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CLASS I
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OFF-CENTERLINE 1/4 SCALE T-QUENCHER TEST REPORT

TASK 9.2.3

GENERAL ELECTRIC

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OFF-CENTERLINE

1/4 SCALE T-QUENCHER

TEST REPORT

TASK 9.2.3

Prepared by

NUS Corporation
for
General Electric Company

Approved: E. Kiss
E. Kiss, Manager
Applied Mechanics

Approved: P. W. Ianni
P. W. Ianni, Manager
Containment Design

Approved: A. E. Rogers
A. E. Rogers, Manager
Containment Technology

Approved: M. E. Tanner
M. E. Tanner, Manager
Safety Relief Valve Program

Approved: H. E. Townsend
H. E. Townsend, Manager
Containment Methods

NUCLEAR ENERGY ENGINEERING DIVISION • GENERAL ELECTRIC COMPANY
SAN JOSE, CALIFORNIA 95125

GENERAL ELECTRIC

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ABSTRACT

This report documents the results of a 1/4 scale T-quencher test program performed to investigate the effects of an off-center location of a T-quencher in a Mark I pressure suppression pool. The test results reported herein supplement those reported in GE report NEDE-24549-P, Mark I Containment Program: Final Report 1/4 Scale T-Quencher Test. The off-center location used resulted in an increase in air clearing pressure magnitude by a factor of 2 over that measured for an otherwise identical centered T-quencher location.

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1. INTRODUCTION

This report documents the results of 1/4 scale Safety/Relief Valve (SRV) discharge tests conducted by the NUS Corporation for the General Electric Company. These tests investigated the effect of an off-center location of a T-quencher in a Mark I pressure suppression pool. This test program supplements that reported in GE report NEDE-24549-P *Mark I Containment Program: Final Report/1/4 Scale T-Quencher Test* (Reference 1).

Safety/relief valves are installed on Boiling Water Reactor (BWR) main steam lines to protect against overpressurization and to aid the primary coolant system depressurization. After an SRV is opened, steam enters the line, compressing the air in the line causing a buildup of pressure. This increased pressure accelerates the water slug initially occupying the submerged portion of the discharge line and water is expelled into a pressure suppression pool. The air initially contained in the Safety/Relief Valve Discharge Line (SRVDL) follows the water into the pool. The expelled air forms high pressure, oscillatory bubbles in the suppression pool and pool hydrodynamics and inertia cause the bubbles to expand and contract as they rise to the pool surface, imposing oscillatory loads on the torus and associated structures.

The test facility included a 1/4-scale mockup of the discharge line, discharge device (T-quencher) and a section of a torus (suppression tank). The T-quencher allows the injection of the compressed air from the discharge line into the suppression pool without generating large pressures.

The purpose of these tests was to determine the effect of locating the T-quencher horizontally off the centerline of the suppression tank. The purpose of the tests reported in Reference 1 was to determine the effect of various other operating and geometric parameters on the air clearing performance of a reduced scale model of a Mark I T-quencher. The test results given here are to be used for formulation of an empirical correlation which adjusts the output of the T-quencher air clearing empirical model (Reference 2), valid only for centerline discharge, to the off-centerline Peach Bottom case.

This report presents a description of the test facility, the instrumentation, the test procedures and the test results.

2. SUMMARY OF PRINCIPAL OBSERVATIONS

The test results are summarized in Table 6-1. The following is a summary of principal observations:

- Location of the T-quencher 1.45 ft horizontally off the suppression pool centerline resulted in an increase in peak wall pressure by a factor of 2 over that which was measured for an otherwise identical centerline T-quencher discharge.

- For the off-centerline arrangement, submerging the T-quencher 0.375 ft deeper into the pool and therefore closer to the containment wall resulted in an increase of approximately 20% in the peak wall pressure.

3. FACILITY DESCRIPTION

The test facility simulated a BWR Mark I SRV piping system from the safety/relief valve to the torus. The facility included a steam supply, a steam flow control system, a discharge line and a T-quencher in a pressure suppression tank. A schematic of the test facility is given in Figure 3-1 and a photograph in Figure 3-2. A more detailed description of the test facility is given in Section 3 of Reference 1.

The steam supply system consisted of power plant steam, a pressure reducing valve, and a surge tank. The 1800 psig power plant saturated steam was reduced to approximately 300 psia before it entered the bottom of the surge tank. The surge tank was about half-full of water. This system assured an adequate supply of saturated steam and was designed to deliver 4 lb/sec for 20 seconds without the surge tank pressure dropping more than 6%.

The steam flow control system, which simulated the SRV, consisted of a fast-acting valve, a rupture disc and a flow control nozzle. The 200 psig rupture disc was used in series with the valve for two reasons:

- To obtain the required pressurization rise time upstream of the nozzle.
- To assure no steam leakage into the discharge line which contained dry air.

The flow control nozzle was also used to measure the steam flow, according to the following equation (Reference 2):

$$W = 0.3044\ C_d A \left(\frac{P_1}{V_1}\right)^{1/2}$$

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where:

W = Steam flow rate (lb/sec)

P_1 = Inlet pressure (psia)

V_1 = Specific volume of steam (ft^3/lb)

A = Throat area = 0.375 $in.^2$

C_d = Coefficient of discharge = 0.97

The nozzle upstream pressure was measured by use of a pressure transducer and recorded on a Visicorder.

The discharge piping used for the three tests was 1-1/2-in., Schedule 40, Type-304 stainless steel. The length from the rupture disc to the water surface was 54.4 ft and is shown schematically by Figure 3-3. The discharge pipe was electrically heated to control the pipe and contained air initial temperature at 325°F for each test. The discharge line was purged with dry air before each test. The temperature, pressure, and humidity of the air in the discharge line were measured to assure known conditions.

The discharge line terminated below the water surface in a mockup of a Mark I torus with a device containing a large number of holes for dispersing the air/steam into the suppression pool. This device, called a T-quencher because of its shape, consisted of two perforated pipe "arms" welded to two short-radius elbows, which were in turn welded back-to-back to form an inverted "T" as shown in Figure 3-4. The suppression tank was a reinforced cylindrical shell with flat ends. It was 10 ft long and had a 6.9-ft inside diameter.

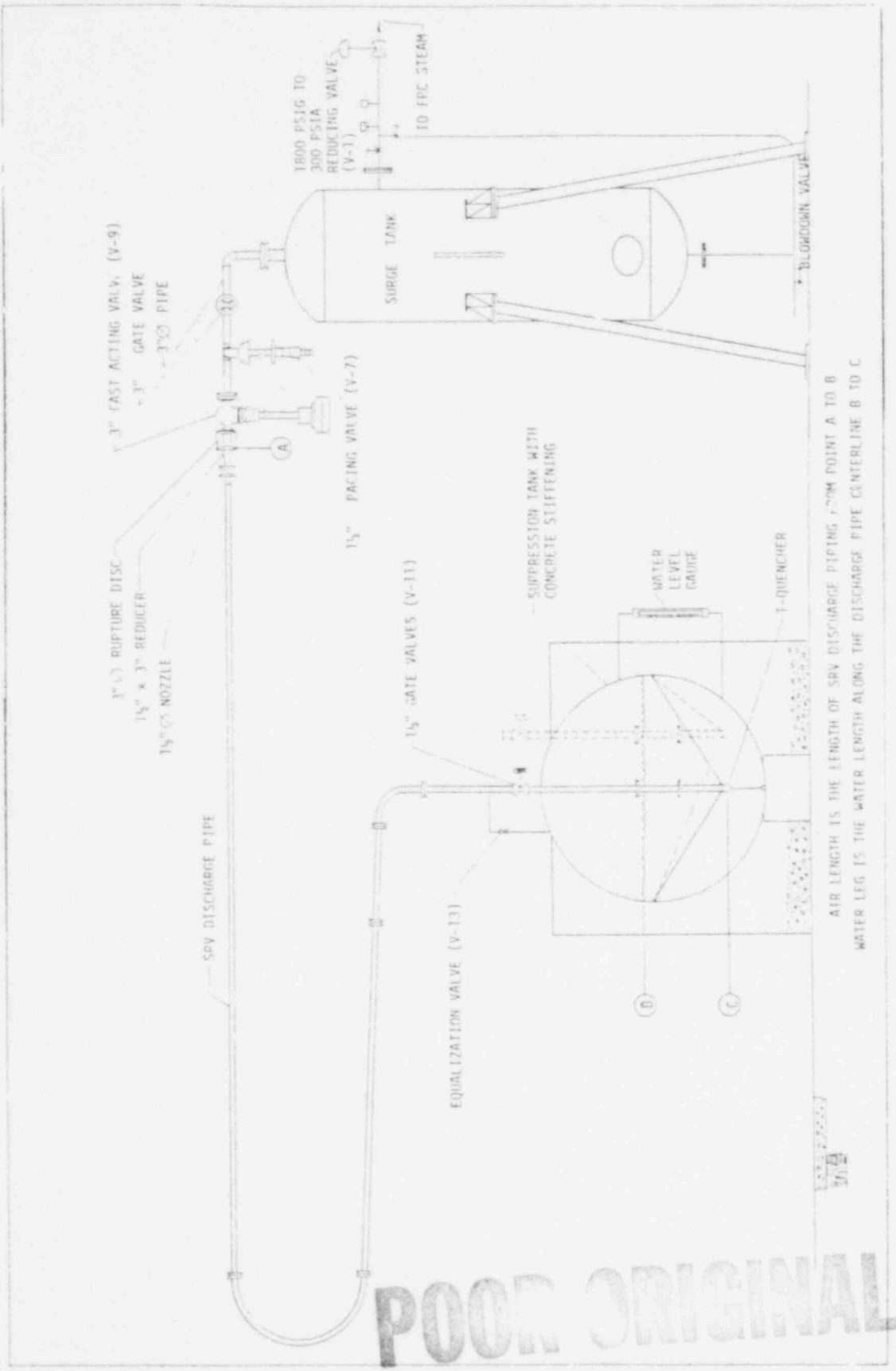


Figure 3-1. Principal Components of Test Facility

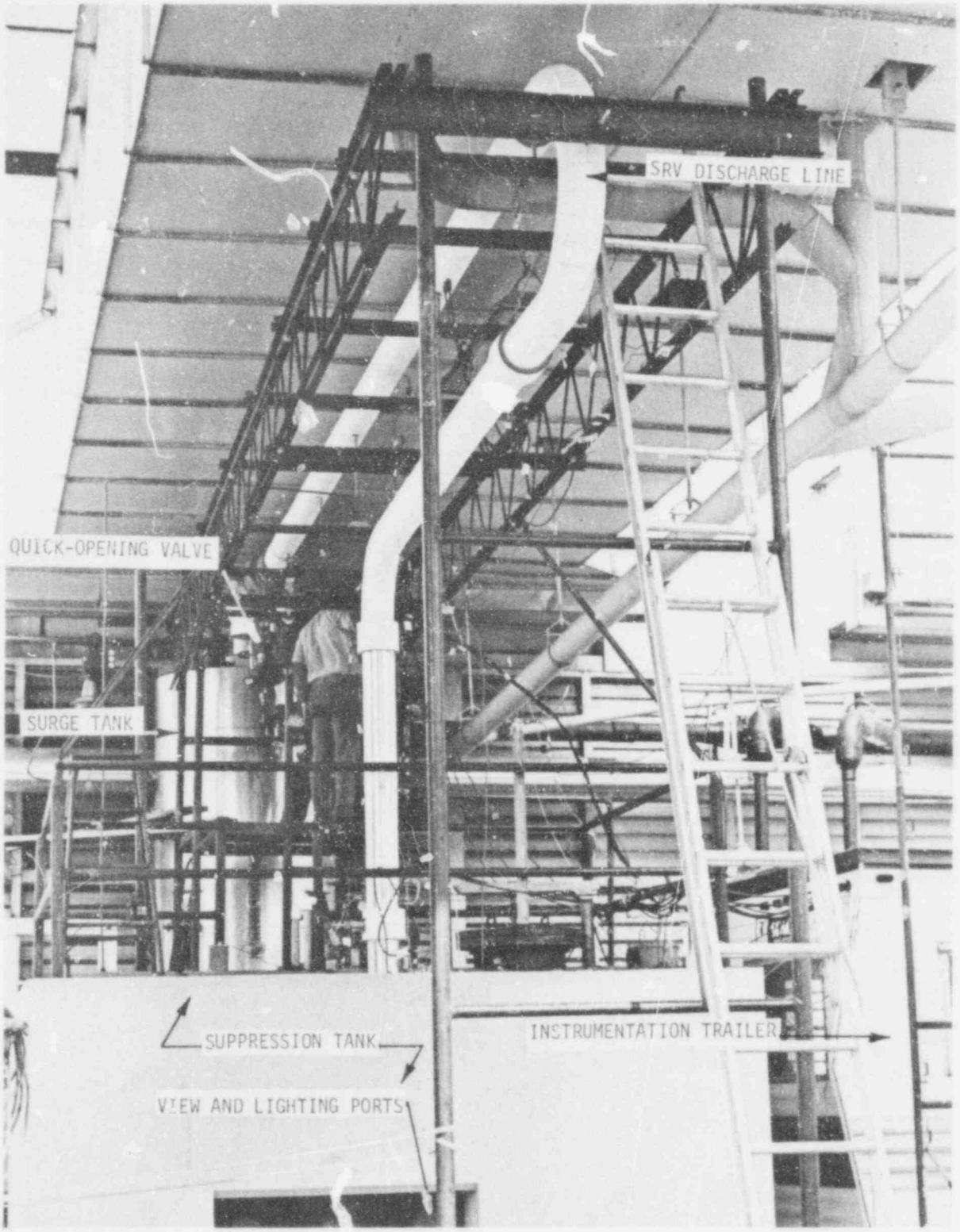
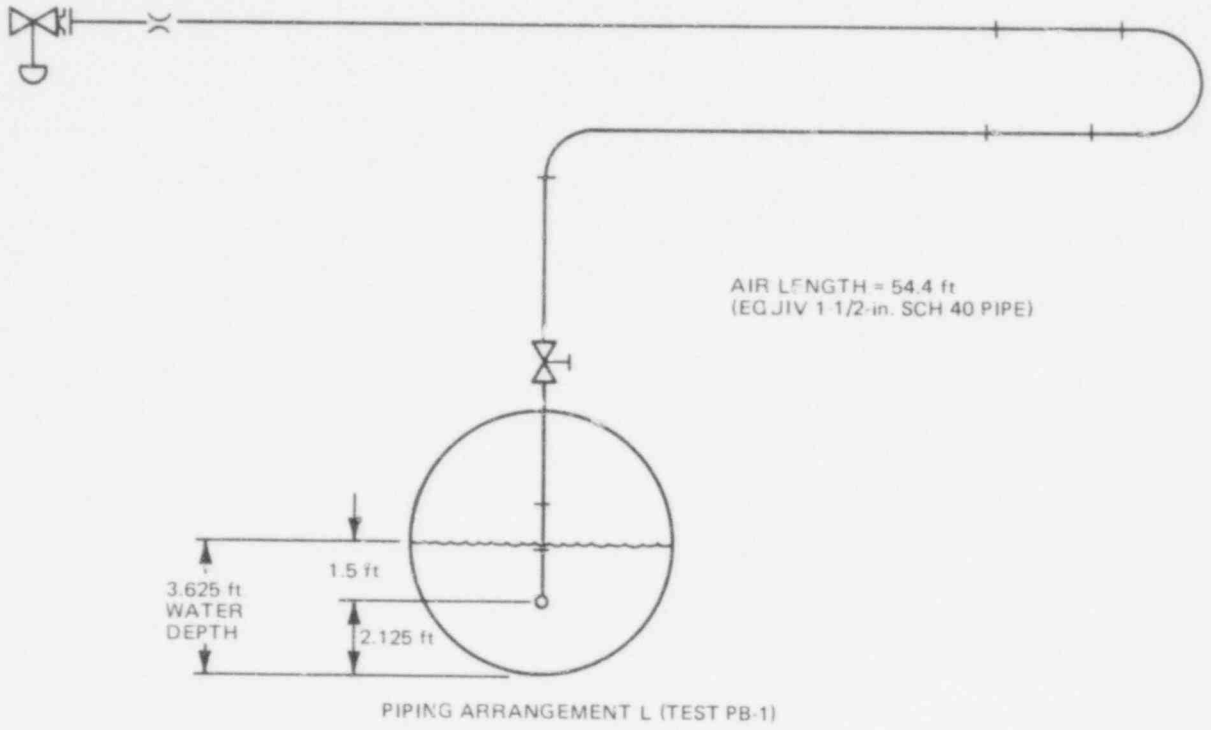
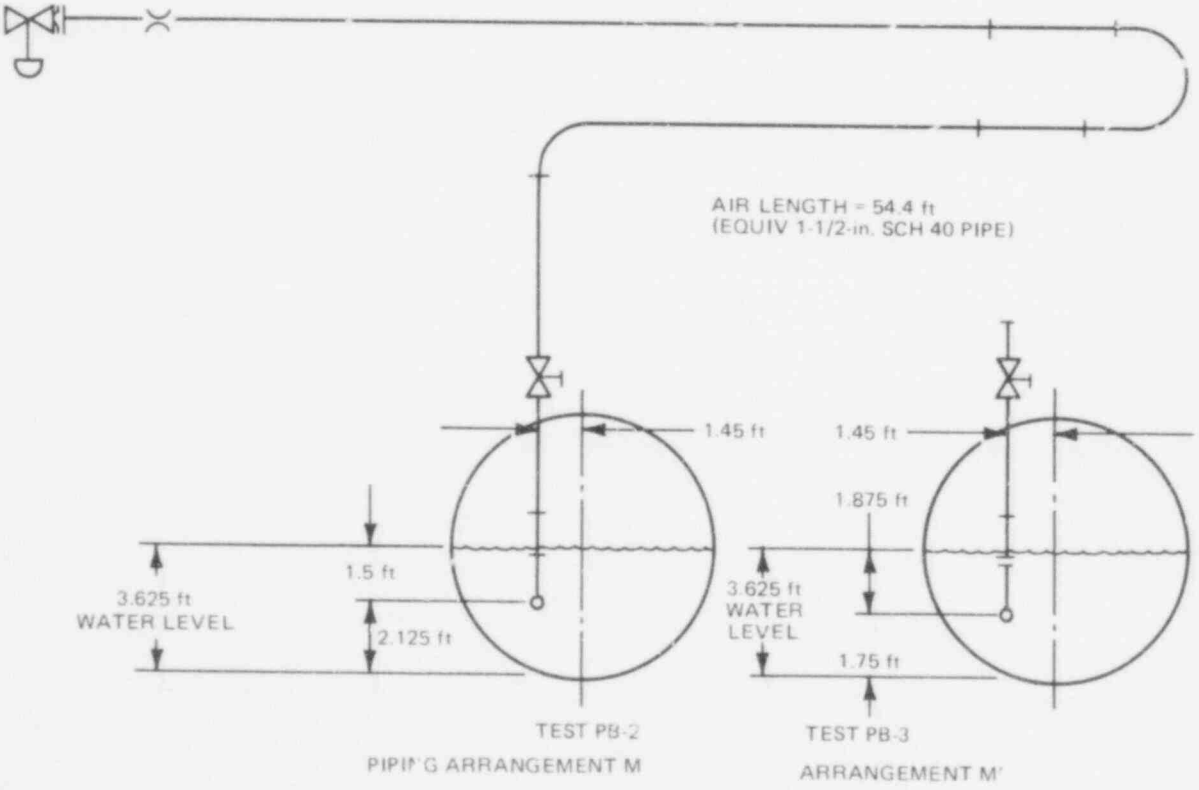


Figure 3-2. Photograph of Test Facility



PIPING ARRANGEMENT L (TEST PB-1)



TEST PB-2
PIPING ARRANGEMENT M

TEST PB-3
ARRANGEMENT M'

Figure 3-3. Piping Arrangements for Tests PB-1, PB-2 and PB-3

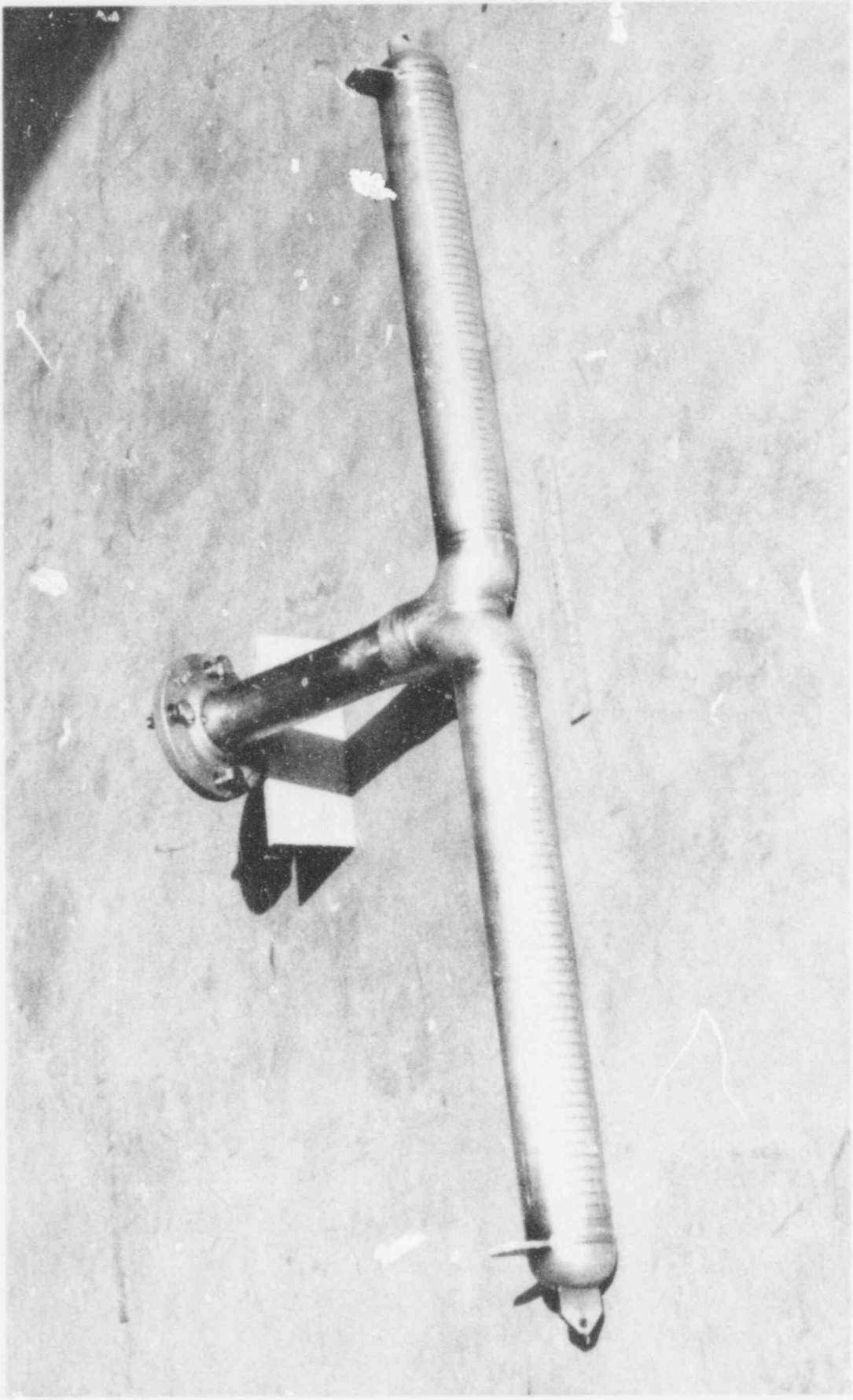


Figure 3-4. Photograph of T-quencher

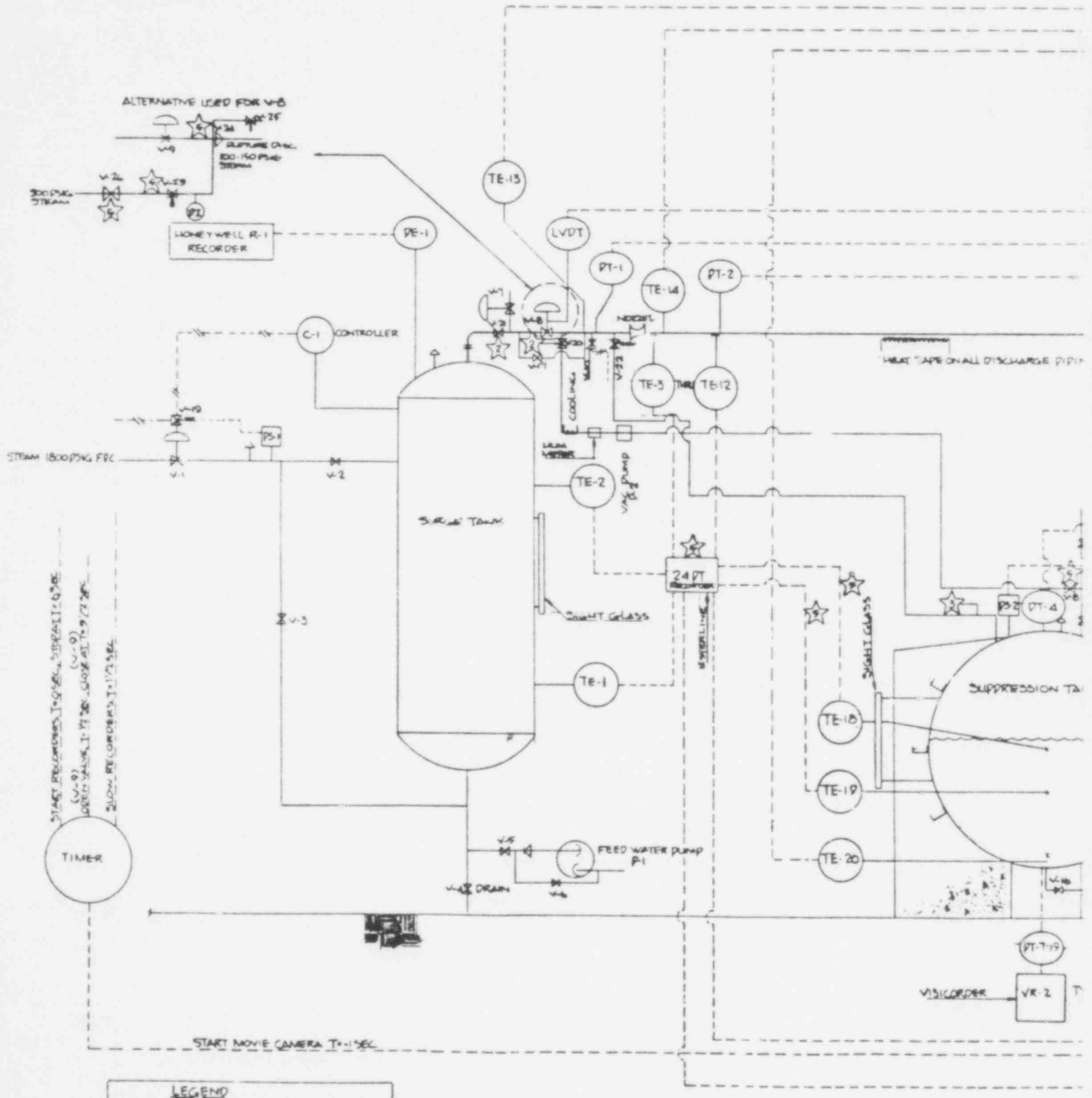
4. INSTRUMENTATION

The primary measurements required in these tests were for the pressure transients on the submerged portion of the suppression tank wall. The results of these measurements were used to determine the effect of moving the T-quencher to an off-center location. Additionally, to control initial conditions, it was necessary to measure temperatures, pressures, water levels, steam flow rates, discharge pipe pressurization rates, and the dewpoint temperatures of the air in the discharge line.

The instrumentation is described in detail in Section 4 of Reference 1. A piping and instrumentation schematic is given in Figure 4-1. The same instrumentation was used as for the previously reported tests, except as described below. For Test PB-1, the instrumentation was as described in Reference 1 except the bubble pressure transducers (PT-19 and PT-20) were removed. For comparison, the locations of the suppression tank wall transducers used for Test PB-1 are shown by Figure 4-2. For Tests PB-2 and PB-3, two transducers were relocated in the tank, three were replaced with 0-15 psia transducers in new locations, and one 0-15 psia transducer was added. The locations of these transducers on the tank wall are shown in Figure 4-3. The four new transducers were from Senso-Metric Inc., Model SP-65B, 0-15 psia range, with a manufacturer's specified accuracy of 0.25%.

A Milliken Model DBM5B, 500 frame per second, 16mm movie camera was used to record the SRV discharge phenomena for Test PB-1, from above the T-quencher, during four test runs.

The temperatures of the pipe and inside air were measured and recorded, as was the temperature of the suppression tank water at three locations.



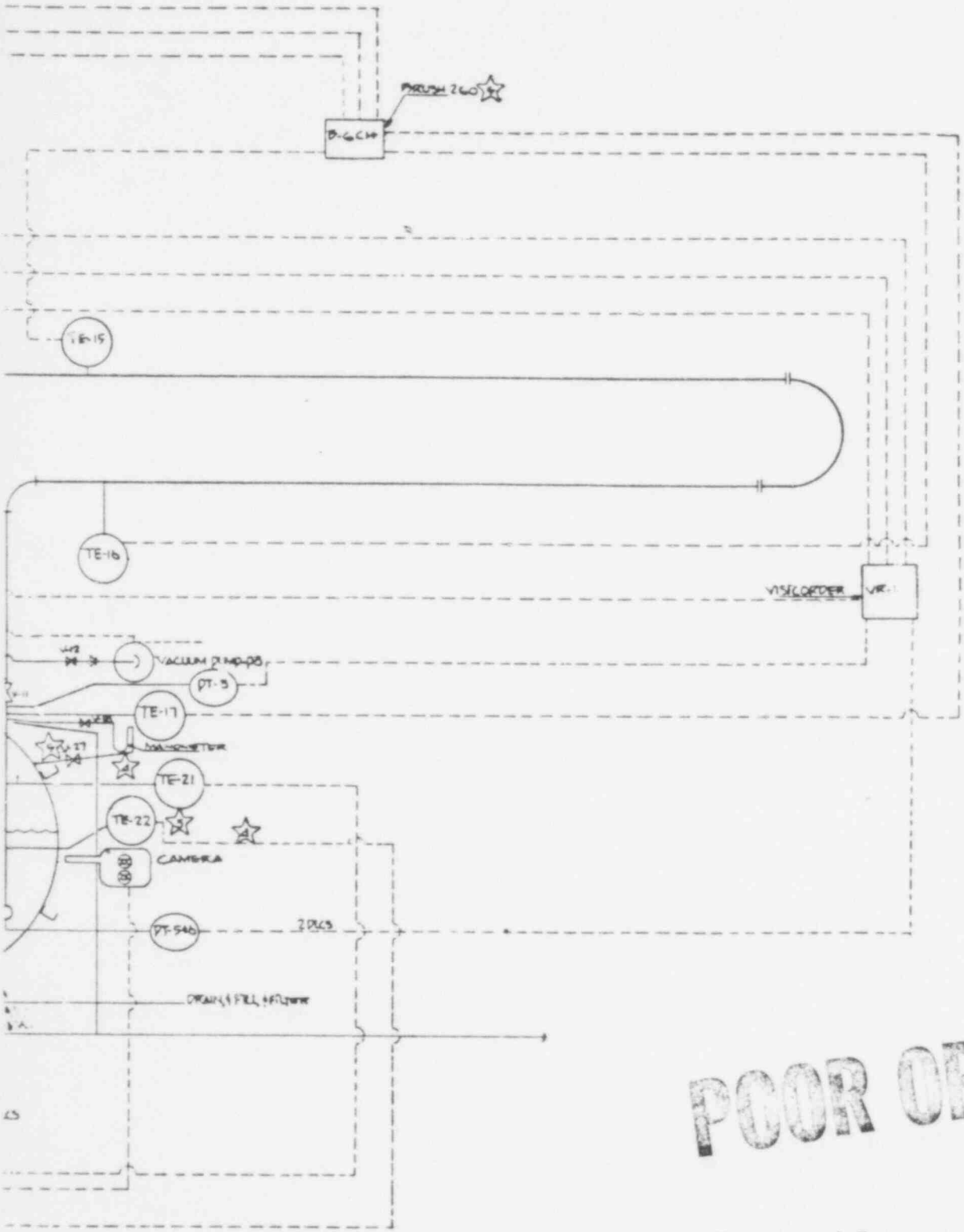


Figure 4-1. Piping and Instrumentation Schematic for Test Facility

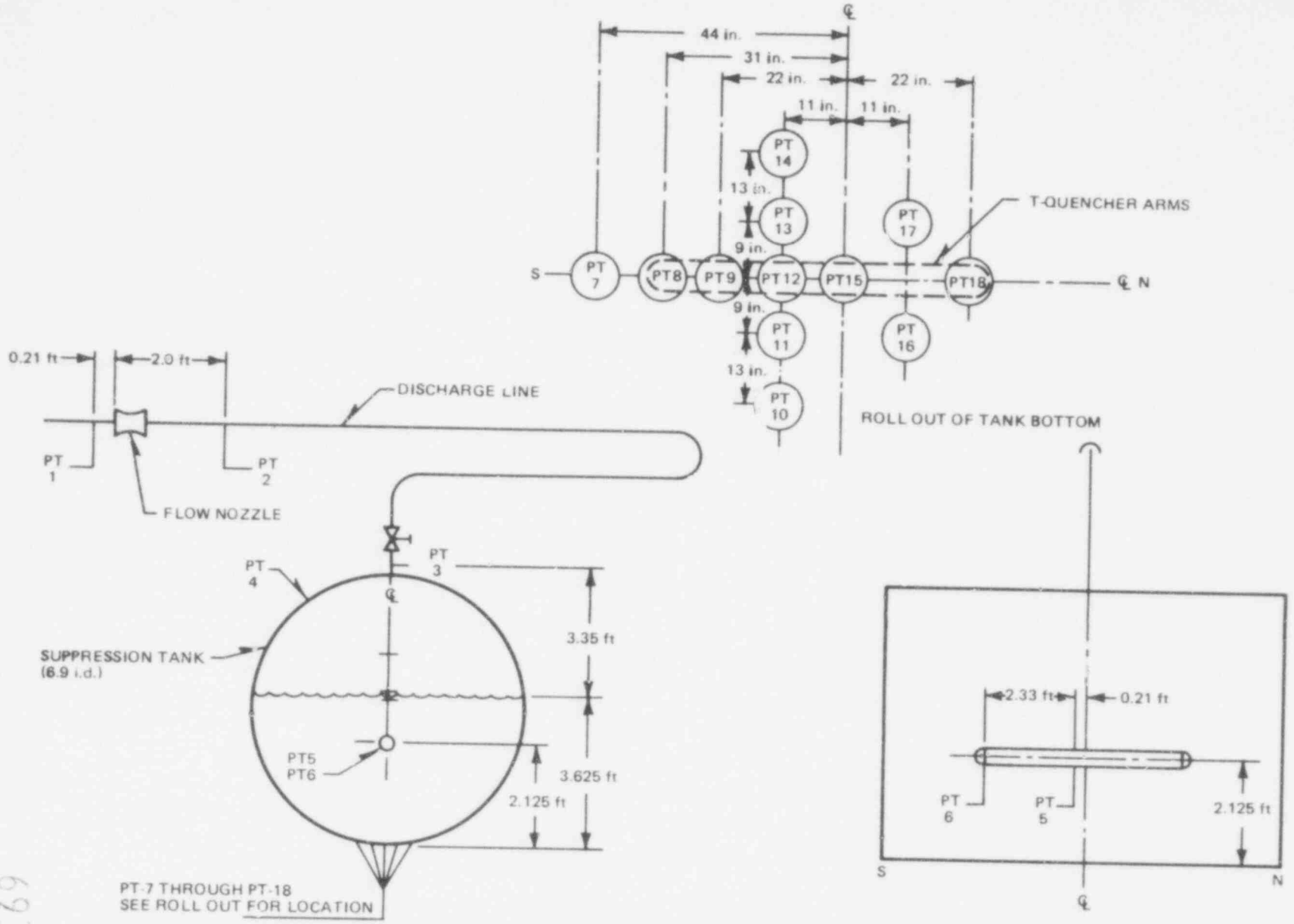


Figure 4-2. Test Facility Pressure Transducer Locations for Test PB-1

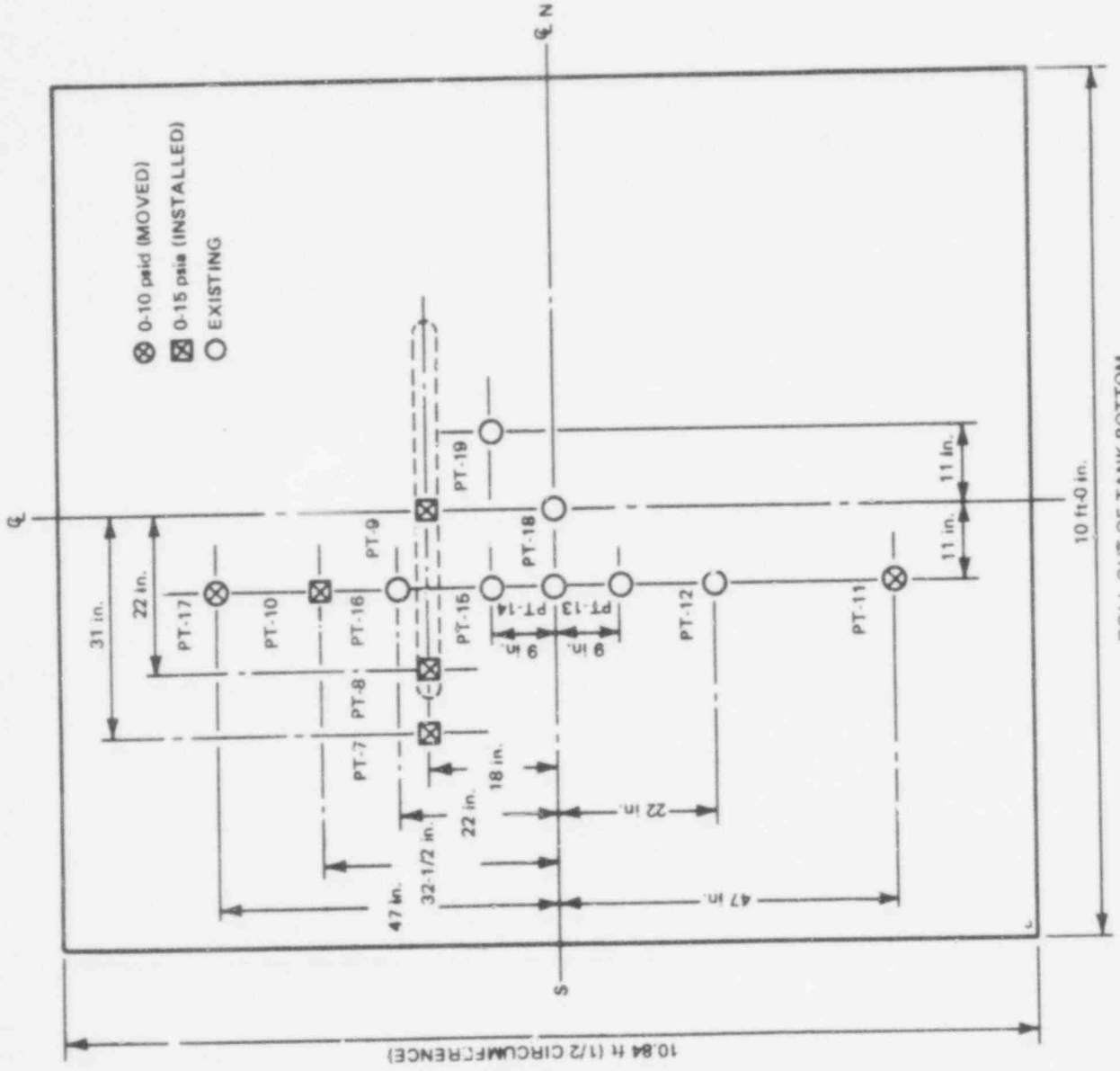


Figure 4-3. Location of Pressure Transducers for Test PB-2 and 3

5. PROCEDURES

The matrix of initial test conditions is presented in Table 5-1. Each test was performed a minimum of four times, plus one initial shakedown run with no rupture disc (to assure all equipment was functioning properly). The tests were performed in accordance with a detailed test plan, operating procedure and quality assurance plan. To assure uniformity of conditions from test to test, a detailed checklist was used for each test and test run.

The detailed procedures are discussed in Section 5 of Reference 1. The general test procedure was as follows:

- Assure the test facility piping arrangement requirements are satisfied.
- Bring the steam supply pressure to the test value of 300 psia.
- Bring the test facility to the desired initial conditions (pressure, temperature, water levels, etc.).
- Purge the entire discharge line with dry air.
- Check all instruments for readiness.
- Check the temperatures of the discharge line to assure values of 325 ± 10°F.
- Perform a final purge of the discharge line with dry air.
- Check the moisture content of the discharge line air.
- Wait 3 minutes to allow temperature equalization between the air and the heated discharge pipe.

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- Check the pressure in the discharge line and the suppression tank.

- Open the discharge line to the suppression tank isolation valve (V-11 of Figure 4-1) to equalize water level between discharge line and suppression tanks.

- Activate starting circuit which turns on recorders and cameras and opens the fast-acting valve (V-8).

- Run test for 10 seconds.

- Check data to ascertain the test objectives were met.

After each test run, the pressure and temperature traces were checked for legibility and compared with previous runs of the same test. Certain temperatures and pressures were transcribed from the charts to assure test conditions were within the required test specification tolerances. Each test was performed a minimum of four times to ensure repeatable results. A specific requirement was that the standard deviation of the suppression tank wall pressure at PT-15 must not exceed 20% of its mean measured value.

The quality assurance and data reduction requirements are the same as those discussed in Section 5 of Reference 1.

Table 5-1

TEST PARAMETERS

Parameter and Required Tolerance	Test Number PB-1	PB-2	PB-3
Distance of T-quencher from tank centerline (± 0.05 ft)	0.0	1.45	1.45
Submergence (± 0.05 ft)	1.5	1.5	1.875
Distance of T-quencher to bottom of tank (± 0.05 ft)	2.125	2.125	1.75
Pool Temperature (± 5°F)	80	80	80
Tank Gas Pressure (± 0.1 psia)	3.7	3.7	3.7
Initial SRVDL/Tank Gas Pressure Differential (± 1 in. H_2O)	0.0	0.0	0.0
Steam Supply Pressure (± 10 psi)	300	300	300
Steam Flow Rate (± 0.04 lb/sec)	1.55	1.55	1.55
Pipe Air Length (± 0.3 ft) (1-1/2 in. Schedule 40 pipe)	52[a]	52[a]	52[a]
Water Leg Length (± 0.05 ft)	1.5	1.5	1.875
Pipe and Pipe Air Temperature (± 10°F)	325	325	325
Piping Arrangement (Figure 3-3)	L	M	M'

[a] 54.5 ft equivalent 1-1/2-in. Schedule 40 pipe from the rupture disc to the water level in the suppression tank.

6. TEST RESULTS

The tests were initiated by releasing 300 psia steam from the supply surge tank via a fast-acting valve. (See Figure 3-1.) This steam burst the 200 psig (design pressure) rupture disc, and caused a rapid pressurization of the discharge pipe. The pressure traces for the pressurization of the discharge line for a typical run for each of the three tests are given in Figures 6-1, 6-2, and 6-3. Only the more pertinent time interval (from the fast-acting valve actuation to 200-400 milliseconds after valve actuation) is shown by the figures. The steam compressed the air initially contained in the discharge line, causing the water initially occupying the submerged portion of the discharge line and T-quencher to be expelled into the suppression tank. The compressed air expanded into the pool and coalesced into large bubbles. As the air bubbles rose to the surface, they expanded and contracted, thereby causing oscillatory pressures on the suppression tank wall. These oscillatory pressures are shown by Figures 6-4, 6-5, and 6-6.

The initial conditions for each of the four runs for all three tests are given in Appendix A. The first run for Tests PB-1 and PB-2 were not used in the results since the tank wall pressure magnitudes were much smaller than the other test runs. This was probably due to small air bubbles clinging to the tank wall and T-quencher surfaces.

The desired pressure data were transcribed from the Visicorder charts and input to a computer program which applied appropriate calibration slopes and correction factors.

The slope coefficients were obtained by a linear least squares regression analysis of the monthly pressure calibration data. These coefficients were adjusted for very minor daily shifts in the recording and signal conditioning equipment by multiplying by the ratio of the daily-to-monthly signal conditioners and recorder calibrations. The monthly pressure calibration slope coefficients are given in Appendix B and the adjusted slopes are given in the printout of reduced data in Appendix C. The calibration procedure is presented in Appendix A of Reference 1.

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A complete set of reduced test data for all test runs is presented in Appendix C. Tabulated in Appendix C are the following:

- Pressure Pulse Rise Time - The discharge pipe inlet pressurization rate as measured by PT-1.

- Steam Flow Rate - The final steam flow rate through the discharge pipe as measured by PT-1 and calculated by the flow equation in Section 3.

- Steam Inlet Pressure - Pressure measured by PT-1 and used in steam flow calculation.

- Peak Pipe Pressure - Peak discharge pipe pressure downstream of flow control nozzle and at air/water interface as measured by PT-2 and PT-3, respectively.

- Inlet Steam Temperature - Steam supply temperature as measured by TE-13 in the discharge pipe upstream of the flow nozzle.

- Pipe Pressure at 5 Seconds - Discharge pipe pressures 5 seconds after initial pressurization of discharge pipe as measured by PT-2 and PT-3.

- Peak Pressure - Peak transient pressures in the suppression tank gas space, the T-quencher upstream and downstream of the hole pattern, as measured by PT-4, PT-5, and PT-6, respectively.

- Pressure at 5 Seconds - T-quencher pipe pressures, 5 seconds after initial pressurization of the discharge pipe, as measured by PT-5 and PT-6.

- Frequency - Air bubble oscillation frequency as measured by suppression tank wall pressure sensor PT-18.

- Peak Over Pressure - Peak positive pressure on suppression tank wall during air clearing phase of T-quencher discharge as measured by each of the wall pressure sensors, PT-7 through PT-19.

- Peak Under Pressure - Peak negative pressure on suppression tank wall during air clearing phase of T-quencher discharge as measured by each of the wall pressure sensors, PT-7 through PT-19.

The results are summarized in Table 6-1, which presents the highest value, the mean value, the standard deviation and the ratio of the standard deviation to the mean for all test conditions. In general, the pressures measured in the discharge pipe are very similar from run to run. The ratios of standard deviation to the mean for these values are generally only a few percent. The same ratio for the wall pressure values are generally in the 8-10% range.

The suppression tank wall pressure distribution, both longitudinal and circumferential, are presented in Figures 6-7, 6-8, and 6-9 for tests PB-1, PB-2 and PB-3, respectively. The variability of test data from run to run is given by the bars which represent plus and minus 1.0 standard deviation. Both positive and negative pressures are represented. As shown in the figures for Test PB-1, the peak wall pressures occur directly under the center of the T-quencher and the pressure distribution is symmetrical. Figures 6-8 and 6-9 show the asymmetrical circumferential distribution for Tests PB-2 and PB-3, which was caused by the off-center T-quencher location. The maximum wall pressures occur approximately 45° from the tank centerline. The shape of the longitudinal distribution for Tests PB-2 and PB-3 is similar to that for Test PB-1.

Table 6-1

SUMMARY OF TEST RESULTS FOR PEAK PRESSURES

Test Identification		Pressure Pulse Frequency (Hz)	SRVDL Pressures (psia)			T-Quencher Pressures (psia)		Tank Wall Pressures[a]	
			PT-1	PT-2	PT-3	PT-5	PT-6	Pressure (psid)	Transducer Number[b]
Test PB-1									
Runs 2-5	High								15/15
Base Case	Mean								
Piping Arr L	Std Dev								
	Std Dev/Mean								
Test PB-2									
Runs 2-5	High								10/10
T-Quencher Off-Center	Mean								
	Std Dev								
Piping Arr M	Std Dev/Mean								
Test PB-3									
Runs 1-4	High								10/10
T-Quencher Off-Center and Lower	Mean								
	Std Dev								
Piping Arr M[1]	Std Dev/Mean								

[a] Maximum positive/negative pressures not necessarily at the same sensor

[b] For sensors with highest positive and negative values

*Proprietary information deleted

*

Figure 6-1. Discharge Pipe Pressure Histories (Test PB-1, Run 4)

*Proprietary information deleted

Figure 6-2. Discharge Pipe Pressure Histories (Test PB-2, Run 4)

Figure 6-3. Discharge Pipe Pressure Histories (Test PB-3, Run 4)

Figure 6-4. Tank Wall Pressure Histories (Test PB-1, Run 4)

Figure 6-5. Tank Wall Pressure Histories (Test PB-2, Run 4)

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Figure 6-6. Tank Wall Pressure Histories (Test PB-3, Run 4)

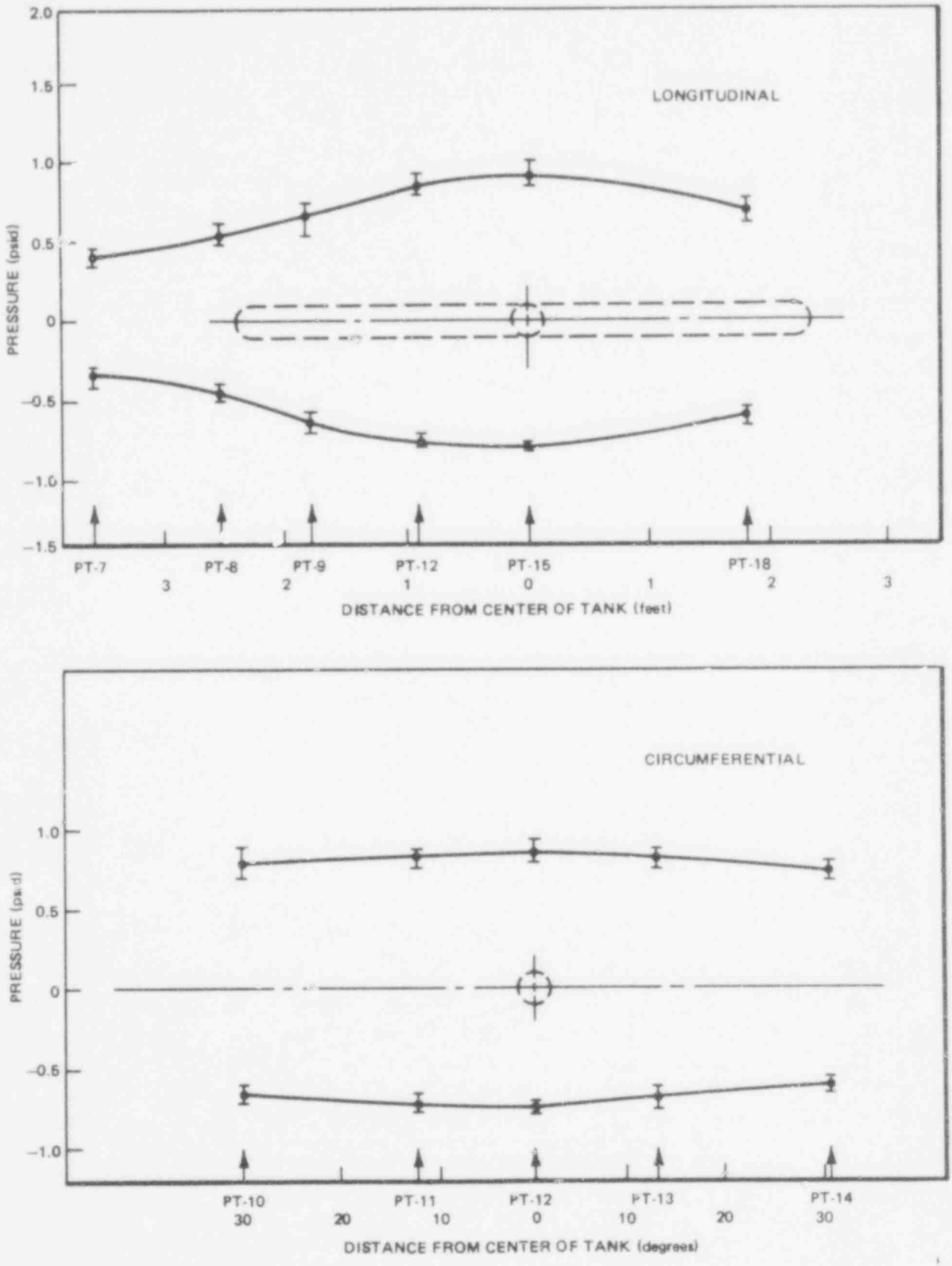


Figure 6-7. Distribution of Pressures on Tank Wall for Test PB-1

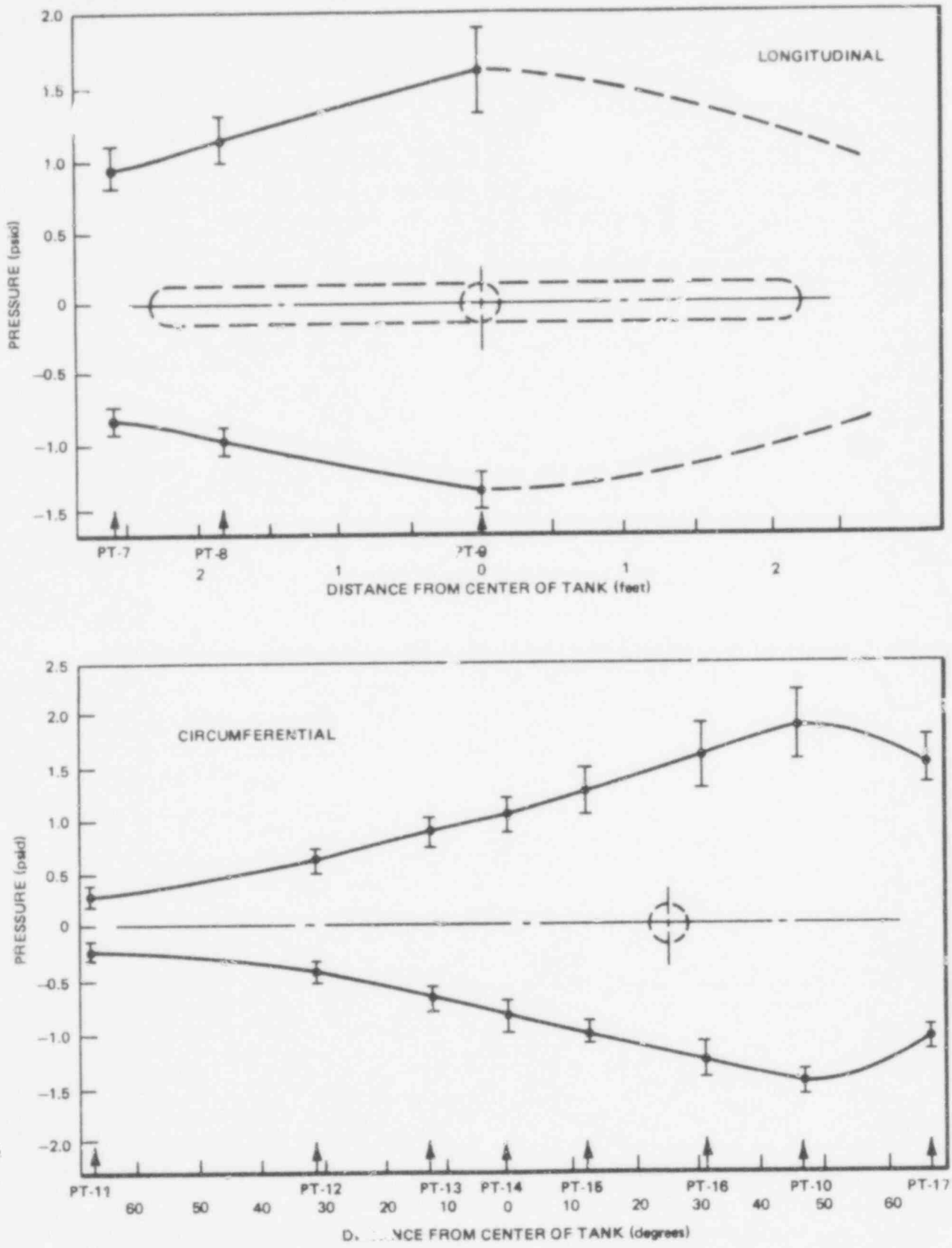
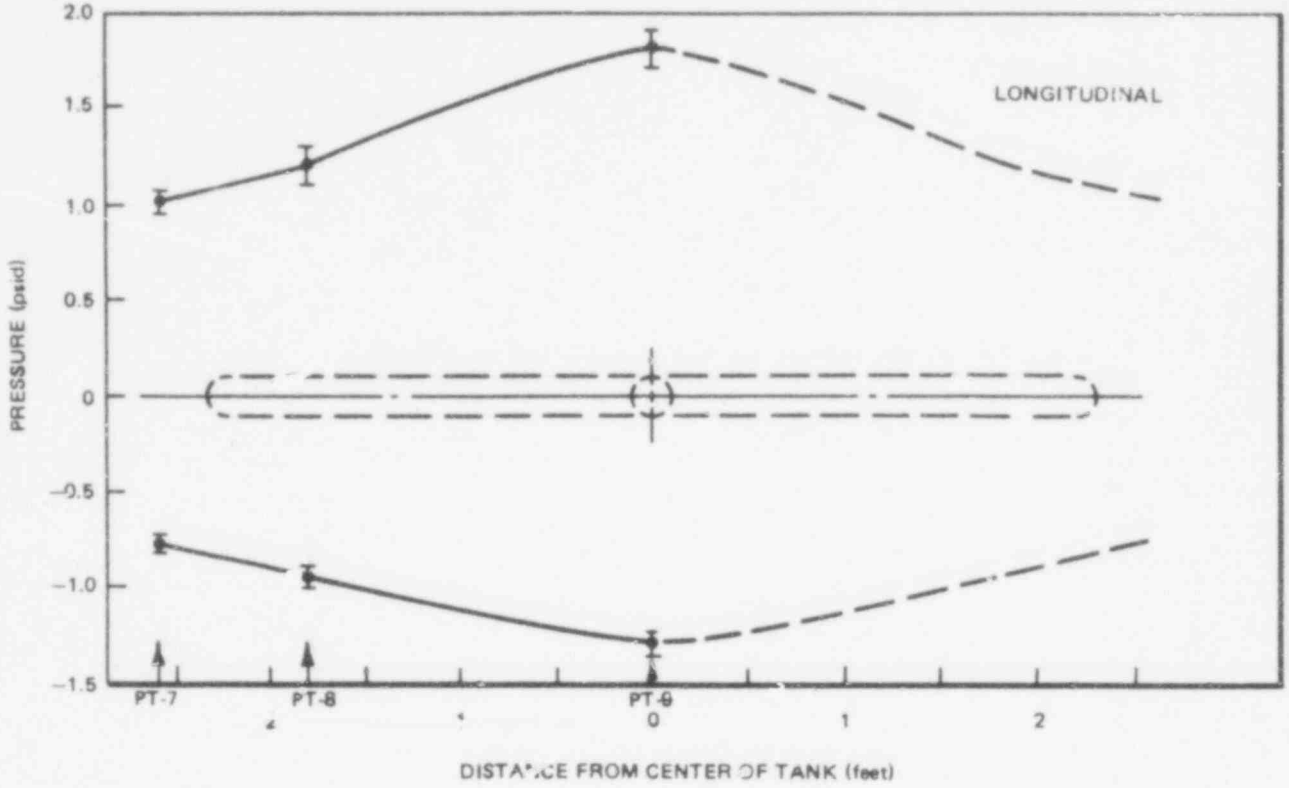


Figure 6-8. Distribution of Pressures on Tank Wall for Test PB-2



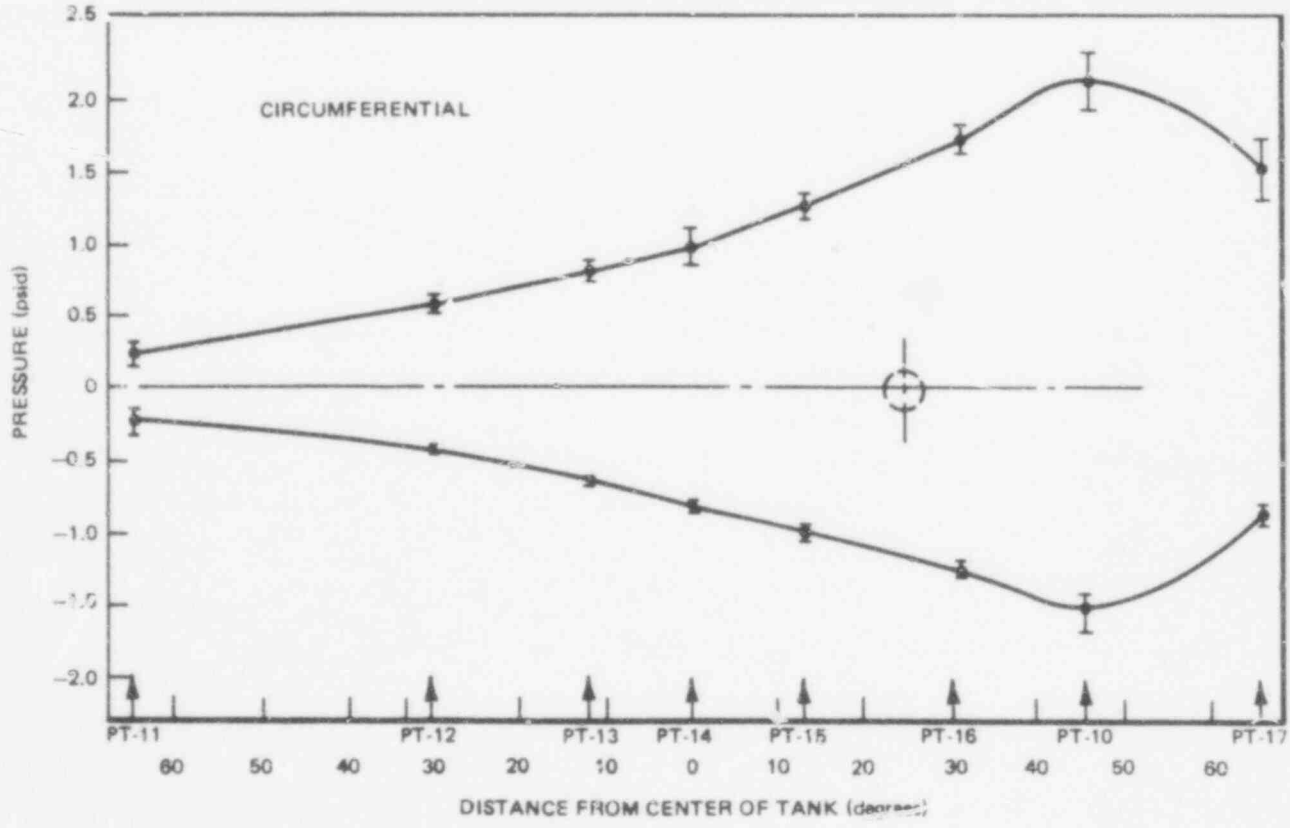


Figure 6-9. Distributions of Pressures on Tank Wall for Test PB-3

7. REFERENCES

1. C. T. Sawyer, et al., *1/4-Scale T-quencher Tests*, General Electric Company, June 1979 (NEDO-24549).

2. *Steam and Gas Turbine*, Church, Second Edition, 1935, p. 72.

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APPENDIX A

INITIAL CONDITION DATA SHEETS FOR ALL TESTS

INITIAL CONDITIONS FOR 1/4-SCALE T-QUENCHER TESTS

TEST NO. PB-1 PIPING ARRANGEMENT L

DATE RUN 1/12/79 AIR LENGTH 54.370 ft

DISTANCE OF T-QUENCHER ABOVE TANK BOTTOM 2.17 ft

DISTANCE OF T-QUENCHER FROM VERTICAL CENTERLINE OF TANK 0

PARAMETER	RUN NUMBER 1	2	3	4	5
A. Temperature (^{o}F)		75	75	76	76
1. Tank water	NOT REPORTED BECAUSE OF SMALL PRESSURES MEASURED ON TANK WALL	423.5	422.5	422.5	422.5
2. Steam supply		285-325	290-330	290-320	290-315
3. Discharge pipe air (range)		325-340	327-335	325-338	320-332
4. Discharge pipe (range)					
B. Pressure (PSIA)					
1. Suppression tank		3.69	3.73	3.71	3.66
2. Discharge pipe		3.69	3.73	3.71	3.66
3. Steam supply		308.9	296.0	306.1	304.8
C. Humidity Reading (Dew point/air temp.) ^{o}F		6.6/ 69.1	10.3/ 68.8	0.8/ 67.6	5.5/ 67.6
D. TE-22 (^{o}F)		77	77	83	84
E. Tank water level (ft)		3.65	3.65	3.65	3.65
F. Discharge pipe water level (ft)		3.65	3.65	3.65	3.65
G. Steam Flow Rate (lb/hr)		1.60	1.53	1.58	1.57

INITIAL CONDITIONS FOR 1/4-SCALE T-QUENCHER TESTS

TEST NO. PB-2 PIPING ARRANGEMENT M

DATE RUN 1/31/79 AIR LENGTH 54.435 ft

DISTANCE OF T-QUENCHER ABOVE TANK BOTTOM 2.125 ft

DISTANCE OF T-QUENCHER FROM VERTICAL CENTERLINE OF TANK 1.45 ft

PARAMETER	RUN NUMBER				
	1	2	3	4	5
A. Temperature (^{o}F)					
1. Tank water		77	76	76	76
2. Steam supply		419.0	419.0	420.0	420.0
3. Discharge pipe air (range)		303-360	303-335	312-319	317-318
4. Discharge pipe (range)		317-355	319-335	313-335	327-337
B. Pressure (PSIA)					
1. Suppression tank	NOT REPORTED BECAUSE OF SMALL PRESSURES MEASURED ON TANK WALL	3.72	3.65	3.69	3.70
2. Discharge pipe		3.72	3.65	3.69	3.70
3. Steam supply		304.4	305.5	306.5	299.3
C. Humidity Reading (Dew point/air temp.) ^{o}F		NA	-3.6/ 55.1	-4.9/ 54.5	-11.7/ 53.2
D. TE-22 (^{o}F)		72	72	75	75
E. Tank water level (ft)		3.6	3.6	3.6	3.6
F. Discharge pipe water level (ft)		3.6	3.6	3.6	3.6
G. Steam Flow Rate (lb/hr)		1.57	1.58	1.58	1.55

INITIAL CONDITIONS FOR 1/4-SCALE T-QUENCHER TESTS

TEST NO. PB-3 PIPING ARRANGEMENT M[1]

DATE RUN 2/5/79 AIR LENGTH 54.435 ft.

DISTANCE OF T-QUENCHER ABOVE TANK BOTTOM 1.75 ft

DISTANCE OF T-QUENCHER FROM VERTICAL CENTERLINE OF TANK 1.45 ft

PARAMETER	RUN NUMBER				
	1	2	3	4	5
A. Temperature (^{O}F)					
1. Tank water	76	76	77	77	
2. Steam supply	417	417.5	417	417	
3. Discharge pipe air (range)	305-333	305-325	310-330	307-330	
4. Discharge pipe (range)	322-337	320-335	322-335	318-334	
B. Pressure (PSIA)					
1. Suppression tank	3.66	3.66	3.67	3.67	
2. Discharge pipe	3.70	3.70	3.71	3.70	
3. Steam supply	303.6	304	302.8	303.4	
C. Humidity Reading (Dew point/air temp.) ^{O}F	-2.7/52.8	-6.6/53.0	-23.4/55.4	-3.5/56.1	
D. TE-22 (^{O}F)	70	73	74	75	
E. Tank water level (ft)	3.60	3.605	3.605	3.61	
F. Discharge pipe water level (ft)	3.52	3.52	3.52	3.53	
G. Steam Flow Rate (lb/hr)	1.57	1.57	1.56	1.57	

APPENDIX B

MONTHLY CALIBRATION RESULTS

TABLE B-1

SLOPE COEFFICIENTS FROM MONTHLY CALIBRATIONS

VISICORDER	PRESSURE TRANSDUCER	CHANNEL NUMBER	SLOPE PSIA/DIV (Test PB-1)	SLOPE PSIA/DIV (Tests PB-2&3)
1	1	1	12.5719	12.4566
1	2	3	6.5391	6.5585
1	3	5	6.5728	6.6528
1	4	7	0.4887	0.4910
1	5	9	3.9290	3.9663
1	6	11	3.9295	4.0547
2	7	1	0.2193	0.6776
2	8	2	0.1995	0.4059
2	9	3	0.2030	0.5879
2	10	4	0.4483	0.5236
2	11	5	0.1965	0.2170
2	12	6	0.1937	0.1996
2	13	7	0.2032	0.2041
2	14	8	0.1930	0.2088
2	15	9	0.1964	0.1999
2	16	10	0.1970	0.1947
2	17	11	0.1861	0.2040
2	18	12	0.2065	0.1961
2	19	13	--	0.2056

693 043

APPENDIX C

PEAK SRVDL, AIR BUBBLE, AND TANK WALL PRESSURES FOR ALL TESTS

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 1

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV	
PRESSURE PULSE RISE TIME	1	1				
STEAM FLOW	1	1				
STEAM INLET PRESSURE	1	1				
PEAK PIPE PRESSURE	2	3				
PEAK PIPE PRESSURE	3	5				
INLET STEAM TEMPERATURE	NA	NA				
PIPE PRESSURE AT T=5 SEC	2	3				
PIPE PRESSURE AT T=5 SEC	3	5				
PEAK PRESSURE	4	7				
PEAK PRESSURE	5	9				
PEAK PRESSURE	6	11				
PRESSURE AT T=5 SEC.	5	9				
PRESSURE AT T=5 SEC.	6	11				
PEAK POSITIVE PRESSURE	19	13				
PEAK NEGATIVE PRESSURE	19	13				
PEAK POSITIVE PRESSURE	20	14				
PEAK NEGATIVE PRESSURE	20	14				
AVERAGE POSITIVE PRESS.	19&20	13&14				
AVERAGE NEGATIVE PRESS.	19&20	13&14				

*

*Indicates GE Company Proprietary information

693 045

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 2

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID-PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

693 046

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 1

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1		0	
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	_4			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 047

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 2

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

693 048

TOUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 1

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	2	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 049

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 2

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 1

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 5 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 051

TOUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/11/79 VISICORDER 2

TEST NO. PB-1 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 5 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

693 052

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 1

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 053

TORUS/SCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 2

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

693 054

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 1

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 055

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 2

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 1

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 2

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TOUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 1

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 5 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRECSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 059

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 1/31/79 VISICORDER 2

TEST NO. PB-2 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 5 (CHART ANALYSIS)

FUNCTION	TEST ID-PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 1

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 1 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

693 061

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 2

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 1 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 1

TEST NO. Pb-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO.OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

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TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 2

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 2 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 1

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

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TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 2

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 3 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 1

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
PRESSURE PULSE RISE TIME	1	1			
STEAM FLOW	1	1			
STEAM INLET PRESSURE	1	1			
PEAK PIPE PRESSURE	2	3			
PEAK PIPE PRESSURE	3	5			
INLET STEAM TEMPERATURE	NA	NA			
PIPE PRESSURE AT T=5 SEC	2	3			
PIPE PRESSURE AT T=5 SEC	3	5			
PEAK PRESSURE	4	7			
PEAK PRESSURE	5	9			
PEAK PRESSURE	6	11			
PRESSURE AT T=5 SEC.	5	9			
PRESSURE AT T=5 SEC.	6	11			
PEAK POSITIVE PRESSURE	19	13			
PEAK NEGATIVE PRESSURE	19	13			
PEAK POSITIVE PRESSURE	20	14			
PEAK NEGATIVE PRESSURE	20	14			
AVERAGE POSITIVE PRESS.	19&20	13&14			
AVERAGE NEGATIVE PRESS.	19&20	13&14			

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TQUENCHER TEST (N U S CORP) (1 / 4 S C A L E)
TEST DATE 2/5/79 VISICORDER 2

TEST NO. PB-3 DATA REDUCTION SHEET ANALYSIS BY

RUN NO. 4 (CHART ANALYSIS)

FUNCTION	TEST ID- PT	CHAN. NO.	NO. OF DIV.	PRESSURE (PSI) OR LABELED	SLOPE PSIA/DIV
FREQUENCY (CYCLES/SEC)					
PEAK OVER PRESSURE	7	1			
PEAK UNDER PRESSURE	7	1			
PEAK OVER PRESSURE	8	2			
PEAK UNDER PRESSURE	8	2			
PEAK OVER PRESSURE	9	3			
PEAK UNDER PRESSURE	9	3			
PEAK OVER PRESSURE	10	4			
PEAK UNDER PRESSURE	10	4			
PEAK OVER PRESSURE	11	5			
PEAK UNDER PRESSURE	11	5			
PEAK OVER PRESSURE	12	6			
PEAK UNDER PRESSURE	12	6			
PEAK OVER PRESSURE	13	7			
PEAK UNDER PRESSURE	13	7			
PEAK OVER PRESSURE	14	8			
PEAK UNDER PRESSURE	14	8			
PEAK OVER PRESSURE	15	9			
PEAK UNDER PRESSURE	15	9			
PEAK OVER PRESSURE	16	10			
PEAK UNDER PRESSURE	16	10			
PEAK OVER PRESSURE	17	11			
PEAK UNDER PRESSURE	17	11			
PEAK OVER PRESSURE	18	12			
PEAK UNDER PRESSURE	18	12			

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SUMMARY

This report documents the results of a 1/4 scale T-quencher test program performed to investigate the effects of an off-center location of a T-quencher in a Mark I pressure suppression pool. The test results reported herein supplement those reported in GE report NEDE-24549-P, Mark I Containment Program: Final Report 1/4 Scale T-Quencher Test. The off-center location used resulted in an increase in air clearing pressure magnitude by a factor of 2 over that measured for an otherwise identical centered T-quencher location.

This document was prepared by NUS Corporation for General Electric Company.

By cutting out this rectangle and folding in half, the above information can be fitted into a standard card file.

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