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MFN-186-82

November 28, 1982

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Washington, D.C. 20555

Attention: D. B. Vassallo, Chief
Operation Reactors Branch No. 2

Gentlemen:

SUBJECT: MARK I POOL SWELL VACUUM BREAKER ACTUATION

This letter provides responses, Attachment 1, to questions raised by the NRC during a telecon on November 12, 1982 between F. Eltawila of the NRC, and P. P. Stancavage, R. L. Mapes, and the undersigned of GE. It was concluded that the wetwell/drywell vacuum breaker actuation during pool swell is not a concern at Mark I plants.

Very truly yours,

H. C. Pfefferlen, Manager
BWR Licensing Programs
Nuclear Safety & Licensing Operation

HCP:rm/A12039

Attachment

cc: L. S. Gifford (GE-Bethesda)
B. Siegel (NRC)

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ATTACHMENT 1

MARK I POOL SWELL VACUUM BREAKER ACTUATION

Reference: NSEO-63-0682, U. C. Saxena "Wetwell/Drywell Vacuum Breaker Actuation During Pool Swell In A BWR Mark I Containment," June 1982

The potential for the wetwell/drywell vacuum breaker to actuate during pool swell for a BWR Mark I containment has been evaluated. This is documented in the referenced report which concluded that the actuation of wetwell/drywell vacuum breakers during pool swell is not a concern for Mark I plants. The report showed that the geometry of the Mark I containment accounted for the vacuum breaker behavior during pool swell. It also documented that of the 193 pool swell tests performed for Mark I, the wetwell airspace pressure never exceeded the drywell or vent header pressure. Therefore, the vacuum breaker would always remain shut during that phase of a LOCA.

Another question was raised concerning the possibility of short pressure spikes occurring in the wetwell which may have been undetected during the pool swell tests. No physical reasons can be found to justify the existence of these pressure spikes due to Mark I containment system unique design features. In Mark I plants the shallow submergence and location of the vent header/deflector (right above the pool surface) promote an early bubble breakthrough, thus limiting the compression of the wetwell airspace. Also, the Mark I wetwell cross-section curvature and angled downcomers contribute to avoidance of pressure conditions necessary to actuate the vacuum breaker. However, in spite of the lack of physical justification for the existence of these pressure spikes, they were studied to determine what effect they might have on the vacuum breaker.

Because of the rapid sampling time used by the instruments in the Mark I tests, the largest undetected pressure spike which could have occurred in the wetwell is of the range of 2 to 3 milliseconds. An analysis was performed to determine what effects a 2 psid amplitude pressure spike with a 3 msec duration would have on the vacuum breakers. Using conservative assumptions on the Mark I vacuum breaker valve dynamic model, it was shown that this postulated pressure spike would cause a GPE 18" valve (see Table 1 for the valve data) to open a maximum of 3.9×10^{-4} radians (0.022 degrees). The maximum impact closing velocity would be less than 0.41 radians/second (23 degrees/second) which is more than an order of magnitude below the design limit for the valve.

Therefore, it can be concluded that wetwell/drywell vacuum breaker actuation during pool swell is not a concern at Mark I plants.

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TABLE 1

GPE 18" INTERNAL VALVE CHARACTERISTICS

	GPE 18" INTERNAL
I, system moment of inertia (lb-in-s^2)	20.38
L_G, system moment arm (in)	10.71
L_D, disk pressure moment arm (in)	11.47
m, system mass (lb)	50.9
A, disk area (in^2)	375.82
Λ_G, rest angle (rad)	0.0
Λ_{max}, maximum opening angle (rad)	1.32
β, coefficient of restitution (seat and body)	0.6

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