Dave Morey
Vice President
Farley Project

Southern Nuclear
Operating Company
P.O. Box 1295
Birmingham, Alabama 35201

Tel 205.992.5131

October 30, 1998

SOUTHERN COMPANY
Energy to Serve Your World™

Docket Nos.: 50-348
50-364

10 CFR 50.54

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Joseph M. Farley Nuclear Plant
Response To Request For Additional Information (RAI)
Regarding Generic Letter 96-06, "Assurance Of Equipment
Operability And Containment Integrity During Design Basis Accident Conditions"

Ladies and Gentlemen:

By letter dated August 25, 1998, the NRC issued a Request for Additional Information (RAI) regarding responses to Generic Letter (GL) 96-06. Attachment 1 contains the response to the RAI. Attachment 2 contains requested drawings.

Mr. D. N. Morey states that he is a Vice President of Southern Nuclear Operating Company and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and that, to the best of his knowledge and belief, the facts set forth in this letter and enclosures are true.

This letter contains no formal NRC commitments and nothing stated herein should be considered as a license commitment. If you have any questions, please advise.

Respectfully submitted,

DN Morey

Dave Morey

Sworn to and subscribed before me this 30th day of October 1998

Martha Gayle Dow
Notary Public

My Commission Expires: November 1, 2001

SLG/EWC/clt:9606rai.doc

A072 1/1

Attachment and Drawings:

cc: Mr. L. A. Reyes, Region II Administrator
Mr. J. I. Zimmerman, NRR Project Manager
Mr. T. P. Johnson, Plant Sr. Resident Inspector

DWGS located in Central Files

ATTACHMENT

Response To RAI Regarding Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions"

ATTACHMENT

Response To RAI Regarding Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions"

In response to submitted information related to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," the NRC has issued a Request for Additional Information (RAI). The information requested relates to pipe segments residing between closed inboard and outboard containment isolation valves. Accident conditions within containment may affect the temperature and pressure of the water trapped between the valves by heat transfer through the pipe wall. The concern lies in the potential for pressure within the pipe segment to rise such that adverse consequences occur (i.e., pipe rupture, valve failure).

The NRC questions and the SNC responses are provided below.

1) **Provide the applicable design criteria for the piping and the valves. Include the required load combinations.**

The applicable Code for the piping and valves is ASME Section III, 1971 Edition, with addenda through Summer 1971. A later edition of the Code is allowed with proper justification.

The combined load conditions used for analysis included the dead weight stress as well as stress resulting from the elevated temperature and pressure during post-accident conditions (i.e., post-LOCA). The subject event of elevated piping temperature and pressure is a post-accident condition initiated by a postulated faulted event. As discussed in NUREG-1061, Volume 4, LOCA and seismic events are not considered to occur concurrently. In addition, the subject condition of these elevated parameters exists for only a relatively short duration. Therefore, it was considered unnecessary to analyze the loads concurrent with other faulted events (i.e., seismic). NC-3652 equations 8, 10 and 11 of the Code (Winter 1972 addenda) were used to determine if the loads met Code allowables.

Below are the design criteria for the piping and valves for each of the applicable penetrations.

Design Criteria for Piping:

Penetration No.	Size	Schedule	Material	Function
29	3/4"	160	Stainless Steel	Accumulator Test
43	3"	160	Carbon Steel	RCP CCW Return
49	1"	160	Stainless Steel	Accumulator Fill
50	3/8"	0.065" thickness	Stainless Steel	Sample Line

ATTACHMENT

Design Criteria for Valves:

Penetration No.	Valve #'s	Size	Rating	Type	Actuator
29	Q1(2)E21V049	3/4"	1500 lb.	Globe	Air
	Q1(2)E21V050	3/4"	1500 lb.	Globe	Air
43	Q1(2)P17HV3045	3"	1500 lb.	Globe	Air
	Q1(2)P17HV3184	3"	1500 lb.	Globe	Air
49	Q1(2)E21V052	1"	1500 lb.	Check	N/A
	Q1(2)E21V091	1"	1500 lb.	Globe	Air
50	Q1(2)P15HV3334	3/8"	1500 lb.	Globe	Air
	Q1(2)P15HV3766	3/8"	1500 lb.	Globe	Air

Note: Properties for Unit 1 and Unit 2 piping and valves for each penetration are the same.

Material Properties:

Parameter	Stainless Steel	Carbon Steel	Water
Modulus of Elasticity E (psi)	2.83E7	3E7	-
Poisson Ratio ν	0.3	0.3	-
Linear Coefficient of Expansion α (1/°F)	9E-6	6E-6	-
Bulk Modulus (psi)	-	-	3.2E5

2) **Provide a drawing of the piping run between the isolation valves. Include the lengths and thicknesses of the piping segments and the type and thickness of the insulation.**

UNIT 1

Penetration No.	Drawing Numbers	Pipe		Insulation	
		Length (Inside/Outside Containment)	Thickness	Type	Thickness
29	D-518105 R/0 D-518643 R/0	8.2 ft. (0.8 ft / 7.4 ft)	0.219 in.	N/A	N/A
49	D-518106 R/0 D-518570 R/0	29.7 ft. (1.3 ft / 28.4 ft)	0.250 in.	N/A	N/A

* Note: Inside containment only.

UNIT 2

Penetration No.	Drawing Numbers	Pipe		Insulation	
		Length (Inside/Outside Containment)	Thickness	Type	Thickness
29	D-515878 R/0 D-515939 R/0	20.8 ft. (1.1 ft / 19.7 ft)	0.219 in.	N/A	N/A
49	D-515699 R/0 D-515875 R/0	20.1 ft. (1.8 ft / 18.3 ft)	0.250 in.	N/A	N/A

* Note: Inside containment only.

3) **For penetrations 29 and 49, provide the maximum calculated temperature and pressure for the pipe run. Describe, in detail, the method used to calculate these pressure and temperature values. Please include a discussion of the heat transfer model used in the analysis and the basis for the heat transfer coefficients used in the analysis.**

Penetration No.	Temperature (°F)	Pressure (psig)	Unit
29	275	3006	1
49	275	2418	2

Note: The penetrations used in this analysis was chosen to provide the most conservative results. The difference between the two units is primarily in pipe length between the two containment isolation valves.

When trapped water is heated, the temperature increase causes the water to expand. Assuming there is no trapped air, pressurization of the water volume is limited by the expansion of the pipe material and the compressibility of the water. The pressures resulting from relative expansion of the water and the piping are solved to provide internal pressures.

The temperature of the fluid inside the piping inside containment is maximized by conservatively assuming the water and pipe steel follow the containment saturation temperature without delay. Therefore, no heat transfer analysis is performed for these pipes. Pressures for these pipes are calculated at 275°F, thus bounding the maximum containment saturation temperature postulated following a LOCA. The piping volume outside containment is considered when calculating pressure.

4) **For penetrations 43 and 50, in which pressure in the pipe segment is relieved by valve leakage, provide a drawing of the isolation valves. Provide the pressure at which the valve was determined to lift off its seat or leak and describe the method used to estimate this pressure. Discuss any sources of uncertainty associated with the estimated lift off or leakage pressure.**

As listed above under question 1, the following values were analyzed as the lifting pressure for penetration 43 and 50:

Penetration No.	Valve TPNS No.	Valve Seat Lift Pressure (psig)
43	Q1(2)P17HV3184	680
50	Q1(2)P15HV3334	4047

Each of these valves is an air-operated, fail-closed globe valve. In establishing the required line pressure to unseat the valve, the following process was utilized.

The actuator force required to lift the valve plug from the seat, acting against the preload of the spring and the valve frictional forces, is considered equivalent to the hydraulic force needed to lift the valve plug. The hydraulic force is equal to the product of the line pressure and the exposed area of the plug. For the calculations, the assumed air pressure to lift the valve plug was established as the available supply air pressure. There were no uncertainties included in these calculations. The basis of omitting any uncertainties is discussed below.

Assuming the available supply air pressure in the calculations is considered conservative, the air pressure required to fully open the valve would be less than the available supply air pressure. The air pressure to fully open the valve consists of the pressure required to unseat the valve plus the additional pressure to raise the valve stem through its full travel. Therefore, the actual pressure required to unseat the plug would be less than the full open air pressure. The difference between the unseat pressure and the full open pressure value is determined by considering the installed spring rate, the actual valve travel, and the diaphragm area. The conservatism in using the supply air pressure would encompass any associated uncertainties with spring rates, diaphragm area, etc.

These penetrations are also equipped with an inside and an outside containment air-operated isolation valve. The valves are installed such that any pressure build-up in the piping section between the valves is applied to the under plug area of the outboard valve for penetration 50, and the inboard valve for penetration 43. The pressure required to lift the valve and relieve the pressure is less than the allowable pressure of the piping and components within the pressure boundary. Once unseated, penetration 50 will relieve to the Volume Control Tank (VCT), which will support the addition of this small amount of fluid with no adverse effect to the VCT. For penetration 43, the inboard valve is designed to reverse leak when pressure is applied under the seat to a section of CCW piping protected by pressure relief valves.

Drawings of the valves are attached. They are listed below.

Drawing	Valve TPNS No.	Penetration No.
U-176882	Q1P17HV3184	43
U-209211	Q2P17HV3184	43
U-258078	Q1P15HV3334 Q1P15HV3766	50
U-213131	Q2P15HV3334	50

5) **For penetrations 43 and 50, provide the maximum calculated stress in the piping run based on the estimated lift off or leakage pressure.**

Penetration No.	Valve Seat Lift Pressure (psig)	Maximum Pipe Stress at Valve Seat Lift Pressure (psi)
43	680	1358
50	4047	5837

The principle stresses on the pipe wall under net internal pressure are determined by the following formula:

$$\sigma = \frac{PD_o}{4t_n}$$

where:

σ = principle stress (psi)
P = internal pressure (psi)
D_o = outer diameter (in)
t_n = thickness of pipe (in)

Using the values for the pipe listed under question 1, and the maximum pressure in the pipe for stem lift in the valves listed under question 4, the above equation can be used to find the maximum stress experienced by the pipe.

The above valve seat lift pressures and the associated pipe stresses are within the Code allowables as listed in ASME Section III, 1971 Edition, Appendix I, Table I-7.1. Based upon a review of the piping configurations and support systems, adequate margin exists to Code allowables to accommodate dead weight and thermal stresses.

OVERSIZE

DOCUMENT PAGE(S) PULLED

SEE APERTURE CARD FILES

APERTURE CARD/PAPER COPY AVAILABLE THROUGH NRC FILE CENTER

NUMBER OF OVERSIZE PAGES FILMED ON APERTURE CARD(S) 12

ACCESSION NUMBERS OF OVERSIZE PAGES:

9811130283	9811160066	
9811130284	9811160073	
9811130286	9811160079	
9811130287	9811130284 "DUPE"	
9811130288		
9811160053		
9811160056		
9811160065		