TU ELECTRIC

Log # TXX-6398
File # 10010
Ref # 10CFR50.30(a)

April 15, 1987

William G. Counsil
Executive Vice President

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKETS NOS. 50-445 AND 50-446
REQUEST FOR ADDITIONAL INFORMATION - NUREG-0737, ITEM II.D.1
PERFORMANCE TESTING OF RELIEF AND SAFETY VALVES

Gentlemen:

By letter dated March 27, 1987, the NRC staff requested additional information regarding the TU Electric submittal of June 13, 1986, "NUREG-0737, Item II.D.1 - Performance Testing of Relief and Safety Valves".

Attached is the information requested.

Very truly yours,

W. G. Counsil

W. G. Counsil

By: G. S. Keeley

G. S. Keeley
Manager, Nuclear Licensing

BSD/amb
Attachment

c - Mr. E. H. Johnson, Region IV
Mr. D. L. Kelley, RI - Region IV
Mr. H. S. Phillips, RI - Region IV

A046
1/1

QUESTION 1: Load Combination Equation

In the load combination equation for the emergency service condition given on Page A-12 of Appendix A of Reference 1 [TU Electric letter TXX-4849 dated June 13, 1986], the summation of the moment, M_{Wt}, due to deadweight, and the moment, M_{SOT_E}, due to safety valve discharge, is expressed as $M_{SOT_E} + |M_{Wt}|$. Explain why the absolute value of the deadweight moment is used in this equation. This summation will produce unconservative results when both M_{SOT_E} and M_{Wt} have negative values.

RESPONSE 1: The computer program used for the stress evaluations automatically considers the absolute value of the respective moment from the thrust events including SOT_E. Consequently, M_{SOT_E} is actually the absolute value of M_{SOT_E} and has been combined with the absolute value of M_{Wt}.

QUESTION 2: Piping Stress Comparison

A. The piping stress comparison presented in Appendix A of Reference 1 [TU Electric letter TXX-4849 dated June 13, 1986] included the design, fatigue, and faulted condition stresses for the Class 1 (upstream) portion of the safety valve and PORV piping. The upset and emergency condition stresses were not provided. Table A-5 in the above reference showed that the faulted condition stresses were low enough to fall below the emergency condition stress limits. However, it is difficult to draw the same conclusion for the upset condition, since not all of the stresses listed in Table A-5 are below the upset condition stress limit. The Licensee should provide a stress comparison for the upset condition to demonstrate that the PORV piping stresses are within allowable limits.

B. Reference 1 did not include a stress comparison for the downstream piping. Provide a comparison of the normal, upset, emergency, and faulted condition stresses and the applicable stress limits for the downstream piping in a similar manner as those for Class 1 piping.

C. Provide sketches of the upstream and downstream piping indicating the locations of the structural nodes used in the stress comparisons.

RESPONSE 2:

The loadings for the design condition listed in Table A-4 are for the combination P + DWT + SRSS (OBE, SOT_U). Therefore, the normal and upset conditions are automatically covered by the design data in Table A-4 and the emergency and faulted conditions are automatically covered by the faulted data in Table A-5 of the reference.

RESPONSE 2: (cont'd) Since the transmittal and review of the reference data, the line has been reanalyzed to reflect pipe support changes. A comparison of the normal, upset, emergency and faulted condition stresses and the applicable stress limits for both the upstream and downstream piping is presented in the attached Tables 2-1 through 2-9 for the revised analysis. Figures A-1 and A-2 illustrate the structural node points and support locations.

QUESTION 3: Piping Support Loads

A. The piping support evaluation was performed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Subsection NF. The stress limits listed in Tables A-1 and A-2 (Reference 1) [TU Electric letter TXX-4849 dated June 13, 1986] for load combinations for normal, upset, emergency, and faulted conditions appear to be oriented toward pipe stresses only, and not pipe support stresses. The allowables for the supports would be expected to be multiples of Subsection NF stress limits. Therefore, clarify the stress limits used for the supports for all load combinations. Also, identify the stress limits used for standard components such as snubbers.

B. Present a table comparing the worst case load (or stress) in several representative supports with the applicable allowable load (or stress) and identify the associated load combination equation. Also indicate in the table the support number and support type. If the support number used in the table are not shown in the piping sketches in Figures A-8 through A-13 in Reference 1, provide additional sketches to identify the support locations.

RESPONSE 3: Regarding Item 3A, the load combinations and stress allowables for the ASME Code Class 1, 2, and 3 pipe supports are in conformance with Subsection NF of the ASME Section III Code. This includes standard component supports. These allowables are tabulated in FSAR Tables 3.9B-1C, 3.9B-1D, and 3.9B-1E.

For Item 3B, the worst case load/stress versus the allowables for representative pipe supports in Figures A-8 through A-13 are tabulated in Tables 3-1 through 3-6, respectively. Table 3-7 contains a similar comparison for small bore pipe supports within the stress problem boundary but not shown in the piping sketches in Figures A-8 through A-13 of Reference 1.

QUESTION 4: Provide a description of the pipe material for the Class 1 piping upstream of the valves.

RESPONSE 4: The Class 1 piping, per the as-built data, is either ASME SA-376 TP304 or TP316 stainless steel. However, the lower allowable stress values for TP304 are used in the stress analysis.

Table 2-1

CLASS 1 (UPSTREAM) PRIMARY STRESS SUMMARY

NORMAL CONDITION

COMBINATION: P + DWT

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 1.5 S_m (ksi)
3020	Butt Weld	10.064	24.225
3041	Long Radius Elbow	12.123	24.225
5000	Branch Connection	15.844	24.225
3030	CRUN	9.905	24.225
4332	5-D Bend	5.384	24.225
4170	Reducer	12.867	24.225

Table 2-2

CLASS 1 (UPSTREAM) PRIMARY STRESS SUMMARY

UPSET CONDITION

COMBINATION: P + DWT + SRSS (OBE, SOT_U)

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress (1.8 S_m or 1.5 S_y)* (ksi)
4480	Butt Weld	15.704	26.850
1031	Long Radius Elbow	17.089	26.850
5000	Branch Connection	26.466	26.850
4481	CRUN	15.704	26.850
4332	5-D Bend	13.625	26.850
4170	Reducer	19.561	26.850

* The smaller of the given allowable is to be used.

Table 2-3

CLASS 1 (UPSTREAM) PRIMARY STRESS SUMMARY

EMERGENCY CONDITION

COMBINATION: P + DWT + SOT_E

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress (2.25 S_m or 1.8 S_y)* (ksi)
3161	Butt Weld	16.846	32.220
3152	Long Radius Elbow	23.471	32.220
3160	Branch Connection	31.104	32.220
3152	CRUN	16.846	32.220
4332	5-D Bend	7.885	32.220
4170	Reducer	13.730	32.220

* The smaller of the given allowable is to be used.

Table 2-4

CLASS 1 (UPSTREAM) PRIMARY STRESS SUMMARY

FAULTED CONDITION

COMBINATION: P + DWT + SRSS (SSE, SOT_F)

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 3.0 S_m (ksi)
5170	Butt Weld	21.021	48.450
1031	Long Radius Elbow	26.075	48.450
5000	Branch Connection	40.223	48.450
5171	CRUN	21.016	48.450
4332	5-D Bend	17.868	48.450
4170	Reducer	22.982	48.450

Table 2-5

CLASS NNS (DOWNSTREAM) PRIMARY STRESS SUMMARY

NORMAL CONDITION

COMBINATION: P + DWT

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 1.0 S_h (ksi)
3302	Butt Weld	6.794	15.900
3311	Long Radius Elbow	7.641	15.900
2440	Branch Connection	5.206	15.900
2430	CRUN	6.081	15.900

Table 2-6

CLASS NNS (DOWNSTREAM) PRIMARY STRESS SUMMARY

UPSET CONDITION

COMBINATION: P + DWT + SOT_U

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 1.2 S_h (ksi)
3302	Butt Weld	6.989	19.080
3311	Long Radius Elbow	7.888	19.080
2440	Branch Connection	5.703	19.080
2430	CRUN	7.099	19.080

Table 2-7

CLASS NNS (DOWNSTREAM) PRIMARY STRESS SUMMARY

UPSET CONDITION

COMBINATION: P + DWT + SRSS (OBE, SOT_U)

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 1.8 S_h (ksi)
4531	Butt Weld	14.070	28.620
3311	Long Radius Elbow	11.965	28.620
3450	Branch Connection	10.871	28.620
2430	CRUN	13.414	28.620

Table 2-8

CLASS NNS (DOWNSTREAM) PRIMARY STRESS SUMMARY

EMERGENCY CONDITION

COMBINATION: P + DWT + SOT_E

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 1.8 S_h (ksi)
3360	Butt Weld	17.421	28.620
3322	Long Radius Elbow	18.386	28.620
1430	Branch Connection	10.860	28.620
1420	CRUN	18.629	28.620

Table 2-9

CLASS NNS (DOWNSTREAM) PRIMARY STRESS SUMMARY

FAULTED CONDITION

COMBINATION: P + DWT + SRSS (SSE, SOT_F)

Node Point	Piping Component	Maximum Equation #9 Stress (ksi)	Allowable Stress 2.4 S_h (ksi)
4531	Butt Weld	19.288	38.160
1311	Long Radius Elbow	20.838	38.160
3450	Branch Connection	14.571	38.160
1420	CRUN	22.400	38.160

TABLE 3-1

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Supports from Figure A-8

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-115-015-C76R	Parallel struts attached to frame	52475 lbs	75900 lbs (clamp)	F	2	18,189 psi	19,600 psi	F
					3	Interaction 0.76	1.0	F
					1	Interaction 0.565	1.0	F
RC-1-115-008-C76K	Snubber attached to frame	2346 lbs	22100 lbs	F	5	0.5" Thick plate	0.39" Thick plate	F (1)
					4	Interaction 0.57	1.0	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other: Load-Carrying End Plate

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

(1) Analysis based on allowable stress requires plate thickness of 0.39"; actual plate thickness is 0.50".

TABLE 3-2

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Supports from Figure A-9

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-115-019-C66K	Snubber attached to frame	20121 lbs	67200 lbs	E	3	Interaction 0.89	1.0	F
		20466 lbs	72450 lbs	F	1	Interaction 0.77	1.0	F
RC-1-115-020-C66R	Rigid frame	---	---	--	2	14,899 psi	17,864 psi	F
					3	Interaction 0.84	1.0	F
RC-1-115-023-C66R	Rigid frame	---	---	--	2	Interaction 0.76	1.0	F
					1	Interaction 0.56	1.0	F
RC-1-115-029-C56K	Snubber attached to frame	8226 lbs	72450 lbs	F	2	0.25"	0.221"	F (1)
					4	Interaction 0.66	1.0	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

(1) Analysis based on allowable stress requires weld size of 0.221"; actual weld size is 0.25".

TABLE 3-3

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Sampling for Supports on Figure A-10

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-097-002-C86K	Snubber attached to frame	8488 lbs	72450 lbs	F	3	Interaction 0.54	1.0	F
					3	12485 psi	26250 psi	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

TABLE 3-4

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Supports from Figure A-11

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-099-002-C86K	Snubber attached to frame	7915 lbs	22100 lbs	F	4	Interaction 0.83	1.0	F
					2	14,005 psi	17,864 psi	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

TABLE 3-5

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Supports from Figure A-12

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-101-002-C86K	Snubber attached to base plate	3452 lbs	10640 lbs	F	5	13,125 psi	26,250 psi	F
					3	Interaction 0.12	1.0	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

TABLE 3-6

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Sampling for Supports on Figure A-13

		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-110-001-C86K	Snubber attached to base plate	3226 lbs	6000 lbs	U	3	Interaction 0.43	1.0	F
		4612 lbs	9400 lbs	F	3	9,769 psi	23,925 psi	F
RC-1-112-003-C86K	Snubber attached to base plate	2147 lbs	6000 lbs	U	3	Interaction 0.25	1.0	F
		3339 lbs	9400 lbs	F	2	1,371 psi	20,365 psi	F

*Structural Component Types:

1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

**Load Combination Case:

F - Faulted
E - Emergency
U - Upset

TABLE 3-7

Tabulation of Worst-Case Stress vs. Allowable Stress

Representative Sampling for Supports on Small Bore Iso RC-1-RB-019

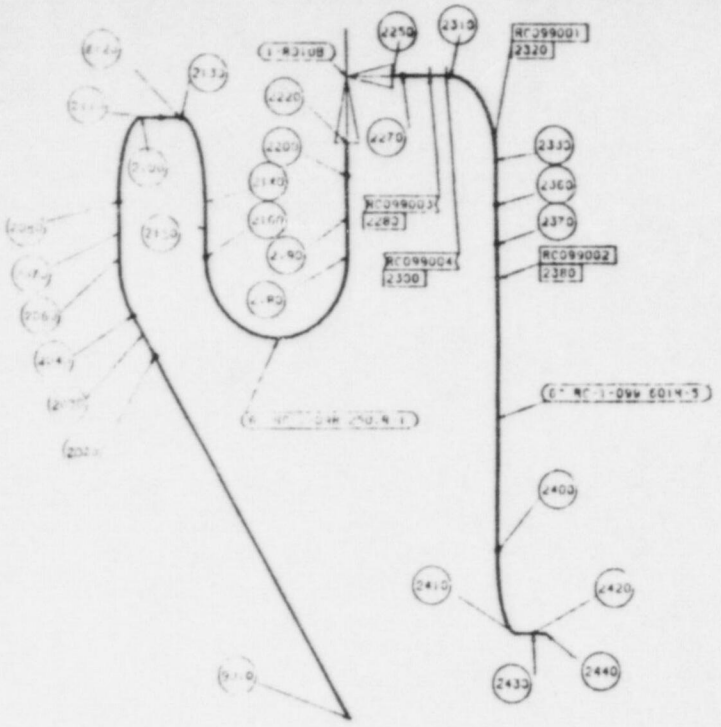
		Worst Standard Component (Strut or Snubber)			Worst Stressed Structural Component			
Support No.	Support Type	Actual Load	Allowable Load	L.C.**	Type*	Actual	Allowable	L.C.**
RC-1-103-700-C75K	Snubber attached to frame	39 lbs	267 lbs	F	---	---	---	---
RC-1-103-702-C75R	Rigid frame	---	---	---	3	1,528 psi	27,000 psi	F
					2	2,763 psi	17,864 psi	F
RC-1-103-705-C75R	Snubber attached to base plate	84 lbs	510 lbs	F	3	1,514 psi	27,000 psi	F

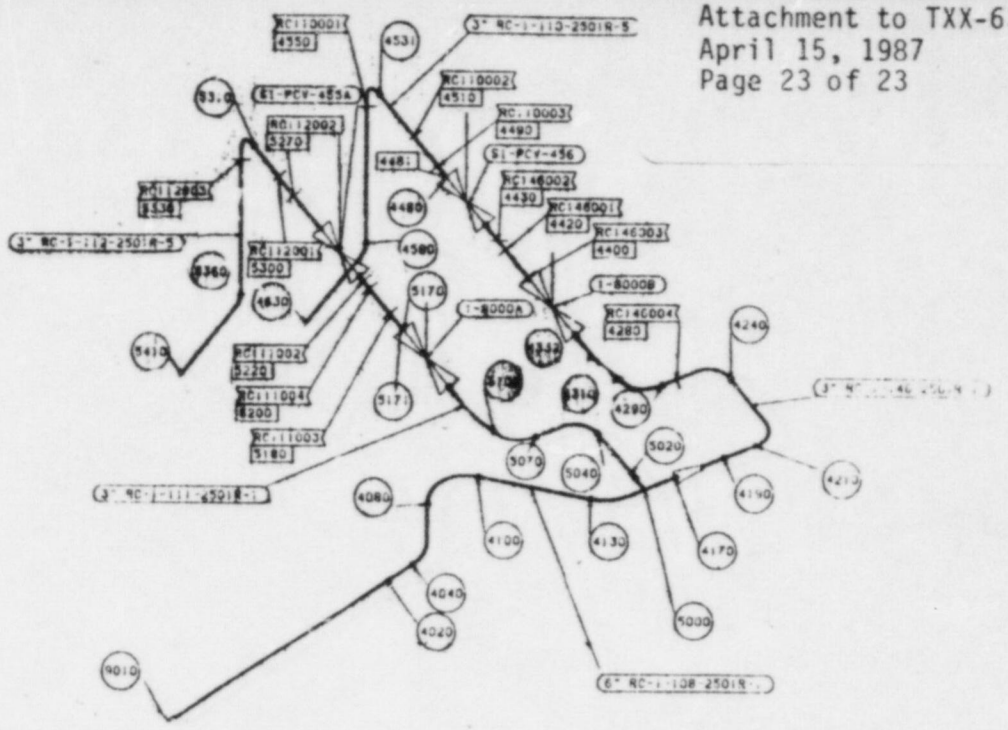
*Structural Component Types:

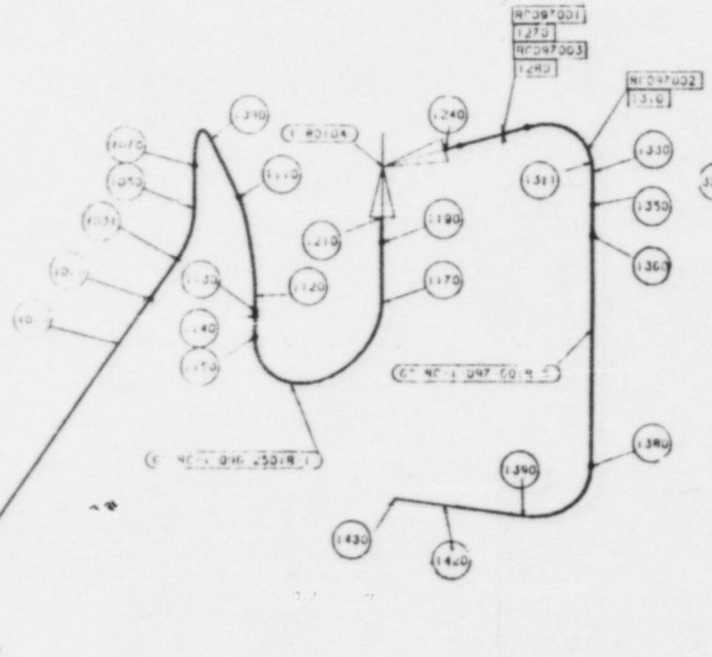
1 - Support Member
2 - Weld
3 - Base Plate/Anchor Bolt
4 - Richmond Insert/Threaded Rod
5 - Other:_____

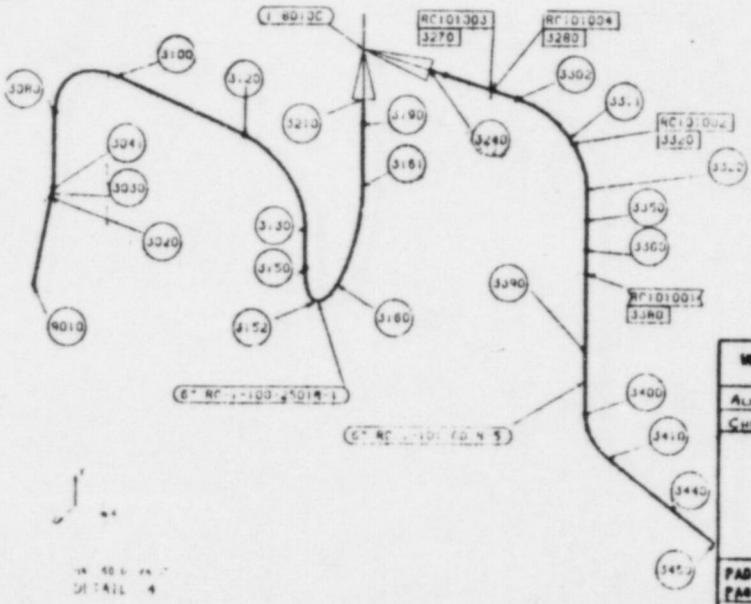
**Load Combination Case:

F - Faulted
E - Emergency
U - Upset









WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PA.

AUTHOR [illegible] 4/10/87

CHECKED [illegible]

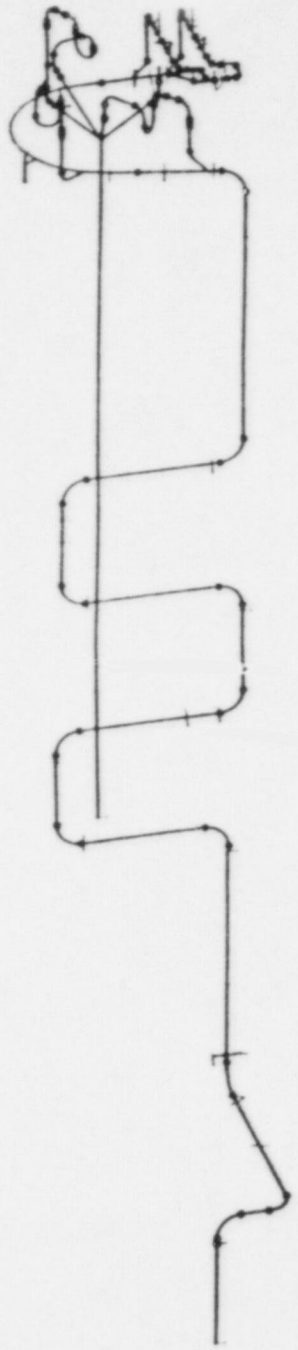
OFNEB PDARV PIPING MODEL

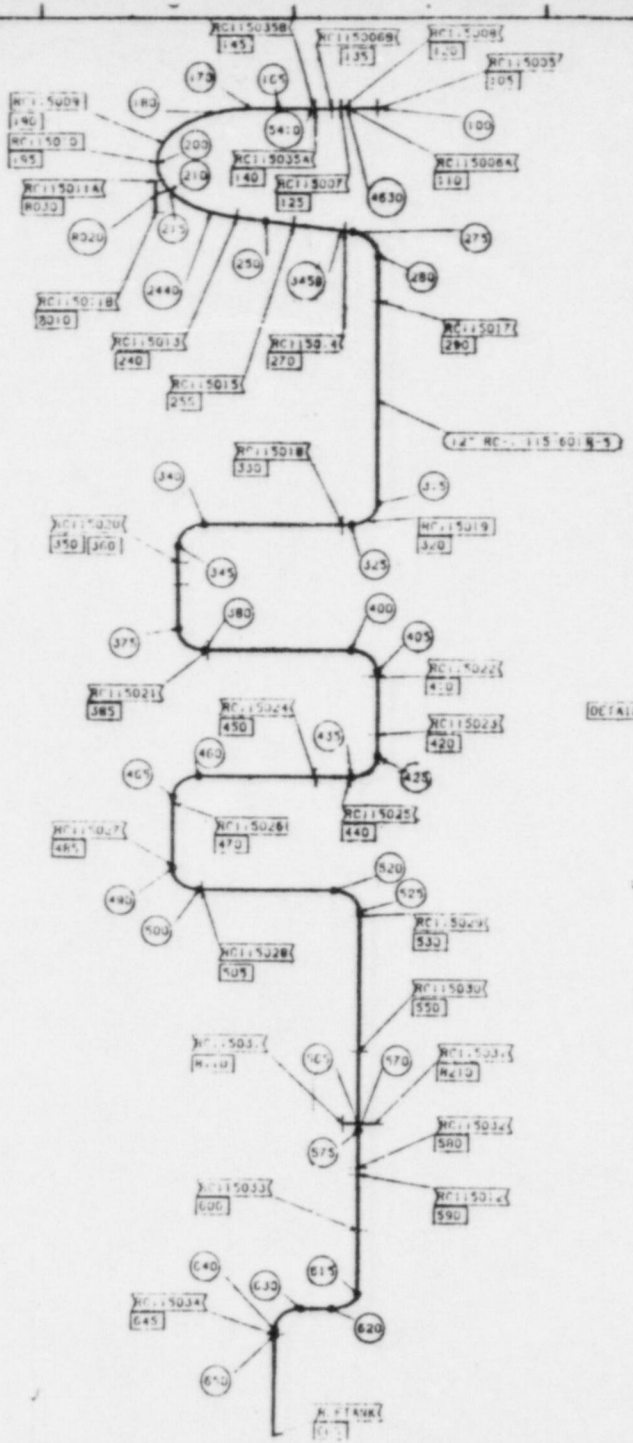
STRESS PROBLEM 1-083

FIGURE A-2

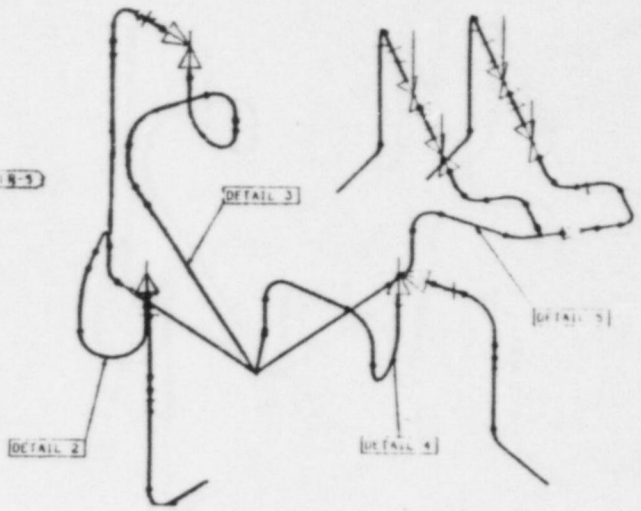
PADS 3.48 DESIGN	USE OBJ. 88
PADS 3.87 DOES	USE OBJ. 98
SCALE: N.T.S.	DRAWING NO.
JOB NO.	SHEET 8 OF 8

REV 0





DETAIL 6



DETAIL 1

LEGEND

	ELEMENT NUMBER
	COMPONENT MASS NUMBER
	EXTERNAL NODE NUMBER

WESTINGHOUSE ELECTRIC CORPORATION	
PITTSBURGH, PA	
AUTHOR	
CHECKED	
OPSEB PRARY PIPING MODEL	
STRESS PROBLEM 1-083	
FIGURE A-1	
PADS 3.66 B83DV0	USE OPT. 88
PARES 3.27 B083	USE OPT. 38
SCALE: N.T.S.	DRAWING NO.
JOB NO.	SHEET 1 OF 1
REV	0