TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

August 13, 1981

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 - DESIGN BASIS ACCIDENT MOVEMENTS OF STEEL CONTAINMENT VESSEL - NCR CEB 79-19 - REVISED FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector T. E. Burdette on May 11, 1979 in accordance with 10 CFR 50.55(e). Interim reports were submitted on June 11 and July 18, 1979; a final report was submitted on October 15, 1979; and a supplemental report was submitted on June 18, 1980. Enclosed is our revised final report. This report has been revised to reflect the current status of this deficiency.

If you have any questions, please get in touch with D. L. Lambert at FTS 857-2581.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Victor Stello, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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ENCLOSURE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2
DESIGN BASIS ACCIDENT MOVEMENTS OF STEEL CONTAINMENT VESSEL
NCR SQN CEB 79-19
10 CFR 50.55(e)
REVISED FINAL REPORT

Description of Deficiency

Piping which penetrates the steel containment vessel with rigid penetrations or is rigidly attached to steel containment vessel was analyzed and designed without adequate consideration for design basis accident (DBA) movements of the steel containment vessel. Specifically, due to possible inadequacies in piping analyses procedures, earlier analysis and design of piping systems penetrating the steel vessel incorrectly accounted for the following.

1. Most piping systems which penetrate the steel vessel are supported by rigid pipe supports, springs, and/or by mechanical seismic supports (snubbers). However, the containment and piping response to earthquake motion is rapid enough to cause the snubbers to lock up thereby preventing movement of the pipes. In the original analysis of the piping, it was assumed that the snubbers would not lock up during the accident condition.

2. The displacement of the vessel wall and attached piping (at the point of attachment) was incorrectly assumed to be only outward for the analysis and design of certain piping systems where movement of the vessel wall was considered. However, inward movement of the containment vessel must also be considered where vessel wall movement is important.

3. In the original analysis of Sequoyah and Watts Bar piping systems, TVA's analysis approach was to conservatively analyze for containment vibratory motion during a DBA inside containment using static displacements. This analysis was consistent with the analysis approach and philosophy which was used at that time for free standing steel containment buildings and was judged to be adequate to encompass inertial effects. It has recently been determined that acceleration effects due to the rapid vibratory movement of the containment vessel may not be adequately considered by the static analysis.

The attached table lists the piping systems by penetrations which have been reanalyzed to correct this nonconformance. All piping systems listed have been reanalyzed to account for the inertial effects. This reanalysis enveloped any corrective action for the displacement problem. Piping systems which have been reanalyzed for snubber lockup are identified in the table.

Safety Implications Statement

Had this condition gone uncorrected, certain piping systems would have been overstressed during a DBA and could, as a consequence, result in a breach in containment integrity. This could have adversely affected the safe operation of the plant.

Corrective Action

TVA has generated time history and response spectra data at each containment nozzle location for each of the six primary system DBA's. Using this information, all piping systems having rigid penetrations through the steel containment vessel were reanalyzed giving full consideration for the DBA event. Also, the new DBA movements were examined with respect to bellows type penetrations by both TVA and the bellows penetration vendor. All bellows type penetrations have been qualified for the DBA movements.

TVA previously reported an oversight which occurred in the reanalysis of the residual heat removal (RHR) spray header piping. The RHR spray header piping attached to the steel containment vessel was within a lapped region contained in two separate analyses. Because of some confusion over responsibility with a contractor, only one of the two analyses was reanalyzed in the original DBA reanalysis effort. TVA completed the reanalysis of the RHR spray header piping under LECN 5282 which was issued in June 1980. The reanalysis showed that new supports and changes to existing supports were required. The required new support installations and changes to existing supports have been made.

TVA has also checked all other systems for any similar oversight. There are no additional lines where TVA and contractor analyses join that were not completely reanalyzed in accordance with NCR SQNCEB79-19.

The total analysis effort and final documentation for unit 1 is complete. The piping reanalysis effort and its final documentation for unit 2 is also complete. The only unit 2 item remaining to be completed is qualification of the steel containment vessel nozzles and support pads for the new loads obtained from the piping reanalysis. This qualification effort will be completed by August 20, 1981. The loads are presently expected to be acceptable with no reinforcement modifications required. Should any such modifications be required, they will be completed before initial criticality. To prevent recurrence of this deficiency, TVA has incorporated the proper DBA methods into their piping analysis procedures.

SEQUOYAH NUCLEAR PLANT

Piping Penetrations Affected by NCR CEB 79-19

Penetration Number	System*	Pipe Size	Service	Affected by Snubber Lockup	Sys Reqd for Safe Shutdown
16	CVCS (Supply)	3	Normal charging to Regen Hx	X	
29	CCS (Disch)	6	R.C. Pump Oil Cooler		
35	CCS (Disch)	6	Excess Letdown Hx	X	**
39A	WDS	1	N2 to Accumulators	X	
39B	WDS	.75	N2 to Pressure Relief Tank	X	
40A	AFW (Supply)	4	Auxiliary Feedwater	X	X
40B	AFW (Supply)	4	Auxiliary Feedwater	X	X
40D	CSAS (Supply)	3	Air supply for H2 Purge	X	
41	WDS	3	Floor Sump Pump Discharge	X	
42	PWS	3	Pressurizer Relief Tank Makeup	X	
43A	CVCS (Supply)	2	Sealwater Injection - RC Pump		
43B	CVCS (Supply)	2	Sealwater Injection - RC Pump		
43C	CVCS (Supply)	2	Sealwater Injection - RC Pump		
43D	CVCS (Supply)	2	Sealwater Injection - RC Pump		
44	CVCS (Disch)	4	Sealwater Return - RC Pump		
48A	Containment Spray	12	Spray Header	X	X
48B	Containment Spray	12	Spray Header	X	X
49A	RHR Spray	8	Spray Header	X	X
49B	RHR Spray	8	Spray Header	X	X
50A	CCS (Disch)	3	RC Pump Thermal Barrier		
50B	CCS (Supply)	3	RC Pump Thermal Barrier		
51	FPS	4	Service to Standpipe Sys inside Cranewll		
52	CCS (Supply)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
53	CCS (Supply)	6	Excess Letdown Hx	X	X**
56	ERCW (Supply)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
57	ERCW (Disch)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
58	ERCW (Supply)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
59	ERCW (Disch)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
60	ERCW (Supply)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
61	ERCW (Disch)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
62	ERCW (Supply)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
63	ERCW (Disch)	6	RCP, CRDM, Lower Cont Vent Cooler	X	
64	ACS	2	Instrument Room Vent Cooler	X	
65	ACS	2	Instrument Room Vent Cooler	X	

SEQUOYAH NUCLEAR PLANT

Piping Penetrations Affected by NCR CEB 79-19

Penetration Number	System*	Pipe Size	Service	Affected by Snubber Lockup	Sys Reqd for Safe Shutdown
66	ACS	2	Instrument Room Vent Cooler	X	
67	ACS	2	Instrument Room Vent Cooler	X	
68	ERCW (Supply)	2	Upper Containment Vent Cooler	X	
69	ERCW (Supply)	2	Upper Containment Vent Cooler	X	
70	ERCW (Disch)	2	Upper Containment Vent Cooler	X	
71	ERCW (Disch)	2	Upper Containment Vent Cooler	X	
72	ERCW (Disch)	2	Upper Containment Vent Cooler	X	
73	ERCW (Disch)	2	Upper Containment Vent Cooler	X	
74	ERCW (Supply)	2	Upper Containment Vent Cooler	X	
75	ERCW (Supply)	2	Upper Containment Vent Cooler	X	
76	CSAS	2	Service Air		
77	DWS	2	Demineralized Water	X	
78	FPS	4	Service to RCP Spray Coverage		
82	Fuel Pool Cooling	6	From Refueling Cavity	X	
83	Fuel Pool Cooling	4	To Refuleing Cavity	X	
110	UHI (Supply)	2	UHI Valve Test Line		
114	ICS	2	Glycol Floor Cooling	X	
115	ICS	2	Glycol Floor Cooling	X	

*For description of acronyms, see next page.

**The CCS piping between the excess letdown heat exchanger and the steel containment vessel is TVA Class B and is required to function as a containment boundry (i.e., a closed system). It is for this reason that it is indicated as required for safe shutdown. The function of supplying and discharging CCS water to and from the heat exchanger is not required for safe shutdown.

SEQUOYAH NUCLEAR PLANT

Piping Penetrations Affected by NCR CEB 79-19

Acronyms	System
CVCS	Chemical Volume and Control System
CCS	Component Cooling System
WDS	Waste Disposal System
AFW	Auxiliary Feedwater System
PWS	Primary Water System
ICS	Ice Condenser System
FPS	Fire Protection System
ERCW	Essential Raw Cooling System
DWS	Demineralized Water System
UHI	Upper Head Injection System
ACS	Air-Conditioning/Chilled Water System