TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

March 22, 1983

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

Please refer to a letter from R. L. Tedesco to H. G. Parris dated January 25, 1982 which transmitted a Franklin Research Center request for additional information on environmental qualification of equipment for the Sequoyah units 1 and 2.

Responses to item A of the request were previously submitted letters from M. R. Wisenburg to you dated April 7, 1982 and from me to C. J. Crane, of the Franklin Research Center, dated July 16, 1982.

In response to part of item B of their request, we are providing equipment qualification sheets (EQS) and supporting qualification documentation on acoustic monitors for PORV and SV position indication (TMI action plan, item II.D.3). The test procedures and results are documented in Technology for Energy Corporation (TEC) reports 517-TR-01, appendix H, 517-TR-02, appendix I, and 517-TR-03, revision 2, including appendices A, B, C, D, E, and F. The NRC may obtain this information directly by contacting TEC. TEC's address is One Energy Center, Pellissippi Parkway, Knoxville, Tennessee 37922.

The response to the remainder of equipment qualification documentation for the TMI action plan equipment identified by item B of the Franklin Research request will be submitted along with TVA's response to the 10 CFR 50.49 final rule dated January 21, 1983. The final rule requires each holder of an operating license to identify by May 20, 1983 the electric equipment important to safety which is already qualified and to submit a schedule for either the environmental qualification or for the replacement of the remaining electric equipment important to safety.

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Director of Nuclear Reactor Regulation March 22, 1983

If you have any questions, please get in touch with K. P. Parr at FTS 858-2685.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 22nd day of Mar 1983

Bryant M. Lowery

Notary Public
My Commission Expires 4/8/86

Enclosure
cc (Enclosure):
U.S. Nuclear Regulatory Commission
Region II
Attention: Mr. J. P. O'Reilly, Regional Administrator
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30303

Mr. Cyril J. Crane
Franklin Research Center
The Parkway at Twentieth Street
Philadelphia, Pennsylvania 19103

Revision	R	R	R	R
Preparer/Date R N Bell 6-30-82	/	/	/	/
Reviewer/Date B.O. Buchanan 6-30-82	/	/	/	/

See Appendix I
EQS No. SQNEEB1064
TVA ID No: See Appendix I
Rev No. 0

SQN EQUIPMENT QUALIFICATION SHEET (EQS) (R3)

Manufacturer and Model Number See Appendix I

Verification of Table Information (Table See Appendix I)

X Equipment Type - The equipment has been identified as per TVA ID number designations (e.d., MOV, SOV, etc.).

X Location - The location has been identified (E.G., Inside Primary Containment, Annulus, Individually Cooled Rooms, General Spaces, or area affected by HELB outside primary containment).

X Component - A unique TVA ID number has been assigned (e.g., 1-FSV-68-303).

X Function - A functional description of the component has been given (e.g., Steam Generator Blowdown).

X Contract No., Manufacturer, and Model No. - The contract number, manufacturer, and model number has been given.

X Abnormal or Accident Environment - All abnormal or accident environmental conditions applicable to this equipment have been identified either in tables or by references to figures from tables.

X Environment to Which Qualified - The environment to which the equipment has been qualified is addressed in either the tables or the environmental analysis attached.

X Category - A category of a, b, c, or d has been defined for the equipment.

X Operation and Accuracy Required and Demonstrated - The operation and accuracy required and demonstrated have been defined.

Qualification Status (check if applicable, NA if not) Qualified Life 7 years

X Qualification Report and Method - A qualification report and the method of qualification has been identified.

X Environmental Analysis - An environmental analysis has been done, attached to the EQS, and independently reviewed by the responsible organization.

NA Qualification by Similarity (If applicable) - A justification for qualification by similarity is attached to the EQS considering all the above factors and referenced to the appropriate tables.

X Qualification of Several Exact Components (If applicable) - When an EQS is used for more than one item, a list of all exact components are given as an appendix with all references to appropriate tables with justification for qualification considering all the above factors.

NA Interim Qualification (If applicable) - (Open item) - Component has been determined to be qualified only for a limited interim operation, an NCR has been written, and plan of action has been determined to yield a qualified component. Term of Interim Qualification ______

NCR No. ______

NA Unqualified Component-(Open item) - (If applicable) - Component has been determined to be unqualified; the following is attached to EQS: NCR number, reason for non-qualification, and justification of continued operation.

NCR No. ______

Revision	R	R	R	R
QA ACCEPTANCE / DATE W.E. Troutt 7/2/82	/	/	/	/

Preparer/Date R. N. Bell 6-30-82

Reviewer/Date B. O. Buchanan 6-30-82

EQS No. SQNEEB1064
Appendix 1 Rev 0
Sheet 1 of 1

Manufacturer Technology for Energy Corporation

Component Valve Flow Monitoring System

Component ID	Model No.	Table/Sheet
1,2 XE-68-340A	ENDEVCO 2273A	3.11-4/1a
1,2 XE-68-334	"	"
1,2 XE-68-363	"	"
1,2 XE-68-364	"	"
1,2 XE-68-365	"	"
1,2 XT-68-340A	TEC 504A	"
1,2 XT-68-334	"	"
1,2 XT-68-363	"	"
1,2 XT-68-364	"	"
1,2 XT-68-365	"	"
2 XE-68-366	ENDEVCO 2273A	"
2 XT-68-366	TEC 504A	"

Preparer/Date R. N. Bell 6-30-82

Reviewer/Date B. O. Buchanan 6-30-82

Technology for Energy Corporation (TEC) has qualified their valve flow monitoring system by testing to the requirements delineated in IEEE Standard 323-1974. Test procedures and results are documented in TEC reports 517-TR-01 and 517-TR-03, revision 2, respectively.

All qualification tests were performed at test levels or conditions in excess of known maximum application requirements. Margins were in accordance with those suggested by IEEE Standard 323-1974.

This equipment is located inside containment (lower compartment) where the maximum normal operating temperature is 120°F. The system is subject to a LOCA/HELB condition inside primary containment which is shown in figures 1 and 2. The system is required to operate for one year after the start of an accident.

Operating Environment

The system is required to operate in the following environment:

	Normal	Abnormal	Accident
Temperature:	120°F	130°F	327°F
Pressure:	14.7 psia	14.7 psia	26.4 psia
Relative Humidity:	80%	100%	100%
Radiation:	$2x10^7$ rads (40 year TID)	N/A	$1x10^8$ rads
LOCA/HELB:	Temperature and pressure profiles are shown in figures 1 and 2, respectively.		

Figure 1 shows the worst case temperature versus time profiles for both upper and lower compartments. These curves take into account the effects of both a double ended pump suction break (LOCA) and the most severe steam line break (HELB). Relative humidity in both compartments will increase to 100 percent during the first few seconds and will remain at that value until 10^5 seconds, at which time it will decrease linearly to the normal maximum value of 80 percent at 30 days. The pressure curve (figure 2) is for a LOCA and completely envelopes the HELB pressure profile.

The manufacturer has tested this system to the following environment:

	Normal	Accident
Temperature:	257°F	450°F
Pressure:	Atmospheric	85 psig
Relative Humidity:	80%	100%
Radiation:	($2.1x10^8$ rads total)	
LOCA/HELB:	(See description below)	

The equipment was subjected to a MSLB/LOCA simulation test. The transient portion of the test was repeated twice as required by IEEE Standard 323-1974. The first transient was performed as follows. The test chamber was stablized at 180°F and remained in this condition for 10 minutes. The test chamber temperature was then increased to 465°F in 48 seconds, and the pressure increased to 88 psig in 32 seconds. The pressure and temperature rises were simultaneous. The pressure was then reduced to 85 psig, and this condition was maintained for a period of 1.5 minutes. At the conclusion of the 465°F and 85 psig dwell, the temperature was reduced to 365°F in 25 seconds. Approximately eight minutes after completion of the first transient, the test chamber decayed to 180°F and ambient pressure. The second transient was initiated after test chamber stabilization, and the temperature of 180°F and ambient pressure had been maintained for approximately 10 minutes. During the second transient, the chamber temperature was increased to 450°F in 31 seconds, and the pressure increased simultaneously to 88 psig in 24 seconds. The pressure was then reduced to 85 psig, and this condition was maintained for 1.5 minutes. At the [illegible]ion of the 450°F and 85 psig dwell, the chamber temperature was red[illegible] 365°F in 21 seconds. After four days and 12 hours, the chamber had [illegible] reduced to a temperature of 265°F and 50 psig. The chamber remained at these conditions for five days and 12 hours for a total of 10 days. After 10 days, the TEC 160 Transient Shield malfunctioned due to shorting of the inputs. The input connections were then modifed to those in the TEC 160-2 Transient Shield with the connections sealed with Raychem WCSF-N heat shrink. In this configuration it was successfully tested an additional 23 days for a total of 33 days. However, for our qualification purposes, we will consider only the first ten days.

The one year post-LOCA life requirement can be extrapolated from the actual ten-day test using the Arrhenius Equation, which states:

$$l_1 = l_2 \; e^{\frac{E}{K}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]}$$

where

l_1 = Qualified life
l_2 = Accelerated (test) life
E = Worst-case activation energy, eV
K = Boltzmann's constant, 8.617×10^{-5} eV/°K

T_1 = Qualified temperature, absolute
T_2 = Elevated (test) temperature, absolute
e = Base of natural logarithms

Reference: EPRI, NP-1558, Research Project 890-1, dated September 1980.

The portion of the temperature versus time profile (shown in figure 1) that extends from 200°F at 5×10^3 seconds to 115°F at 2.59×10^6 seconds respresents the period during the actual test that extends from 365°F immediately after the second transient to 265°F after four and one-half days. Using 315°F as an average temperature for T_2, 200°F as a conservative value for T_1, and 0.6eV as a conservative value for E, 0.20/ years can be derived from the Arrhenius Equation. Then using 265°F for T_2, 115°F for T_1, and 0.6eV for E, 1.375 years can be derived from the remaining five and one half days of the test. This yields a total post-LOCA life of 1.582 years. It is our engineering judgment that satisfactory performance can be expected from this system in the LOCA/HELB environment for a period of one year.

Aging (Qualified Life)

TEC has thermally aged this system for 1000 hours at 257°F (125°C). The qualified life at 120°F for this system is 7.116 years based on the Arrhenius Equation. The required temperature, pressure, radiation, and humidity are well within TEC's test data. It is our engineering judgment that satisfactory performance can be expected from this system in the normal operating environment for seven years.

Chemical Spray

The system is located inside containment so it is subjected to a chemical spray.

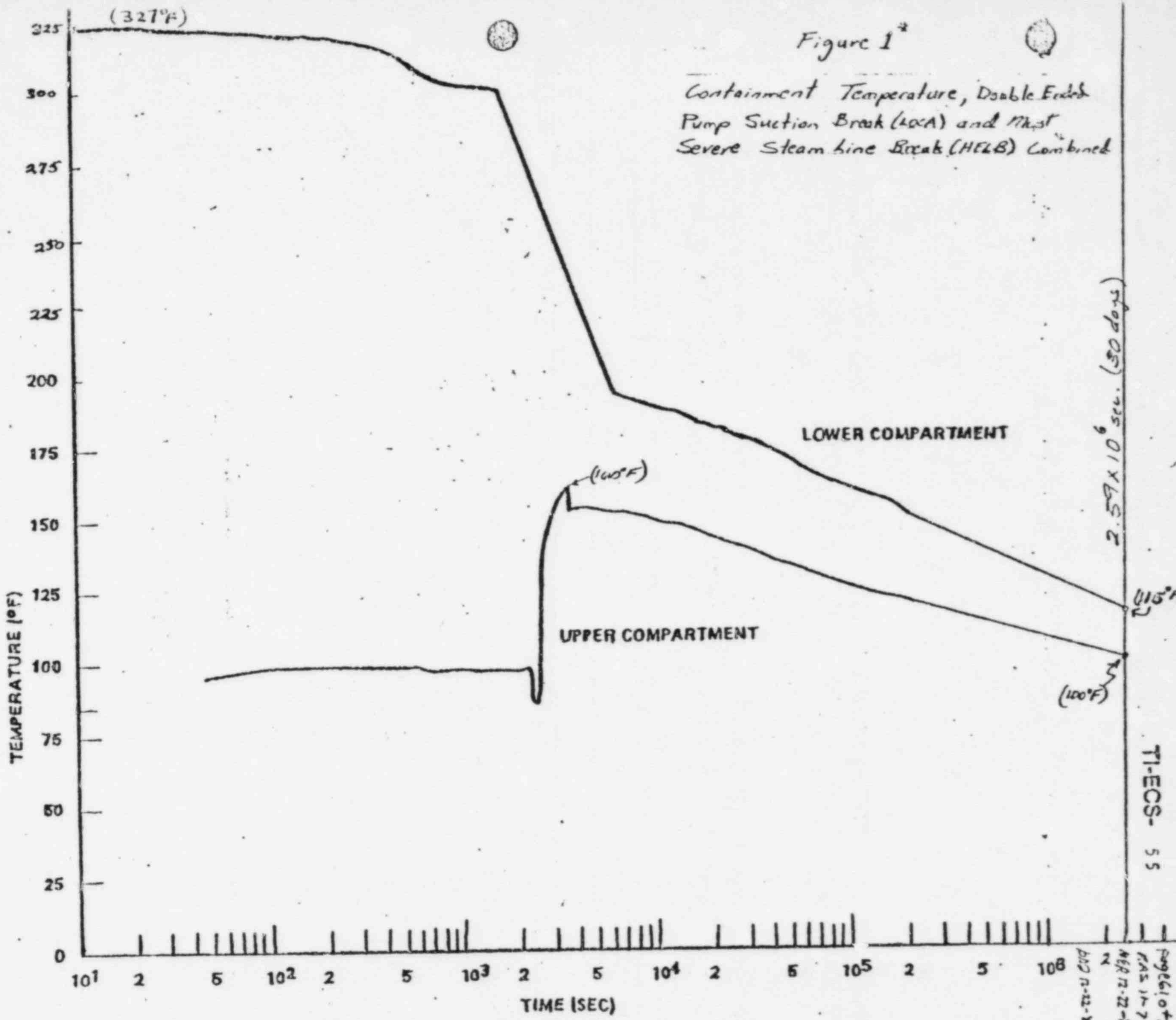
The test specimen was exposed to a chemical spray at the rate of approximately 0.15 gpm per square foot of test specimen area projected onto a horizontal plane. The spray solution was prepared with 5,500±500 ppm boron buffered with sodium hydroxide to achieve a pH factor of 9 ±1. The spray remained on throughout the entire phase of the LOCA simulation.

The chemical composition of the containment spray at Sequoyah is a concentration of 0.1847 molar H_3BO_3 (2000 ppm boron), and 0.033 molar NaOH resulting in a pH of 8.2 at 25°C.

The system successfully completed the LOCA simulation without incurring any corrosion or operability failures. Since the chemical concentration of Sequoyah's containment spray is less severe than the concentration used in the LOCA simulation, the system should not be affected.

Figure 1*

Containment Temperature, Double Ended Pump Suction Break (LOCA) and Most Severe Steam Line Break (HELB) Combined



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KAS 11-7-81

MER 12-22-81

DMD 12-22-81

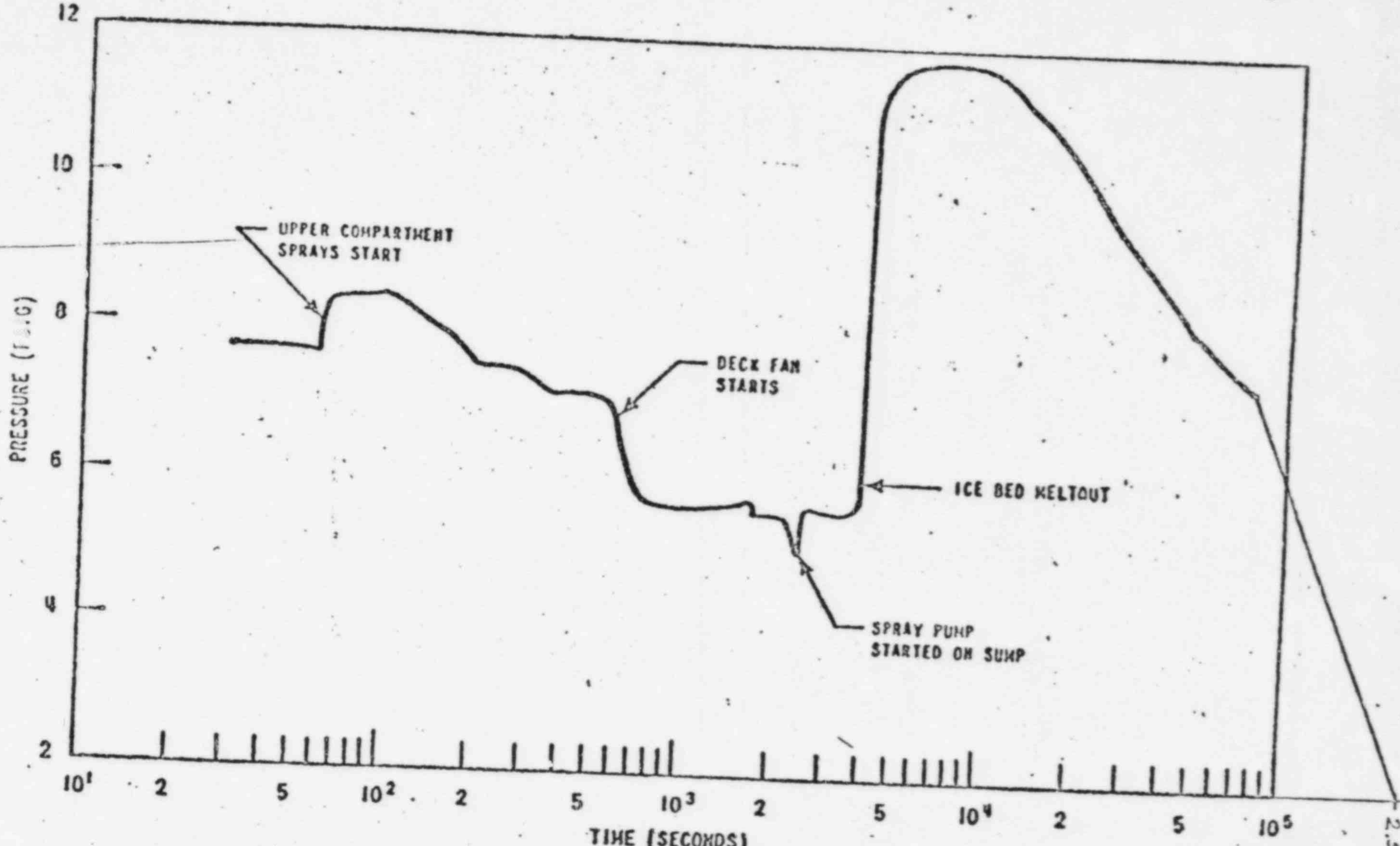

FIGURE 2

Containment Pressure - Double Ended Pump Suction Break (LOCA).

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WER 7-24-81
BAD 12-12-81

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