant Equipment & Special Projects Section
T. L. Aaron, PA, Electrical Section
P. Arnold, Supervisor, Open Market Mechanical Section
J. E. Barker, PA, Construction & Building Materials Section
*P. R. Bevil, Staff Specialist, Procurement Studies Section
+*N. A. Brown, Assistant to the Director
*J. J. Cain, Supervisor, Procurement Studies Section
B. L. Carmack, Supervisor, Expediting Services Branch
P. J. Davis, Supervisor, Structural & General Supply Section
T. Davis, Supervisor, Open Market General Supply Section
M. L. Gibson, PA, Construction & Building Materials Section
J. G. Hannah, Jr., PA, Open Market General Supply Section
C. S. Harrel, PA, Structural & General Supply Section
A. B. Helton, PA, Electrical Section

C. E. Kato, Jr., PA, Pipe, Valves, and Accessories Section
*E. C. Kidder, Jr., Chief, Procurement Systems Staff
K. A. Kinslow, PA, ADP Equipment & Instrumentation Section
*E. Kvaven, Chief, Nuclear Procurement Branch
*L. W. Marks, Chief, Equipment Procurement Branch
*J. W. McCarter, Chief, Open Market Procurement Bra
R. W. Meadows, Expeditor, Expediting Services Se
W. F. Neperud, Jr., PA, Mechanical Plant Equipme t . . . ial Projects Section
E. H. New, PA, Pipe, Valves, and Accessories Section
J. P. Opp, Supervisor, Pipe, Valves, and Accessories S ction
R. V. Owens, PA, Open Market Mechanical Section
G. S. Ownsby, Supervisor, Construction & Building Materials Section
S. W. Palmer, PA, Open Market Construction Section
R. S. Patton, Supervsior, Nuclear Equipment Section
W. J. Rogers, Supervisor, Electrical Section
J. A. Stansberry, Supervisor, Systems & Procurement Section
*C. H. Strickland, Chief, Materials Procurement Branch
*R. H. Sunderlund, Chief, Procurement Support Staff
T. W. Tankesley, PA, Structural & General Supply Section
K. E. Tillery, Supervisor, ADP Equipment & Instrumentation Section
W. B. Wade, PA, Nuclear Equipment Section
R. G. Williams, PA, Nuclear Equipment Section

*Attended exit meeting
+Senior representative at exit meeting

VII. DOCUMENTS REVIEWED (REFERENCES)

A. Contract Files Reviewed

1. 76K3-86525
2. 77K34-820737
3. 77K71-543351
4. 78K71-543371
5. 79KA1-589860
6. 80KJ3-827527
7. 80KJ3-827583
8. 81K5-827749
9. 81K5-828088
10. 81K6-119990
11. 81K6-826973
12. 81TJ6-625667

B. NCR's Reviewed

1. 1368
2. 1411
3. BLNBLP8011
4. BLNBLP8012
5. BLNBLP8015
6. BNP-7

C. Procedures and Other Documents Reviewed

1. Procurement Manual, Volumes I and II

2. ID-QAP-4.1, "Responsibilities and Functions of the Divison of Purchasing," revision 2

3. ID-QAP-4.2, "Procurement Document Control by the Divison of Purchasing," revision 2

4. ID-QAP-4.3, "Transfer of Items," revision 0

5. ID-QAP-4.4, "Vendor Quality Assurance Evaluation Information Center," revision 1

6. Memorandum from W. J. Maraist to Office of Procurement Policy (OFPP) FAR Contact Points dated April 17, 1981, "Federal Acquisition Regulation (FAR) Availability of Draft Segment, Federal Register Notice."

D. Audit Files/Documents Reviewed

1. Memorandum from W. R. Stinson to J. L. Williams, Jr., dated April 9, 1981, "Audit Report No. 81-20 - Division of Financing"

2. Memorandum from C. H. Strickland to Those listed dated April 21, 1981, "Quarterly Audit of Contract Files -Branch Review"

3. OEDC QA/POWER audits (including all associated correspondence)

   a. M77-4 (QAM 770620 001)
   b. M78-3 (QAM 780301 002)
   c. M78-21 (QAM 781003 001)
   d. M79-3 (QAM 790402 002)
   e. M80-1 (QAM 800303 005)
   f. M80-10 (QAM 810223 002)
   g. JA8000-03 (QAM 800403 001)

APPENDIX A

ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

ANSI	American National Standards Institute
BLN	Bellefonte Nuclear Plant
BOARD	TVA Board of Directors
BPA	Blanket Purchase Agreement
B.S.	Bachelor of Science Degree
EN DES	Division of Engineering Design
EP	EN DES Engineering Procedure
FAR	Federal Acquisition Regulation
FIN	Division of Finance
I/B	Invitation to Bid
ID-QAP	TVA Interdivisional Quality Assurance Procedure
INRYCO	Inland-Ryerson Construction Products Company
IQT	Indefinite Quantity Term Contract
MMS	Materials Management System
NCM	OEDC Quality Assurance Manual for ASME Section III Nuclear Power Plant Components
NCR	Nonconformance Report
NRC	Nuclear Regulatory Commission
NSRS	Nuclear Safety Review Staff
NSSS	Nuclear Steam Supply System
OEDC	Office of Engineering Design and Construction
OEDC QA	Office of Engineering Design and Construction Quality Assurance Staff
OPQA	Office of Power Quality Assurance Staff
OSSD or D	Overage, Shortage, Substitution, Defect, or Damage
PA	Purchasing Agent
PM A - X.Y.Z	Procurement Manual Section (A) - Part (S), Subpart (Y), Topic (Z)
P-Memo	Memorandums issued to transmit temporary instructions to Procurement Manual holders
POWER	Office of Power
PRM	OEDC QA Program Requirements Manual
PURCH	Division of Purchasing
RA	Recommendation for Award
QA	Quality Assurance
QAB	Quality Assurance Branch - EN DES
QAP	Quality Assurance Procedure - POWER
QEB	Quality Engineering Branch - EN DES
QEB-QC	QEB - Quality Control Section
RFQ	Request for Quote
SAR	Safety Analysis Report - Preliminary or Final
STRIDE	General Electric Company (GE) - Standard Reactor Island Design
TVA	Tennessee Valley Authority
X Type	Agreements which are always priced and written for use by more than one TVA division
Z Type	Agreements which are unpriced and written only for repair parts from original equipment manufacturers and usually for use by one using organization

10CFR50	Title 10, "Energy", Code of Federal Regulations Part 50, "Licensing of Production and Utilization Facilities"
48CFR46	Title 48, "Federal Acquisition Regulation," Code of Federal Regulations Part 46, "Quality Assurance"
Form TVA 45D	Informal TVA Interoffice Mailing Slip
Form TVA 201	Purchase Requisiton
Form TVA 411	Invitation to Bid or Quotation/Contract Worksheet - PURCH

TVA 64 (03-8-69)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : W. R. Brown, Bellefonte Project Manager, 9-167 SB-K
J. P. Darling, Manager of Nuclear Power, 1750 CST2-C

FROM : K. W. Whitt, Director of Nuclear Safety Review Staff, E7B31 C-K

DATE : APR 22 1985

SUBJECT: BELLEFONTE NUCLEAR PLANT (BLN) - FOLLOW-UP REVIEW OF THE CONSTRUCTION CLEANING AND FLUSHING PROGRAM - NUCLEAR SAFETY REVIEW STAFF (NSRS) REPORT NO. R-85-04-BLN

Reference: My memorandum to you dated January 24, 1985, on the same subject (GNS 850124 050)

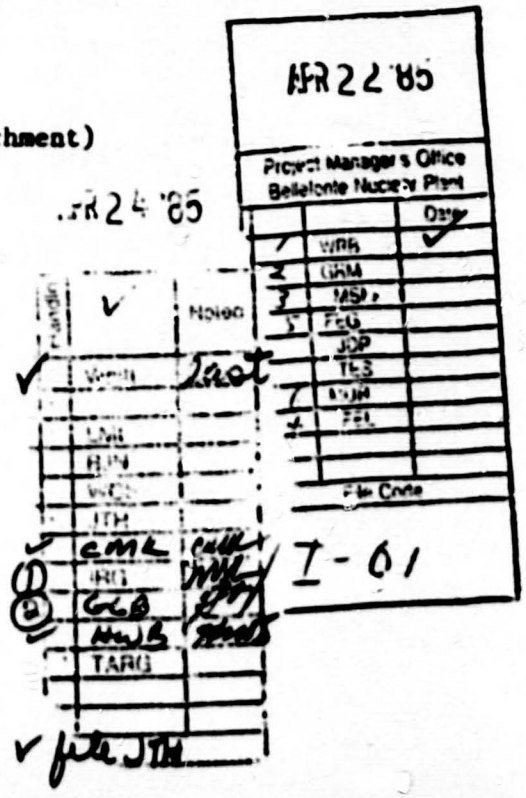
The NSRS has completed its follow-up review of the construction cleaning and flushing program for safety-related systems at BLN. NSRS is pleased to report that significant improvement was observed in the affiliated programs and activities in the Offices of Engineering, Construction, and Nuclear Power. There are some improvements and resolutions identified in the report that NSRS continues to recommend. The report also notes issues that have regulatory implications (variance from TVA commitments to NRC).

NSRS would like to express our appreciation to those members of your staffs who provided cooperation during this follow-up review.

K. W. Whitt

GGB:BJN
Attachment
cc (Attachment):
RIMS, SL26 C-K
B. H. Cadotte, E3C80 C-K (without attachment)
L. S. Cox, OC, Bellefonte
C. W. Crawford, 670 CST2-C
H. G. Parris, 500A CST2-C
A. M. Qualls, NUC PR, Bellefonte
R. J. Mullin, 1350 CUBB-C

SEE PAGE 2 FOR W. R. BROWN ENDORSEMENT.



F01 '85 0423 702

4/23/85--WRB:JM
cc: RIMS, SL26 C-K
*L. S. Cox, OC, Bellefonte
*R. M. Hodges, 9-113 SB-K (with attachment)
*A. M. Qualls, NUC PR, Bellefonte
K. W. Whitt, E7B31 C-K

*This is a good report. It represents the concerted efforts of a dedicated group of employees to correct problems and deficiencies in a program that was floundering. They are to be commended for their efforts.

We now need to concentrate on the additional improvements and recommendations of NSRS; resolution of variances from commitments regarding particle size; and, finally, completion of the system flushes.--WRB

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

REVIEW

NSRS REPORT NO. R-85-04-BLN

SUBJECT: BELLEFONTE NUCLEAR PLANT - FOLLOW-UP REVIEW OF THE CONSTRUCTION CLEANING AND FLUSHING PROGRAM

DATES OF REVIEW: FEBRUARY 12 - FEBRUARY 15, 1985

REVIEWERS: G. G. BRANTLEY — DATE 4/19/85

H. W. BENNETT — DATE 4/19/85

APPROVED BY: M. S. KIDD — DATE 4/19/85

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I. SCOPE

This follow-up review was performed to evaluate actions taken by the Offices of Engineering (OE), Construction (OC), and Nuclear Power (NUC PR) to correct identified weaknesses in the Bellefonte Nuclear Plant (BLN) cleaning and flushing program for safety-related systems. NSRS positions (recommendations) concerning actions to correct these programmatic weaknesses were presented in NSRS Report No. R-83-08-BLN issued May 12, 1983. This review consisted of personnel interviews and review of applicable program documents, correspondence, and regulatory information.

(NOTE: During the following discussion the acronyms EN DES, CONST, and NUC PR will be used when describing activities and program status during the original review in 1983. The acronyms OE, OC, and NUC PR will be used to denote activities performed by the respective and current TVA offices.)

II. CONCLUSIONS AND RECOMMENDATIONS

During this follow-up review of the OC flushing program at BLN, NSRS closed out 8 of 11 open items. NSRS concluded that actions taken by OE, OC, and NUC PR had been effective in improving the quality of the BLN flushing and cleaning program. There was an observed improved working relationship between organizations involved in the program. Detail had been added to the upper tier OE documents and implemented into the respective OC program documents. Criteria and responsibilities for OC and NUC PR review of test procedures and packages had been specified and the review program was working, as applied to the flushing program. Uncertainties about the acceptability of obtaining particulate samples in flush water with bypass strainers or filters had been resolved. The training program for CONST test directors was implemented and acceptable.

NUC PR's involvement in the flushing program was at an acceptable level and their reviews of flush test packages were thorough. The Chemical Laboratory Analysts (CLAs) training program had been formalized and the qualifications of those CLAs performing analyses to support CONST flushing was acceptable. Water chemistry specifications with out-of-limit action levels had been specified in plant documents. Portions of the chemical laboratory quality control program had been implemented sufficiently to assure quality results pertaining to the OC flushing program.

NSRS does continue to recommend some improvements in the program involving additional detail in the form of guidance in the upper tier OE documents, clarification and addition of flushing acceptance criteria and pertinent data in future flush test packages, resolution of uncertainties concerning previous flushes accepted on a variance of TVA commitments to NRC, and acquiring approval from NRC for the variance. Although NSRS continues to consider all of the recommendations important, those associated with variance from TVA commitments to NRC are the most significant.

There were no new areas assessed during this review, and no new conclusions or NSRS positions (recommendations) resulted for presentation in this report.

III. STATUS OF PREVIOUSLY IDENTIFIED OPEN ITEMS

A. R-83-08-BLN-01, Review of Corrective Action Process in OEDC (as it Relates to the Flushing Program)

EN DES and CONST had investigated and documented problems encountered in the CONST testing program at SQN. Corrective actions were specified to strengthen the testing program (including CONST flushing activities) at other TVA facilities. However, these corrective actions were not properly implemented at BLN and problems with the testing program similiar to those that had occurred at SQN and later at WBN were encountered. Additionally, problems existed at BLN with the local corrective action program particularly in the disposition of Quality Control Investigation Reports (QCIRs).

NSRS recommended that OEDC review their corrective action program to determine the root cause for the breakdown in program control which resulted in program deficiencies at BLN and take corrective action to prevent recurrence.

Prior to this follow-up review, OC had implemented a program to communicate potential generic problems from project to project and to/from the CONST manager's office in the form of Quality Bulletins (QBs). This program requires investigation and feedback as to applicability and corrective actions to be taken. NSRS determined that the program was in place.

At BLN the QCIR program had been replaced by a similar program using Inspection Rejection Notices (IRNs). No IRNs had been written against the OC flushing program in over a year. This item is closed (see section IV.A for details).

B. R-83-08-BLN-02, Development of Cleaning/Flushing Program Control Procedures

The EN DES-generated construction specifications did not contain all of the requirements of the ANSI standard governing the CONST flushing program. Inadequate detail was provided to facilitate development of an acceptable flushing and cleaning program by relatively inexperienced site personnel. As a result not all of the requirements of the ANSI standard were being met and not enough detail was provided in the CONST procedures to prevent some significant problems.

Prior to this follow-up review, OE and OC had upgraded General Construction Specification G-39, Construction Specification N4M-891, and Construction Test Procedure CTP 6.1 considerably to provide better program controls. However, some improvements are still recommended involving better documentation of acceptance

criteria and pertinent information before, during, and after flushes, sulfide analyses of flush water, particle size variance for purge dam and glue materials, sampling guidelines, qualitative criteria for identifying purge dam and glue particles, and a conductivity variance for chemical analyses. This item remains open (see section IV.B for details).

C. Review of Site-Generated Procedure and Construction Test Packages

1. R-83-08-BLN-03, EN DES Review of Site-Generated Construction Test Procedures

The initial site-generated CONST test procedure CTP 6.1 contained inadequate details and positive test controls to properly accomplish the task intended for the procedure. Completed test packages contained inadequate documentation of test results that the flushes met the applicable acceptance criteria.

A flush test package examined by NSRS during this follow-up review contained inadequate documentation and test results records to indicate whether the flush had met the 1/32-inch particle size criteria specified by ANSI N45.2.1 and committed to by TVA or the 1/8-inch particle size criteria variance specified by N4M-891. This item remains open until the 1/8-inch variance is granted by NRC or the completed flush packages accepted by the 1/8-inch or 1/32-inch criteria have been differentiated, and CTP-6.1 has been revised to require inclusion of acceptance criteria and pertinent information including test director and inspector observations and results of analyses (see sections IV.C.1 and D for details).

2. R-83-08-BLN-04, Bellefonte Site Engineering Units and NUC PR Review of Site-Developed Construction Test Packages

The CONST engineering units and NUC PR did not have clearly established guidelines to describe specific responsibilities and criteria for review of CONST test packages. The quality of the reviews that were being performed needed improvement.

During this follow-up review the NSRS determined that a new OC procedure had been written which detailed responsibilities and criteria for OC test packages and a NUC PR procedure had been significantly expanded to assure a more detailed and complete review. From review of memorandums between NUC PR and OC it was determined that the NUC PR reviews were thorough and effective in stimulating dialogue on matters of concern. This item is closed (see section IV.C.2 for details).

D. R-83-08-BLN-05, Approval of the 1/8-Inch Variance for Acceptable Purge Dam Residual Particle Size

TVA had requested from the NRC a variance to the proof flushing particle size acceptance criteria in ANSI N45.2.1-1973 for purge dam materials at BLN. Improper purge dam procedures resulted in large quantities of purge paper and glue that CONST was unable to flush from several safety-related systems, so the variance was sought based on technical analyses indicating the purge dam residual is acceptable.

At the time of the review, NRC had not approved or rejected the variance. If the variance is rejected, all systems in which purge dams were used and the ANSI N45.2.1-1973 particle size acceptance criteria were not met may have to be reflushed. For flushes conducted since the criteria were relaxed in N4M-891, there is no way to identify which met the stricter ANSI criteria from the data in the flush packages. This item remains open (see section IV.D for details).

E. R-83-08-BLN-06, Bypass Filter Versus Inspection of Inline Full Flow Strainers

EN DES considered side stream sampling equivalent to inspection of full flow strainers as a method to demonstrate compliance with ANSI N45.2.1-1973 proof flush particle size criteria. There was, however, no documented evidence that the sample flow was representative of the process flow. NSRS recommended that full flow strainers be used.

Prior to this follow-up review the following actions had been taken:

- N4M-891 had been revised to require full flow strainers for proof flushing certain stainless steel systems where purge dam residual may be a problem.
- OE gained provisional agreement from ASME that side stream sampling meets the intent of ANSI N45.2.1-1973.
- A flow test demonstrating that side stream sampling can be representative of process flow was conducted. This satisfies the ASME provision and conditionally satisfied the BLN NRC resident inspector and NSRS.
- Measures designed to ensure representative sampling have been included in specifications G-39, N4M-891, and construction test BLN-CTP-6.1. These measures satisfy the NRC and NSRS conditions.

This item is closed (see section IV.E for details).

F. R-83-08-BLN-07, Construction Qualification, Certification, and Training Program

An informal training program had been implemented for flushing personnel, but a formal program in compliance with ANSI N45.2.1 did not exist.

The program now in place, implemented by BNP-QCP-10.50, meets the requirements of ANSI N45.2.1. One minor discrepancy was identified in that BNP-QCP-10.50 had not been fully implemented in the Flushing Engineering Unit (FEU). The FEU supervisor should revise the present training requirements as necessary to meet actual training needs and document them on BNP-QCP-10.50, Attachment B. NSRS also recommends that BNP-QCP-10.50 be revised to require that unit training printouts be regularly sent to the appropriate Unit Training Officers (UTOs) to minimize duplicity of records. No response is required. This item is closed (see section IV.F for details).

G. R-83-08-BLN-08, NUC PR Involvement in the Flushing Program

NSRS originally took the position that NUC PR should provide a test representative to coordinate support and represent NUC PR interests in acceptability of system flushes.

The shift engineer or NUC PR Coordinator currently performs this function for NUC PR as was the case at the time of the original NSRS review. NSRS finds that this means of coordination is acceptable and we agree with the NUC PR position that separate test representatives are not necessary. This item is closed (see section IV.G for details).

H. NUC PR Chemical Unit Program Improvement

1. R-83-08-BLN-09, Chemical Unit Training

Although the Chemical Unit Analysts (CLAs) had been trained to perform the analyses to support CONST's cleaning and flushing program, the training was informal and training records were not being properly maintained. Not all of the CLAs met the ANSI 18.1 and NUC PR requirements for technicians in responsible positions.

During this follow-up review NSRS found that a formal training program for analysts had been issued and was in the process of being implemented. Training records had been properly classified as quality assurance records, which provides proper record maintenance controls. All analysts meet or will soon meet the ANSI 18.1 requirements for their positions. This item is closed (see section IV.H.1 for details).

2. R-83-08-BLN-10, Laboratory Quality Control

The pertinent portions of the NUC PR specified quality control program applicable to analyses performed to support the CONST flushing and cleaning program had not been implemented at BLN.

During this follow-up review NSRS found that pertinent portions of the quality control program had been implemented sufficiently to assure that quality chemical analytical results are provided to OC to support the flushing and cleaning program. This item is closed (see section IV.H.2 for details).

3. R-83-08-BLN-11, Safety-Related Systems Water Chemistry Specifications and Logsheets

Water chemistry specifications, data logsheets, and corrective action levels for out-of-limit conditions had not been prepared and implemented.

During this follow-up review NSRS found that water chemistry specifications with action level statements for out-of-limit conditions had been established. It is planned to use a computer-based data management system to maintain and trend chemical parameters of systems instead of using logsheets. Currently, results of chemical analyses are being recorded in the chemical laboratory journal. Chemical parameters of systems in wet lay-up are being adequately tracked by OC. This item is closed (see section IV.H.3 for details).

IV. DETAILS

Interviews were conducted with OE, OC, and NUC PR personnel and documents were reviewed to determine the status of actions taken to implement the NSRS recommendations made in NSRS Report No. R-83-08-BLN. The following are the results of those interviews and document reviews:

A. R-83-08-BLN-01, Review of Corrective Action Process in OEDC (As it Relates to the Flushing Program

In 1982 the BLN site issued a "Stop Work Order" because of a number of adverse events that had occurred during flushing activities similar in nature to those that had occurred at SQN in 1980 and at WBN during their construction testing program. An investigation was conducted at BLN and a five-point corrective action plan was presented to NRC to improve the testing program. NSRS concluded that the appropriate corrective actions were not initiated by TVA for the development and implementation of the BLN flushing and cleaning program since many of the conditions that existed at SQN and WBN were not corrected prior to initiation of construction testing at BLN. Failure to adequately implement TVA commitments to NRC through meaningful corrective actions led to similar problems during the initial implementation of the flushing program at BLN.

In addition, problems existed with the local (BLN) corrective action program in that many Quality Control Investigation Reports (QCIRs) were being written against the flushing program and were being improperly closed. NSRS found that the Startup Test and Coordination Unit (STCU) was not taking the necessary corrective actions to ensure that deficiencies cited against the program were being corrected. In some cases the STCU was improperly closing out the QCIRs and was not routing them back to the originating section Mechanical Quality Control Unit (MQCU) for closure as required by plant procedures.

NSRS recommended that the OEDC corrective action program be reviewed to determine the root cause for the breakdown in program control which resulted in program deficiencies at BLN and that actions should be taken to prevent recurrences.

In reference 39 CONST indicated that the inadequate transfer of "lessons learned" from project to project had been recognized as a problem that had resulted in part due to their decentralized organization structure and lack of communications between projects. Recognizing this, CONST indicated that they had moved to greater standardization of procedures and a closer working relationship between project managers, division management, and OEDC project managers. Additional actions implemented or planned to preclude repeated mistakes/ problems included:

1. The Program Information Notice (PIN) process was being formalized in a CONST-QAP and strengthened to include written responses from construction projects to the Manager of Construction identifying actions taken on PINs.

2. Establishment of requirements for distribution of relative reports and correspondence received or prepared by CONST to the CONST Manager's office and construction projects.

In reference 36 the BLN project identified that the problems with the QCIRs were the result of initial confusion as to the STCU's and MQCU's respective responsibilities upon the creation of the Quality Manager's organization during that time period. The response indicated that STCU personnel had been retrained in the applicable requirements with emphasis on the proper procedure for disposition and closing of QCIRs.

During this follow-up review NSRS determined that the PIN program had been replaced by a similar Quality Bulletin (QB) program. This program as delineated in QAP-16.7 and BNP-QCP-10.44 is the method used for informing OC organizations of identified quality programs that may affect different projects. A QB may be initiated at any of the projects or by the OC Manager's office. The QB is distributed to each project or organization for information purposes or for investigation. If the QB is distributed for investigation a written response is required by the investigating organization.

BLN management informed NSRS that no QBs had been written against flushing activities at BLN. NSRS examined QB No. 84-10, "Failure to Back Grind or Back Gauge Attachment and Support Welds," dated May 1, 1984, and QB No. 85-04, "Defective Auma Valve Operators," dated February 1, 1985. QB No. 84-10 had been written as a result of a WBN nonconformance report (NCR) and an NRC violation written against WBN and assigned to BLN for investigation. BLN had investigated and determined that problems identified by QB 84-10 were applicable to the BLN program. As a result of the QB an NCR had been written for the BLN program. This information was recorded in the QB. QB No. 85-04 had been written as a result of an NRC-identified problem at BLN and had been assigned to WBN for investigation. Based upon the review of the OC and BLN procedures for QBs and the specific QBs discussed, NSRS concludes that the QB program appears to be workable and should be an effective method for identifying generic quality problems and sharing the information between projects and the OC Manager's office. However, the QB program as part of the overall corrective action program may be reviewed further in the future.

The QCIR program at BLN had been replaced by the Inspection Rejection Notice (IRN) program as delineated in BLN QCP-10.43. IRNs are written when an inspection is rejected by the OC quality control units. The method for closure for the IRNs is similar to that for the QCIR in that the originating organization closes out the IRN when corrective action has been accomplished. NSRS discussed the closure method with Flushing Engineering Unit (FEU) personnel and determined that those personnel were familiar with the IRN closure process. (NOTE: The FEU is a subsection of the STCU and is assigned the primary responsibilities for executing flushing and chemical cleaning activities at the BLN site.) No IRNs had been written against the flushing program in the past year. This was attributed to the facts that flushing activities were continued until the flush met the applicable acceptance criteria, a better working relationship existed between the MQCU and the FEU personnel, and responsibilities relating to FEU and MQCU activities were better defined and understood.

NSRS discussed Construction Quality Assurance Branch (CQAB) activities relating to the BLN flushing program with CQAB personnel. One CQAB auditor onsite is assigned the flushing and cleaning program as his primary responsibility for cognizance. The auditor indicated that although some problems had been identified in the past, he felt that they had been or were being properly addressed by FEU personnel and that the quality of the flushing program was much improved from the program that existed at the time of the original NSRS review.

Based upon the implementation of the QB program, no identified problems with the current IRN program, and the reported improved relationship between the FEU and MQCU personnel, this item is closed.

B. R-83-08-BLN-02, Development of Cleaning/Flushing Program Control Procedures

The cleaning/flushing program for safety-related systems at the BLN site is governed by the requirements of NRC Regulatory Guide (RG) 1.37 which endorses ANSI N45.2.1-1973. The requirements specified in these documents were to be incorporated in EN DES-generated documents G-39 and N4M-891. Not all of the requirements of the RG and ANSI standard had been incorporated into G-39 and N4M-891 and the documents were very general in nature. As a result, the site-generated procedure, BNP-CTP-6.1, and the construction test packages did not meet all the requirements of RG 1.37 and ANSI N45.2.1-1973 and did not contain sufficient detail to provide adequate guidance for inexperienced personnel to allow development of an acceptable flushing program. Some specific examples of these conditions were:

- Specific responsibilities for flushing activities were not adequately addressed.
- Selection, calibration, and control of test equipment was not adequately addressed.
- No guidance as to a standard data report form was provided. Specific acceptance criteria and results of inspections and chemical analyses were not required to be included in the flush packages in sufficient detail to demonstrate compliance with the applicable acceptance criteria.
- Sulfide limits for flush water were not specified.
- A variance was provided for class B particle size acceptance criteria applied to some stainless steel systems where purge dam and glue particles were a problem. This variance had not been approved by the NRC.
- Organic analyses required by section 3.1.2 of ANSI N45.2.1 were not specified.
- No guidance for proper sampling methods for initial and final flush water to assure representative samples were provided.
- No guidelines were provided to assure proper qualitative identification of purge dam and glue particles.
- No reference to the National Pollutant Discharge Elimination System Permit (NPDES) was provided.
- A variance for circumventing the required ANSI chemical analyses if the flush water had a conductivity of 0.25 micromho/cm or less was provided in G-39.

- No guidelines or instructions existed to prevent contamination of clean systems.

- There were no defined responsibilities for checkout of pump vibration during initial operation.

NSRS recommended that EN DES review RG 1.37, ANSI N45.2.1-1973, other documents containing TVA commitments, and the details of the NSRS report and incorporate the programmatic requirements and applicable recommendations into G-39 and N4M-891 to ensure that responsibilities, technical requirements, documentation and records, training, and adequate program test controls were defined. NSRS recommended that the site review the site-generated procedures, CONST test packages, and the flushing program to ensure conformance to the EN DES-generated documents with specific emphasis on acceptance criteria and adequate details in each system test package for controlling the accomplishment of the activity and documenting the results.

In reference 37 EN DES indicated that MEB would revise G-39 and N4M-891 to satisfy most of the concerns raised by NSRS. In reference 36 CONST indicated that a pending revision of CTP 6.1 (Rev 3) would include complete acceptance criteria from G-39/N4M-891, procedure review requirements by MEU and QA as described in CTP 6.1 ensured a detailed in-depth peer review, and individual flush procedures were required to contain and be reviewed for detailed instructions and acceptance criteria.

During this follow-up review NSRS found that some of those items identified as requiring action had been properly addressed in the OE and site documents. The exceptions are as follows:

- Section 5.5 was added to G-39 to provide general guidance for documentation of test results in a suitable test report or data sheet. However, CTP 6.1 had not been revised to require that the individual test packages contain sufficient recorded data to easily demonstrate compliance with acceptance criteria. The acceptance criteria was still referenced to G-39, N4M-891, and CTP 6.1 (latest revisions) and was not specifically detailed in the individual test packages for use during the initial review of the test package, the subsequent inspection during the flushing operation, and the final review of the completed test package. Additionally, there are no requirements that the QC inspectors describe what they find on the strainers of filters. This lack of specific information in the individual test packages has made it difficult to differentiate between those systems flushed to the 1/32 inch or the variance of 1/8-inch particle size criteria.

- Analyses were not being performed to demonstrate compliance with the ANSI-specified limit for sulfides. OE personnel indicated that they felt that there was a low potential for exceeding the sulfide limit of 1.0 ppm in flush water.

However, they are currently performing an engineering evaluation to document a technical basis for eliminating the sulfide analysis from the required analyses for flush water.

- The variance for purge dam and glue residual and particle size has not been approved by the NRC (see section IV.D of this report for more details).

- Neither G-39 nor N4M-891 contain guidance for obtaining representative samples. OE personnel are considering the addition of some generic sampling criteria to provide guidance to OC personnel in obtaining representative samples during system flushes and system layup.

- No qualitative criteria had been added to N4M-891 to provide specific guidance in identifying purge dam material and glue particles. It is not assured that all new MQCU inspectors would readily recognize purge dam material or glue particles. Such criteria are considered especially important as the purge dam and glue particle size variance has not been resolved with NRC.

- The variance for circumventing the required ANSI chemical analyses if the flush water has a conductivity of 0.25 micromho/cm or less was still provided in G-39. OC personnel have agreed to remove this variance.

In general G-39/N4M-891/CTP-6.1 are now more detailed and afford better program control. However, NSRS continues to recommend some improvements to eliminate the concerns expressed above and this item remains open until the improvements or concerns are addressed in the applicable documents.

C. Review of Site-Generated Procedure and Construction Test Package

1. R-83-08-BLN-03, EN DES Review of Site-Generated Construction Test Procedures

The initial site-generated construction test procedure CTP 6.1, Revision 0, contained inadequate details and positive test controls for the development of an adequate flushing program to accomplish flushing of safety-related systems. Individual test packages for flushes did not contain sufficient detail, adequate documentation, and test results records for accomplishment and verification of the activity being performed.

NSRS recommended that EN DES review the site-generated construction test procedure and ensure conformance to ANSI standards, EN DES-generated documents, past TVA commitments, and past accepted program development and implementation at preceding TVA sites. In addition, NSRS recommended that completed test packages for past flushing activities at BLN also be reviewed to ensure that compliance with applicable requirements could be demonstrated.

In reference 38 EN DES responded that they had reviewed the site-generated construction test procedure (CTP 6.1) and that it did conform to the ANSI standard and had incorporated EN DES-generated documents, past TVA commitments, and relevant program development at preceding TVA sites. In reference 36 BLN CONST responded that completed test packages and flush procedures had been reviewed by Engineering, Quality Assurance, and NUC PR for compliance with requirements and that the documentation on file was adequate to verify compliance. They indicated that any packages with incomplete documentation would be reflushed or incorporated into future flushes.

During this follow-up review NSRS found that CTP 6.1 is still not in strict compliance with ANSI N45.2.1-1973 in that the 1/8-inch particle size variance for purge dam and glue materials has yet to be approved by the NRC. Further review of a typical test package (reference 26) indicated that there was still insufficient detail to determine whether the system cleanliness met the ANSI-specified 1/32-inch particle size criteria or 1/8-inch particle size criteria provided by the N4M-891 variance.

NSRS was informed by FEU personnel that almost all flushes performed during the last year had met the 1/32-inch particle size criteria. However, these systems may have to be reflushed if the NRC disapproves the variance, unless compliance with the 1/32-inch criteria can be shown from the data packages or supporting information such as test director's logs or affidavits from the QC inspectors.

NSRS continues to recommend that a review of completed flush test packages be performed to ensure that compliance with applicable requirements can be demonstrated.

This item remains open until the variance for the 1/8-inch criteria for purge dam and glue materials is granted by NRC or the flush packages that were accepted using the 1/8-inch and the 1/32-inch criteria have been differentiated.

2. R-83-08-BLN-04, Bellefonte Site Engineering Units and NUC PR Review of Site-Developed Construction Test Packages

The CONST engineering units and NUC PR did not have clearly established guidelines within the units and sections to describe specific responsibilities and criteria for review of construction test packages. The NUC PR procedure for review of CONST test packages (Standard Practice BLA 7.9) was very general and provided no specific guidance as to which plant sections were to review the test packages and what each section was to review them for. All CONST engineering units and NUC PR personnel involved with review of CONST test packages expressed concern that their review comments on test packages were not being adequately considered and incorporated into the test packages by STCU.

NSRS recommended that each individual CONST engineering unit responsible for reviewing construction test packages within CONST and NUC PR should develop criteria and guidelines establishing a systematic approach for reviewing the test packages.

In reference 36 BLN CONST responded that engineering units, Quality Control, and NUC PR's responsibility for procedure review were detailed in CTP 6.1, Revision 3, and that detailed responsibility should minimize unnecessary duplication of review while maintaining adequate coverage. In reference 40 NUC PR responded that Standard Practice BLA 7.9 would be updated to include additional requirements concerning CONST flush procedures.

During this follow-up review NSRS determined the following:

- CTP 6.1 had been expanded to include a peer review from the various OC engineering units. A method for documenting the required reviews (peer, approval for performance, and approval of results) had been added in the form of Attachment A to CTP 6.1.

- A new quality control procedure (BNP-QCP-10.46) had been issued providing requirements for the review and/or approval of site-prepared instructions, procedures, and test and procurement documents to ensure that they incorporate requirements of higher tier design and quality assurance documents and would adequately accomplish their intended purpose. That procedure was very comprehensive and delineated the review criteria to be used by each reviewing organization.

- NUC PR had expanded Standard Practice BLA 7.9, Revision 4, to establish that all OC test procedures, packages, and test results will be coordinated by a responsible system engineer. The standard practice delineates the criteria to be used by each BLN NUC PR organization or individual (Operations Section, Chemical Engineering Unit, Instrument Maintenance Section, System Engineer) and provided a methodology for control of the review in the form of a coversheet (Attachment 1). The standard practice was comprehensive and very well organized.

- NUC PR reviews of test packages and results had been well documented in memorandums to the BLN Project Manager from the NUC PR Plant Manager (see references 42 through 59, except 50 and 58). From NSRS review of these memorandums it was determined that the reviews had been very thorough. Even though there was still some concern expressed by NUC PR that not all of their comments were being incorporated into the test procedures packages, it was evident that some changes had been accomplished as a result of the NUC PR reviews and

areas of contention were being negotiated by responsible organizations (NUC PR, OE, and OC).

Based upon review of the expanded versions of CTP 6.1 and Standard Practice BLA 7.9 and the new BNP-QCP-10.46, NSRS concluded that adequate guidelines had been established by OC and NUC PR to describe specific responsibilities for review of construction test packages. From discussions with reviewing organizations and review of memorandums between NUC PR and OC, it was determined that the system as delineated in the documents discussed above appeared to be working. This item is closed.

D. R-83-08-BLN-05, Approval of the 1/8-Inch Variance for Acceptable Purge Dam Residual Particle Size

BLN is committed to meet the requirements of ANSI N45.2.1-1973, which includes the following Class B cleanliness acceptance criteria for particulates in paragraph 3.1.2.5: "There shall be no particles larger than 1/32-inch in any dimension, except fine hairline slivers of less than 1/32-inch thickness are permissible up to 1/16-inch long." In July 1982, EN DES issued Specification Revision Notice SRN-N4M-891-2 which relaxed the particulate size acceptance criteria for purge dam materials at BLN due to inability to meet the ANSI criteria. SRN-N4M-891-4 superseded SRN-N4M-892-2 in October 1982, but it also contained the 1/8-inch particle size variance. SRN-N4M-891-4 was incorporated into N4M-891 by Revision 2 in March 1983. A study performed by EN DES and Singleton Laboratory on the effects of purge dam residual on system operations was submitted to the NRC in September 1982. NRC Region II passed the matter to NRC NRR for approval. At the time of the original NSRS report, NRC approval had not been received.

No further action was proposed by OE or OC pending NRC approval of the 1/8-inch particle size purge dam material variance.

For this follow-up review, NSRS reviewed TVA General Construction Specification G-39 (R7), Bellefonte Nuclear Plant Construction Specification N4M-891 (R4), Construction Test Procedure BNP-CTP-6.1 (R5), and BNP Cleaning/Flushing Procedure Package No. NDFE (Decay Heat Removal System).

N4M-891 (R4) still contains the 1/8-inch particle size purge dam material variance for BLN stainless steel auxiliary systems. Section 12.1.1 states: ". . . Class B acceptance criteria for these systems shall be as defined in G-39 except that purge dam residual remaining on the pipe wall after flushing is acceptable and paper and glue particles up to 1/8-inch in any dimension appearing on the strainers on proof flashing are acceptable." Flush package NDFE included acceptance criteria, by reference to G-39, N4M-891, and

BNP-CTP-6.1 for particulates, organics, and water quality. The NDFE flush package did not record what was found on the strainers, only that the acceptance criteria was met. Consequently, there is no way to determine whether the ANSI criteria were met from the data in the flush package.

If the NRC rejects the 1/8-inch variance, documentary evidence of the particles actually found could be used to differentiate between flushes that are acceptable and those that must be redone. This documentation is also useful to NUC PR for system maintenance history purposes. Flushing Engineering Unit (FEU) personnel indicated that the NDFE flush package is typical of flush packages in the manner that acceptance criteria are addressed.

The 1/8-inch particle size variance for purge dam material had not been approved by the NRC. The OE Nuclear Licensing Section (NLS) indicated they periodically question the NRC about the status of this item and have gotten no indication of when an answer can be expected. OE Mechanical Engineering Branch (MEB) personnel have communicated with the NRC representative charged with the technical evaluation of TVA's study on the effects of purge dam residual. MEB believes that the NRC representative is satisfied that TVA's approach to the purge dam problem is acceptable and that system operations will not be affected.

This item remains open pending NRC approval of the 1/8-inch particle size variance or reflush of the affected systems to the ANSI criteria.

E. R-83-08-BLN-06, Bypass Filter Versus Inspection of Inline Full Flow Strainers

ANSI N45.2.1-1973, paragraph 3.1.2, step 5 (for Class B systems) states, in part, "If flushing is the only practical means for determining system cleanliness, the system shall be evaluated by examining a 20-mesh (ASTM E11-70, Specifications for Wire Cloth Sieves for Testing Purposes) or finer filter, or equivalent, installed on the outlet of the cleaning circuit." General Construction Specification G-39, R5, step 8.5.3.1 stated in part, "An inline strainer, a sample line cartridge filter or equivalent shall be used to filter the flush water or sample during the flush to check for particulates." EN DES considered side stream sampling filters equivalent to full-flow strainers as long as the samples were reasonably representative of the process flow. G-39 included some directions designed to assure the sample flow is representative of the process flow, but no tests or analyses had been performed to verify representative flow.

In response to this item in the original NSRS report, CONST stated that SRN-N4M-891-5 specified full flow strainers for proof flush acceptance and this had been incorporated into site procedures. The response also stated that testing to verify the ade-

quacy of bypass filter sampling was being conducted at Singleton Materials Laboratory at Norris Dam.

For the follow-up review of this item, NSRS reviewed General Construction Specification G-39 (R7), BNP Construction Specification N4M-891 (R4), and Construction Test Procedure BNP-CTP-6.1 (R5). NSRS also witnessed a demonstration of the side-stream sampling test results at Norris on July 28, 1983.

In February 1983, EN DES requested concurrence from ASME that side-stream sampling meets the intent of ANSI N45.2.1-1973. On June 6, 1983, ASME's Nuclear Quality Assurance committee agreed, provided the water that passes through the cartridge filter can be demonstrated to be representative of the process flow. The NRC resident inspector at BLN witnessed the side-stream sampling demonstration at Norris and concluded that it is acceptable if the following conditions are met (see reports 50-438/83-20 and 50-439/83-20).

- An inline strainer is used prior to side-stream sampling to verify that particulates in the system are small enough to pass through the sample line.

- The flow through the sample filter is greater than or equal to 15 gpm.

- The sample is taken after at least 15 minutes of flow or at least one system volume is recirculated.

The NSRS representative who witnessed the side-stream sampling demonstration at Norris also concluded that side-stream sampling is representative if reasonable care is taken in selecting sample points.

The current specifications contain the following statements relative to this item:

- G-39, R7, step 8.5.1.2: "Before proofing a system with a sample apparatus, verification shall be made that any particles are smaller than the inlet to the sample apparatus."

- G-39, R7, step 8.5.1.3: "Unless otherwise specified, sample apparatuses used to check for particulates shall draw samples from the bottom of a horizontal run of the process pipe. Pipe drains or sample connections where the sample would be drawn at the pipe wall shall be used. When cartridge filters are used, they shall be connected by a sample line directly to the process pipe. The cartridge filter shall be of a type that can be easily examined for particulates."

- G-39, R7, step 8.5.1.4. "A minimum of 100 gallons or 1 percent of the system volume shall be sampled for particulates during each proof flush. The sample flow rate shall

be minimum of 15 gallons per minute unless the design flow rate is less. If the design flow rate is less than 15 gallons per minute, then the minimum sample flow rate shall be equal to the design flow rate."

- G-39, R7, step 8.5.1.5: "Upon completion of the flushing operation the strainer or filter shall be examined to determine that it has not ruptured. Evidence of rupture having occurred shall be cause for repeating the flushing operation. Any other strainers in the cleaning path, such as pump suction strainers, shall also be checked for particulates. Any particulates present that are larger than the acceptance criteria shall be cause for rejecting the proof flush."

- N4M-891, R5, step 12.1.2 (applicable only to specific stainless steel systems of concern): "Systems shall be proof flushed with full-flow strainers. One acceptable proof flush passing a minimum of 1-1/2 system volumes of water will be sufficient to verify system cleanliness."

BNP-CTP-6.1, R5, also contains all these statements from G-39, R7, and N4M-891, R5.

This item has been adequately addressed and is closed because:

- Requiring proof flushing by full-flow strainers for the systems of concern makes concern over side-stream sampling a moot issue for systems flushed since SRN-N4M-891-5 was issued.

- The demonstration of the adequacy of side-stream sampling, the provisional acceptance of side-stream sampling by ASME and the NRC resident inspector, and incorporating items in the program as described in the preceding paragraph assure that side-stream sampling is an acceptable procedure for use on other systems.

F. R-83-08-BLN-07, Construction Qualification, Certification, and Training Program

At the time of the original NSRS review, STCU personnel involved in flushing were not included in a formal training program. An informal training program was in place in STCU. STCU personnel interviewed had the experience and training necessary to meet ANSI N45.2.6, but they were not being certified as test directors.

In response to this item, CONST stated that the informal training had been incorporated into BNP-QCP-10.29 and this satisfies the requirements of ANSI N45.2.1-1973. CONST further stated that certification per the requirements of ANSI N45.2.6 applies to quality control personnel rather than test directors.

For the follow-up of this item, NSRS reviewed ANSI N45.2.1-1973, ANSI N45.2.6-1978, TVA-TR75-1A (R8), BNP-QCP-10.29 (R6), BNP-QCP-10.50 (R0), and FEU training records maintained by the FEU Unit Training Officer (UTO).

After further review of the ANSI standards and the quality assurance topical report, NSRS agrees that FEU test director certification is not required. BNP-QCP-10.50, R0, issued October 2, 1984, defines indoctrination, training, qualification, and instruction of individuals in the Construction Engineer Organization (CEO) and the site Management Services Organization (MSO) who perform activities affecting quality. BNP-QCP-10.29 previously included these individuals, but BNP-QCP-10.29 (R6), Addendum 1, changed the scope so that it now applies primarily to the Quality Manager's Organization (QMO). BNP-QCP-10.50 (R0) requires the unit supervisors to train, or arrange training for, their personnel on appropriate procedures and instructions and maintain qualification through periodic performance evaluations. Unit supervisors are also required to define the training required for their personnel. The UTO is required to maintain records of training classes and submit copies to the Plant Training Office (PTO). PTO maintains a training computer program and provides QA orientation and indoctrination.

The FEU UTO training records of the FEU supervisor and four test directors were reviewed and found to be in order except that three test directors lacked training to BNP-CTP-4.4 (R2) as required by the FEU training program. BNP-CTP-4.4 deals with instruments and sense line flushes and knowledge of the requirements of this procedure is necessary to FEU personnel in performing flushes only if they flush instrument sense lines. The three test directors whose records show are not trained to BNP-CTP-4.4, R2, do not perform instrument sense line flushes. The problem, therefore, is not inadequate training, but inadequate definition of training requirements.

The training requirements form being used by the FEU UTO was the old BNP-QCP-10.29, R4, Attachment E, rather than the new BNP-QCP-10.50, Attachment B. FEU training in addition to that required on BNP-QCP-10.29, Attachment E, was being conducted and documented by the UTO. Also, the PTO computer printout of FEU training status is not periodically sent to the UTO. The PTO supervisor indicated that printouts are available by request and UTOs can arrange to receive regular printouts. The FEU UTO did not realize this and consequently was manually maintaining records that also appear on the computer printout.

Because the FEU training program has been formalized, meets the requirements of ANSI N45.2.1, and appears to be working well, this item is closed. To ensure that adequate training requirements are maintained, the FEU supervisor should review the present training requirements, tailor them to specific functions or individuals if necessary, and document them on BNP-QCP-10.50,

Attachment B. To avoid possible discrepancies in training records and as a convenience to the UTO, he should regularly receive the PTO computer printout of FEU training records.

G. R-83-08-BLN-08, NUC PR Involvement in the Flushing Program

As part of the corrective action program resulting from problems during SQN unit 2 reactor coolant system hydro test in 1980, TVA agreed that NUC PR would provide services for hydro tests and flushes under the direction of a test representative who would work directly with the test director. At the time of the original NSRS review, NUC PR services were being coordinated by the shift engineer or the NUC PR coordinator rather than a test representative for each individual test.

NUC PR responded to this item by stating that separate test representatives were not considered necessary and they would continue to coordinate support as they were at the time.

For their follow-up review, NSRS interviewed FEU, CQAB, and NUC PR personnel including the NUC PR coordinator concerning this item. Every person interviewed believed the current interface with the NUC PR coordinator works and they saw no reason to have separate test representatives for NUC PR. Because the personnel involved are satisfied with the arrangement, no problems have been identified because of it, and there is no specific commitment to have separate NUC PR representatives for each test, this item is closed.

H. NUC PR Chemical Unit Program Improvement

1. R-83-08-BLN-09, Chemical Unit Training

The chemical laboratory analysts (CLAs) had been trained to perform the chemical analysis associated with the CONST flushing program. However, the training was informal and the training program had been delineated only in an unapproved draft engineering section instruction letter. Training records were not controlled as quality assurance records. Some of the CLAs performing analyses did not satisfy the NUC PR requirements that technicians in responsible positions shall have a minimum of two years working experience in their specialty and a minimum of one year of related technical training.

NSRS recommended that a formal comprehensive inplant training program satisfying the NUC PR requirements and the needs of all classifications of CLAs be prepared and implemented. In reference 40 NUC PR indicated that details of the inplant phase of training were still in the development stages and that upon receipt of a training plan for CLAs and the updated training plan for radiochemical laboratory analysts (RCLAs) they would update their training program.

During this follow-up review NSRS determined the following:

- A formal RCLA/CLA training program had been issued in the form of Engineering Section Instruction Letter (ENSI)-C-2 and was in the process of being implemented. The training program provided for the initial inplant phase and replacement training along with periodic retraining.

- All records associated with the training and retraining are now classified as QA records and are to be handled in accordance with BLN procedures for QA records.

- All RCLAs/CLAs at BLN now meet the NUC PR requirements for two years working experience in the specialty and all but one CLA have one year of related technical training. That CLA is designated to participate in the next RCLA training class at POTC scheduled in the near future.

- NUC PR had established a Water System Flushes Results Data Sheet which was subsequently made into Attachment G of CTP 6.1. This data sheet contains spaces to record the results of chemical analyses associated with the CONST flushing program. A provision for review by a fully qualified NUC PR individual was added to the data sheet in case the analyses were performed by a CLA not fully meeting the respective NUC PR requirements. This provision had been utilized to the extent practical.

Based upon issuance of a formal RCLA/CLA training program, proper classification of training records, current qualification status and training plans for RCLAs/CLAs, and the establishment of a formal data sheet for the results of QC flushing chemical analyses with its review provision, this item is closed.

2. R-83-08-BLN-10, Laboratory Quality Control

The laboratory quality control program was not sufficient to ensure that the results of analyses provided to CONST by NUC PR were correct and representative of system conditions. The specified NUC PR quality control program for chemical laboratory activities had not been implemented at BLN. The BLN chemical laboratory was not running standards along with samples or series of samples or duplicate samples and analyses as requried by the NUC PR quality control program. Additionally, there were no sample procedures established either by NUC PR or CONST to assure that representative samples were being collected and analyzed.

NSRS recommended that specific sampling procedures be prepared and the laboratory quality control program be

upgraded to comply with the requirements of the NUC PR quality control program.

In reference 40 NUC PR responded that the laboratory quality control program in place at the time of the NSRS review was adequate to ensure accurate results as pertaining to OC flushing activities. They based their positions on their participation in the interlaboratory cross-check program with the Nuclear Central Office (NCO) and the Power Operations Training Center (POTC). They indicated in the response that the BLN chemical unit was in the process of upgrading the laboratory QC program to comply with the latest revision of the NUC PR quality control program. The target date for completing the upgrade process was October 1, 1983. Regarding representative sampling of the process flush water, NUC PR responded that they believed that CONST should delineate the sampling locations and requirements in their test packages and that they would ensure that the necessary details were included during their review of the test procedures.

During this follow-up review NSRS discussed this item with NUC PR personnel and reviewed pertinent documents. The results of these discussions and reviews are detailed below:

- The requirements of the NUC PR laboratory control program as specified in Area Plan Technical Standard 08.08.01 have been incorporated into Standard Practice BLE 7.3, "Program for Ensuring Quality of Chemical and Radiochemical Monitoring." The portions of the program applicable to the OC flushing program had been implemented through Techical Instruction BLTI-CHEM-0401, "Chemical Laboratroy Instruction Calibration Program," and other technical instructions and guidelines associated with specific chemical analyses and operation of chemical analytical equipment. The quality control measures as specified by the current documents are adequate to assure quality analytical results to support the OC flushing program.

- BLN has prepared sampling procedures in the form of Technical Instruction BLTI-CHEM-0110, "Sampling Points and Methods." OC was collecting the samples to support the flushing program using locations and requirements specified in the test packages. During the review of OC test packages NUC PR had assured that sample locations and requirements were properly delineated.

The current quality control program for chemical laboratory analytical activities is adequate to assure that samples processed to support the construction program produce quality results. This item is closed.

3. R-83-08-BLN-11, Safety-Related Systems Water Chemistry Specifications and Logsheets

The water chemistry specifications, data logsheets, and corrective actions levels for out-of-limit specifications had not been prepared and implemented. This was considered necessary by NSRS to provide a basis for comparing the quality of the final flushes of fluid systems for acceptability and to provide corrective actions when specifications were exceeded for systems in wet layup or during preoperational testing. Results of analyses were being recorded in daily journals. It was considered by NSRS to be essential that when water is in a system it should be sampled and analyzed on a periodic basis to assure compliance with applicable specifications.

NSRS recommended that water chemistry specifications and respective data logsheets be developed to provide for corrective actions if adverse conditions are encountered during system layup and to use as a basis for comparing the flushing acceptance criteria for each system.

In reference 40 BLN indicated that they were in the process of implementing the NUC PR specifications for water chemistry into plant documents. They indicated that the use of data logsheets during flushing operations was considered inappropriate since their intent was to track systems by operational chemistry trends. They further indicated that when systems were to be placed in a wet layup condition, the necessary instructions, including monitoring requirements, will be included in the CONST flush procedure and that monitoring of the water quality would be performed and the results recorded by NUC PR on appropriate data sheets.

For this follow-up review, NSRS discussed this item with NUC PR personnel and reviewed applicable documents. The results of the discussions and review of documents are detailed below:

- The NUC PR water chemistry specification (for normal operation and layup) with action levels for out-of-limit conditions has been translated into Technical Instruction BLTI-CHEM-0100, "Chemical and Radiochemical Specifications." These specifications were being used by NUC PR as a basis for evaluating acceptance criteria in flush packages. Using this information the BLN staff had recently identified an error in N4M-891 and the flush packages for the quality of water to be used in the preoperational cleaning of the component cooling water system (see reference 58).

- OC has incorporated provisions into CTP 6.1 to provide for periodic sampling and analysis of systems in wet layup. A FEU employee has been given the responsi-

bility for keeping up with all systems in wet layup. Attachment V of CTP 6.1 and samples from the systems are periodically (on a scheduled basis) submitted to NUC PR for analysis of the system in wet layup. The samples are analyzed, the results recorded on the data sheets, and the sheets returned to FEU. Portions of Trains A and B of the component cooling system were in wet layup. NSRS verified that the systems were being sampled and analyzed as required. Both trains had been sampled and analyzed as required (Train A - February 5, 1985, and Train B - February 1, 1985) and the records were available for inspection.

- Chemical logsheets had not been prepared and results of chemical analyses were still being kept in the laboratory daily journal. BLN chemical unit personnel indicated that it is planned to use a computer-based data management system for maintenance and trending of system chemical parameters but that this system was not yet in place.

Based upon the translation of the NUC PR water chemistry specifications with action levels into plant documents and the implementation of the OC program for periodic sampling analyses, and control of systems in wet layup, this item is closed.

V. LIST OF PERSONNEL CONTACTED

Name	Organization/Job Title
J. D. Allen	NUC PR/Assistant Operations Section Supervisor
J. D. Bedford	OC FEU/Mechanical Engineer
C. E. Burke	NUC PR/Chemical Unit Supervisor
W. A. Conley	NUC PR/NUC PR Coordinator
R. Crews	OC FEU/Instrumentation Engineer
D. T. Drouhard	OE MEB/Chemical Engineer
P. R. Heaton	OC FEU/Training Officer
J. H. Hubbard	OC FEU/Mechanical Engineer
C. N. Lester	NUC PR/Chemical Engineer
P. C. Mann	OC/Quality Manager Supervisor
R. T. McCallum	OC/Mechanical Quality Control Supervisor
J. B. Nelson	OC/Construction Quality Assurance Engineer
J. R. Palatinus	OE MEB/Chemical Engineer Supervisor
E. D. Rose	OC/Construction Training Unit Supervisor
J. D. Thornton	OC FEU/Unit Supervisor
D. L. Williams	OE NLS/Supervisor, Nuclear Licensing Section

VI. REFERENCES (DOCUMENTS REVIEWED)

1. 10CFR50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants"

2. TVA Topical Report TVA-TR75-1A, Revision 8, "Quality Assurance Program Description for Design, Construction and Operation"

3. General Construction Specification No. G-39, Revision 5, dated November 5, 1982, "Cleaning During Fabrication of Fluid Handling Components"

4. ANSI/ASME N45.2-1973, "Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants"

5. ANSI/ASME N45.2.1-1980, "Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants"

6. Regulatory Guide 1.37 dated March 16, 1973, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water Cooled Nuclear Power Plants"

7. ANSI Standard N45.2.6-1978, "Qualifications of Inspection, Examination and Testing Personnel for Nuclear Power Plants."

8. Regulatory Guide 1.58, Revision 1, dated September 1980, "Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel"

9. ANSI Standard N45.2-1971, "Quality Assurance Program Requirements for Nuclear Power Plants"

10. ANSI Standard N45.2.9-1974, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants"

11. Construction Specification No. N4M-891, Revision 2, dated March 9, 1983, "Chemical Cleaning Instructions for Piping Systems for Bellefonte Nuclear Plant"

12. General Construction Specification No. G-39, Revision 7, dated August 8, 1984, "Cleaning During Handling of Fluid System Components"

13. Specification Revision Notice SRN-G-39-8 dated August 23, 1984

14. Specification Revision Notice SRN-G-39-9 dated September 14, 1984

15. Specification Revision Notice SRN-G-39-10 dated November 6, 1984

16. BNP Construction Specification N4M-891, Revision 4, dated October 31, 1984, "Chemical Cleaning Instructions for Piping Systems for Bellefonte Nuclear Plant"

17. Specification Revision Notice SRN-N4M-891-12 dated December 14, 1984

18. QC Quality Assurance Procedure QAP-16.7, Revision 1, dated October 1, 1984, "Quality Bulletins"

19. QC Quality Bulletin 84-10 dated May 1, 1984, "Failure to Back Grind or Back Gouge Attachment and Support Welds"

20. QC Quality Bulletin 85-04 dated February 1, 1985, "Defective Auma Valve Operators"

21. BNP Quality Control Procedure BNP-QCP-10.29, Revision 6, Addendum No. 1, dated November 1, 1984, "Quality Assurance Training and Certification Program for Quality Control Personnel"

22. BNP Quality Control Procedure BNP-QCP-10.43, Revision 1, dated November 1, 1984, "Inspection Rejection Notice"

23. BNP Quality Control Procedure BNP-QCP-10.46, Revision 0, Addendum No. 1, dated January 29, 1985, "Review and/or Approval of Instructions, Procedures, Test Documents, and Procurement Documents"

24. BNP Quality Control Procedure BNP-QCP-10.50, Revision 0, dated October 2, 1984, "QA Training Program for Engineering Personnel"

25. BNP Construction Test Procedure BNP-CTP-6.1, Revision 5, dated February 14, 1985, "Cleaning and Flushing of Systems"

26. BNP Construction Test Document for Cleanliness of Systems, Cleaning/Flushing Procedure Package No. NDFE, Revision 2, "Flushing of Unit 1 Decay Heat Removal (ND) System for Proof of Class B Cleanliness"

27. BNP Construction Test Document for Cleanliness of Systems, Cleaning/Flushing Procedure Package No. RIFL-00, Revision 0, "Control Air System in Unit 1 Reactor Building (Safety Related Portion)

28. BNP Standard Practice BLA 7.9, "Revision 5, dated August 27, 1984, "Review of Construction Test Procedures"

29. BNP Standard Practice BLE 7.1, Revision 3, dated October 23, 1984, "Water Quality Specifications"

30. BNP Standard Practice BLE 7.2, Revision 1, dated October 28, 1983, "Analytical Chemistry Instructions"

31. BNP Standard Practice BLE 7.3, Revision 1, dated September 7, 1984, "Program for Ensuring Quality of Chemical and Radiochemical Monitoring"

32. BNP Standard Practice BLE 7.4, Revision 3, dated July 29, 1984, "Chemical Ordering, Receipt, and Control"

33. BNP Technical Instruction BLTI-CHEM-0100, Revision 0, dated August 22, 1983, "Chemical and Radiochemical Specifications Unit 0, 1, and 2"

34. BNP Technical Instruction BLTI-CHEM-0110, Revision 0, dated August 22, 1983, "Sampling Points and Methods Unit 1 and 2"

35. BNP Engineering Section Instruction Letter ESIL-C2, Revision 0, dated January 11, 1984, "RLA/CLA Training Program"

36. Memorandum from Lonnie S. Cox to W. R Brown, dated June 13, 1983, "Bellefonte Nuclear Plant - Status of Findings of NSRS Report R-83-08" (BLN 830613 046)

37. Memorandum from C. A. Chandley to L. J. Cooney dated June 16, 1983, "Bellefonte Nuclear Plant - Review of the Cleaning and Flushing Program for Safety-Related Systems - NSRS Report No. R-83-08-BLN" (MEB 830516 003)

38. Memorandum from M. N. Sprouse to W. R. Brown dated June 16, 1983, "Bellefonte Nuclear Plant - Review of the Cleaning and Flushing Program for Safety-Related Systems - NSRS Report No. R-83-08-BLN" (ESB 830616 004)

39. Memorandum from Charles Bonine, Jr., to W. R. Brown dated June 27, 1983, "Bellefonte Nuclear Plant - Status of Findings of NSRS Report R-83-08" (DOC 830627 001)

40. Memorandum from H. J. Green to W. R. Brown dated July 5, 1983, "Bellefonte Nuclear Plant - Review of the Cleaning and Flushing Program for Safety-Related Systems - NSRS Report No. R-83-08-BLN" (EDC 830706 701) (L29 830623 869)

41. Memorandum from W. R. Brown to H. N. Culver dated July 7, 1983, "Bellefonte Nuclear Plant - Review of the Cleaning and Flushing Program for Safety-Related Systems - Nuclear Safety Review Staff Report No. R-83-08-BLN" (EDC 830707 702)

42. Memorandum from A. M. Qualls to Lonnie S. Cox dated June 14, 1983, "Bellefonte Nuclear Plant - Review/Approval of BNP-CTP-6.1, R3" (L55 830614 802)

43. Memorandum from A. M. Qualls to L. S. Cox dated June 15, 1983, "Nuclear Power Review of Construction Test Procedures"

44. Memorandum from A. M. Qualls to L. S. Cox dated November 23, 1983 "BNP-CTP-6.1, R3, Addendum No. 1"

45. Memorandum from A. M. Qualls to L. S. Cox dated January 4, 1984, "Flush Procedure NMFD, Test Results"

46. Memorandum from A. M. Qualls to L. S. Cox dated January 11, 1984, "Flush Procedure WDF4-1"

47. Memorandum from A. M. Qualls to L. S. Cox dated February 6, 1984, "Flush Procedure WDF3-1"

48. Memorandum from A. M. Qualls to L. S. Cox dated March 1, 1984, "Flush Procedure WDF3-1"

49. Memorandum from A. M. Qualls to L. S. Cox dated April 5, 1984, "Flush Procedures WDF4-1, Results"

50. Memorandum from C. A. Chandley to John A. Raulston dated April 13, 1984, "Bellefonte Nuclear Plant - Supporting Information for Purge Dam Variance Request for NRC" (MEB 840413 005)

51. Memorandum from A. M. Qualls to L. S. Cox dated June 6, 1984, "Flush Procedure WDF4-1, Results"

52. Memorandum from A. M. Qualls to L. S. Cox dated June 21, 1984, "Flush Procedure NMFD, Test Results"

53. Memorandum from A. M. Qualls to L. S. Cox dated July 11, 1984, "Construction Test Procedure BNP-CTP-6.1, R4"

54. Memorandum from A. M. Qualls to L. S. Cox dated November 27, 1984, "Construction Flush Procedure Results - WDF5E"

55. Memorandum from A. M. Qualls to L. S. Cox dated December 7, 1985, "Construction Test Procedure BNP-CTP-6.1, R5"

56. Memorandum from A. M. Qualls to L. S. Cox dated January 17, 1985, "Flush Procedures WDF5-A and WDF5-C, Results"

57. Memorandum from A. M. Qualls to L. S. Cox dated January 24, 1985, "Bellefonte Nuclear Plant (DLN) - Hydrostatic Test Procedures 2NB-H-31, 1NB-H-35, ONB-H-37, and ONB-H-38"

58. Memorandum from D. T. Drouhard to Mechanical Engineering Branch Files dated January 25, 1985, "Bellefonte Nuclear Plant - Telecon with OC and NUC PR to Discuss Chemical Cleaning Specifications" (MEB 850125 007)

59. Memorandum from A. M. Qualls to L. S. Cox dated January 31, 1985, "Construction Test Procedure BNP-CTP-6.1, R5"

60. Letter from American Society of Mechanical Engineers to TVA dated June 6, 1983, "ANSI/ASME N45.2.1-1973, Section 3.1.2" (MEB 830624 301)

61. Letter from U.S. Nuclear Regulatory Commission Region II to TVA dated September 8, 1983, "Report Nos. 50-438/83-20 and 50-439/83-20"

62. BNP Technical Instruction BLTI-CHEM-2102, revised July 20, 1981, "Spec 70 and Spec 88"

63. BNP Technical Instruction BLTI-CHEM-0401, revised June 8, 1981, "Chemical Laboratory Instrumentation Calibration Program"

64. BNP Technical Instruction BLTI-CHEM-3007A, issued October 24, 1983, "Chloride (Mercuric Thiocyanate)"

65. NUC PR Technical Standard 08.08.01.14.03, revised May 30, 1984, "Program for Ensuring Quality of Chemical Monitoring"

66. BNP Standard Practice BLE 7.3, revised September 7, 1984, "Program for Ensuring Quality of Chemical and Radiochemical Monitoring"