UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

March 3, 1992

NRC INFORMATION NOTICE 92-20: INADEQUATE LOCAL LEAK RATE TESTING

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to problems involving local leak rate testing (LLRT) of containment penetrations under Part 50 of Title 10 of the Code of Federal Regulations (10 CFR 50), Appendix J. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Quad Cities Station, Unit 1

On February 26, 1991, the Commmonwealth Edison Company (the licensee) performed a Type B LLRT on the containment penetration bellows for penetration X-25 at Quad Cities Station, Unit 1, and found an acceptable measured leakage rate of 6 standard cubic feet per hour (scfh). The licensee performed this LLRT by pressurizing the volume between the two plies of the bellows through a test connection. On February 28, while performing the primary containment integrated leak rate test (ILRT) under 10 CFR 50, Appendix J, the licensee found excessive air leakage from the penetration. The licensee recognized the inconsistencies between the LLRT data for the penetration and the ILRT results and began a test program to determine the source of the error. Using a blank flange on the containment side of the bellows, the licensee pressurized the bellows for a "local ILRT," which yielded a leak rate of 137 scfh. The licensee also repeated the Type B LLRT with holes drilled in the bellows. This LLRT result (8 scfh) was only slightly higher than the previous LLRT result. The results of this test program led the licensee to conclude that it is not possible to perform a valid Type B LLRT on this type of bellows assembly. The licensee replaced the bellows for penetration X-25 due to cracks identified by the tests. Commonwealth Edison is also investigating alternative test methods that would provide accurate LLRT results for bellows penetration assemblies. This problem was reported to the NRC under Title 10 of the Code of Federal Regulations, Part 21 (10 CFR 21).

IDHR-11C

Dresden Nuclear Power Station, Unit 2

On December 17, 1990, the Commonwealth Edison Company (the licensee) found a leakage rate significantly greater than the maximum allowed during the pressurization phase of its ILRT. The licensee identified the source of the leak as the inboard flange of the torus purge exhaust inner isolation valve with an estimated leakage rate of approximately 25 weight percent per day at 15 psig. The licensee had last performed maintenance on this valve during the previous outage. Although a LLRT had been performed on the valve following the maintenance, the test did not challenge the inboard flange.

Perry Nuclear Power Plant, Unit 1

On July 7, 1989, the Cleveland Electric Illuminating Company (the licensee) discovered a leak through the inboard flange of the seal leakoff line on a relief valve for the residual heat removal system during the plant's first periodic ILRT. The licensee had performed maintenance on the valve three times from 1986 to 1989. In each case, the licensee had performed a LLRT following the maintenance. However, the LLRT did not challenge the inboard flange.

Clinton Power Station, Unit 1

On December 18, 1990, the Illinois Power Corporation (the licensee) found that lines from the residual heat removal system relief valves were not water-sealed under post-accident conditions as previously indicated in its safety analysis report. These lines were intended to terminate below the suppression pool minimum drawdown level, allowing the water to maintain a seal on the containment isolation valves under accident conditions. The problem was first identified when it was discovered that a line, considered to be water-sealed, included a vacuum breaker. The vacuum breaker would open following an accident, bypassing the water seal. The licensee investigated this condition and found that a number of other lines that empty into the suppression pool either contained flanges or terminated above the pool minimum drawdown level. Since these lines would have been open to the containment atmosphere following an accident, the associated isolation valves should have been tested for leakage using Type C air tests. To correct this problem, the licensee removed the vacuum breaker connections and the flanges and extended the pipes to ensure that a water seal would be maintained.

Discussion

Steel expansion bellows are used on piping penetrations in many plants as part of the containment isolation scheme. A Type B LLRT is performed on the bellows periodically to verify that containment integrity is being maintained. The event at Quad Cities revealed that the LLRT performed between the two plies could not be used to accurately measure the leakage rate that would occur through the bellows under accident conditions. The two plies of the bellows were in contact with each other, restricting the flow of the test medium to the crack locations. The NRC staff investigated and found that this problem is not isolated to the bellows manufactured by the vendor involved at Quad Cities. Any two-ply bellows of similar construction may be susceptible to this problem.

The NRC granted an exemption from the Type B testing requirements of 10 CFR 50, Appendix J, to Commonwealth Edison for Quad Cities and Dresden on February 6, 1992. The exemption covers the testing of the two-ply bellows discussed in this information notice because no valid Type B LLRT can be performed on these bellows. The exemption specifies an alternative program of bellows testing and replacement that involves testing with air at a reduced leakage limit, testing any leaking bellows with helium (sniffer testing), replacing bellows that are unacceptable, and performing an ILRT each refueling outage until all of the bellows have been replaced with testable bellows.

The two events involving leaking flanges occurred because the licensees failed to consider all possible leakage paths when they established their leak rate test programs. Both licensees identified the valves involved in the events as containment isolation barriers, but they failed to consider the gasketed flanges as leakage paths. Both licensees tested the isolation valves in the reverse direction which did not challenge the flanges properly. Any containment isolation valve could have this problem, particularly if the valve is tested in the reverse direction or if both valves on a penetration are outside of containment.

Appendix J to 10 CFR Part 50 requires all licensees to perform local leak rate testing on containment isolation valves. The licensees for some plants, including Clinton, have received credit from the NRC for maintaining a water seal on the valves instead of performing local leak rate testing using air as the test medium. One requirement for a valid water seal is that the penetration have no potential air leakage paths, such as flanges or vacuum breakers. For those lines that depend on the minimum water level in the suppression pool to prevent leakage, it is expected that the lines terminate below the minimum suppression pool level in the actual plant configuration.

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Charles E. Rossi, Director
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Office of Nuclear Reactor Regulation

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(708) 790-5530

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(301) 504-2828

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Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-19	Misapplication of Potter & Brumfield MDR Rotary Relays	03/02/92	All holders of OLs or CPs for nuclear power reactors.
92-18	Potential for Loss of Remote Shutdown Capability during A Control Room Fire	02/28/92	All holders of OLs or CPs for nuclear power reactors.
92-17	NRC Inspections of Programs being Developed at Nuclear Power Plants in Response to Generic Letter 89-10	02/26/92	All holders of OLs or CPs for nuclear power reactors.
92-16	Loss of Flow from the Residual Heat Removal Pump during Refueling Cavity Draindown	02/25/92	All holders of OLs or CPs for nuclear power reactors.
92-15	Failure of Primary System Compression Fitting	02/24/92	All holders of OLs or CPs for nuclear power reactors.
92-14	Uranium Oxide Fires at Fuel Cycle Facilities	02/21/92	All fuel cycle and uranium fuel research and development licensees.
92-02, Supp. 1	Relap5/Mod3 Computer Code Error Associated with the Conservation of Energy Equation	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-13	Inadequate Control Over Vehicular Traffic at Nuclear Power Plant Sites	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-12	Effects of Cable Leakage Currents on Instrument Settings and Indications	02/10/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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The two events involving leaking flanges occurred because the licensees failed to consider all possible leakage paths when they established their leak rate test programs. Both licensees identified the valves involved in the events as containment isolation barriers, but they failed to consider the gasketed flanges as leakage paths. Both licensees tested the isolation valves in the reverse direction which did not challenge the flanges properly. Any containment isolation valve could have this problem, particularly if the valve is tested in the reverse direction or if both valves on a penetration are outside of containment.

All licensees have identified the valves that require Type C testing in accordance with Appendix J to Part 50 of Title 10 of the Code of Federal Regulations. The licensees for some plants, including Clinton, take credit for maintaining a water seal on the valves instead of performing a Type C air test. This is a valid criterion for excluding isolation valves from the Type C testing requirement only if the lines have no potential leakage paths, such as flanges or vacuum breakers. Those lines that depend on the minimum water level in the suppression pool to prevent leakage must terminate below the minimum suppression pool level in the actual plant configuration.

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*SEE PREVIOUS CONCURRENCES Document Name: LLRT IN

C/OGCB:DOEA:NRR	D/DOEA:NRR			
CHBerlinger	CERossi			
02/ /92	02/ /92			
*RPB:ADM	*RIII	*RIII	*RIII	*RIII
TechEd	MPPhillips	FAMaura	GCWright	HJMiller
12/05/91	12/17/91	12/17/91	12/17/91	12/17/91
*OGCB:DOEA:NRR	SPLB:DST:NRR	SPLB:DST:NRR	C/SPLB:DST:NRR	D/DST:NRR
AJKugler	JCPulsipher	JAKudrick	CEMcCracken	ACThadani
12/09/91	01/30/92	02/5/92	02/5/92	02/ /92

The two events involving leaking flanges occurred because the licensees failed to consider all possible leakage paths when they established their leak rate test programs. Both licensees identified the valves involved in the events as containment isolation barriers, but they failed to consider the gasketed flanges as leakage paths. Both licensees tested the isolation valves in the reverse direction which did not challenge the flanges properly. Any containment isolation valve could have this problem, particularly if the valve is tested in the reverse direction or if both valves on a penetration are outside of containment.

All licensees have identified the valves that require Type C testing in accordance with Appendix J to Part 50 of Title 10 of the Code of Federal Regulations. The licensees for some plants, including Clinton, take credit for maintaining a water seal on the valves instead of performing a Type C air test. This is a valid criterion for excluding isolation valves from the Type C testing requirement only if the lines have no potential leakage paths, such as flanges or vacuum breakers. Those lines that depend on the minimum water level in the suppression pool to prevent leakage must terminate below the minimum suppression pool level in the actual plant configuration.

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* SEE ATTACHED PAGES FOR PREVIOUS CONCURRENCES

		D/DOEA	C/OGCB:DOEA:NRR	*RPB:ADM
		CERossi	CHBerlinger	TechEd
		12/ /91	12/ /91	12/05/91
OGCB:DOEA:NRR	SPLB:DST:NRR	SPLB:DST:NRR	C/SPLB:DST:NRR	D/DST:NRR
AJKugler	JCPulsipher	JAKudrick	CEMcCracken	ACThadani
12/9 /91	12/ /91	12/ /91	12/ /91	12/ /91
RIII	RIII	RIII	RIII	
MPPhillips	FAMaura	GCWright	HOMiller	
12/17 /91	12/17 /91	12/17 /91	12/17 /91	

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All licensees, either as part of their initial licensing, or in their initial response to the issuance of 10 CFR Part 50, Appendix J, identified those isolation valves that required Type C testing. Some plants, including Clinton, take credit for the maintenance of a water seal on the valves in lieu of the performance of a Type C air test. This is a valid criterion for the exclusion of isolation valves from the Type C testing requirement only if there are no possible leakage paths, such as flanges or vacuum breakers, in the lines. In addition, for those lines that depend on suppression pool minimum water level to prevent leakage, it is critical that htese lines terminate below the minimum suppression pool level in the actual plant configuration.

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12/ /91	12/ /91	12/ /91	12/ /91	12/ /91
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CHBerlinger	TechEd	MPPhillips	FAMaura	GCWright
02/20/92	12/05/91	12/17/91	12/17/91	12/17/91
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DOCUMENT NAME: IN 92-20

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