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

September 19, 1988

NRC INFORMATION NOTICE NO. 88-76: RECENT DISCOVERY OF A PHENOMENON NOT PREVIOUSLY CONSIDERED IN THE DESIGN OF SECONDARY CONTAINMENT PRESSURE CONTROL

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to a recent discovery of a phenomenon not previously considered in the design of the secondary containment pressure control system, which could cause the secondary containment pressure to rise above allowable values. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

In Licensee Event Report (LER) 87-065-00, dated November 10, 1987, Niagara Mohawk Power Corporation, licensee for Nine Mile Point, Unit 2 (NMP 2), notified the NRC that the NMP 2 secondary containment had not been maintained at the required subatmospheric pressure at higher building elevations because of a phenomenon not considered in the design of the secondary containment pressure control system.

At NMP 2, the instruments that measure the differential pressure (delta P) between the interior of the secondary containment and the atmosphere sense pressure at an elevation of approximately 265 feet (near the bottom of the building). The delta P at the upper portion of the building (at an elevation of 435 feet) is obtained by taking into account the interior and exterior static pressure gradients between the elevations. The design of the system did not take into account the temperature-induced difference in the pressure gradients inside and outside the secondary containment. Whenever the outside temperature is lower than the temperature maintained in the secondary containment, the vertical pressure decrease at the higher elevation outside the secondary containment is greater than the pressure decrease inside the secondary containment because of the higher density of the colder air.

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The calculated values for reactor building delta P as a function of outside air temperature at an elevation of 435 feet demonstrate this effect (Table 1). For outside temperatures lower than reactor building temperatures, pressure differentials between the inside and outside of the building at upper elevations were calculated to be less negative than the allowable value of -0.25 inch water gauge (WG). The installed instrumentation was insufficient to accurately determine reactor building differential pressure at higher elevations.

Discussion:

In a postulated accident, the secondary containment structure, which is normally maintained at a pressure lower than atmospheric, and supporting systems would collect and process radioactive material that may leak from the primary containment. Whenever an outward positive pressure exists across the secondary containment boundary, the leakage prevention function of the secondary containment is assumed to be negated and all primary containment leakage is assumed to be released directly into the environment. Under these circumstances, the offsite dose limits stated in 10 CFR Part 100 for fission product releases from postulated accidents could be exceeded.

As stated in Branch Technical Position (BTP) CSB 6-3 (NUREG-0800), a "positive" pressure in this regard is defined as any pressure greater than -0.25 inch WG, to conservatively account for wind loads and the uncertainty in pressure measurements. In addition to these factors, the problems at NMP 2 show that the effect of delta P gradients caused by low outside air temperatures can be an important factor in the design of the secondary containment pressure control. Because its density is higher, cold air exerts more force per increment of elevation than warm air. Thus, while maintaining the -0.25 inch WG differential pressure in lower portions of the secondary containment, the delta P decreases at higher elevations and becomes "positive" as demonstrated in Table 1. It should also be noted that this effect increases as humidity increases in the reactor building.

Subsequent to discovery of this phenomenon, the licensee took several corrective actions. The setpoint on the delta P pressure transmitters was reset from 0.33 inch to 0.76 inch vacuum WG. The licensee's analysis indicated that this would assure a delta P of at least 0.25 inch vacuum WG at upper elevations for a temperature differential of 85°F between reactor building interior and exterior. A modification was also initiated to relocate the delta P elements to the roof of the reactor building. After completion of this modification the delta P setpoint would be reset to the original value of 0.33 inch vacuum WG. With implementation of this modification, a minimum delta P of 0.25 inch vacuum WG would be established in the reactor building. A considerably larger delta P in the lower elevations of the reactor building would occur on days with low outside temperature.

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

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact: Jack Kudrick, NRR
(301) 492-0871

Attachments:
1. Table 1 - Effect of Outside Temperature on Reactor Building Delta P
2. List of Recently Issued NRC Information Notices

TABLE 1

EFFECT OF OUTSIDE TEMPERATURE ON REACTOR BUILDING DELTA P

OUTSIDE TEMPERATURE (°F)	REACTOR BUILDING DELTA P* (inches water gauge [WG])
85	-0.25
60	-0.17
40	-0.10
20	-0.03
0	+0.06
-20	+0.15

*Reactor building delta P at elevation 435 feet with -0.25 inch (water gauge) measured at elevation 265 feet; building temperature at 85°F, 0% humidity.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-75	Disabling of Diesel Generator Output Circuit Breakers by Anti-Pump Circuitry	9/16/88	All holders of OLs or CPs for nuclear power reactors.
88-74	Potentially Inadequate Performance of ECCS in PWRs During Recirculation Operation Following a LOCA	9/14/88	All holders of OLs or CPs for W and B&W-designed nuclear power reactors.
88-73	Direction-Dependent Leak Characteristics of Containment Purge Valves	9/8/88	All holders of OLs or CPs for nuclear power reactors.
88-72	Inadequacies in the Design of dc Motor-Operated Valves	9/2/88	All holders of OLs or CPs for nuclear power reactors.
88-71	Possible Environmental Effect of the Reentry of COSMOS 1900 and Request for Collection of Licensee Radioactivity Measurements Attributed to That Event	9/1/88	All holders of OLs or CPs for nuclear power reactors, fuel cycle licensees, and Priority 1 material licensees.
88-70	Check Valve Inservice Testing Program Deficiencies	8/29/88	All holders of OLs or CPs for nuclear power reactors.
88-69	Movable Contact Finger Binding in HFA Relays Manufactured by General Electric (GE)	8/19/88	All holders of OLs or CPs for nuclear power reactors.
88-48, Supplement 1	Licensee Report of Defective Refurbished Valves	8/24/88	All holders of OLs or CPs for nuclear power reactors.
88-68	Setpoint Testing of Pressurizer Safety Valves with Filled Loop Seals Using Hydraulic Assist Devices	8/22/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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1. Table 1 - Effect of Outside Temperature on Reactor Building Delta P
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*SEE PREVIOUS CONCURRENCES

		D/DOEA:NRR	*C/OGCB:DOEA:NRR	*RPB:ARM
		CERossi	CHBerlinger	TechEd
		09/13/88	09/07/88	07/13/88
*OGCB:DOEA:NRR	*PSB:DEST:NRR	*C/PSB:DEST:NRR	*SAD/DEST:NRR	*D/DEST:NRR
BMann	JKudrick	JCraig	AThadani	LShao
07/06/88	07/07/88	07/07/88	07/08/88	07/11/88

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CHB with changes noted.

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BMann	JKudrick	JCraig	AThadani	LShao
07/6 /88	07/7 /88	07/7 /88	07/8 /88	07/ /88