LILCO
LONG ISLAND LIGHTING

LONG ISLAND LIGHTING COMPANY

SHOREHAM NUCLEAR POWER STATION • P.O. BOX 628 • WADING RIVER, NEW YORK 11792

TEL. (516) 929-8300

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PM 85-184

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

In accordance with Shoreham Nuclear Power Station's Technical Specifications Section 6.9.2 and 3.7.9.a, enclosed is a Special Report on elevated Drywell general and head area temperatures.

50-322

Sincerely yours,

W. Steiger

William E. Steiger, Jr.
Plant Manager

WES/gr

Enclosure

cc: Dr. Thomas E. Murley, Regional Administrator
John Berry, Senior Resident Inspector
Institute of Nuclear Power Operations, Records Center
American Nuclear Insurers

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INTRODUCTION

The drywell air cooling system circulates the atmosphere within the drywell space to remove heat and maintain design temperatures. The drywell is to be maintained at or below the volume weighted average temperature of 145°F during plant operation. The maximum Tech Spec local air temperatures during normal operation are 185°F for the drywell head area, and 150°F at the remaining locations within the drywell space. The maximum temperature in the control rod drive area during reactor scram is to be limited to 165°F. These air temperature limitations ensure that safety-related equipment will not be subjected to temperatures in excess of their environmental qualification temperatures.

DISCUSSION

On August 3, during the PATP and while the reactor was approaching the 600 psig plateau, Plant Staff reported that the drywell temperatures in the Zone 2 outlet drywell area and drywell head area were approaching the 150°F and 185°F maximum temperature limit respectively. The RTDs that monitor the temperature of the Zone 2 outlet (annular space between RPV and biological shield wall) are located at four equidistant points circumferentially on the top of the biological shield wall. Other temperature readings taken from the control room temperature recorders for various other areas and elevations in the drywell were within their normal limits.

Due to the actual location of the Zone 2 outlet temperature monitoring RTDs, T47-TE024A,B,C,D, approximately 4" above the top surface of the shield wall at El. 144' and in close proximity to uninsulated portions of main steam piping, it was determined that these temperature sensors detect only a "hot spot" temperature profile which is not a representative measurement of the surrounding air space. This was similar with temperature sensor T47-TE027L which due to its actual location, vicinity of drywell head vent piping penetration through insulation and approximately 1.0' off the centerline of the RPV @ El. 162'-8½", was detecting high temperature readings. Since additional temperature data taken off the control room panels showed evidence of temperature increase in these areas, it was felt essential to install temporary thermocouples to determine the bulk air temperature. The TC location was to be next to safety-related equipment in order to monitor actual ambient temperature for equipment qualification concerns and demonstration of their continuous operability per Tech Spec requirements.

A review of plant arrangement and equipment location drawings showed that the only safety-related equipment located in the 141' elevation and above, known as Zone A-22 in the EQ Reports, are as follows:

	Equipment No.	Description	Location
1.	B21*MOV083	RPV Head Vent Valve	Elev. 141'
2.	B21*MOV084	RPV Head Vent Valve	Elev. 141'
3.	B21*MOV085	RPV Head Vent Valve	Elev. 141'
4.	T46*AOV039A	Drywell Purge Valve	Elev. 141'
5.	1T46*SOV039A	Operates T46*AOV039A	Elev. 141'
6.	1T46*PNS039A	Pos. Ind. for T46*AOV039A	Elev. 141'
7.	Associated Cabling for Above Equipment		

Three temporary thermocouples identified as TEMP TE-1, TEMP TE-2 and TEMP TE-3 with instrumentation accuracy of about ±1°F, were installed at elevations 142', 141', 142.2', respectively, within close proximity of the above equipment. Temperature monitoring of the TCs commenced on August 6, 1985. The temperature readings, taken over a two-week period, ranged between 125°F and 165°F. The cumulative time the temperature exceeded the 150°F limit was for approximately twelve days. During the same time period, temperature sensor T47-TE027L was also monitored to determine temperature profile in the drywell head area. This RTD provides input through the process computer to the calculation of the average bulk drywell temperature. While other RTDs in the vicinity of the drywell head area provided temperature readings within the design temperature of the drywell head (185°F), the readings for T47-TE027L ranged between 181°F and 250°F. The average bulk temperature of the drywell was substantially below the 145°F maximum temperature limit. Other drywell air cooling parameters such as RBCLCW temperature in the supply and return to the drywell air coolers, inlet and outlet air temperature from the coolers, etc. were also monitored and showed no evidence of system malfunction. Therefore, it was concluded through engineering judgment that the T47-TE027L readings were local "hot spot" readings and not a representative ambient air temperature indication of the overall drywell head area. A review of plant design drawings showed that there is no safety-related equipment in the area between the bellow seals and the top of the drywell head.

Other components that were evaluated to determine the impact on operability/structural integrity due to the elevated drywell temperature were:

(1) biological shield wall,
(2) drywell head,
(3) inner bellows, and
(4) non-metallic components.

The detailed analysis to determine temperature impact on the operability, qualified life and structural integrity of each individual component for these hot local areas in the drywell are as follows:

(1) ELECTRICAL COMPONENTS

A. VALVES

Tag No.	Local Ambient Air Temperature	Expected Qualified Life (Years)*	Remarks
1T46*SOV039A	125° - 165°F	20.0	
1T46*PNS039	125° - 165°F	1.06	Pending revision to qualified life defined in EQDP 003-02, refurbish at intervals not exceeding 1.06 years.
1B21*MOV083 (Limitorque Operator)	125° - 165°F	32.8	Seals and lubricants to be inspected every 12 to 18 months per EQDP requirements.
1B21*MOV084 (Limitorque Operator)	125° - 165°F	32.8	Seals and lubricants to be inspected every 12 to 18 months per EQDP requirements.
1B21*MOV085 (Limitorque Operator)	125° - 165°F	32.8	Seals and lubricants to be inspected every 12 to 18 months per EQDP requirements.

B. CABLES

Device/Conduit/Cable			
1T46*PNS039A/1CC960NQ/ (2)NFP-21	125° - 165°F	40.0	
1T46*SOV039A/1CC667RJ1/ (1)NFP-21	125° - 165°F	40.0	
1T47*PNS039A/1CC667RJ2/ (1)NFP-21	125° - 165°F	40.0	
1T46*PNS039A/1CX696NQ/ (1)NFP-22	125° - 165°F	40.0	
1T46*PNS039A/1CX969NQ1/ (2)NFP-44	125° - 165°F	40.0	
1B21*MOV083/1CK667RF1/ NFM-30	125° - 165°F	See Remarks	Valve actuator, nuclear valve actuator switches and associated cable are qualified at temperature higher than 165°F.

*Based on continuous operation at a constant upper limit (165°F) of the ambient air temperature measured by the thermocouples. No loss of operability occurs.

Device/Conduit/Cable	Local Ambient Air Temperature	Expected Qualified Life (Years)*	Remarks
1B21*MOV084/1CK777BF/ NFM-30	125° - 165°F	See Remarks	Valve actuator, nuclear valve actuator switches and associated cable are qualified at temperature higher than 165°F.
1B21*MOV085/1CK667RF2/ NFM-30	125° - 165°F	See Remarks	Valve actuator, nuclear valve actuator switches and associated cable are qualified at temperature higher than 165°F.

Device/Conduit/Cable	Local Ambient Air Temperature	Expected Qualified Life (Years)	Remarks
C. TEMPERATURE SENSORS			
1T47-TE027L			
1) Viton Termination Head Seal	181° - 250°F	1.66	Based on an equivalent qualified life at 215°F. Pending revision to qualified life defined in EQDP 406A-1, replace at intervals not exceeding 1.66 years.
2) Electric Conductor Seal Assembly	181° - 250°F	40.0	Based on an equivalent qualified life at 215°F.
3) RTD Probe Termination	181° - 250°F	40.0	Based on an equivalent qualified life at 215°F.

(2) MECHANICAL COMPONENTS
(Non-Metallic)

Component ID No.	Temperature Exposed	Remarks
1T46*AOV039A	125° - 165°F	The maximum service temperature in which the non-metallic subcomponents of these valves can be subjected to without loss of function is 300°F, which is well above the elevated drywell temperature of 165°F.
1B21*MOV083	125° - 165°F	
1B21*MOV084	125° - 165°F	
1B21*MOV085	125° - 165°F	

*Based on continuous operation at a constant upper limit (165°F) of the ambient air temperature measured by the thermocouples. No loss of operability occurs.

(3) STRUCTURAL COMPONENTS

Component	Local Ambient Air Temperature	Remarks
Biological Shield Wall	150° - 200°F	An evaluation by SWEC indicates that the critical area of design, in regards to a potential thermal gradient, is the shield wall base and the actual temperature data show that no significant difference exists between the inner and outer diameter of the wall that would jeopardize its structural integrity.
Drywell Head	133° - 250°F	The drywell head assembly, although subjected to a mean temperature level well below its maximum design value (296°F), will be further evaluated to determine effects on internal stresses due to temperature profile variations.
Inner Bellows	120° - 160°F	Although this equipment is not safety related, a GE evaluation was performed to determine the thermal stress impact on its structural integrity. The conclusion is that no adverse effects on this component were experienced when exposed to this temperature profile.

In order to narrow down the potential causes of the elevated drywell temperature problem, the following requests were made by NED to Plant Staff:

(1) Perform a field walkdown on the Drywell Cooling System in order to verify proper damper position and any abnormalities observed to be corrected. In addition to that, flow measurements were to be taken on selected number of points on the Drywell Cooling System ductwork to verify system air flow.

Preliminary indications from the field walkdown showed no resetting required on damper positions and the air flow measurement data taken was within the system design flow tolerances.

(2) Perform a visual inspection on insulation around the RPV and various hot piping inside the drywell. A field walkdown by R. A. Keasby, the insulation contractor, identified numerous uninsulated pipe sections* around pipe whip restraints, pipe hangers, clamps, etc. which should be insulated in order to reduce the total heat load inside the drywell. These insulation modifications are planned to be implemented during the upcoming source outage. It is believed that four (4) main steam line uninsulated sections around the elbows in the area of the pipe rupture restraints may have contributed to the local high temperatures at TE-24A,B,C,D. Also, drywell head insulation is known to have open spaces around the head vent and head spray nozzles. This condition may have caused high temperature readings on temperature sensor T47-TE-027L.

An evaluation was also performed on the reactor coolant system leakage data collected from August 8, 1985 to August 17, 1985. The recorded plant data shows that the maximum level rise in the equipment floor drains tank in a four hour period was 14 inches. This value corresponds to a flow of 0.5 gpm which represents all the unidentified leakage rates in the primary containment. This is below the Tech Spec limit of 5 gpm (Tech Spec No. 3.4.3.2).

*These uninsulated pipe sections identified around pipe whip restraints are in accordance with site installation specification requirements for purpose of Power Ascension Test Program thermal "hot-gap" displacement measurements.

CONCLUSIONS

(1) The overall volume weighted average drywell temperature is well within its design limits.

(2) The elevated upper drywell area temperature condition was most probably caused by uninsulated portions of the main steam lines.

(3) The drywell head area temperatures average within the drywell head design conditions but may vary locally due to possible heat leaks at the nozzle penetrations.

(4) Although the electrical equipment qualified life may be shortened due to the locally elevated drywell temperatures, the equipment will still remain operable.

(5) There are no adverse effects on mechanical equipment due to elevated drywell temperatures.

(6) The structural integrity of the shield wall and inner bellows is not affected by the temperature increase. However, the drywell head assembly, although the temperature level exposed is well below its maximum allowable, will be further evaluated to determine effects of thermal variations on internal stresses in the shell structure.

LILCO will continue to monitor these drywell temperatures. It is felt that no further report is necessary or required unless drywell temperature conditions change.