

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

July 17, 1978

IE Circular No. 78-14

HPCI TURBINE REVERSING CHAMBER HOLD DOWN BOLTING

Recent inspections by the Philadelphia Electric Company of HPCI turbines at Peach Bottom 2/3 facilities disclosed broken cap screws and missing clamping plates which secure the turbine reversing chambers. The cap screws are used to fasten clamping plates and reversing chamber rails to the support ring. Additional detailed information is available in Section 6 of the HPCI Terry Turbine instruction manual. Missing parts were recovered from components in the turbine steam exhaust piping and unrecovered parts are believed to be in the torus. Subsequent examination of the cap screws indicated the failures resulted from fatigue.

The design of the cap screws includes a 1/4 inch deep concentric counterbore from the threaded end. Failures generally occurred at the base of the counterbore with a few failures occurring at the base of the screw head. The screw length of 1 1/4 inches allows about 5/16 inches of thread engagement in the support ring.

After review, the vendor (Terry Steam Turbine Company) recommended modification of the bolting design to prevent recurrence. An interim solution was to replace the 3/8-16 X 1 1/4" long ASTM A574 socket head cap screws with similar 1 1/2" long cap screws. This required deeper drilled and tapped holes in the support ring to prevent the longer screws from bottoming. Later, the General Electric Company advised of a further modification from Terry Turbine consisting of bolting the reversing chamber directly to the support ring, lockwiring the cap screws and eliminating the clamping plate. In addition, the replacement cap screws were changed to 3/8-16 X 1" long ASTM Gr. B6 with a Rockwell Hardness of Rc28 or less.

Information supplied by the Terry Steam Turbine Company indicates that similar turbines were supplied for HPCI systems at the following facilities: Browns Ferry Unit Nos. 1, 2, and 3; Brunswick Unit Nos. 1, and 2; Cooper; Vermont Yankee; Fermi Unit No. 2; J. A. FitzPatrick; Hatch Unit Nos. 1 and 2; Hope Creek Unit Nos. 1 and 2; Limerick Unit Nos. 1 and 2; Pilgrim Unit No. 1; Shoreham; Susquehanna Unit Nos. 1 and 2. In addition, HPCI Terry Turbine were also supplied for Monticello and Duane Arnold; however, these applications involved smaller machines which incorporate a single turbine wheel and reversing chambers which are supported without clamping plates, and therefore are not subject to similar failure of cap screws.

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All holders of BWR operating licenses or construction permits for facilities with a similar HPCI Terry Turbine should be aware of the potential for failure of the turbine reversing chamber hold down bolting. It is recommended that inspection of the clamping plate cap screws be included in the next inspection of these turbines. If the present bolting design is inadequate, it is further recommended that the nuclear steam supplier and vendor be contacted for assistance in determining the appropriate modification.

No written response to this Circular is required. If additional information is needed regarding this matter, contact the Director of the appropriate NRC Regional Office.

LISTING OF IE CIRCULARS ISSUED IN 1978

Circular No.	Subject	Date of Issue	Issued To
78-01	Loss of Well Logging Source	4/5/78	All Holders of Well Logging Source Licenses
78-02	Proper Lubricating Oil for Terry Turbines	4/20/78	All Holders of Reactor OLS or CPs
78-03	Packaging Greater Than Type A Quantities of Low Specific Activity Radioactive Material for Transport	5/12/78	All Holders of Reactor OLS, CPs, Fuel Cycle, Priority I Material and Waste Disposal Licenses
78-04	Installation Error That Could Prevent Closing of Fire Doors	5/15/78	All Holders of Reactor OLS or CPs
78-05	Inadvertent Safety Injection During Cooldown	5/23/78	All Holders of Reactor OLS or CPs
78-06	Potential Common Mode Flooding of ECCS Equipment Rooms at BWR Facilities	5/23/78	All Holders of Reactor OLS or CPs
78-07	Damaged Components of a Bergen-Paterson Series 25000 Hydraulic Test Stand	5/31/78	All Holders of Reactor OLS or CPs
78-08	Environmental Qualification of Safety Related Equipment at Nuclear Power Plants	5/31/78	All Holders of Reactor OLS or CPs
78-09	Arcing of General Electric Company Size 2 Contactors	6/5/78	All Holders of CPs

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Circular No.	Subject	Date of Issue	Issued to
78-10	Control of Sealed Sources Used in Radiation Therapy	6/14/78	All Medical Licensees in Categories G and G1
78-11	Recirculation M-G Set Overspeed Stops	6/15/78	All Holders of BWR OLS or CPs
78-12	HPCI Turbine Control Valve Lift Rod Bending	6/30/78	All Holders of BWR OLS or CPs for plants with HPCI Terry Turbine
78-13	Inoperability of Multiple Service Water Pumps	7/10/78	All Holders of Reactor OLS and CPs except for plants located in: AL, AK, CA, FL, GA, LA, MS, SC