

ORGANIZATION: TERRY CORPORATION  
WINDSOR, CONNECTICUT

REPORT NO.:	99900720/82-01	INSPECTION DATE(S)	6/6-8/82	INSPECTION ON-SITE HOURS:	19
CORRESPONDENCE ADDRESS: Terry Corporation ATTN: Mr. R. A. Neeld Vice President and Secretary Lamberton Road, P. O. Box 555 Windsor, CT 06095					
ORGANIZATIONAL CONTACT: Mr. H. Wainscott, Corporate Quality Control Manager TELEPHONE NUMBER: (203) 688-6211					
PRINCIPAL PRODUCT: Steam Turbine & Reduction Gears for Power and Industrial Uses. NUCLEAR INDUSTRY ACTIVITY: The Terry Corporation's contribution to the nuclear industry represents approximately two percent of its total work load.					
ASSIGNED INSPECTOR:	<u>Wm D Kelley</u> Wm. D. Kelley, Reactive & Component Program Section (R&CSP)			<u>8/16/82</u> Date	
OTHER INSPECTOR(S):					
APPROVED BY:	<u>I. Barnes</u> I. Barnes, Chief, R&CPS			<u>8/17/82</u> Date	
INSPECTION BASES AND SCOPE:					
A. <u>BASES</u> : 10 CFR Part 21 and 10 CFR Part 50, Appendix B.					
B. <u>SCOPE</u> : This inspection was made as a result of a 10 CFR Part 21 report by the Tennessee Valley Authority concerning the rotation of the inboard bearing of a Terry Corporation turbine installed in the Browns Ferry Nuclear Plant Unit 3, Reactor Core Isolation Cooling System. Additionally, the following areas were inspected: quality assurance program; and nonconformances and corrective action.					
PLANT SITE APPLICABILITY: 50-254; 50-259; 50-260; 50-263; 50-265; 50-271; 50-277; 50-278; 50-293; 50-296; 50-298; 50-322; and 50-333.					
DESIGNATED ORIGINAL Certified By <u>Phyllis Jouts</u>					

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A. <u>VIOLATIONS:</u> None		
B. <u>NONCONFORMANCES:</u> None		
C. <u>UNRESOLVED ITEMS:</u> None		
D. <u>OTHER FINDINGS OR COMMENTS:</u> 1. Tennessee Valley Authority (TVA): Brown's Ferry Nuclear Plant, Unit 3 - Problem reported was rotation of bearing in reactor core isolation cooling (RCIC) turbine causing partial blockage of the lubricating oil supply. a. <u>Background</u> TVA issued a 10 CFR Part 21 report to the NRC on February 3, 1982, stating that a routine inspection of the RCIC turbine revealed that the inboard babbit-lined bearing had rotated in its bearing mount causing partial blockage of the lubricating oil supply and could have eventually resulted in rendering the RCIC system inoperable. The cause of the rotation of the bearing was attributed by TVA to the lack of an antirotation pin or device. b. <u>Findings</u> (1) <u>Contractual Requirements:</u> The NRC inspector reviewed the the General Electric Company (GE), Atomic Power Equipment Department, purchase order Number 205-B2104, dated August 16, 1967, with the Terry Steam Turbine Company (TC) and verified that 13 steam turbines were ordered to drive the RCIC system pumps in the following nuclear plants; (a) Tennessee Valley Authority, Brown's Ferry Nuclear Plant, Units 1, 2, and 3; (b) Philadelphia Electric Company, Peach Bottom Atomic Power Station, Units 2 and 3; (c) Commonwealth Edison Company, Quad Cities Station, Units 1 and 2; (d) Northern States Power Company, Monticello Nuclear Generating Station; (e) Boston Edison Company,		

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<p>Pilgrim Nuclear Power Station, Unit 1; (f) Vermont Yankee Nuclear Power Corporation, Vermont Yankee Nuclear Power Station; (g) Power Authority of the State of New York, James A. Fitzpatrick Nuclear Station; and (h) Nebraska Public Power District, Cooper Nuclear Station.</p> <p>(2) <u>Notification by TVA and TC Action</u> - In a telephone conversation the last week of January 1982, TVA informed TC that the RCIC system turbine installed in their Brown's Ferry Nuclear Plant, Unit 3, did not have an antirotation pin in the in-board bearing. TC drawing 77574E, as issued to the shop for the assembly of the 13 turbines purchased by GE, did not show the antirotation pin. TC personnel informed the NRC inspector orally that during the 1969-1971 era in which these turbines were assembled, it was TC's standard shop practice to install bearing antirotation pins during assembly. The NRC inspector verified that the antirotation pin hole was detailed on the bearing manufacturing drawing; however, there was no written procedure or subassembly drawing that addressed the layout and drilling of the antirotation pin hole in the bearing cap or the installation of the antirotation pin during assembly. The purpose of the pin was to assure correct location of the bearing during either assembly in the TC shop or during maintenance at the nuclear plant. Rotation of the bearing during operation is prevented, however, by a 0.002 to 0.004 inch pinch fit of the bearing between the bearing cap and the pedestal.</p> <p>GE purchase order Number 205-B2104 and GE QC Plan 288 required TC to generate and maintain records of all test and inspection operations and the records had to contain the date of inspection, inspector's identification, inspection procedures identification and the results, disposition and date of repairs; also, the original of these quality control records were to be maintained for a period of five years. The NRC inspector was informed that the original copies of the quality control records and shop travelers had not been retained; however, the quality control records and certified mill test reports had been microfilmed. The NRC inspector reviewed the microfilmed records for the TVA Brown's Ferry Nuclear Plant, Unit 3, turbine and verified that the TC "Quality Control-Turbine Checklist, After Assembly-Before Test," had been signed off by the TC inspector and Item 20 entitled, "All Rotor/Stator Locking Nuts, Shrink Collars, Collars, Set Screws, etc., secured.," had been checked off.</p>		

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After TVA informed TC that their Brown's Ferry Nuclear Plant, Unit 3, turbine did not have the bearing antirotation pin, TC reviewed the assembly drawings for all turbines sold for installation in nuclear plants and engineering change notices were issued revising 14 assembly drawings and their parts list to include the bearing antirotation pin. In addition, TC reviewed the shop practice for the installation of the bearing antirotation pins and a training session was stated to have been held for the assemblers and inspectors on how the bearing antirotation pins were to be installed and inspected.

The NRC inspector reviewed a select sample of the 14 TC turbine assembly drawings and verified that the engineering change notices had been issued and the assembly drawings and parts lists had been revised to show the bearing antirotation pin; however, the NRC inspector could not verify the training because TC did not document the training session.

TC reviewed the missing antirotation pin in the TVA Brown's Ferry Nuclear Plant, Unit 3, turbine for reportability in accordance with their procedure SOM Number 6.1.111, revision 1, "Reporting of Defects and Noncompliance, 10 CFR Part 21 (Part 21 of Title 10 of the Code of Federal Regulations), for Nuclear Turbine," and issued a report signed by their designated responsible officer on July 8, 1982, that evaluated the failure to install the antirotation pin as not being a reportable safety hazard. It would appear that this determination was made based upon the pin function being for location purposes and not to prevent rotation. Consideration of effects of bearing misorientation did not appear to have been included in the evaluation.

(3) Followup Item:

As of this inspection, other TC turbine customers had not been notified of the identified potential for bearing rotation. TC personnel informed the NRC inspector that letters would be sent to the purchasers and/or owners of the TC turbines that have been shipped to nuclear sites, advising them to check their turbine bearing for the installation of the antirotation pin. These letters will be reviewed on a subsequent inspection.

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<p>2. <u>Quality Assurance Program Review:</u> Reviewed the TC Quality Control Manual, Standard Operating Manual, two design data procedures, two standard practice specifications, two engineering change notices, four design drawings, and documentation microfilm. Verified that procedures referenced in the quality control manual had been implemented to control the quality of the turbines and reduction gears.</p> <p>3. <u>Nonconformances and Corrective Action:</u> Reviewed TC Quality Control Manual Sections XV and XVI, two standard practice specifications, two welding compliance records and 25 Quality Control Reports. Relative to the documents examined, due to the small amount of nuclear work in the plant Quality Control Reports for both nuclear and commercial turbines were reviewed by the NRC inspector to verify compliance with the standard practice specifications because the standard practice specifications and Quality Control Reports are used to identify nonconformances and document corrective actions for both nuclear and commercial turbines and reduction gears.</p>		



Item No.	Doc. Type	TITLE/SUBJECT	Doc Date	Doc Rev.
01	2	GE Nuclear Energy Div. Document No. 21A5840 Project(s), Browns Ferry 1, 2 and 3 Auxiliary Steam Turbine Drives	8/16/71	4
02	2	GE Nuclear Energy Div. Document No. 21A5840 AF Project(s) TVA (Browns Ferry) 1, 2 & 3	11/10/70	3
03	3	GE Atomic Power Equipment Dept. Quality Control Plan Number 277 - General QC Plan For RCIC And HPCI Turbines	6/10/69	4
04	5	GE Atomic Power Equipment Dept. Purchase Order No. 205 B 2104	8/16/67	
05	5	GE Atomic Power Equipment Dept. Rev. to PO. 205 B 2104	10/5/67	1
06			12/5/67	2
07			6/7/68	3
08			6/15/68	4
09			7/29/68	6
10			8/24/68	7
11			10/10/68	8
12			5/6/69	10
13			7/24/69	11
14			8/21/69	13

Document Types:

- |                  |                                 |
|------------------|---------------------------------|
| 1. Drawing       | 5. Purchas Order                |
| 2. Specification | 6. Internal Memo                |
| 3. Procedure     | 7. Letter                       |
| 4. QA Manual     | 8. Other (Specify-if necessary) |

Inspector W.D. Kelley  
 Scope ICER Part 21 Report  
TVA - Browns Ferry Unit 3

DOCUMENTS EXAMINED

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Item No.	Doc. Type	TITLE/SUBJECT	Doc Date	Doc Rev.
15	4	Terry Steam Turbine Co. Quality Control Plan # 150 for Special Nuclear Applications	9/16/70	—
16	8	Terry Steam Turbine Co Vendor Document Index... Browns Ferry 3	8/21/79	—
17	4	Terry Corp - Nuclear Quality Control Manual	7/16/76	8/23/77
18	7	TVA letter to NRC RE - "Tennessee Valley Authority - Browns Ferry Nuclear Plant Unit 3 - Docket No 50-296... ICER 21 Report	2/3/82	—
19	8	TVA Form BF 119 Evaluation Logic for Part 21	1/28/82	—
20	8	Terry Corp Microfilm of final documentation for turbine serial number 35687 shipped to TVA Browns Ferry Nuclear Plant Unit 3	—	—
21	3	GE Atomic Power Equipment Dept. Quality Control Plan Number 288 General Q.C. Plan For Auxiliary Steam Turbine Drives (RCIC)	13/8/67	0
22	7	TC letter to TVA - Browns Ferry - Installation of bearing stoppins	2/5/82	—
23	1	TC drawing 77574E - RCIC, Type GS-1, longitudinal Section	5/4/82	B
24	1	TC drawing 103323E - Longitudinal Section, Type GS-2 Nuclear	2/6/79	E

- Document Types:
1. Drawing
  2. Specification
  3. Procedure
  4. QA Manual
  5. Purchas Order
  6. Internal Memo
  7. Letter
  8. Other (Specify-if necessary)



Inspector Wm D. Kelley  
 Scope 10 CFR Part 21 Report  
IVA Browns Ferry, Unit 3

DOCUMENTS EXAMINED

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Item No.	Doc. Type	TITLE/SUBJECT	Doc Date	Doc Rev
25	8	TC Engineering Change Notice 82-2430	5/28/82	
26	8	TC Engineering Change Notice 82-2015	4/27/82	
27	1	TC drawing No. C-8212 Bearing-Coupling End	4/23/80	N
28	1	TC drawing No D-3326 Pedestal Coupl. End.	11/3/81	J
29	1	TC drawing No D-6089 Outline	10/17/78	Q

- Document Types:
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  3. Procedure
  4. QA Manual
  5. Purchas Order
  6. Internal Memo
  7. Letter
  8. Other (Specify-if necessary)

Inspector Wm D Kelley  
 Scope Quality Assurance  
Program Review

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Item No.	Doc. Type	TITLE/SUBJECT	Doc Date	Doc Rev
01	6	Post Experience & Performance		
02	6	Management Commitment and Priority		
03	6	Organization		
04	6	Functional Interface		
05	4	TC Nuclear Quality Control Manual	8/23/77	1
06	3	TC DR G.10.02 Office Instructions to Engineers, Designers & Draftsmen (Order Entry Procedure)	8/18/74	
07	3	TC DR G.10.11 Routing of Engineering Change Notice	6/1/76	

Document Types:

1. Drawing
2. Specification
3. Procedure
4. QA Manual
5. Purchas Order
6. Internal Memo
7. Letter
8. Other (Specify-if necessary)

spector Wm D. Kelly  
Scope Nonconformances &  
Corrective Action

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Item No.	Doc. Type	TITLE/SUBJECT	Doc Date	Doc Rev
01	4	TC Quality Control Manual	8/23/77	1
02	2	TC Standard Practice Specification SP-183	1/23/81	2
03	3	Quality Control Report Procedure		
04	2	TC Standard Practice Specification SP-183 Appendix 1	7/14/78	0
05	B	Twenty Five Quality Control Reports		
06	B	Two Welding Compliance Record		

- Document Types:
- 1. Drawing
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  - 4. QA Manual
  - 5. Purchas Order
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