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SSINS No.: 6835
IN 86-34

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

May 13, 1986

IE INFORMATION NOTICE NO. 86-34: IMPROPER ASSEMBLY, MATERIAL SELECTION,
AND TEST OF VALVES AND THEIR ACTUATORS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This notice is being issued to advise recipients of potential problems resulting from improper material selection and improper assembly procedures for safety-related power actuated valves. This information is applicable to valves at the time of initial installation and during post-maintenance reassembly or test. Although both the cited facilities are BWRs, it appears that PWRs may be equally vulnerable.

It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to determine if similar problems exist at their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

In the recent past, River Bend and Shoreham have reported operational problems and structural integrity problems with safety-related valves and their actuators. Both BWR facilities are currently in the startup and initial operational period and have reported significant problems with severe vibration of components and systems. These vibrational problems appear to exacerbate but not directly cause the identified valve problems.

At Shoreham on September 25, 1985, when a valve in the RHR system was being operated from the control room, a response feedback signal was not received. Local inspection disclosed that the bolts connecting the actuator to the valve yoke were broken and the actuator was completely detached from the valve. The valve was a relatively small "mini-flow" valve.

At River Bend on January 5, 1986, a similar event occurred involving a 20-inch main feedwater system containment isolation valve.

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Discussion:

Licensee evaluation efforts at River Bend disclosed that manufacturer's instructions on actuator valve assembly were generally vague and sometimes the information furnished by the actuator manufacturer was contradictory to that supplied by the valve supplier. The 20-inch valve at River Bend has a Limitorque SMB-4 actuator on a Velan valve. The mounting capscrews are 1½-inch diameter, high strength steel, threaded into the 35,000 psi strength cast iron actuator housing. The valve manufacturer specified assembly torque of 1270 ft-lb. The installed bolts did not have the normally specified 1½ diameters thread engagement, and as part of the failure analysis, the licensee calculated that the preload stress on the engaged cast iron threads would approximate the specified ultimate strength of the cast iron. The failure which allowed the actuator to become detached was the capscrews tearing out of the cast iron. Subsequently the licensee, the valve supplier, and the actuator supplier agreed that a proper installation torque for the valve-actuator combination would be 700 ft-lb.

During reassembly of the 20-inch valve at River Bend, the licensee discovered that the mating flanges did not come together at the specified 700 ft-lb torque value. Review of the actuator vendor installation and maintenance instructions disclosed a caution that final assembly torque should be applied with the valve stem at about midstroke. If the valve is closed, the bolt preload may be transferred through the stem to the valve disc. When the valve is next opened, the bolts are relaxed and have low (or no) preload. Such a condition, particularly in the presence of high vibration, will cause early fatigue failure of the bolts.

Examination and testing of other valve assemblies at these sites showed some with very high torque levels and others where some of the capscrews were found to be broken. The failures appeared to be caused by overload on some mild steel, low strength bolts or fatigue for higher strength bolts. In some cases it appears that bolting material specifications were missing or not adhered to. Material traceability problems with bolts and other fastenings are discussed in IE Information Notice 86-25, "Traceability and Material Control of Material and Equipment, Particularly Fasteners." River Bend and Shoreham have established specific programs to ensure that in the future proper bolts are used and are properly torqued.

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No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.



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Attachment: List of Recently Issued IE Information Notices