

ORGANIZATION: BW/IP INTERNATIONAL, INCORPORATED
VERNON, CALIFORNIA

REPORT NO.: 99900030/89-01	INSPECTION DATE: September 11-14, 1989	INSPECTION ON-SITE HOURS: 150
CORRESPONDENCE ADDRESS: BW/IP International, Incorporated 2300 East Vernon Avenue Vernon, California 90058		
ORGANIZATIONAL CONTACT: Mr. R. Donald Ham, Manager of Quality TELEPHONE NUMBER: (213) 587-6171		
NUCLEAR INDUSTRY ACTIVITY: Manufacturer of valves and pumps used in safety-related nuclear applications.		
ASSIGNED INSPECTOR:	<u>R. L. Pettis, Jr.</u> R. L. Pettis, Jr., Reactive Inspection Section No. 1 (RIS-1), Vendor Inspection Branch (VIB)	<u>12/20/89</u> Date
OTHER INSPECTOR(S):	S. Matthews, Quality Assurance Specialist, VIB M. Snodderly, Reactor Engineer, VIB C. Hammer, Mechanical Engineer, NRC/EMEB W. Shier, Brookhaven National Laboratory	
APPROVED BY:	<u>Gregory C. Cwalina</u> Gregory C. Cwalina, Acting Chief, RIS-1, VIB	<u>12/21/89</u> Date
INSPECTION BASES AND SCOPE:		
A. BASES: ASME Section III, Subsection NCA 4000; 10 CFR 50, Appendix B; 10 CFR Part 21; and the BW/IP International, Incorporated (BW/IP) Nuclear Program Quality Manual, Second Edition.		
B. SCOPE: Verify implementation of BW/IP's quality assurance program as a result of check valve failures reported at the Comanche Peak Steam Electric Station in May 1989.		
PLANT SITE APPLICABILITY: Multiple		

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A. VIOLATIONS:

1. Contrary to Section 21.21, "Notification of failure to comply or existence of a defect," of 10 CFR Part 21, BW/IP International, Incorporated (BW/IP) could not provide documentation to support their basis for informing TU Electric in a letter dated June 22, 1989, that a previous deficiency related to the adjustment height of the swing arm did not constitute a reportable condition pursuant to the provisions of 10 CFR Part 21. This condition led to excessive backleakage through 13 safety-related check valves. In addition, BW/IP also failed to notify all of its nuclear customers of the deviation. A 10 CFR Part 21 report would have resulted if BW/IP had evaluated the deviation.

In addition, at the time of the inspection BW/IP, had not initiated an evaluation of a deviation concerning a broken cast swing arm and several other swing arms that were metallurgically tested and determined to have material flaws (hot cracks) which were discovered after TU Electric performed hot functional testing in May 1989 at the Comanche Peak Steam Electric Station (CPSES). BW/IP had actual knowledge of these deviations from a July 7, 1989 Stone and Webster Engineering Corporation (SWEC) technical report furnished to BW/IP during a SWEC inspection of BW/IP in July 1989 (89-01-01).

B. NONCONFORMANCES:

1. Contrary to Criterion III, "Design Control," of 10 CFR 50, Appendix B, BW/IP failed to adequately review for suitability, eight replacement swing arms supplied to the Comanche Peak Steam Electric Station (CPSES). The swing arm, classified by BW/IP as a critical nonpressure boundary item, is essential to the operation of the swing check valve which is used in various nuclear safety-related applications at the CPSES and other nuclear facilities (89-01-02).
2. Contrary to Criterion VII "Control of Purchased Material, Equipment, and Services," of 10 CFR 50, Appendix B, and Section 7-3.3(6b), "Vendor Surveys and Audits," of the BW/IP Nuclear Program Quality Manual (NPQM), Second Edition, dated June 1, 1988:
 - a. BW/IP failed to audit 17 suppliers of nuclear safety-related items due to their status as holders of an American Society of Mechanical Engineers (ASME) Quality System Certificate. Items furnished to BW/IP from these suppliers included, but

were not limited to, fasteners, castings, valves and valve parts, piping, vessels, special testing services, filler material, and wrought products (89-01-03).

- b. BW/IP failed to qualify ACME Castings, Incorporated as a supplier of safety-related QL-3 and 4 items. ACME's quality program, based on Military Specification MIL-I-45208A, "Inspection System Requirements," was disapproved by BW/IP on November 11, 1985. On June 8, 1987, ACME's vendor status was changed to that of a QL-3 and 4 supplier based solely on ACME's certification that they comply with the provisions of 10 CFR Part 21 (89-01-04).
 - c. BW/IP failed to survey initially and audit triennially 43 suppliers of safety-related QL-1, 3, and 4 items currently on the BW/IP Approved Vendors List (AVL) (89-01-05).
 - d. Quality Survey/Audit Report's and Quality Audit Checklists for vendor/suppliers evaluated by BW/IP are incomplete and/or inadequate to determine that the supplier's quality program had been effectively implemented (89-01-06).
3. Contrary to Criterion XVI of 10 CFR 50, Appendix B, and Section 16, "Corrective Action," of the BW/IP NPQM, Requests for Corrective Actions (RCAs) are not issued for conditions considered detrimental to quality for nonpressure boundary, non-ASME Code safety-related items (89-01-07).
 4. Contrary to Criterion XVII, "Quality Assurance Records," of 10 CFR 50, Appendix B, and Section 17, "Control and Maintenance of Quality Records," of the BW/IP NPQM, an adequate system for quality record retention and retrieval did not exist. The engineering calculations to support the design basis of a 3-inch, 150 lb. stainless steel, manual gate valve supplied to the CPSES, and a 12-inch motor-operated gate valve supplied to Bellefonte and used in a safety-related application, could not be produced during the inspection (89-01-08).

Contrary to the above, Engineering Change Notices and supporting engineering analyses were unavailable to support field changes of bolt torque specifications implemented as a result of two deficiency reports submitted by the Tennessee Valley Authority

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to the NRC for a 6-inch and a 12-inch motor operated gate valve installed in safety-related applications at the Bellefonte and Watts Bar nuclear power plants (89-01-09).

C. UNRESOLVED ITEMS:

1. Section 21.51, "Maintenance of Records," of 10 CFR Part 21 requires that records be maintained to assure compliance with the regulation. However, BW/IP was unable to produce records that documented evaluations for three occurrences that were reported to the NRC by licensees through 10 CFR 50.55(e). These licensee reports included:
 - a. Overtorqued bolts on a flow control valve at Bellefonte Units 1 and 2, reported to the NRC by the Tennessee Valley Authority on November 20, 1981.
 - b. Overtorqued studs on gate valve motor operators at Watts Bar and Bellefonte, reported to the NRC by the Tennessee Valley Authority on February 16, 1981.
 - c. Oversized motor-operated valve stem keys that were supplied by BW/IP to the Perry Plant. This item was reported to the NRC by Cleveland Electric Illuminating Company on January 11, 1984.

In each case, BW/IP was unable to produce documentation to support that an evaluation of these deviations was conducted as required by 10 CFR Part 21. BW/IP stated that these records may be in storage. This item will be reviewed during a future inspection (89-01-10).

2. During the inspection it was noted that BW/IP performs an Acceptance Test Procedure (ATP) on safety-related check valves prior to delivery. Based on Criterion XVII of 10 CFR 50, Appendix B, and Section 17 of the BW/IP NPQM, the results of these tests should be maintained as quality records. However, BW/IP was unable to produce the ATP results for the 3 and 4-inch check valves supplied to the CPSES, which subsequently failed during hot functional testing. BW/IP stated that these records may be in storage. This item will be reviewed during a future inspection (89-01-11).
3. Documentation was unavailable during the inspection to support the procurement, qualification of suppliers, and the overall nuclear quality assurance program in-place at the Borg-Warner Nuclear Valve Division, Van Nuys, California, prior to 1986 for

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the swing check valve product line. BW/IP stated that these records may be in storage. This item will be reviewed during a future inspection (89-01-12).

D. STATUS OF PREVIOUS INSPECTION FINDINGS:

This area was not reviewed during the inspection.

E. INSPECTION FINDINGS AND OTHER COMMENTS:

Background:

The Borg-Warner Corporation was a large company with many branches. Of these branches, the industrial products branch consisted of three divisions including the Nuclear Valve Division located in Van Nuys, California. Each division had at its location, Quality Assurance, Engineering, and Procurement programs. The Nuclear Valve Division and the Byron Jackson Pump division had N-stamps and provided material to the nuclear industry. In late 1986, the nuclear valve product line was transferred from Van Nuys to the Byron Jackson Pump Division, located in Vernon, California. All activities are now controlled by the Byron Jackson Quality Assurance Program. The Nuclear Valve Division discontinued its N-stamp at that time and became the Fluid Controls Division. In 1987, Borg-Warner Corporation sold the industrial products group to its existing management and it was renamed BW/IP International, Incorporated.

1. Root Cause Analysis and Evaluation of Failed Swing Arms at the Comanche Peak Steam Electric Station (CPSES).

In May 1989 while performing hot functional testing at the CPSES, several swing check valves failed which allowed backflow through the auxiliary feedwater system. As a result, an NRC augmented inspection was conducted on May 15-June 16, 1989. The results of this inspection are documented in NRC Report No. 50-445 and 446/89-30, dated July 7, 1989. The licensee, TU Electric, contracted with the Stone and Webster Engineering Corporation (SWEC) to perform a root cause analysis of three swing check valve swing arms. The results indicated that one swing arm was broken, leaving the disk completely detached from the valve body, while the other two swing arms were found to contain flaws, but were not broken. The swing arms were originally specified to be of alloy 17-4 PH martensitic stainless steel in accordance with Aerospace Material Specification (AMS) 5398 and heat treated to an H1100 condition per Military Specification MIL-H-6875, Class D. The

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SWEC report, "Evaluation of Swing Arm Failure/Casting Flaws," (Report No. 19245-ME(B)-1, dated July 7, 1989) was provided to Bk/IP during a SWEC inspection of the Vernon, California facility in July 1989. The SWEC report concluded that the swing arms were improperly cast and heat treated. The major conclusions of the report are as follows:

- a. The overall quality of the swing arm castings is generally poor and contained porosity, hot-cracks, and chemical segregation.
- b. The failure of the swing arm initiated from surface defects formed during solidification or cooling during the casting process.
- c. The swing arms did not receive adequate heat treatment to produce the H1100 condition and had been weld repaired with austenitic weld material.
- d. Normal nondestructive inspection techniques may not reveal hot cracks similar to those identified in the failed swing arm.
- e. Alternative materials should be considered for the swing arm part.

The NRC inspection team traced the origin of the swing arms, identified as part numbers 72225 and 73994, to the Industrial Pattern and Casting Company, with subsequent heat treatment performed by the Valley Heat Treating Company. The records reviewed indicated over 1000 swing check valves have been supplied to various customers for eventual use in nuclear applications (Attachment I).

The inspectors reviewed BW/IP's Nuclear Stress Report (NSR) 75500, dated October 26, 1976, concerning the broken and flawed CPSES check valve. The methodology incorporated in the report included the effects of dead weight, seismic, and other occasional loadings, but did not include the effects of large dynamic loads and transients that are possible during rapid valve closure caused by reverse fluid flow. Stress levels analyzed in the report for the swing arms were noted to be low. It is the NRC staff's opinion that large dynamic loads and transients may result in failure of a flawed, but not yet broken, swing arm.

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2. 10 CFR Part 21

BW/IP's Procedure L-A-16, "Compliance with 10 CFR Part 21," dated December 9, 1987, establishes standard practices for identifying, documenting, evaluating, and reporting identified deviations pursuant to 10 CFR Part 21. Deviations identified are evaluated by the BW/IP Evaluation Board which consists of the Manager of Quality, the Director of Engineering, and the appropriate Project Manager. The evaluation board determines if the deviation is reportable or not and documents the justification.

On June 1, 1989, TU Electric made BW/IP aware of a possible deviation concerning their swing check valves. The deviation, which involved the valve disc sitting too low within the valve body, resulted from improper disassembly and reassembly of the valves, which were performed by licensee personnel in accordance with Borg-Warner Procedure No. OMM 1003, dated March 15, 1977. On June 9, 1989, BW/IP provided an expanded assembly manual, BW/IP Operation and Maintenance Instruction OMM 2361, originally dated March 5, 1984, to TU Electric to enhance TU Electric's ability to use manufacturers recommended reassembly techniques. However, no other customers had been made aware of this revision nor had the BW/IP Evaluation Board performed an evaluation of the deviation in accordance with BW/IP procedures to support their conclusion to TU Electric that the deviation was not reportable under 10 CFR Part 21.

As a result of inspections conducted after the CPSES backseat issue, TU Electric later informed the NRC of a broken cast swing arm identified during their review. SWEC was contracted to perform a metallurgical analysis of the failed swing arm, which was documented in a July 7, 1989, technical report furnished to BW/IP during a SWEC inspection of the Vernon, California, facility in July 1989. As of the completion of the NRC staff's inspection, BW/IP had not evaluated the deviation identified to them by the SWEC report. As a result, Violation 89-01-01 was identified during this part of the inspection.

3. BW/IP Design Review

This area of the inspection concentrated on a review of the BW/IP design procedure, supporting analyses, and the quality system used to accomplish these activities. Independent calculations to verify BW/IP analysis methods were not performed by the NRC inspectors during this part of the inspection.

- a. BW/IP's NSR 70180, dated April 27, 1973, and revised April 8, 1989, describes the stress analysis for a Class 1, 8-inch,

1500 lb swing check valve. The analysis included a description of the applicable ASME Code, pressure and temperature design specifications, and 13 plant transients that represented the operating environment that occurred throughout the life of the valve. This plant transient specification was used in the fatigue analysis supporting the valve design. Calculations were performed using referenced formulas for the stress analysis and the results were reviewed and approved by an independent reviewer. It was also noted that considerable margin was available with respect to the allowable stress for each valve analyzed. However, dynamic loads generated during operation of the valve were not included in this analysis.

- b. NSR 75520, dated October 26, 1976, described the stress analysis of 3 and 4-inch, 150 lb, stainless steel check valves that were supplied to the CPSES and were designed to ASME Section III, Class 2 requirements. Areas of the valve that were analyzed included the valve body and arm, clevis and bolt, pivot pin, disk, flange and bolt, and the bonnet. Thermal transients were specified at 100°F/hour. The seismic load factor was 3g in each of two orthogonal horizontal directions and 2g in the vertical direction. These seismic accelerations were assumed to act simultaneously and appear to be typical values used for seismic load factors. The analysis results indicated that the calculated stress in the valve body was limiting with respect to the allowable stress and that the available margin was greater than a factor of 2 times the calculated maximum stress.
- c. BW/IP report number 401HDC1-005, Revision A, dated March 28, 1989, describes the stress analysis of a 3-inch, 150 lb, stainless steel, manual gate valve supplied to the CPSES. The valves were designed as ASME III, Class 3 components with a design pressure of 275 psig for application in the plant service water system. Nine different valve sections were considered in the analysis with the limiting calculated stress occurring in the valve gate. It was noted that stresses computed for the faulted load condition were conservative compared with stress limits for the normal mode; however, a very small margin existed with respect to the allowable stress.

The NRC inspectors requested the engineering calculations to support the basis for the valve design; however, these design documents could not be located in the BW/IP files. Similarly, the engineering calculations to support the design of a 12-inch motor operated gate valve supplied to

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Bellefonte, Units 1 and 2, also could not be located. Design information for this 12-inch valve was requested since the same valve was the subject of a 50.55(e) deficiency report issued to the NRC by the Tennessee Valley Authority (TVA). As a result of BW/IP not being able to retrieve the information, Nonconformance 89-01-08 was identified during this part of the inspection.

- d. The inspectors reviewed two 10 CFR 50.55(e) deficiency reports for BW/IP valves supplied to the Bellefonte and Watts Bar plants. The deficiencies involved overtightening of bolts which produced elongation and subsequent failure of the bolts when torqued to values specified on the BW/IP drawings. The product lines involved were the 12-inch motor operated gate valve (BW/IP drawing 80590) previously discussed in Item 3(c) above, and a 6-inch motor operated gate valve used in the auxiliary feedwater system (BW/IP drawing 79760). The resolution of both deficiencies was that incorrect bolt torquing values were specified on the drawings. The Engineering Change Notices and the supporting calculations were requested, however, BW/IP was unable to produce such documentation during the inspection. As a result, Nonconformance 89-01-09 was identified during this part of the inspection.
- e. The NRC inspectors reviewed NSR 75500, dated October 26, 1976, which was prepared for the 3 and 4-inch, 150 lb, carbon steel swing check valves which failed during hot functional testing at the CPSES. The stress analysis indicated that considerable margin (greater than a factor of 2) existed with respect to the allowable stress at the limiting location in the valve body. BW/IP correspondence also indicated that these valves were performance tested prior to delivery in 1975. However, the NRC inspectors were unable to review the documentation since it was in storage at an offsite location. As a result, Unresolved Item 89-01-11 was identified during this part of the inspection.
- f. During a review of the operating history associated with the Borg-Warner valve product line, several deficiency reports were selected for review at BW/IP. BW/IP was requested to supply documentation associated with the corrective action for the following issues:
 1. Overtightened bolts on a flow control valve at the Bellefonte Nuclear Plant as reported by TVA on November 20, 1981.

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2. Overtorqued studs on gate valve operators at the Watts Bar and Bellefonte Nuclear Plants as reported by the TVA on February 16, 1981.
3. Oversized motor-operated valve stem keys supplied to the Perry Nuclear Plants as reported by Cleveland Electric Illuminating Company on January 11, 1984.

As a result of BW/IP's stating the documentation could not be reviewed due to storage at an offsite location, Unresolved Item 89-01-10 was identified.

4. Review of Swing Arms as Replacement Parts

Borg-Warner Incorporated, Van Nuys, California procured swing arms and other valve internals for various models and sizes of swing check valves. The records, available for review during the inspection, indicated that Industrial Pattern and Casting Company and Valley Heat Treating supplied the majority of the castings for arms used in swing check valves. Historical receiving inspection reports reviewed indicate that originally the swing arms were heat-treated prior to machining. Subsequent orders for cast swing arms were procured with heat treatment as a post-machining operation versus a pre-machining operation. Traceability to material test reports and certificates of conformance were available for some orders; however, traceability to each casting could not be established. Several purchase orders to Industrial Pattern and Casting Company for the same part number imposed the requirements of a quality program and many others did not. Traceability distinction between the different purchase orders was not maintained and the total inventory of any particular part number would represent commingled castings from various purchase orders.

In late 1986 the remaining inventory of swing arms was transferred from Van Nuys, California to the newly formed BW/IP in Vernon, California, and rendered "Commercial Grade," as defined in 10 CFR Part 21, due to the lack of documentation supporting the qualification of this material. The inspection identified the following examples of Van Nuys inventory which were inadequately reviewed by BW/IP for suitability for use in safety-related swing check valves furnished to TU Electric and Arizona Public Services. As a result, Nonconformance 89-01-02 was identified during this part of the inspection.

- a. BW/IP Job Number 891H2977 for TU Electric required that eight machined swing arms, Part No. 72225, be drawn from

inventory. The route sheet required a material identity check per alloy identity procedure GS-1563, Revision D, dated May 24, 1988. This material identity check uses a comparison type instrument based on thermal conductivity differences between metals. Paragraph 3.0 of the procedure states, "Metals of the same or similar chemistry will produce instrument readings repeatable over established ranges, thereby generically sorting the test pieces." The instrument is capable of sorting between generic alloy groups, such as austenetic and martensitic stainless steels. However, the instrument cannot distinguish between any one of the four typical martensitic stainless steel specifications used by BW/IP. There was no verification of the mechanical properties of the swing arms and the verification of chemical properties is considered inadequate. In addition, traceability to a material manufacturer's material test report or certificate of conformance could not be established. Also, the results of BW/IP's visual and dimensional inspection performed on the arms were not documented.

- b. BW/IP Job Number 861L0201 for Arizona Public Services required one machined swing arm, Part No. 73748, to be drawn from inventory and used in a bonnet/arm disk assembly. The route sheet did not describe the steps necessary to determine compliance with the material specification, dimensional and configuration conformance, part identification, or nondestructive examination (NDE) requirements of the as-cast or machined surfaces. Therefore, the quality of this arm is indeterminate.
- c. BW/IP Job Number 861L2488 for Arizona Public Services required 11 machined arms, Part No. 72194, to be drawn from inventory. The route sheet again did not describe the necessary steps to determine compliance with the material specification or NDE requirements as stated in Item 4(b) above. Therefore, the quality of these arms is also indeterminate.

5. Review of Corrective Actions

A review of corrective actions performed by BW/IP indicates that Requests for Corrective Actions (RCAs) for non-ASME Code, nonpressure boundary parts used in safety-related applications covered by 10 CFR 50, Appendix B were not initiated. Section 16-1.2 of the BW/IP NPQM requires that RCAs be issued only for deficiencies identified in ASME Code items and violations involving by-passed hold tags. However, RCAs are not required by the NPQM

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for deficiencies identified in non-ASME Code, nonpressure boundary, safety-related items. Additionally, follow-up to RCAs is only required by Section 16-1.5 of the BW/IP NPQM to be performed for ASME Code items. The BW/IP quality inspector stated that logs used for trending to preclude repetition of RCAs are not maintained and RCAs are not generally issued for deficiencies identified in safety-related items that are non-ASME Code, nonpressure boundary. The process files for items excluded under this practice were reviewed during the inspection and the inspector verified the practice of not applying RCAs to those items. The BW/IP NPQM does not adequately provide measures required by Criteria V and XVI of 10 CFR 50, Appendix B to assure that all conditions considered detrimental to quality for safety-related, non-ASME Code, nonpressure boundary items are addressed by a corrective action program. As a result, Nonconformance 89-01-07 was identified during this part of the inspection.

6. Review of BW/IP's Approved Vendor List

The inspectors reviewed the Approved Vendor List (AVL) for nuclear safety-related QL-1, 3 and 4 items and services dated July 12, 1989. During this review it was determined that 43 vendors, available to supply nuclear safety-related items and services, were not surveyed initially and have not been audited triennially as required by Section 7-3.3 of the BW/IP NPQM. As a result, Nonconformance 89-01-06 was identified during this part of the inspection.

The review also identified 17 vendors holding ASME Quality System Certificates (QSC) as Material Manufacturers (MM) and/or Material Suppliers (MS) who also have not been audited due to their status as QSC holders. Therefore, BW/IP has not adequately ensured that the vendors are effectively implementing their quality program as required by BW/IP procedure. This issue was previously discussed in NRC Information Notice No. 86-21: Recognition of American Society of Mechanical Engineers Accreditation Program for N-Stamp Holders, dated March 31, 1986.

In one example, the NRC inspectors identified purchase orders for cast swing arms placed by BW/IP with the Atlas Foundry & Machine Company, an ASME QSC holder. The swing arms ordered were replacements for the failed swing arms identified by TU Electric. Atlas is one of the 17 QSC holders not audited by BW/IP to ensure effective implementation of their quality program. As a result, Nonconformance 89-01-04 was identified during this part of the inspection.

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In another example, the basis for qualifying the ACME Casting Company as an approved nuclear supplier of QL-3 and 4 cast valve internal parts was reviewed. The basis for approval of ACME relied on Military Specification MIL-I-45208A, "Inspection System Requirements." ACME's QA program was approved by the Byron Jackson Pump Division of Borg-Warner in May 1980. In 1985, ACME's program was reaudited and determined to be "inadequate requiring extensive manual revisions." As a result, ACME's status was changed to that of an unapproved supplier. On June 5, 1987, ACME was reclassified as an approved supplier of QL-3 and 4 safety-related items based upon ACME's certification that they complied with the provisions of 10 CFR Part 21. A review of safety-related purchase orders placed with ACME since 1986 identified 10 orders for various cast valve internals including the swing arm, yoke, and clevis. The NRC inspectors were unable to determine from the documentation reviewed, the customer or the nuclear facility involved in each of the procurements. As a result, Nonconformance 89-01-04 was identified during this part of the inspection. Qualification of the remaining 125 vendors was not reviewed during the inspection.

7. Review of Vendor Surveys and Audits Performed by BW/IP

The NRC inspectors reviewed the Quality Survey/Audit Reports and the Quality Audit checklist for several suppliers that have been evaluated and approved by BW/IP and are currently on the AVL for furnishing nuclear safety-related QL-1, 3, and 4 items and services. The QL-1 category applies to pressure boundary items and component supports in accordance with ASME Section III, Division 1, and NQA-1. This also includes activities related to Material Manufacturers and Material Suppliers holding a QSC. The QL-3 category applies to items manufactured or procured which require the highest level of quality as determined by BW/IP design engineering and references the requirements of NQA-1, ANSI N45.2, and 10 CFR 50, Appendix B. The QL-4 category applies to items manufactured or procured which require no more documentation than material test reports or certificates of conformance and references NQA-1, ANSI N45.2, and 10 CFR 50 Appendix B.

The Quality Survey/Audit Report and Quality Audit checklist for the suppliers discussed below were identified by the NRC inspector to not provide sufficient objective evidence to demonstrate effective implementation of the supplier's quality program. As a result, Nonconformance 89-01-06 was identified during this part of the inspection.

- a. Eagle Pattern & Manufacturing Company, Seattle, Washington is currently listed on the AVL (dated July 12, 1989) as a

supplier of QL-3, and 4 castings. The vendor was last audited by BW/IP on November 1, 1983. Documentation of the audit consisted of a four page "Vendor Quality Evaluation Questionnaire." A review of the questionnaire identified no objective evidence to substantiate the ability of the vendor to implement a quality program consistent with the applicable portions of 10 CFR 50, Apperidix B. The Quality Control Manual (QCM) is dated March 1, 1980 (Revision 0).

- b. M&N Metals, Incorporated, Odessa, Texas is currently listed on the AVL (dated July 12, 1989) as a supplier of QL-3, and 4 ferrous/nonferrous castings & wrought products. Welding, NDE, and heat treating is not within the scope of M&N as established by BW/IP. M&N was last audited on August 21, 1987 by BW/IP. An excerpt from the Quality Survey/Audit Report states, "Survey shows compliance to applicable portions of MIL-I-45208A and also meets safety-related requirements of 10 CFR 21 and 10 CFR 50, Appendix B. No NDE, heat treating or welding is allowed. Rough machined items only." However, the quality audit checklist reviewed does not describe any objective evidence evaluated by the auditor to substantiate M&N's ability to implement a quality program. The checklist also indicates that work instructions for machining is "Not Applicable" although rough machining is currently in M&N's scope. No procedures exist for the selection and surveillance of subcontractors, although metallurgical laboratory needs are subcontracted. Procedures for the identification, control, and issuance of material were not audited.

The inspectors independently reviewed M&N's QCM, dated January 2, 1987, and identified that the QCM does not adequately address the applicable criteria of 10 CFR 50, Appendix B. It was also noted that the format and wording was identical to the QCM for Eagle Pattern & Manufacturing Company described in Item 6(a) above.

- c. GMC Precision Tool Corporation, La Habra, California, is currently listed on the AVL (dated July 12, 1989) as a supplier of QL-3 and 4 machined parts; including material, tooling and fixtures, and special processes. Welding is not allowed to be performed by GMC. GMC was last audited on

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October 17, 1988 by BW/IP. The inspector reviewed the audit checklist for GMC which did not describe any objective evidence evaluated by the auditor to substantiate GMC's ability to implement a quality program. The audit also indicated that material supply is in GMC's authorized scope, although the audit checklist did not address procurement control or control of subcontractors as would be necessary to effectively supply material to BW/IP.

- d. Tooltex, Houston, Texas is currently listed on the AVL (dated July 12, 1989) as a QL-1 supplier of machining services for BW/IP furnished ASME Code material. Welding, NDE, and heat treating is not allowed to be performed by Tooltex. For ASME Code material, Tooltex was last audited by BW/IP on May 13, 1988 for QL-1 items and January 16, 1987 for QL-3, and 4 items. The quality audit checklist did not describe any objective evidence evaluated by the auditor to substantiate Tooltex's ability to implement a quality program commensurate with the level of services furnished. Although the audit checklist did not address procurement control or control of subcontractors, the file contained a copy of Tooltex's QCM with annotations where the BW/IP auditor had extensive revisions and rewrites.

8. Review of the Borg-Warner Corporation, Nuclear Products Approved Vendor List (NP/AVL)

The inspectors attempted to review the quality program requirements in-place during the period (prior to the end of 1986 when BW/IP was formed) when safety-related swing check valves were manufactured by the Nuclear Valve Division of Borg-Warner, Van Nuys, California (BW/NVD). Since BW/IP could only provide the BW/NVD, Nuclear Products Quality Assurance Manual (NPQAM), ASME Code Section III, Division 1, Revision K, dated February 18, 1980, the evaluation of the program requirements and documentation to support the qualification of vendors during the time when the failed CPSES swing arms were produced could not be accomplished. However, the inspectors determined from the BW/NVD NPQAM, Section 7.0, "Control of Purchased Material, Items, and Services," Paragraph 7.2.1, that prospective vendors of pressure boundary material and critical, nonpressure boundary parts shall be surveyed prior to being added to the NP/AVL. Paragraph 7.2.12 requires that approved vendors be audited at intervals not to exceed 12 months.

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Due to storage at an offsite location, BW/IP was unable to produce records of vendor surveys/audits performed by BW/NVD during the inspection. However, BW/IP produced a copy of the Borg-Warner Fluid Controls, Approved Nuclear Vendor List, dated January 16, 1984, with continued revision pages, representing all deletions and additions since November 25, 1972. The accuracy and completeness of this documentation could not be determined during the inspection. A review of the documentation identified that two vendors used in the procurement and manufacture of the failed swing arm did not appear on the list, Valley Heat Treating, used between December 1975 to January 1977, and Peabody, used between November 1978 to December 1978. Another vendor, Pacific Steel Treating, was used in June 1979 but did not appear on the list until August 1980 and remained on the list through February 1986. Unresolved Item 89-01-12 was identified during this part of the inspection.

F. PERSONS CONTACTED:

- *F. Burgers, Vice President Operations
- G. Godwin, General Manager
- *D. Gibson, Manufacturing Operations Manager
- *W. Klenner, Nuclear Valve Product Manager
- L. Boswell, Project Engineering Manager
- *R. Ham, Manager of Quality
- *J. Bartholomew, Senior Project Engineer
- *J. Soet, Purchasing Manager

* Attended Exit Meeting

ORGANIZATION: BW/IP INTERNATIONAL, INCORPORATED
VERNON, CALIFORNIA

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ATTACHMENT I

Potential Recipients of BW/IP Swing Check Valves

Palo Verde
Arkansas Nuclear One
Pilgrim Station Unit No. 2
San Onofre Unit No. 1
Perry Nuclear Power Plant
St. Lucie Unit No. 1
Catawba Nuclear Station
McGuire Nuclear Station
Oconee Nuclear Station
Diablo Canyon
Ginna Station
Sequoyah Nuclear Project
Watts Bar Nuclear Plant
Browns Ferry Nuclear Plant
Comanche Peak Steam Electric Station