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T. C. NICHOLS, JR.
VICE PRESIDENT AND GROUP EXECUTIVE
NUCLEAR OPERATIONS

December 2, 1980

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

Subject: Virgil C. Summer Nuclear Station, Unit 1
Docket No. 50-395
Emergency Feedwater System

Dear Mr. Denton:

In response to questions by Auxiliary Systems Branch Reviewers of the emergency feedwater system reliability analysis and subsequent telephone conversations with Linda Huang, South Carolina Electric and Gas Company acting for itself and as agent for the South Carolina Public Service Authority provides forty-five (45) copies of our commitment to do the following:

1. Install a manually operated valve in parallel with the isolation valve for the condensate storage tank (Valve 1010).

2. Provide the same type of control room indication (i.e. audible alarm and by-pass and inoperable status indication (BISI)) for the parallel valve as already exists for Valve 1010.

3. Remove the handwheels and place locking clamps on the shafts of both Valve 1010 and its parallel valve.

4. Provide the same type of surveillance for the parallel valve as for Valve 1010. In addition, information is attached regarding the time required for switchover to service water to avoid damage to the emergency feedwater pumps versus the actual response time of the plant.

This information will be incorporated in a subsequent FSAR Amendment.

We understand that this allows completion of Task Action Plan Item II.E.1.1 concerning the emergency feedwater reliability analysis.

If you have any questions, please contact us.

THIS DOCUMENT CONTAINS POOR QUALITY PAGES

Very truly yours,

T. C. Nichols, Jr.

T. C. Nichols, Jr.

NEC:rm

A 8012090218

CC: Messrs. V. C. Summer
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Gilbert Associates, Inc. Reading Pennsylvania	SUBJECT: Suction Line Rupture	FILING CODE: FP-16-a	PAGE 3 OF 6 PAGES
ANALYSIS/CALCULATION	PROJECT NAME: V. C. Summer Station Unit 1	W.O. NUMBER: 04-4061-000	
DEPARTMENT NUMBER: 0428	DEPARTMENT NAME: Mechanical		

COVER PAGE AND DESIGN VERIFICATION RECORD

REVISION NUMBER	3	2	1	0
ORIGINATOR (INITIALS AND SURNAME)				R.J. Sheldon
DATE COMPLETED				5/30/80
THIS ANALYSIS/CALCULATION CONTAINS ASSUMPTIONS REQUIRING LATER CONFIRMATION (YES OR NO)				No
VERIFIER (INITIALS AND SURNAME)				D.T. Hinkle
DATE VERIFIED				3 June 1980
THE DESIGN ANALYSIS/CALCULATION HAS BEEN REVIEWED BY ME AGAINST THE APPLICABLE DESIGN REVIEW QUESTIONS (REFERENCE ANSI N45.2.11). ANY FINDINGS UNCOVERED DURING MY REVIEW HAVE BEEN DIRECTED TO THE ORIGINATOR AND RESOLVED. (VERIFIER'S SIGNATURE)				David T. Hinkle
THE DESIGN REVIEW OF THE ANALYSIS/CALCULATION INCLUDED EVALUATION AGAINST THE FOLLOWING QUESTIONS: WERE INPUTS, INCLUDING CODES, STANDARDS, AND REGULATORY REQUIREMENTS, CORRECTLY SELECTED AND APPLIED? ARE ASSUMPTIONS ADEQUATELY DESCRIBED AND REASONABLE? ARE ASSUMPTIONS REQUIRING REVERIFICATION ADEQUATELY IDENTIFIED? HAVE APPLICABLE CONSTRUCTION AND OPERATING EXPERIENCES BEEN CONSIDERED? WAS AN APPROPRIATE ANALYSIS/CALCULATION METHOD USED? IS THE OUTPUT REASONABLE COMPARED TO INPUTS?	REMARKS:	REMARKS:	REMARKS:	REMARKS: NONE

FILING CODE

Gilbert Associates, Inc. Reading, Pennsylvania — ANALYSIS/CALCULATION	SUBJECT: Suction Line Rupture			FILE: C1-16-2	PAGE 2 OF 6 PAGES
	REV. 0	1	2	3	
	ORIGINATOR: R.J. Sexton				
	DATE: 1/30/80				

1 Objective

Determine time available to open SW to EF cross-tie valves after a tornado causes loss of normal water supply to the EF pumps.

2. Assumptions

1. Tornado causes rupture of EF suction line to condensate storage tank at ground level.

2. The single largest pump (Turbine Driven) is operating at rated capacity.

3. A loss of off-site power occurs simultaneously.

4. Head loss (for calculating NPSH) in the short run of pipe from the vertical line (from 414'-9" to 411'-0") is negligible.

5. Flow is proportional to valve position between the closed and the 1/4 open positions. Archer/Darling graph for a gate valve attached to Vinter letter shows correlation.

6. ΔP across two identical valves in series is equal and the pressure drop in the SW to EF piping is insignificant compared to the ΔP across partially open valves.

3. References

a. 1MS-17-153-0
b. B/M R1d-1
c. E-304-089, Rev 14
d. E-303-022, Rev 11
e. Hydraulic Institute Standards, 12th edition, 1969
f. Crane TP No 410, 1976
g. 1MS-224-3
h. Anchor Darling Ltr of 3/1/76
i. Crane TP No 410, 1969
j. D-302-221, Rev 5
k. FSAR

4. Equations

$NPSH = h_{20} = \frac{144}{w}(p_a - p_{vp}) + h_s$ Ref (e) pg 69

$Q = C_v \sqrt{\Delta P \frac{62.4}{\rho}}$ Ref (f) equation 3-16

5. Data

Pump NPSH required	27 ft	Ref (a)
Pump Design Capacity	900 gpm	Ref (a)
EF Maximum Temp	120°F	Ref (b)
Pump Suction Elevation	414'-3"	Ref (c)
Pipe length from 414'-6" elev in vertical line to ground level	137 ft	Ref (c) + (d)
Pipe Size	10" Sch 40	Ref (c)
Area, 10" Sch 40	0.5475 ft²	Ref (f) pg B-16

5 Data cont'd

Valves 1002, 100B, 1037A+B-EF		
Opening time	42 sec	Ref (h)
Cv	4440	Ref (g)
Diesel Ready to Load	10 sec	Ref (k) pg 8.3-10b
SW Pressure	40 psig	Ref (j)
SW Pumps loaded onto diesel	10 sec.	Ref (k) Fig 7.3-1

6 Calculation

A. Time from pipe rupture to pump out of NPSH

$NPSH = h_{sv} = \frac{144}{w}(p_a - h_{vp}) + h_s$

h_{sv} required is 27 ft

p_a = 14.7 psig

p_{vp} (120°F) = 1.7 psig — Ref (c) pg A-12

$w_{(120°F)}$ = 61.7 lb/ft³ — Ref (c) pg A-12

$$h_s = h_{sv} - \frac{144}{w}(p_a - p_{vp})$$

$$= 27 - \frac{144}{61.7}(14.7 - 1.7)$$

$$= 27 - 30.3$$

$$= -3.3$$

∴ Pump will run if water level maintained to level of top of pump suction.

Time for pump to empty line from ground level to elev. 414'-6"

Volume pipe = Length × Area

= 137 ft × .5475 ft² × 7.48 gal/ft³

= 561 gal

6. Calc's Cont'd

Time = Vol / Pump Capacity
= 561/900 = .623 min
= 37 sec.

B. Time from line break to when SW is available

1. Cv of valve full open = 11140

L/D of full open gate valve is 13 } Ref(6) pg A-30
L/D of 1/4 open gate valve is 900 }

Cv is proportional to $1/\sqrt{40}$ Ref(5) Eqn 3-15 & 3-16

Using ratio from Crane,

Cv 1/4 open = 534

Total ΔP = 40 psig

ΔP across one valve is 20 psig

$Q = C_v \sqrt{\Delta P \frac{62.4}{\rho}}$ $\rho = 62.4$
$= C_v \sqrt{\Delta P}$
$= 534 \times \sqrt{20} = 2388$

Position for 900 gpm = $\frac{900}{2388} \times .25 = .1$

Time = .1 × 42 sec
= 5 seconds

6. Calc's Cont'd

Time for valve to open = diesel start time (10 sec) + valve open to 300 gpm position (5 sec) = 15 sec.

(Valves are load block 1 which has a 0 sec delay, Ref (4), Fig 7.3-1)

2. Time for SW pumps to be on line = diesel start time (10 sec) + SW Pump start delay (10 sec, Ref (4), Fig 7.3-1) = 20 sec.

Worst case is 20 sec for SW pump to be on line

∴ Since EF pump has 37 sec supply before SW is required 20 sec for SW pump to be on line is satisfactory.