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FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400
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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards addl info re revised pressure/temp curves in response to SER Confirmatory Item 11.Allowances for differences between RCS temp & reactor vessel flange region temp discussed.

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Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NO. 1 - DOCKET NO. 50-400
REVISED PRESSURE/TEMPERATURE CURVE

Dear Mr. Denton:

Carolina Power & Light Company hereby submits additional information concerning revised pressure/temperature curves for the Shearon Harris Nuclear Power Plant (SHNPP). This information is submitted in response to Safety Evaluation Report (SER) Confirmatory Item 11 from the Materials Engineering Branch and supplements our previous response dated November 11, 1984. The attached information responds to a follow-up question from the NRC reviewer concerning allowances for differences between the Reactor Coolant System temperature and the Reactor Vessel Flange region temperature.

If you have any further questions on the subject or require additional information, please contact me.

Yours very truly,

S. R. Zimmerman
Manager
Nuclear Licensing Section

JDK/crs (1939JDK)

Attachment

cc: Mr. B. C. Buckley (NRC
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Shearon Harris Nuclear Power Plant
SER Confirmatory Item No. 11
Pressure/Temperature Curve

Provide additional information concerning the allowance for temperature differences between the RCS coolant temperature and the Reactor Vessel Flange region temperature.

Response

The critical regions of interest for the temperature lag during normal heatup in the closure head and vessel flange regions are cross sections 1 and 2 shown in Figure 1. A finite element model was used for the analysis to obtain temperature gradients caused by heatup transients. All exterior surfaces of the model were assumed to be perfectly insulated and, therefore, adiabatic. Figure 2 shows the thermal boundary conditions.

The temperature lags in the reactor vessel closure head flange and vessel flange were determined for the lower temperature region of heatup transients where the new 10 CFR 50 rule is applicable. The new 10 CFR 50 Appendix G rule requires that when the pressure exceeds 20 percent of the preservice hydrostatic test pressure the temperature of the closure head and vessel flange regions must exceed the material RT_{NDT} by at least 120 degrees F for normal operation. For SHNPP, 20 percent of the preservice hydrostatic test pressure is 621 psig. The minimum temperature of the SHNPP closure head flange region is 128 degrees F since the limiting RT_{NDT} is 8 degrees F. The minimum temperature of the vessel flange region is 112 degrees since the RT_{NDT} is negative 8 degrees F.

During the 60 degree F per hour heatup transient, the temperature at the outside surface at cross section 1, of Figure 1, lags the coolant temperature by 58.1 degrees F. In order for the metal temperature at this location to be 128 degrees F, the coolant temperature has to be 58.1 degrees above 128 degrees F or 186.1 degrees F. The Figure 1, cross section 2, temperature lag is 51.2 degrees F during the 60 degrees F per hour heatup transient, and the coolant temperature has to be 163.2 degrees F for the metal temperature to be 112 degrees F. As a result, the new 10 CFR 50 rule including temperature lag limits the SHNPP pressure to 621 psig until a coolant temperature of 186 degrees F is reached. Comparison of this pressure-temperature point with Figure 3 shows that the new 10 CFR 50 rule does not impact the SHNPP 60 degrees F per hour heatup curve.

During the 100 degree F per hour heatup transient, the temperature at the outside surface of Figure 1, cross section 1, lags the coolant temperature by 74.1 degrees F. In order for the metal temperature at this location to be 128 degrees F, the coolant temperature has to be 74.1 degrees F above 128 degrees F or 202.1 degrees F. The Figure 1, cross section 2, temperature lag is 92.8 degrees F during the 100 degree F per hour heatup transient, and the coolant temperature has to be 204.8 degrees F for the metal temperature to be 112 degrees F. As a result, the new 10 CFR 50 rule including temperature lag limits SHNPP pressure to 621 psig until a coolant temperature of 204.8 degrees F is reached. Comparison of this pressure-temperature point with Figure 3 shows that the new 10 CFR 50 rule does not impact the SHNPP 100 degree per hour heatup curve.

Based on the above, the current heatup and cooldown curves are more limiting than the new 10 CFR 50 Appendix G rule.

(1939JDK/crs)

FIGURE 1

CRITICAL CROSS SECTIONS

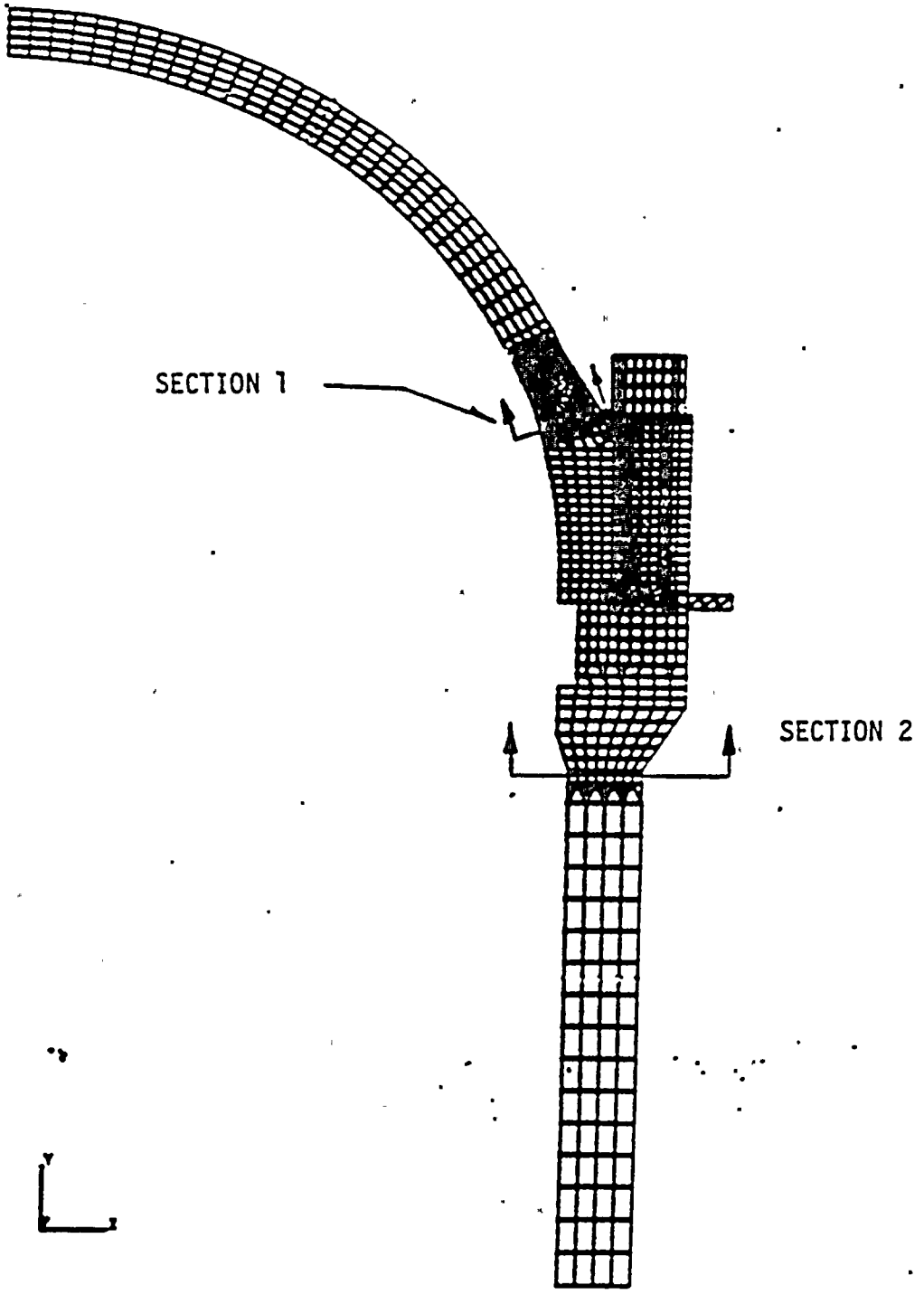


FIGURE 2

THERMAL BOUNDARY CONDITIONS

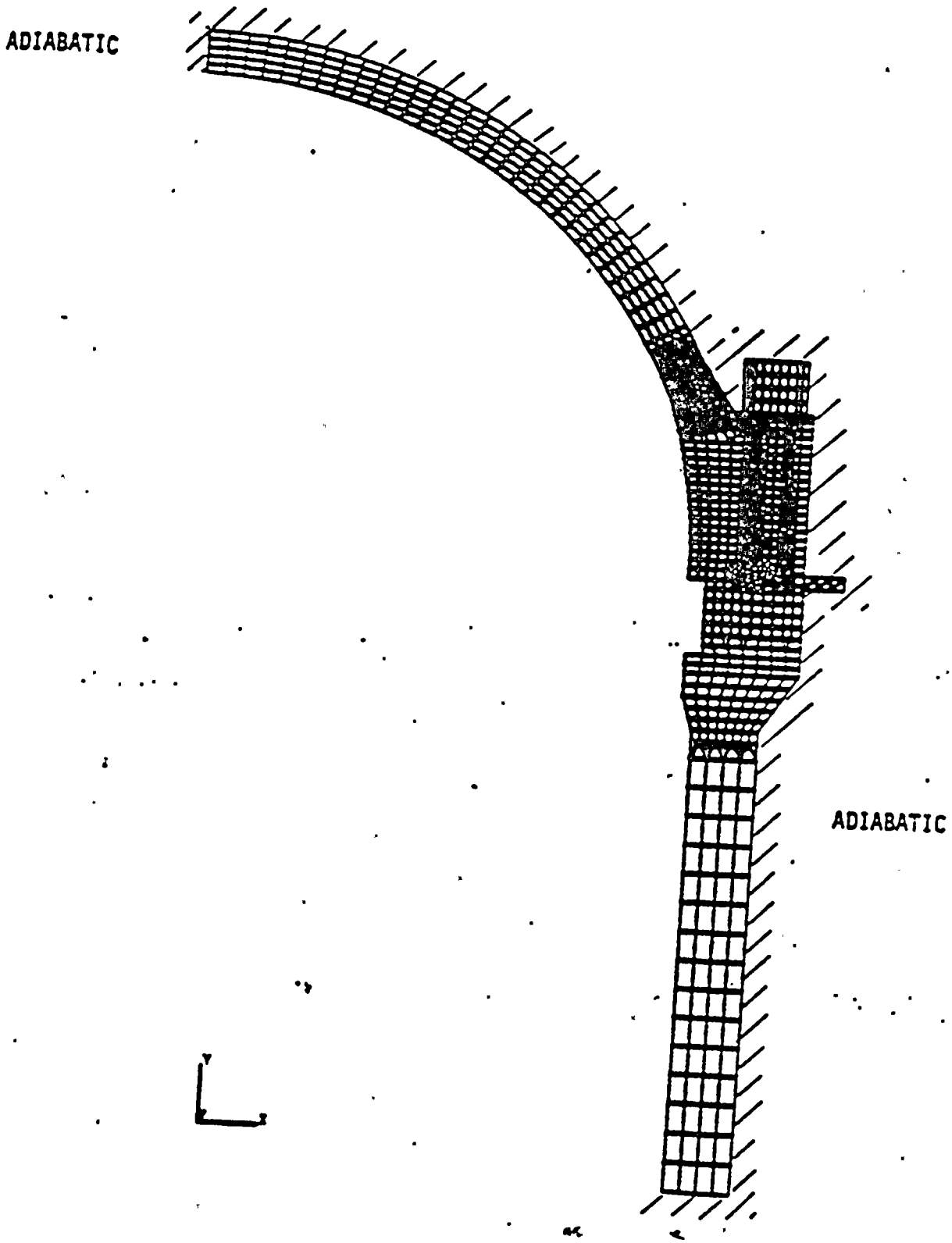
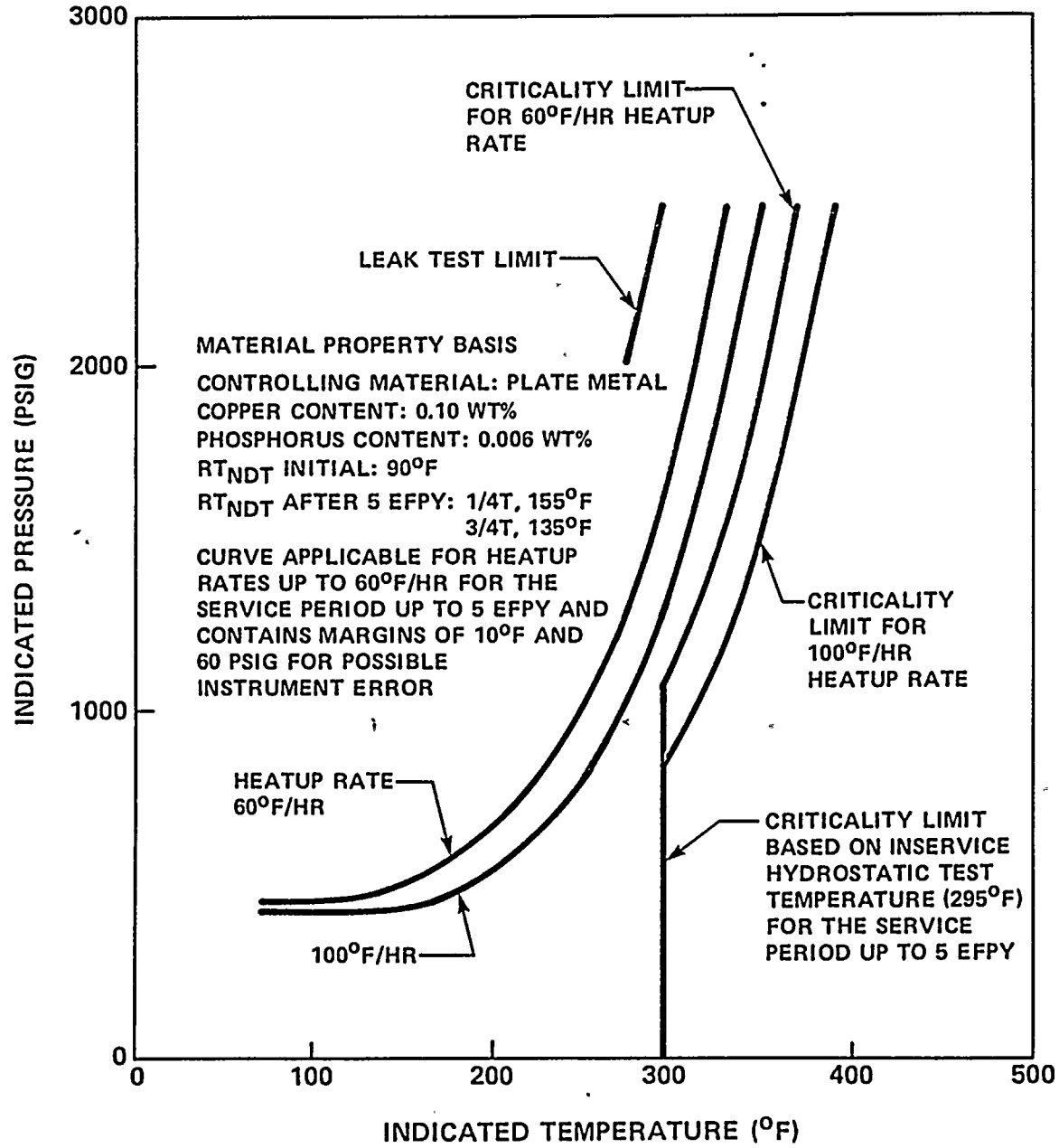


FIGURE 3



SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company	SHEARON HARRIS (CQL) REACTOR COOLANT SYSTEM HEATUP LIMITATIONS APPLICABLE FOR 5 EFPY	