

ORGANIZATION: ANCHOR/DARLING ENTERPRISES, INCORPORATED
LACONIA, NEW HAMPSHIRE

REPORT NO.: 99901115/90-01	INSPECTION DATE: September 17-20, 1990	INSPECTION ON-SITE HOURS: 78
CORRESPONDENCE ADDRESS: Mr. Peter B. Ellis General Manager Anchor/Darling Enterprises, Incorporated 32 Moulton Street Laconia, New Hampshire 03246		
ORGANIZATIONAL CONTACT: Jean Keyes-Stewart, Quality Assurance Manager TELEPHONE NUMBER: (603) 528-1931		
NUCLEAR INDUSTRY ACTIVITY: Designer and manufacturer of dynA/Damp mechanical and hydraulic shock suppressors used throughout the nuclear power industry. Anchor/Darling Enterprises (formerly Anchor/Darling Industries, Hatfield, Pennsylvania) also holds a Quality System Certificate as a Material Supplier issued by the American Society of Mechanical Engineers.		
ASSIGNED INSPECTOR:	<u>Robert L. Pettis, Jr.</u> R. L. Pettis, Jr., Reactive Inspection Section No. 1 (RIS-1) Vendor Inspection Branch (VIB)	<u>1/31/91</u> Date
OTHER INSPECTOR(S):	S. L. Magruder, Special Projects Section, VIB D. L. Jew, NRC Consultant, EAS Energy Services	
APPROVED BY:	<u>Richard P. McIntyre</u> U. Potapovs, Chief, RIS-1, VIB	<u>2/5/91</u> Date
INSPECTION BASES AND SCOPE:		
A. <u>BASES</u> : 10 CFR Part 21; 10 CFR Part 50, Appendix B and ASME III Subsection NCA, Article NCA-3800.		
B. <u>SCOPE</u> : The inspection was performed primarily to review Anchor/Darling's response to previous nonconformances identified during NRC Inspection No. 99901115/88-01, dated December 16, 1988.		
PLANT SITE APPLICABILITY: Arkansas Nuclear One 1 and 2 (50-313, 50-368); Diablo Canyon 1 and 2 (50-275, 50-323); Vogtle 1 and 2 (50-424, 50-425); South Texas 1 and 2 (50-498, 50-499); Surry 1 and 2 (50-280, 50-281).		

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A. VIOLATIONS:

There were no violations identified during the inspection.

B. NONCONFORMANCES:

1. Contrary to the requirement of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50, Anchor/Darling Enterprises, Incorporated (A/DE) does not require program implementation audits of material manufacturers and/or material suppliers holding a Quality Systems Certificate (QSC) issued by the American Society of Mechanical Engineers (ASME). (90-01-01)
2. Contrary to the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50; Article NCA-3551.2, "Load Capacity Data Sheet" (LCDS) and Article NF-3261, "Procedure for Load Rating," of Subsections NCA and NF, respectively, to the 1980 Edition of Section III to the ASME Code, A/DE was unable to provide load rating documentation necessary to support the qualification and design basis of their Model AD-12500 mechanical shock suppressor. Additionally, A/DE was also unable to provide documentation to support spring rate data for their entire mechanical shock suppressor product line as published in the A/DE catalog. (90-01-02)
3. Contrary to the requirements of Criterion XVII, "Quality Assurance Records," of Appendix B to 10 CFR Part 50 and A/DE Procedure MST5-0001, "Mechanical Snubber Development Program," A/DE could not produce calibration records for equipment used to qualification test the AD-5500 and AD-12500 model mechanical snubber during the July 1981 and January 1982, test periods, respectively. Additionally, A/DE could not produce documentation to verify the basis of acceptance charts used to verify snubber operability in the field using in-place testing methods. (90-01-03)

C. UNRESOLVED ITEMS:

During the review of Anchor/Darling Industries' (A/DI's) corrective action to previous nonconformance 88-01-04, A/DI's disposition for several Material Rejection Notices (MRNs), which remained "open" for several years without the affected material placed "on-hold," is inadequate to assure that the affected material was not inadvertently used. (90-01-04)

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D. STATUS OF PREVIOUS INSPECTION FINDINGS:

1. (Closed) Violation (88-01-01)

Contrary to Section 21.31 of 10 CFR Part 21, Anchor/Darling Industries purchase orders (POs) to vendors for safety-related components and services, up through early 1988, failed to specify the provisions of 10 CFR Part 21. Several POs reviewed during the 1988 time frame, however, did invoke 10 CFR Part 21, but only on a limited basis.

The NRC inspectors selected several safety-related POs for review to determine A/DI's compliance. The POs included J. T. Ryerson (May 21, 1990); GE Silicone Products (June 11, 1990); Bearings, Incorporated (May 31, 1990); Lindberg Heat Treating (July 24, 1990) and A.E.L. Laboratories (August 2, 1990). In all cases, the provisions of 10 CFR Part 21 were invoked on each supplier. Violation 88-01-01 is considered closed.

2. (Closed) Nonconformance (88-01-04)

Contrary to Sections 7.3 and 9.3 of the A/DI Quality Assurance (QA) manual, approximately 68 MRNs covering potentially defective material during the period 1981 to present, remain "OPEN" and the affected material cannot be located.

The NRC inspector reviewed 55 MRNs relating to snubbers provided to the nuclear industry by A/DI to determine if adequate corrective action had been performed. The remaining 13 MRNs (out of the 68 identified during the August 1988 inspection) could not be located by A/DI, and therefore were not reviewed during the inspection. A/DI stated that these MRNs related only to the valve actuator product line which was manufactured by A/DI prior to October 10, 1980. A/DI's first shipment of snubbers to the nuclear industry began in February 1981.

The approach utilized by A/DI to disposition the affected material associated with the MRNs initiated during the 1983 timeframe was to reconvene the Material Review Board (MRB) in 1988 and provide a reasonable disposition based on present information available and, in some cases, records obtained during the 1983 timeframe. The NRC review of this documentation indicated that for most cases documentation was unavailable to support the MRB's disposition. For example, MRNs which noted the disposition "Use As-Is", "Scrap" or "Return to Vendor" did

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not contain documentation, other than the MRB's written statement, to support the basis for the disposition. The NRC inspectors expressed concern over the MRB's method of dispositioning the affected material. A/DE representatives stated that they received such material directly from A/DI (Hatfield) during the move to Laconia and were not responsible for the content nor were they familiar with the issue.

Despite the lack of documentation provided by A/DI to support the disposition of the MRNs, the extent to which material was rejected primarily involved discrepancies within the machining process which may have led to tolerance related problems. Most of the dispositions involved the statement "OK, Use As-Is" with some additional work to be performed by A/DI during the assembly process. Tolerance related problems in active components such as the Ball Screw, Verge and Rack would have normally been identified during the functional test phase performed by A/DI prior to shipment of the snubber. However, other discrepancies noted were of a material defect nature (linear indications, cracked housings, etc.). The following is a list of several MRNs reviewed during the inspection for which documentation was unavailable to adequately support implementation of the MRB's disposition. The deficiency identified on the MRN appears to have the potential to cause a possible reduction in the load carrying capacity of the snubber. Additionally, such a deficiency may not be detected during normal functional or routine maintenance testing of the snubber in the field.

<u>MRN NO.</u>	<u>DATE OPENED</u>	<u>DATE CLOSED</u>	<u>DEFICIENCY IDENTIFIED</u>	<u>DISPOSITION OF THE MRB</u>
1316	7/82	9/88	Undercut welds in Transition Tube	Use As-Is
1478	3/83	9/88	Failed Tensile Test for 6-inch Tube	Returned to Vendor
1523	6/83	9/88	Linear Indications on Rear Housing	Scrap Material
1657	10/83	9/88	No Heat Number Etched on Cap	Use For Non-Nuclear
1906	10/84	10/88	Crack observed in 24-inch Pipe Clamp	Scrap Material

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Unresolved item 90-01-04 was identified during this part of the inspection.

E. INSPECTION FINDINGS AND OTHER COMMENTS:

1. Background

The last inspection performed at A/DI was conducted in August 1988 at Hatfield, Pennsylvania. Since then, A/DI has undergone substantial changes including relocating to Laconia, New Hampshire. The changes began in the early 1980's when A/DI bought an interest in the Bergen-Paterson Pipesupport Corporation (B-P), a manufacturer of hydraulic snubbers and component supports. Late in December 1987, Anchor/Darling management decided that A/DI and B-P should separate and that A/DI would take over B-P's facilities in Laconia as well as their snubber product line. A/DI's intentions at this point were to move the product line to Hatfield within 18 months.

For the first eight months of 1988, A/DI had only two employees in Laconia both of whom were former B-P employees. The former head of snubber testing was designated as Facilities Manager and the former head of manufacturing was designated his assistant. Basically, business went on as usual for B-P as they continued to process orders for hydraulic snubbers. A/DI essentially took parts manufactured or bought by B-P (under the B-P quality assurance program) assembled them and sold them back to B-P who then shipped them under the B-P name. This continued until June of 1988 when A/DI issued B-P a QA manual to work under. At this time, paperwork was processed through the Hatfield office instead of relying on B-P, who was also significantly reducing their workforce during this period.

During the summer of 1988, A/DI purchased a small machine shop that had been doing work for them and integrated them into the B-P facility. A/DI also hired a QA assistant in August 1988 to implement their QA program. During the time of the NRC inspection at Hatfield, mechanical snubbers were being manufactured in Hatfield while the hydraulic line was being manufactured in Laconia.

In December 1988, A/DI reversed its earlier decision and moved the entire snubber line to Laconia. Additionally, instead of moving the Hatfield employees to Laconia, it was decided to staff the Laconia plant with former B-P personnel. A/DI also received permission from ASME to transfer their QSC from Hatfield to

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Laconia in May 1989, and during the summer A/DI transferred all their inventory to Laconia. In July 1989, the Hatfield facility was officially terminated and the name of the Laconia facility changed to Anchor/Darling Enterprises, Incorporated. A/DE successfully passed an ASME audit in July 1990. As a result, their QSC has been extended through August 31, 1993.

2. Qualification of the dynA/Damp Mechanical Snubber Product Line

The qualification of the dynA/Damp Mechanical Snubber product line was reviewed during the inspection. This product line includes seven snubber sizes ranging from design loads of 400-125,000 pounds (commonly referred to as 0.40-125 kips). The review involved determining the technical adequacy of Product Specification No. EN-DS-01, "Mechanical Snubber Design Specification," Revision F, dated April 1990, and the conformance of the actual snubber qualification to the product specification. Revision F of the specification contains minimal technical changes since its initial issuance in January 1981.

The functional and engineering requirements established by this specification appeared to be technically adequate to qualify the mechanical snubber product line. However, upon reviewing the qualification of the 125 kip snubber (Model AD-12500), the NRC inspectors noted that the documentation available did not substantiate qualification of this unit per the product specification for the following reasons:

- a. Section 5.2 of Product Specification No. EN-DS-01 states that, "snubber rated loads be established by load rating in accordance with ASME III, Subsection NF-3260." Additionally, this load rating test shall be performed in accordance with A/DI Load Rating Test Procedure MSTs-007. For the AD-12500 model snubber, documentation was unavailable to support the load rating basis according to NF-3260.
- b. Section 8.1 of Product Specification No. EN-DS-01 states that, "qualification testing shall be performed on a minimum of two units of each size in accordance with Anchor/Darling Procedure MSTs-005, "Snubber Qualification Test." For the AD-12500 snubber, qualification testing was performed per Anchor/Darling Procedure MSTs-003, "Engineering Evaluation Testing" and was done on only one unit. The major differences between procedures MSTs-003 and -005 are that MSTs-005 requires the testing of two units (as opposed to one unit per MSTs-003) and MSTs-005 requires that qualification tests be performed on spring rate, displacement, velocity, and drag force at elevated temperatures (205 degrees F) as well

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as at ambient temperatures. Procedure MST5-003 only requires that these tests be performed at ambient temperatures. During the inspection, it was determined that Vogtle, South Texas Project, Diablo Canyon and Arkansas were the only recipients of the AD-12500 model and that such units may have been furnished by A/DE under the 1977 Edition of the ASME Code which allowed qualification to be performed by analysis. However, such units were certified to the 1980 Edition which only recognizes load rating. A/DE stated that a 10 CFR Part 21 report was not required since analytical calculations performed previously demonstrate the load carrying capacity of the AD-12500 model. In a letter dated September 26, 1990, A/DE committed to perform a requalification test using the load rating method which is required in the 1980 Edition of ASME III, Subsection NF-3260. Such tests are scheduled for completion by April 1991. A complete review of A/DE's calculations used to support their basis for not issuing a 10 CFR Part 21 report will be reviewed during our next inspection. Nonconformance 90-01-02 was identified during this part of the inspection.

3. Calibration of Test Instrumentation

Section 9.1 of Product Specification No. EN-DS-01, "Documentation" states, "See Anchor/Darling Procedure MST5-0001, 'Mechanical Snubber Development Program', Paragraph 9.0 for requirements." Section 9.2.4 of Procedure MST5-001 requires a "calibration records reference for all instrumentation used."

A/DE stated that the qualification tests for the AD-5500 Model (55 kip) and AD-12500 Model (125 kip) were performed in July 1981 and January 1982, respectively, by New Hampshire Testing Laboratory, a subsidiary of B-P. However, calibration records for the Wavetek Function Generator and the PRC Humitemp (Model B, Serial No. 809), which were two instruments used in the qualification test of these two snubbers, could not be produced by A/DE during the inspection. The Wavetek Function Generator had calibration records which dated back to March 1982, while the PRC Humitemp had records which dated back to February 1982. Nonconformance 90-01-03 was identified during this part of the inspection.

4. Spring Rate Data

The 1982 dynA/Damp Mechanical Snubber catalog, which was published

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when A/DI was located in Kulpsville, Pennsylvania, and the most recent edition, which lists their corporate office in Rosemont, Pennsylvania, contain spring rates for the mechanical snubber line.

Section 5.6 of Product Specification EN-DS-01 requires that spring rates be established by test by subjecting test specimens to cyclic loading between 3 and 33 cycles per second (CPS). Furthermore, peak-to-peak displacement (one cycle) shall not exceed 0.060 inches measured pin-to-pin at frequencies of 9 and 18 CPS. No correlation could be made between the published spring rate values and those attained by testing per the product specification.

More specifically, for the Model AD-5500 unit, the 1982 catalog lists the average dynamic spring rate as 150,000 pounds per inch while in the 10 - 33 CPS range. When qualifying this unit per MST5-005, however, the maximum tested dynamic spring rate was only 124,000 pounds per inch which is 21% lower than the published value. Likewise, for the Model AD-12500 unit in the 10 - 33 CPS range, the published spring rate was 1,600,000 pounds per inch while the maximum tested dynamic spring rate was only 1,100,000 pounds per inch, or 45% below the published value. These deviations could not be evaluated since A/DI could not produce documentation to support the basis for the published spring rates. Nonconformance 90-01-02 was identified during this part of the inspection.

5. In-Place Snubber Testing Machine

A/DE has designed a machine to test snubbers in-place which consists of a solid-state control console, an electric drive head, and adapters which allow for testing of the complete mechanical snubber line. The unit is designed to check for the drag and velocity of the snubber in-place. Verification of drag and velocity is performed by recording resistance torque and plotting these values on a corresponding acceptance chart which then determines the operability status of the snubber based on the values plotted.

A/DE could not produce documentation to verify the basis of the acceptance charts. Furthermore, upon performing some experimental tests with the unit, A/DE realized the acceptance charts could possibly yield erroneous results depending on certain factors such as snubber orientation. Subsequently, A/DE informed Houston Light & Power not to use the test unit on the AD-40,

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AD-70, AD-150, AD-500, and, by additional testing, regenerated more accurate curves for the acceptance chart for the AD-1600 and AD-5500 models. A/DE determined that one other unit was sold to Pacific Gas & Electric (PG&E) for the Diablo Canyon nuclear plant. A/DE stated that to their knowledge, PG&E has never used their unit. A more accurate curve for the acceptance chart for the AD-12500 model will be generated in the near future. Nonconformance 90-01-03 was identified during this part of the inspection.

6. Analysis of the AD-12500 Model Snubber

A hand calculation analyzing the critical members in the load path (compression and tension) of the AD-12500 unit was performed by A/DE. The calculation used a design load of 125 kips and the allowable stresses from ASME III, Appendix XVII. The analysis demonstrated that the critical load carrying members were satisfactory with respect to allowable stress. However, the calculation did not account for the compression stress on the rollers and the thrust race. A/DE stated that these items were probably considered exempt under ASME III, Subsection NF-2121 and, therefore, not included in the stress analysis. This approach is unacceptable since the Code (NF-2121) only exempts such items from material considerations. However, if such items fall inside the load path of the snubber, their effect should be analyzed with respect to the total load carrying capacity of the snubber.

It should be noted that the Load Capacity Data Sheets (LCDS) for the mechanical snubber line are only qualified to the ASME III 1980 Edition, Summer of 1981 Addenda. Additionally, paragraph NCA-3551.2 states that a LCDS is the design document used when the component support is designed by load rating. Therefore, A/DE's analysis cannot be used to support the qualification basis for the AD-12500 model mechanical snubber. This item was discussed previously in Section E.2 of the report.

7. Review of A/DE's Approved Vendor List

The inspectors reviewed A/DE's Approved Vendor List (AVL) and procedures for controlling vendors. Section 5.5.1 of the A/DE QA manual titled, "Subcontracted Services and Material" provides procedures to guide personnel in classifying and qualifying vendors. These procedures require all vendors to be audited by a qualified auditor in accordance with Quality Assurance Standard QA-AU-2, "Quality Assurance Evaluation of Vendors" and QA-AU-3,

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"Qualification of Audit Personnel." A/DE uses a five category system to rate vendors upon audit. However, Section 5.5.1 also considers this audit responsibility to have been met if the Material Manufacturer or Material Supplier holds a valid QSC issued by ASME covering the materials or services to be supplied. This practice does not verify that the supplier is effectively implementing its QA approved program. Licensees and their subcontractors are responsible for ensuring that the supplier is effectively implementing their approved QA program as discussed in NRC Information Notice 86-21, issued March 31, 1986 and Supplement 1, issued December 4, 1986. Nonconformance 90-01-01 was identified during this part of the inspection.

The AVL currently contains 73 vendors and is broken up into the following categories: Calibration, Gear Cutting, Heat Treating, Machining, Material Manufacturer, Material Supplier, Nondestructive examination (NDE) Services, Surface Finishing, Testing, 10 CFR 50/ANSI N45.2 Procurements and Commercial Grade Items. These categories are designated for ASME Section III and 10 CFR Part 50, Appendix B related work.

The AVL appears to be well maintained and utilized. All POs for safety-related items must be placed with vendors who are on the AVL. The inspectors concluded that A/DE has established acceptable procedures for categorizing and controlling vendors.

8. Review of A/DE's Supplier Audits

The inspectors reviewed the procedures for performing audits of vendors and also reviewed several examples of audits performed to verify implementation. Section 5.5.1.1 of the A/DE QA Manual titled "Vendor Audits" provides guidance to personnel for conducting audits. This procedure directs that audits be performed on a triennial basis and that approved checklists be used. The following vendors providing services such as heat treating, machining and NDE were selected for review: Precision Heat Treatment; Unique Machine Company; Valley Enterprises; Universal Testing and Briggs Associates.

The NRC inspectors determined that the audits reviewed appeared thorough and well documented and that the vendors appeared qualified to provide the services contracted for by A/DE.

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9. Review of A/DE's Quality Assurance Program

The inspectors were particularly interested in the status of the A/DE QA program during the period January 1988 - July 1989 when Laconia was transitioning from B-P to A/DI. During the period January 1988 - June 1988 it appears that the operations at Laconia, under the direction of the Hatfield office, relied on B-P for QA services. All procurements were from vendors audited and approved by B-P and the parts receipt inspected by B-P inspectors. All manufactured parts were also made by B-P under their quality control program and the finished products were tested and certified by the B-P QA department. Although the QA manager from Hatfield visited Laconia occasionally, A/DI did not have quality control over the products shipped from Laconia, B-P did. The B-P QA program in effect during this period was briefly reviewed by the inspectors and appeared to be adequate.

In June 1988, A/DI issued a QA manual specifically for the Laconia plant and started assuming more of the QA responsibility, since B-P was significantly reducing the size of its workforce. The transition to the A/DI system progressed gradually until early 1989 when additional employees were hired and the operations began to change more rapidly. The Spring of 1989 involved transferring the entire inventory from Hatfield to Laconia and, as a final move in the transition, the ASME approved the transfer of the QSC from Hatfield to Laconia in May. In July 1989, the Hatfield facility was officially terminated and the name of the Laconia facility changed to Anchor/Darling Enterprises, Incorporated.

In February 1990, A/DE revised both their ASME Section III and 10 CFR Part 50, Appendix B, QA manuals significantly to reflect their operations. The ASME conducted another audit of A/DE in June 1990 and renewed their QSC for another three years.

10. 10 CFR Part 21 Reports

The NRC inspectors reviewed A/DE's processing of an issue that resulted in a 10 CFR Part 21 report from A/DE to the NRC on August 28, 1989. The issue involved potential interference problems associated with a specific structural attachment and snubber body. The NRC inspectors were interested in how A/DE identified, evaluated, and dispositioned the issue.

The inspectors identified that A/DE's corporate office (located in Hatfield, Pennsylvania) was the first to be made aware of the problem. A sales engineer from A/DI (Hatfield) received a phone

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call from Pacific Gas and Electric (PG&E) in November 1988. The sales engineer wrote a memo to PG&E dated November 8, 1988, acknowledging the problem and promising to notify all effected customers. However, the sales engineer left A/DI in January 1989, and as a result, followup on the issue was not accomplished.

Nothing further happened with this issue until PG&E sent a letter to A/DI (now located in Rosemount, PA) on June 12, 1989, stating that they had corrected the interference problem. PG&E also inquired about whether A/DI was going to process the issue in accordance with the requirements of 10 CFR Part 21. This letter prompted an interoffice memo from A/DI (Rosemount) to A/DE on June 21, 1989, stating that they were aware of the problem and had determined that, besides PG&E, only two plants (Vogtle and Arkansas) had affected snubbers. The memo advised that these customers should be notified of the problem and that the affected components should be redesigned.

On July 7, 1989, A/DI sent out a letter to the affected plants officially informing them of the problem. The letter stated that snubber installation locations which utilize the AD-5500 snubber in conjunction with an AD-5505 structure attachment may encounter swing clearance problems between the structural attachment and fixed end paddle of the snubber. This interference could introduce additional stresses into the snubber, which could impair the snubber's ability to perform. The letter further asked that the plants have their engineering staff review those snubber installations utilizing these components for the potential interference problem. This action on the part of A/DI fulfilled their responsibility under 10 CFR Part 21. A/DE also sent a letter to the NRC on August 28, 1989, identifying the problem and stating that their customers had been notified.

The NRC inspectors were concerned with the delay between November 1988 when A/DI was informed of the problem, and July 1989 when they finally notified their customers. The records relating to this issue and the procedures covering it were not reviewed during the inspection due to the fact that the records were stored at the Rosemount, Pennsylvania location. This concern was treated as a "Lesson Learned" during discussions with A/DE personnel on their 10 CFR Part 21 procedures. The inspectors were satisfied that A/DE personnel appeared to be familiar with the requirements of 10 CFR Part 21 and that they would notify Rosemount personnel of the inspectors' concern over the timeliness issue.

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11. Review of Repair Procedures Associated with the A/DE Snubber Line

The inspectors reviewed the process that A/DE uses to repair snubbers. Of particular interest were the procedures that are used to control the process. The review determined that repairs are treated similarly to new orders when they come in and that they are well documented and thoroughly controlled.

The process starts when the PO is received by the A/DE sales staff who then generate a shop order form and a shop order review and release form. These forms allow the shop to test the snubber and then tear it down to identify the problem. An assembly authorization form, generated by engineering in accordance with procedure MF-AA-1, "Preparation and Use of the Assembly Authorization," then provides a list of material that is required to rebuild the snubber.

The assembly and testing of the snubbers are controlled by procedures specific to the type of snubber being repaired. A/DE still uses B-P procedures that have not yet been incorporated into the A/DE numbering system. For example, hydraulic snubbers are assembled in accordance with procedure BP-5-9, "Hydraulic Shock and Sway Arrester Sub-assembly and Pre-calibration Techniques." The procedures reviewed appeared to be adequate, however, an implementation review was not performed during the inspection.

F. Persons Contacted

- # Peter B. Ellis, General Manager
- * Jean Keyes-Stewart, Quality Assurance Manager
- * Paul Larose, Manufacturing Manager
- * Walter Paszul, Engineering Manager

- * Attended both entrance and exit meetings
- # Attended exit meeting only