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格納容器圧力抑制系信頼性実証試験
データレポート・1 (TEST 0002)

1979年12月

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格納容器圧力抑制系信頼性実証試験
データレポート・1 (TEST 0002)

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格納容器圧力抑制系信頼性実証試験は、LOCA時にBWR用Mark II格納容器圧力抑制系に発生すると予想される熱水力現象に関する試験を行い、格納容器信頼性の実証に資するデータを得ることを目的としている。試験装置の体積縮小率は $\frac{1}{18}$ であり、ウェットウェル部は実炉のウェットウェルの実物大20°セクタ模型である。

本報告は、昭和54年2月21日に実施したTEST 0002のデータ報告である。本試験は株式会社日立製作所により装置の第2回検収試験として実施されたもので、破断口径100mmの水放出試験である。得られたドライウェル内初期圧力上昇率は約50kPa、ベント管内最大蒸気重量速度は約 $30 \text{ kg/m}^2\text{-s}$ であり、いずれも実炉の再循環系配管両端破断事故時の想定値の約25%に相当する。

Full-Scale Mark II CRT Program
Data Report No. 1 (TEST 0002)

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The Full-Scale Mark II CRT (Containment Response Test) Program^{*} was initiated in April 1976 to provide a full-scale data basis for the evaluation of the pressure suppression pool hydrodynamic loads associated with a hypothetical LOCA in a BWR Mark II Containment. The test facility, completed in March 1979, is 1/18 in volume of a typical 1100 MWe Mark II, and has a wetwell which is a full-scale replica of one 20°-sector of that of the reference Mark II.

The present report documents experimental data from TEST 0002, a medium size (100 mm) water blowdown test, performed by Hitachi Ltd. for JAERI as the second of the four shakedown tests. Test data is provided for the vessel depressurization, the pressure and temperature responses in the test containment, and especially for the chugging phenomena associated with low flux steam condensation in the pool.

Keywords: BWR, LOCA, Pressure Suppression, Containment, Hydrodynamic Loads,
Full-Scale Test, Data, Pressure Response, Temperature Response

* Work performed under auspices of the Atomic Energy Bureau, the Science and Technology Agency of Japan.

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試験データ

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1. ま え が き

格納容器圧力抑制系信頼性実証試験は、わが国の最新型沸騰水型炉に使用されている Mark II 格納容器における冷却材喪失事故時の熱水力現象を模擬した試験を行い、格納容器の信頼性実証に資するデータを得ることを目的としている。本試験計画は、電源開発促進対策事業の一環として、科学技術庁より原研に委託されたものであり、昭和 52 年度を初年度として 5 年間にわたり実施される予定である。原研内では、安全工学部安全工学第 1 研究室が試験計画の立案および試験結果の解析を担当し、同安全試験技術室が試験装置の建設、運転、管理を担当している。試験装置は昭和 54 年 3 月原研東海研究所敷地内に完成し、以後 1 ヶ月に約 1 回の割合で試験を実施している。

本報告書は、昭和 54 年 2 月 21 日に実施した TEST 0002 のデータ報告である。TEST 0002 は、株式会社日立製作所により実施された計 4 回の検収試験の第 2 回目であり、この試験においてはじめて圧力容器内の保有水を実炉相当の圧力・温度まで昇圧・昇温し、ラプチャディスクの破断により放出を開始させた。本試験は破断口径 100 mm の水放出試験であり、放出直後のドライウェル内圧力上昇率は約 50 kPa/s 、ベント管内蒸気重量速度は最大約 $30 \text{ kg/m}^2\text{-s}$ であった。

なお、本試験に先立って、昭和 54 年 2 月 18 日に第 1 回の検収試験 TEST 0001 を実施した。TEST 0001 は、圧力容器保有水を飽和状態で約 600 kPa まで昇圧し、主放出弁を開くことにより径 100 mm のノズルを通じて格納容器内に放出したものであり、実炉の事故時の想定条件とは大きく異なる条件の下での試験である。従って、この試験に関しては試験データの報告は行わない予定である。

2. 試験装置

試験装置の概略を Fig. 2.1 に示す。試験装置主要部は試験格納容器、圧力容器、放出配管等により構成される。試験格納容器ウェットウェル部は、1100 MWe 級 Mark II 格納容器のウェットウェルの中心角 20° の 1 セクタを模擬したものであり、各部の高さ、内部のベント管等の寸法は実炉とはほぼ同一である。ドライウェル、1 次系の容積は、実炉の相当部分の約 $\frac{1}{18}$ である。これらの諸元を Table 2.1 に示す。

本試験装置における計測の項目を Table 2.2 に、計測チャンネルリストおよび計測点位置を Tables 2.5, 2.6, 2.7, Figs. 2.2 ~ 2.9 に示す。データ収録系は 2 系統を有し、比較的变化の遅い信号（温度、水位計出力等）は小型計算機によってオンライン収録し、比較的变化の速い信号（圧力の大半、歪、加速度等）は PCM（Pulse Code Modulation）方式により収録し、試験後小型計算機を介してデータを再編集し、以後の処理はすべて原研計算センターの大型計算機により行う。データ収録装置の主要諸元を Table 2.3 に示す。

本試験における計測器の動作状態、圧力・差圧変換器に関する校正試験結果、計測レンジの設定値をそれぞれ Tables 2.10, 2.11, 2.12, に示す。

なお、本試験に際して生じた計測上の主要な障害は以下の通りである。

プール内に設置された圧力変換器、加速度計、水位計の一部は、絶縁が劣化して使用不能となった。

格納容器内圧力の計測レンジは最高約 600 kPa に設定したが、1 部のチャンネルではこれを上回る圧力が計測され、シグナルコンディショナにおいて信号が飽和した。

格納容器内温度の計測レンジは最高約 150°C に設定したが、試験の後半ではドライウェル内は過熱状態となり、1 部のチャンネルでは 150°C 以上の温度が計測されたため、直流増幅器において信号が飽和した。

加速度計は、圧電型の変換器とチャージアンプを計測レンジ $9.8 \times 10^3 \text{ m/s}^2$ (100 g) に設定して使用し、出力を直流増幅器で増幅することにより増幅度可変としたが、ベント管出口に設置した加速度計の 1 部ではチャージアンプが 1 時的に飽和し、出力はアンプの回復特性の影響を受けた。また、プール底面・壁面に設置した加速度計のほとんどの出力は、直流増幅器において飽和した。

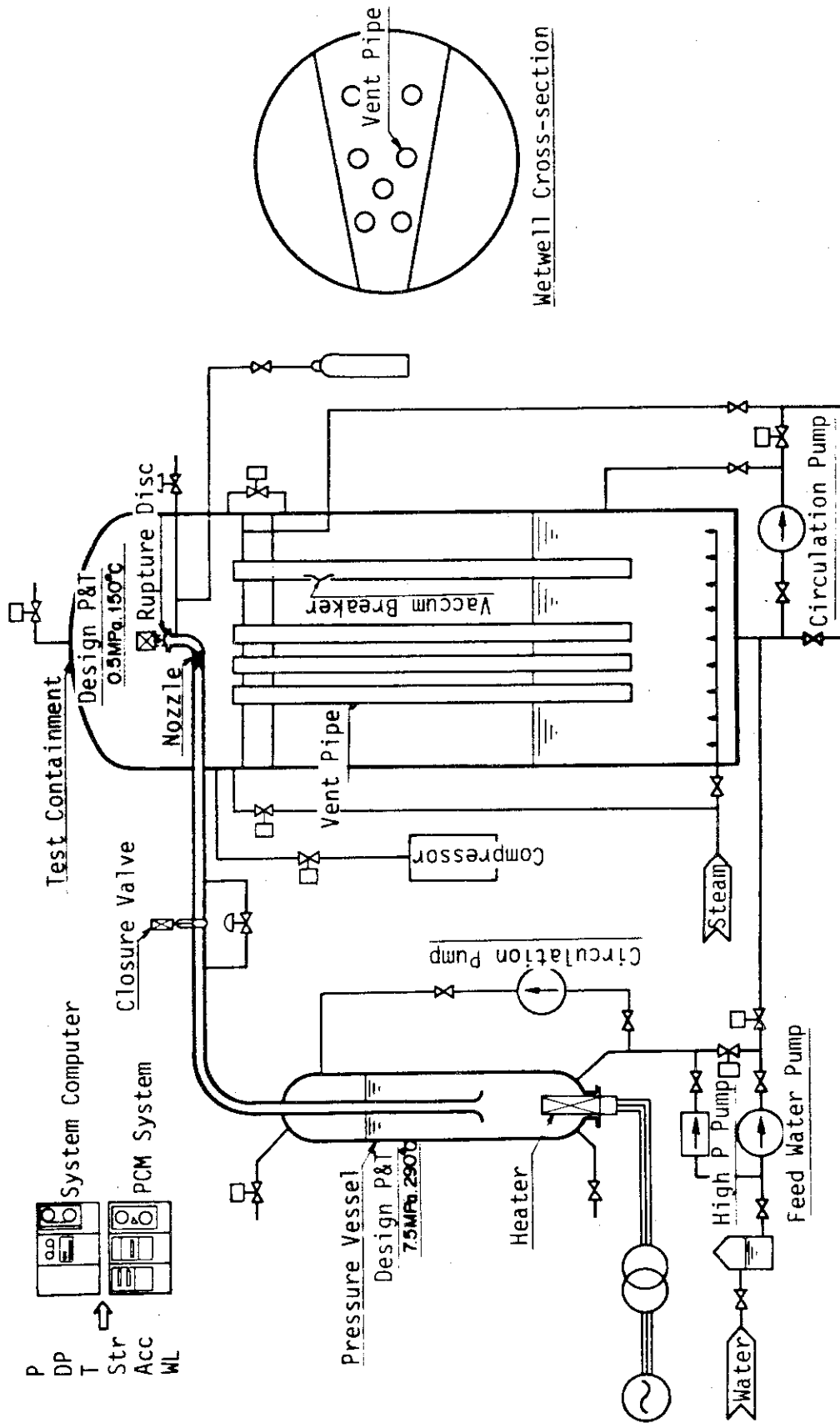


Fig. 2.1 Schematic Flow Diagram of Test Facility

Table 2.1 Comparison of Major Design Parameters

Parameter		Reference Mark II	CRT Facility
<u>Drywell</u>			
Free Volume, Including Air Volumes in Vent Pipes	(m ³)	5700	329
<u>Vent Pipe</u>			
Number	(-)	108	7
Length	(m)	14.2	13.6
Clearance, to Pool Bottom	(m)	3.66	3.66
Number of Vacuum Breakers	(-)	11	1
<u>Wetwell</u>			
Free Volume	(m ³)	4100	255
Water Volume	(m ³)	3200	188
Height, to Diaphragm Floor	(m)	17.3	17.0
<u>Pressure Vessel</u>			
Inside Diameter	(m)	6.4	2.2
Height	(m)	22.0	10.4

Table 2.2 Summary of Data Channels

Location	Item	Data Acquisition	
		Computer	PCM
Pressure Vessel	Pressure	2	Track-1
	Diff. Press.	6	Track-2
	Temperature	6	
	Water Level	6	
Blowdown Pipe	Pressure	2	
	Diff. Press.	1	
	Temperature	3	
	Timing Sig.	2	2
Drywell	Pressure	1	1
	Temperature	8	
	Water Level	4	
Vent Pipe	Pressure	6	9
	Temperature	19	
	Water Level	4	
	Strain	1	4
	Acceleration	1	4
Wetwell	Pressure	1	20
	Diff. Press.	2	
	Temperature	32	
	Water Level	80	
	Acceleration		15
			12

Table 2.4 Identification of Data Channels

- Channel Code = A B C D - E F G
- A B Location
- = P V Pressure Vessel
 - = B P Blowdown Pipe
 - = D W Drywell
 - = V P Vent Pipe
 - = W W Wetwell
- C Measurement Item
- = P Pressure
 - = D Differential Pressure
 - = T Temperature
 - = L Water Level Signal
 - = S Strain
 - = A Acceleration
 - = M Actuation Signal
- D Data Acquisition System
- = S Computer Recorded, 50 data/s
 - = F PCM Recorded, 455.6 data/s
- E Group Number
- F G Sequential Number

Table 2.3 Summary of Data Acquisition Systems

	Computer	PCM System
Max. Number of Channels	192	39 x 2 tracks
Input Range (V)	+10.00	+10.00
Resolution (mV/digit)	4.883	19.53
Sampling Rate (data/ch./s)	50.00	455.56
Skew (ms/ch.)	0.028	0.0488

Table 2.5 List of Data Channels (Computer Recorded Channels)

Channel No.	Channel Code	Measurement Location
1	BPMS-001	RUPTURE DISC BREAK SIGNAL
2	BPMS-002	MAIN DISCHARGE VALVE CLOSE SIGNAL
3	VPMS-001	OPENING OF VACUUM BREAKER (5-STEPS)
4		
5	BPPS-001	BLOWDOWN PIPE (8.4M FROM OUTL.)
6	PVPS-002	VESSEL STEAM DOME
7	PVPS-001	VESSEL STEAM DOME
8	BPPS-002	BLOWDOWN PIPE (0.9M FROM OUTL.)
9	DWPS-001	DRYWELL
10	WWPS-001	WETWELL AIRSPACE (15.0M ABOVE BOT.)
11		
12	PVDS-001	DP OVER VESSEL (EL = 0.0M - +9.2M)
13	PVDS-002	DP OVER VESSEL (EL = 0.0M - +2.6M)
14	PVDS-003	DP OVER VESSEL (EL = +2.2M - +4.2M)
15	PVDS-004	DP OVER VESSEL (EL = +3.8M - +5.8M)
16	PVDS-005	DP OVER VESSEL (EL = +5.4M - +7.4M)
17	PVDS-006	DP OVER VESSEL (EL = +7.0M - +9.2M)
18	BPDS-001	DYNAMIC PRESS. IN BLOWDOWN PIPE
19	WWDS-001	DP OVER POOL (EL = 4.5M -15.5M)
20	WWDS-002	DP ACROSS DIAPHRAGM FLOOR
21		
22	PVTS-001	VESSEL (EL = 0.6M)
23	PVTS-002	VESSEL (EL = 2.2M)
24	PVTS-003	VESSEL (EL = 3.8M)
25	PVTS-004	VESSEL (EL = 5.4M)
26	PVTS-005	VESSEL (EL = 7.0M)
27	PVTS-006	VESSEL (EL = 8.6M)
28	BPTS-001	BLOWDOWN PIPE (6.5M FROM OUTL.)
29	BPTS-002	BLOWDOWN PIPE (4.1M FROM OUTL.)
30	BPTS-003	BLOWDOWN PIPE (0.9M FROM OUTL.)
31	DWTS-101	DRYWELL (0.5M ABOVE DF)
32	DWTS-102	DRYWELL (2.5M ABOVE DF)
33	DWTS-103	DRYWELL (4.5M ABOVE DF)
34	DWTS-201	DRYWELL (0.5M ABOVE DF)
35	DWTS-202	DRYWELL (2.5M ABOVE DF)
36	DWTS-203	DRYWELL (4.5M ABOVE DF)
37	DWTS-301	DRYWELL (0.5M ABOVE DF)
38	DWTS-302	DRYWELL (3.5M ABOVE DF)
39	VPTS-101	VP1 (0.5M ABOVE OUTL.)
40	VPTS-102	VP1 (11.5M ABOVE OUTL.)
41	VPTS-201	VP2 (0.5M ABOVE OUTL.)
42	VPTS-202	VP2 (11.5M ABOVE OUTL.)
43	VPTS-301	VP3 (0.5M ABOVE OUTL.)
44	VPTS-302	VP3 (11.5M ABOVE OUTL.)
45	WWTS-101	WETWELL (T1, 1.0M ABOVE BOT.)
46	WWTS-102	WETWELL (T1, 3.0M ABOVE BOT.)
47	WWTS-103	WETWELL (T1, 5.0M ABOVE BOT.)
48	WWTS-104	WETWELL (T1, 7.0M ABOVE BOT.)
49	WWTS-105	WETWELL (T1, 9.0M ABOVE BOT.)
50	WWTS-106	WETWELL (T1, 11.0M ABOVE BOT.)
51	WWTS-107	WETWELL (T1, 13.0M ABOVE BOT.)
52	WWTS-108	WETWELL (T1, 15.0M ABOVE BOT.)

Table 2.5 (continued)

Channel No.	Channel Code	Measurement Location
53	WWTS-201	WETWELL (T2, 1.0M ABOVE BOTT.)
54	WWTS-202	WETWELL (T2, 3.0M ABOVE BOTT.)
55	WWTS-203	WETWELL (T2, 5.0M ABOVE BOTT.)
56	WWTS-204	WETWELL (T2, 7.0M ABOVE BOTT.)
57	WWTS-205	WETWELL (T2, 9.0M ABOVE BOTT.)
58	WWTS-206	WETWELL (T2, 11.0M ABOVE BOTT.)
59	WWTS-207	WETWELL (T2, 13.0M ABOVE BOTT.)
60	WWTS-208	WETWELL (T2, 15.0M ABOVE BOTT.)
61	WWTS-301	WETWELL (T3, 1.0M ABOVE BOTT.)
62	WWTS-302	WETWELL (T3, 3.0M ABOVE BOTT.)
63	WWTS-303	WETWELL (T3, 5.0M ABOVE BOTT.)
64	WWTS-304	WETWELL (T3, 7.0M ABOVE BOTT.)
65	WWTS-305	WETWELL (T3, 9.0M ABOVE BOTT.)
66	WWTS-306	WETWELL (T3, 11.0M ABOVE BOTT.)
67	WWTS-307	WETWELL (T3, 13.0M ABOVE BOTT.)
68	WWTS-308	WETWELL (T3, 15.0M ABOVE BOTT.)
69	WWTS-401	WETWELL (T4, 1.0M ABOVE BOTT.)
70	WWTS-402	WETWELL (T4, 3.0M ABOVE BOTT.)
71	WWTS-403	WETWELL (T4, 5.0M ABOVE BOTT.)
72	WWTS-404	WETWELL (T4, 7.0M ABOVE BOTT.)
73	WWTS-405	WETWELL (T4, 9.0M ABOVE BOTT.)
74	WWTS-406	WETWELL (T4, 11.0M ABOVE BOTT.)
75	WWTS-407	WETWELL (T4, 13.0M ABOVE BOTT.)
76	WWTS-408	WETWELL (T4, 15.0M ABOVE BOTT.)
77		
78	PVLS-001	VESSEL (EL = 0.6M)
79	PVLS-002	VESSEL (EL = 2.2M)
80	PVLS-003	VESSEL (EL = 3.8M)
81	PVLS-004	VESSEL (EL = 5.4M)
82	PVLS-005	VESSEL (EL = 7.0M)
83	PVLS-006	VESSEL (EL = 8.6M)
84	DWLS-001	DRYWELL (0.048M ABOVE DF)
85	DWLS-002	DRYWELL (0.096M ABOVE DF)
86	DWLS-003	DRYWELL (0.144M ABOVE DF)
87	DWLS-004	DRYWELL (0.192M ABOVE DF)
88	VPLS-101	VP1 (0.042M ABOVE OUTL.)
89	VPLS-103	VP1 (2.042M ABOVE OUTL.)
90	VPLS-105	VP1 (4.042M ABOVE OUTL.)
91	VPLS-201	VP2 (0.042M ABOVE OUTL.)
92	VPLS-203	VP2 (2.042M ABOVE OUTL.)
93	VPLS-205	VP2 (4.042M ABOVE OUTL.)
94	VPLS-301	VP3 (0.042M ABOVE OUTL.)
95	VPLS-302	VP3 (1.042M ABOVE OUTL.)
96	VPLS-303	VP3 (2.042M ABOVE OUTL.)
97	VPLS-304	VP3 (3.042M ABOVE OUTL.)
98	VPLS-305	VP3 (4.042M ABOVE OUTL.)
99	VPLS-401	VP4 (0.042M ABOVE OUTL.)
100	VPLS-403	VP4 (2.042M ABOVE OUTL.)
101	VPLS-405	VP4 (4.042M ABOVE OUTL.)
102	VPLS-501	VP5 (0.042M ABOVE OUTL.)
103	VPLS-502	VP5 (1.042M ABOVE OUTL.)
104	VPLS-503	VP5 (2.042M ABOVE OUTL.)
105	VPLS-504	VP5 (3.042M ABOVE OUTL.)
106	VPLS-505	VP5 (4.042M ABOVE OUTL.)

Table 2.5 (continued)

Channel No.	Channel Code	Measurement Location
107	WWLS-104	WETWELL (L1, 5.75M ABOVE BOTT.)
108	WWLS-105	WETWELL (L1, 6.50M ABOVE BOTT.)
109	WWLS-106	WETWELL (L1, 7.25M ABOVE BOTT.)
110	WWLS-107	WETWELL (L1, 8.00M ABOVE BOTT.)
111	WWLS-108	WETWELL (L1, 8.75M ABOVE BOTT.)
112	WWLS-109	WETWELL (L1, 9.50M ABOVE BOTT.)
113	WWLS-110	WETWELL (L1, 10.25M ABOVE BOTT.)
114	WWLS-111	WETWELL (L1, 11.00M ABOVE BOTT.)
115	WWLS-112	WETWELL (L1, 11.75M ABOVE BOTT.)
116	WWLS-113	WETWELL (L1, 12.50M ABOVE BOTT.)
117	WWLS-114	WETWELL (L1, 13.25M ABOVE BOTT.)
118	WWLS-115	WETWELL (L1, 14.00M ABOVE BOTT.)
119	WWLS-116	WETWELL (L1, 14.75M ABOVE BOTT.)
120	WWLS-201	WETWELL (L2, 3.50M ABOVE BOTT.)
121	WWLS-202	WETWELL (L2, 4.25M ABOVE BOTT.)
122	WWLS-203	WETWELL (L2, 5.00M ABOVE BOTT.)
123	WWLS-204	WETWELL (L2, 5.75M ABOVE BOTT.)
124	WWLS-205	WETWELL (L2, 6.50M ABOVE BOTT.)
125	WWLS-206	WETWELL (L2, 7.25M ABOVE BOTT.)
126	WWLS-207	WETWELL (L2, 8.00M ABOVE BOTT.)
127	WWLS-208	WETWELL (L2, 8.75M ABOVE BOTT.)
128	WWLS-209	WETWELL (L2, 9.50M ABOVE BOTT.)
129	WWLS-210	WETWELL (L2, 10.25M ABOVE BOTT.)
130	WWLS-211	WETWELL (L2, 11.00M ABOVE BOTT.)
131	WWLS-212	WETWELL (L2, 11.75M ABOVE BOTT.)
132	WWLS-213	WETWELL (L2, 12.50M ABOVE BOTT.)
133	WWLS-214	WETWELL (L2, 13.25M ABOVE BOTT.)
134	WWLS-215	WETWELL (L2, 14.00M ABOVE BOTT.)
135	WWLS-216	WETWELL (L2, 14.75M ABOVE BOTT.)
136	WWLS-303	WETWELL (L3, 5.00M ABOVE BOTT.)
137	WWLS-305	WETWELL (L3, 6.50M ABOVE BOTT.)
138	WWLS-307	WETWELL (L3, 8.00M ABOVE BOTT.)
139	WWLS-309	WETWELL (L3, 9.50M ABOVE BOTT.)
140	WWLS-311	WETWELL (L3, 11.00M ABOVE BOTT.)
141	WWLS-313	WETWELL (L3, 12.50M ABOVE BOTT.)
142	WWLS-315	WETWELL (L3, 14.00M ABOVE BOTT.)
143	WWLS-401	WETWELL (L4, 3.50M ABOVE BOTT.)
144	WWLS-402	WETWELL (L4, 4.25M ABOVE BOTT.)
145	WWLS-403	WETWELL (L4, 5.00M ABOVE BOTT.)
146	WWLS-404	WETWELL (L4, 5.75M ABOVE BOTT.)
147	WWLS-405	WETWELL (L4, 6.50M ABOVE BOTT.)
148	WWLS-406	WETWELL (L4, 7.25M ABOVE BOTT.)
149	WWLS-407	WETWELL (L4, 8.00M ABOVE BOTT.)
150	WWLS-408	WETWELL (L4, 8.75M ABOVE BOTT.)
151	WWLS-409	WETWELL (L4, 9.50M ABOVE BOTT.)
152	WWLS-410	WETWELL (L4, 10.25M ABOVE BOTT.)
153	WWLS-411	WETWELL (L4, 11.00M ABOVE BOTT.)
154	WWLS-412	WETWELL (L4, 11.75M ABOVE BOTT.)
155	WWLS-413	WETWELL (L4, 12.50M ABOVE BOTT.)
156	WWLS-414	WETWELL (L4, 13.25M ABOVE BOTT.)
157	WWLS-415	WETWELL (L4, 14.00M ABOVE BOTT.)
158	WWLS-416	WETWELL (L4, 14.75M ABOVE BOTT.)
159	WWLS-503	WETWELL (L5, 5.00M ABOVE BOTT.)
160	WWLS-505	WETWELL (L5, 6.50M ABOVE BOTT.)

Table 2.5 (continued)

Channel No.	Channel Code	Measurement Location
161	WWLS-507	WETWELL (L5, 8.00M ABOVE BOTT.)
162	WWLS-509	WETWELL (L5, 9.50M ABOVE BOTT.)
163	WWLS-511	WETWELL (L5, 11.00M ABOVE BOTT.)
164	WWLS-513	WETWELL (L5, 12.50M ABOVE BOTT.)
165	WWLS-515	WETWELL (L5, 14.00M ABOVE BOTT.)
166	WWLS-604	WETWELL (L6, 5.75M ABOVE BOTT.)
167	WWLS-606	WETWELL (L6, 7.25M ABOVE BOTT.)
168	WWLS-608	WETWELL (L6, 8.75M ABOVE BOTT.)
169	WWLS-610	WETWELL (L6, 10.25M ABOVE BOTT.)
170	WWLS-612	WETWELL (L6, 11.75M ABOVE BOTT.)
171	WWLS-614	WETWELL (L6, 13.25M ABOVE BOTT.)
172	WWLS-616	WETWELL (L6, 14.75M ABOVE BOTT.)
173	WWLS-704	WETWELL (L7, 5.75M ABOVE BOTT.)
174	WWLS-706	WETWELL (L7, 7.25M ABOVE BOTT.)
175	WWLS-708	WETWELL (L7, 8.75M ABOVE BOTT.)
176	WWLS-710	WETWELL (L7, 10.25M ABOVE BOTT.)
177	WWLS-712	WETWELL (L7, 11.75M ABOVE BOTT.)
178	WWLS-714	WETWELL (L7, 13.25M ABOVE BOTT.)
179	WWLS-716	WETWELL (L7, 14.75M ABOVE BOTT.)
180	WWLS-804	WETWELL (L8, 5.75M ABOVE BOTT.)
181	WWLS-806	WETWELL (L8, 7.25M ABOVE BOTT.)
182	WWLS-808	WETWELL (L8, 8.75M ABOVE BOTT.)
183	WWLS-810	WETWELL (L8, 10.25M ABOVE BOTT.)
184	WWLS-812	WETWELL (L8, 11.75M ABOVE BOTT.)
185	WWLS-814	WETWELL (L8, 13.25M ABOVE BOTT.)
186	WWLS-816	WETWELL (L8, 14.75M ABOVE BOTT.)
187		
188		
189		
190		
191		
192		

Table 2.6 List of Data Channels (PCM Track-1 Channels)

Channel No.	Channel Code	Measurement Location
1	BPMF-001	RUPTURE DISC BREAK SIGNAL
2	BPMF-002	MAIN DISCHARGE VALVE CLOSE SIGNAL
3		
4	DWPF-001	DRYWELL
5	VPPF-101	VP1 (0.5M ABOVE OUTL.)
6	VPPF-201	VP2 (0.5M ABOVE OUTL.)
7	VPPF-301	VP3 (0.5M ABOVE OUTL.)
8	VPPF-302	VP3 (6.0M ABOVE OUTL.)
9	VPPF-303	VP3 (11.5M ABOVE OUTL.)
10	VPPF-401	VP4 (0.5M ABOVE OUTL.)
11	VPPF-501	VP5 (0.5M ABOVE OUTL.)
12	VPPF-502	VP5 (6.0M ABOVE OUTL.)
13	VPPF-503	VP5 (11.5M ABOVE OUTL.)
14	WWPF-101	POOL BOTT., UNDER VP1
15	WWPF-102	POOL BOTT., UNDER VP2
16	WWPF-103	POOL BOTT., UNDER VP3
17	WWPF-104	POOL BOTT., UNDER VP4
18	WWPF-105	POOL BOTT., UNDER VP5
19	WWPF-106	POOL BOTT., BETW. VP1, VP6 & PEDESTAL
20	WWPF-107	POOL BOTT., BETW. VP2 & VP3
21	WWPF-201	WALL BESIDE VP2 (P1, 1.8M ABOVE BOTT.)
22	WWPF-202	WALL BESIDE VP2 (P1, 3.6M ABOVE BOTT.)
23	WWPF-203	WALL BESIDE VP2 (P1, 6.0M ABOVE BOTT.)
24	WWPF-301	WALL BESIDE VP3 (P2, 1.8M ABOVE BOTT.)
25	WWPF-302	WALL BESIDE VP3 (P2, 3.6M ABOVE BOTT.)
26	WWPF-303	WALL BESIDE VP3 (P2, 6.0M ABOVE BOTT.)
27	WWPF-401	SHELL BESIDE VP3 (P3, 1.8M ABOVE BOTT.)
28	WWPF-402	SHELL BESIDE VP3 (P3, 3.6M ABOVE BOTT.)
29	WWPF-501	SHELL BESIDE VP4 (P4, 1.8M ABOVE BOTT.)
30	WWPF-502	SHELL BESIDE VP4 (P4, 3.6M ABOVE BOTT.)
31	WWPF-602	WALL BESIDE VP4 (P5, 3.6M ABOVE BOTT.)
32	WWPF-702	WALL BESIDE VP7 (P6, 3.6M ABOVE BOTT.)
33	WWPF-001	WETWELL AIRSPACE (15.0M ABOVE BOTT.)
34		
35	VPSF-101	LOWER BRACE BETW. VP1 & WALL
36	VPSF-102	LOWER BRACE BETW. VP1 & VP2
37	VPSF-103	LOWER BRACE BETW. VP1 & VP6
38	VPSF-201	UPPER BRACE BETW. VP1 & PEDESTAL
39		

Table 2.7 List of Data Channels (PCM Track-2 Channels)

Channel No.	Channel Code	Measurement Location
1	BPMF-001	RUPTURE DISC BREAK SIGNAL
2	BPMF-002	MAIN DISCHARGE VALVE CLOSE SIGNAL
3		
4	VPAF-101	VP2 OUTL. (0DEG)
5	VPAF-102	VP2 OUTL. (90DEG)
6	VPAF-201	VP5 OUTL. (0DEG)
7	VPAF-202	VP5 OUTL. (90DEG)
8	WWAF-001	POOL BOTT., UNDER VP5
9	WWAF-002	POOL BOTT., BETW. VP2, VP3, VP4 & VP7
10	WWAF-003	WALL BESIDE VP2 (3.0M ABOVE BOTT.)
11	WWAF-004	WALL BESIDE VP7 (3.0M ABOVE BOTT.)
12	WWAF-005	SHELL BESIDE VP3 (3.0M ABOVE BOTT.)
13	WWAF-006	SHELL BESIDE VP3 (6.0M ABOVE BOTT.)
14	WWAF-007	SHELL BESIDE VP4 (3.0M ABOVE BOTT.)
15	WWAF-008	SHELL BESIDE VP4 (6.0M ABOVE BOTT.)
16	WWAF-009	PEDESTAL (3.0M ABOVE BOTT.)
17	WWAF-010	PEDESTAL (6.0M ABOVE BOTT.)
18	WWAF-011	SHELL AT DF LEVEL (0DEG)
19	WWAF-012	SHELL AT DF LEVEL (90DEG)
20		
21	WWLF-101	PHASE BDRY. (0.9M BELOW OUTL., CENTER)
22	WWLF-102	PHASE BDRY. (0.9M BELOW OUTL., 0DEG)
23	WWLF-104	PHASE BDRY. (0.9M BELOW OUTL., 90DEG)
24	WWLF-106	PHASE BDRY. (0.9M BELOW OUTL., 180DEG)
25	WWLF-108	PHASE BDRY. (0.9M BELOW OUTL., 270DEG)
26	WWLF-201	PHASE BDRY. (0.6M BELOW OUTL., CENTER)
27	WWLF-203	PHASE BDRY. (0.6M BELOW OUTL., 45DEG)
28	WWLF-205	PHASE BDRY. (0.6M BELOW OUTL., 135DEG)
29	WWLF-207	PHASE BDRY. (0.6M BELOW OUTL., 225DEG)
30	WWLF-209	PHASE BDRY. (0.6M BELOW OUTL., 315DEG)
31	WWLF-301	PHASE BDRY. (0.3M BELOW OUTL., CENTER)
32	WWLF-302	PHASE BDRY. (0.3M BELOW OUTL., 0DEG)
33	WWLF-304	PHASE BDRY. (0.3M BELOW OUTL., 90DEG)
34	WWLF-306	PHASE BDRY. (0.3M BELOW OUTL., 180DEG)
35	WWLF-308	PHASE BDRY. (0.3M BELOW OUTL., 270DEG)
36		
37		
38		
39		

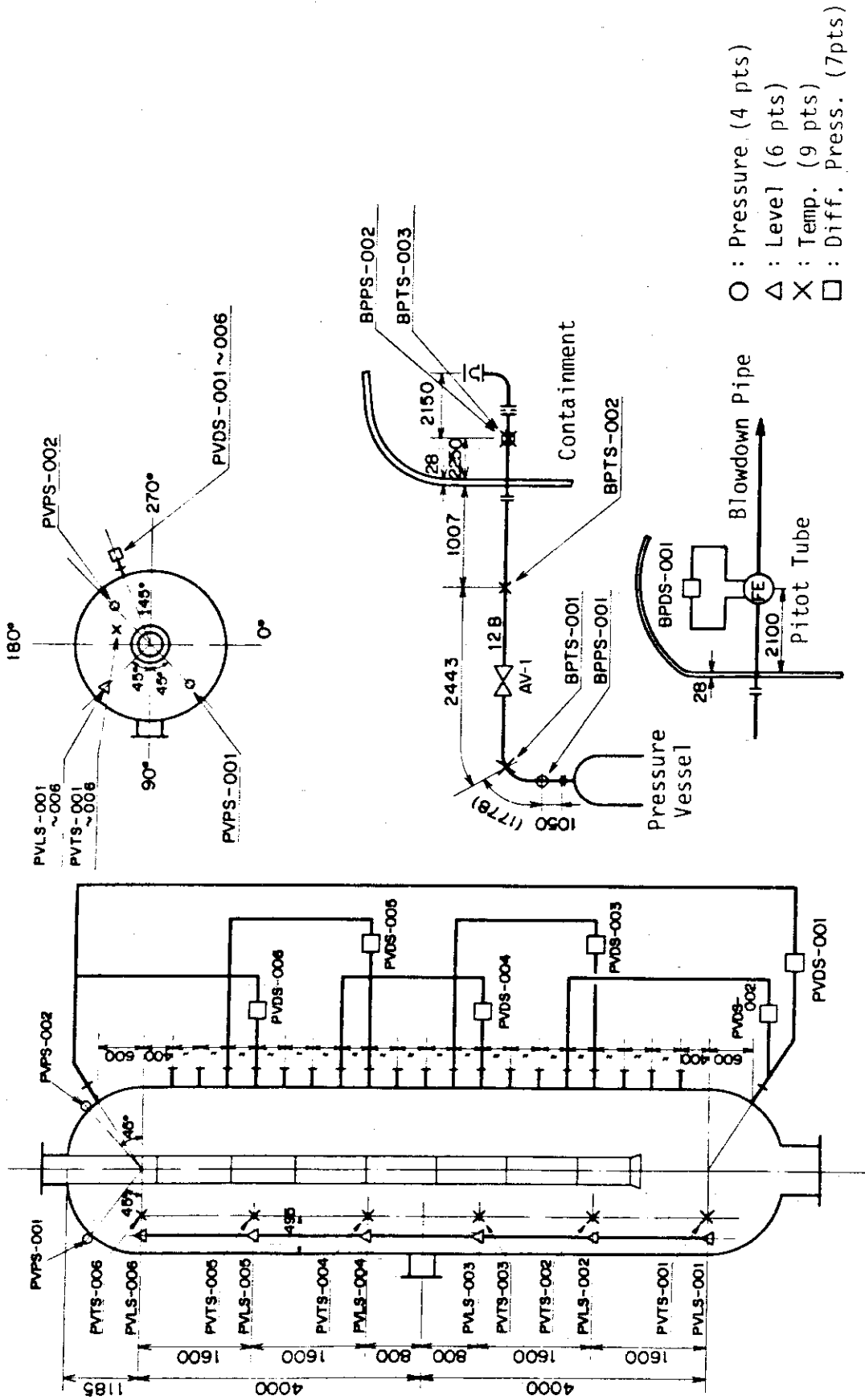


Fig. 2.2 Transducer Locations for Primary System

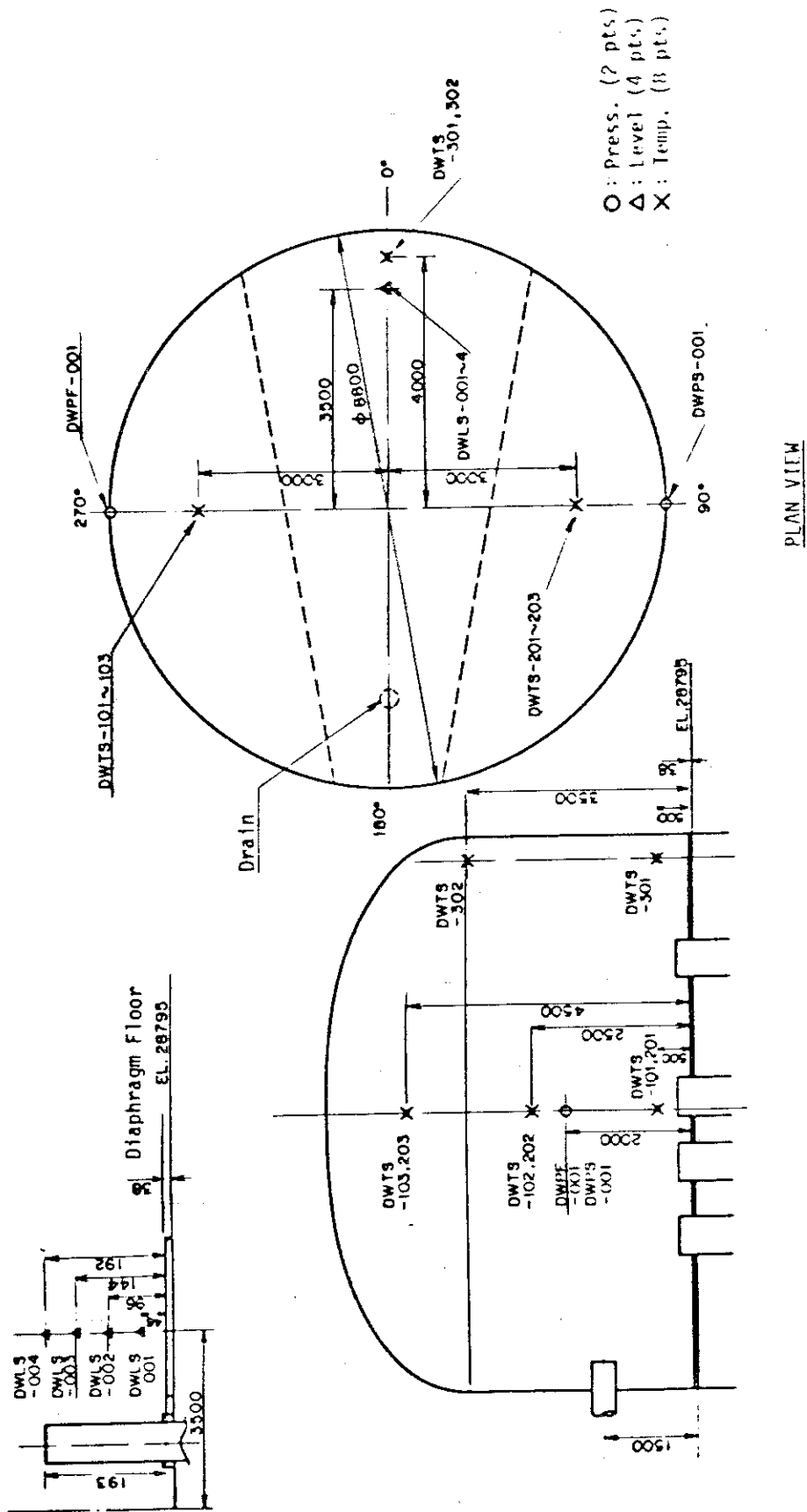


Fig. 2.3 Transducer Locations for Drywell

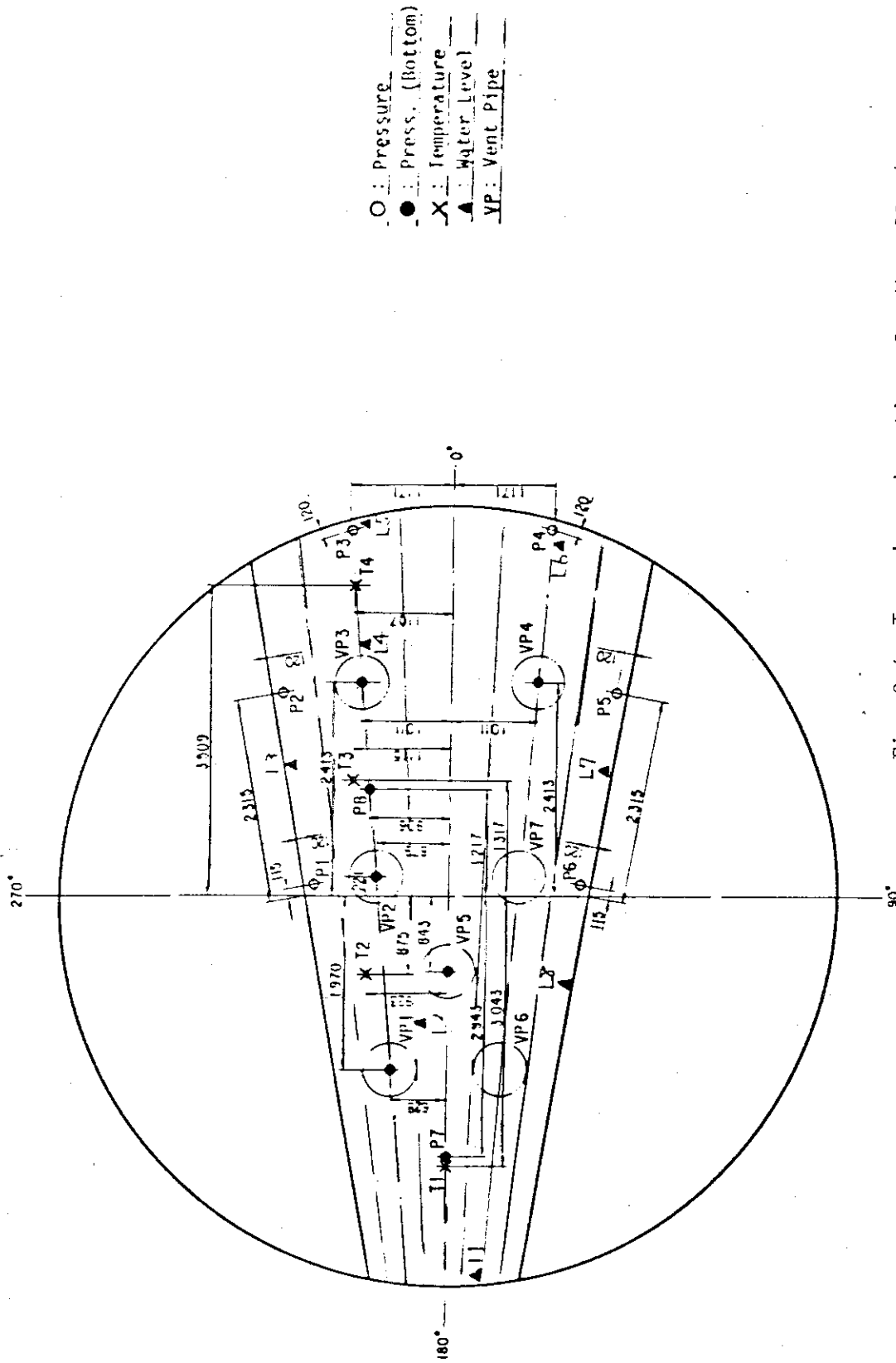


Fig. 2.4 Transducer Locations for Wetwell (Plan View)

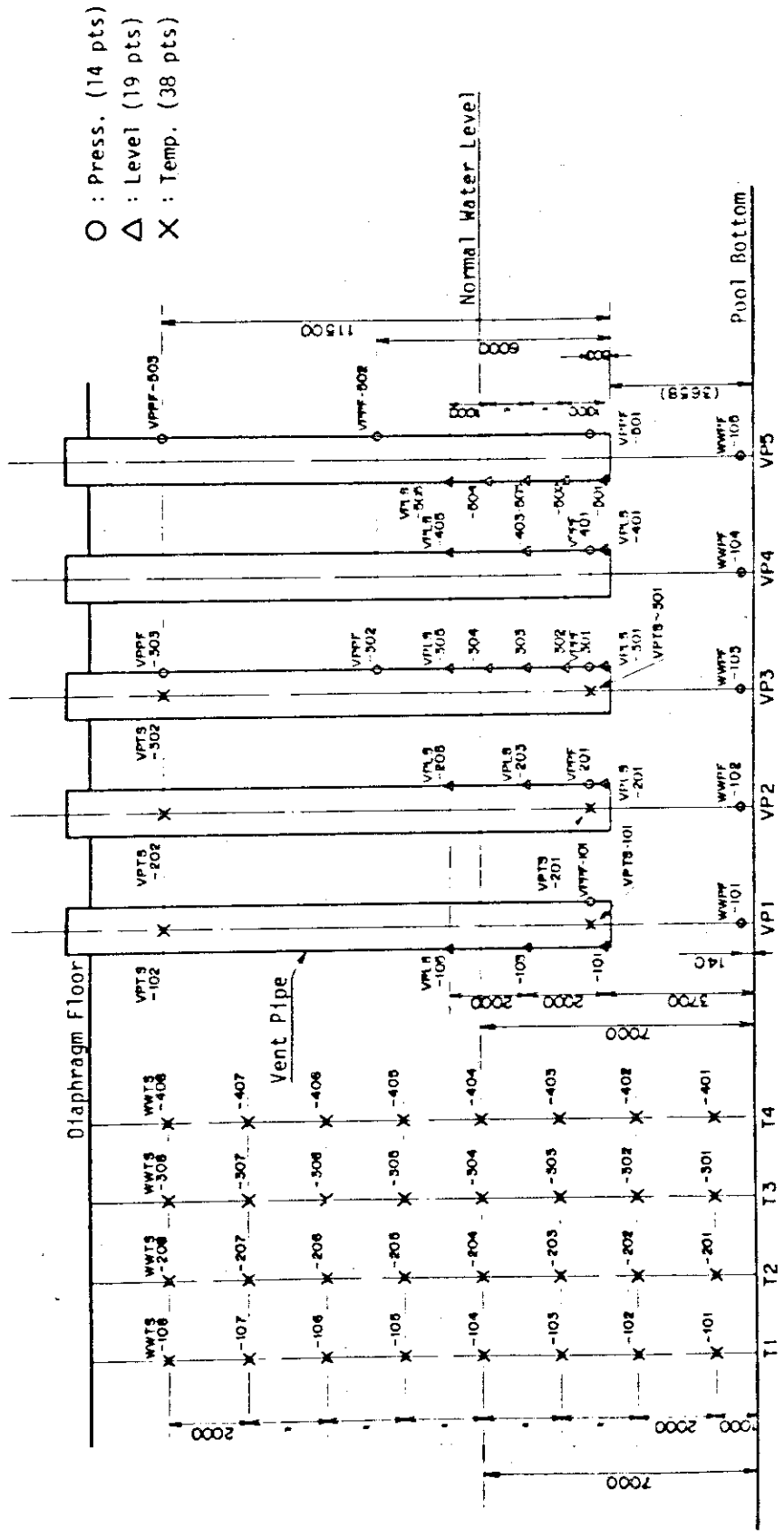


Fig. 2.5 Transducer Locations for Vent Pipes and Thermocouple Locations for Wetwell

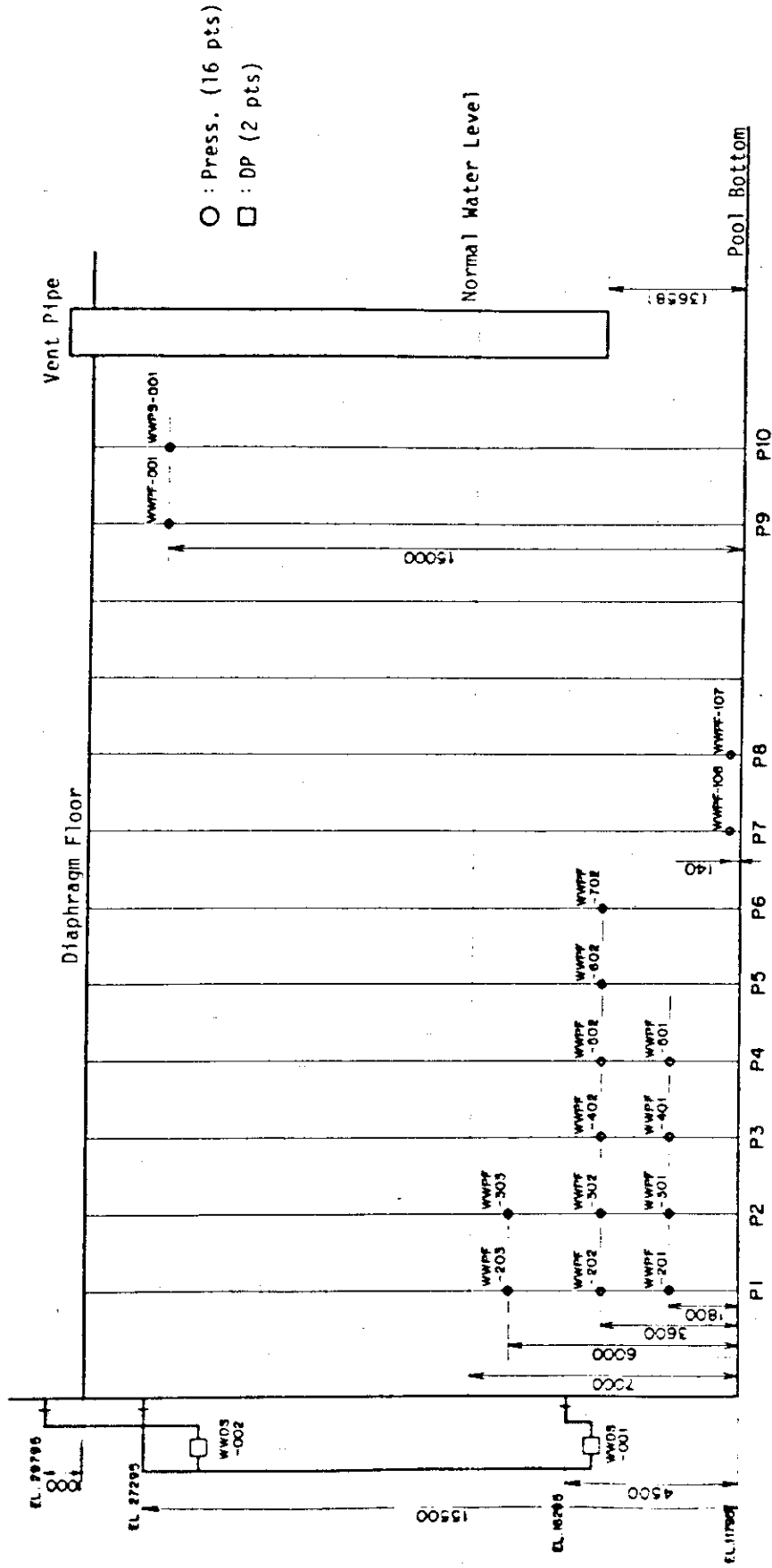
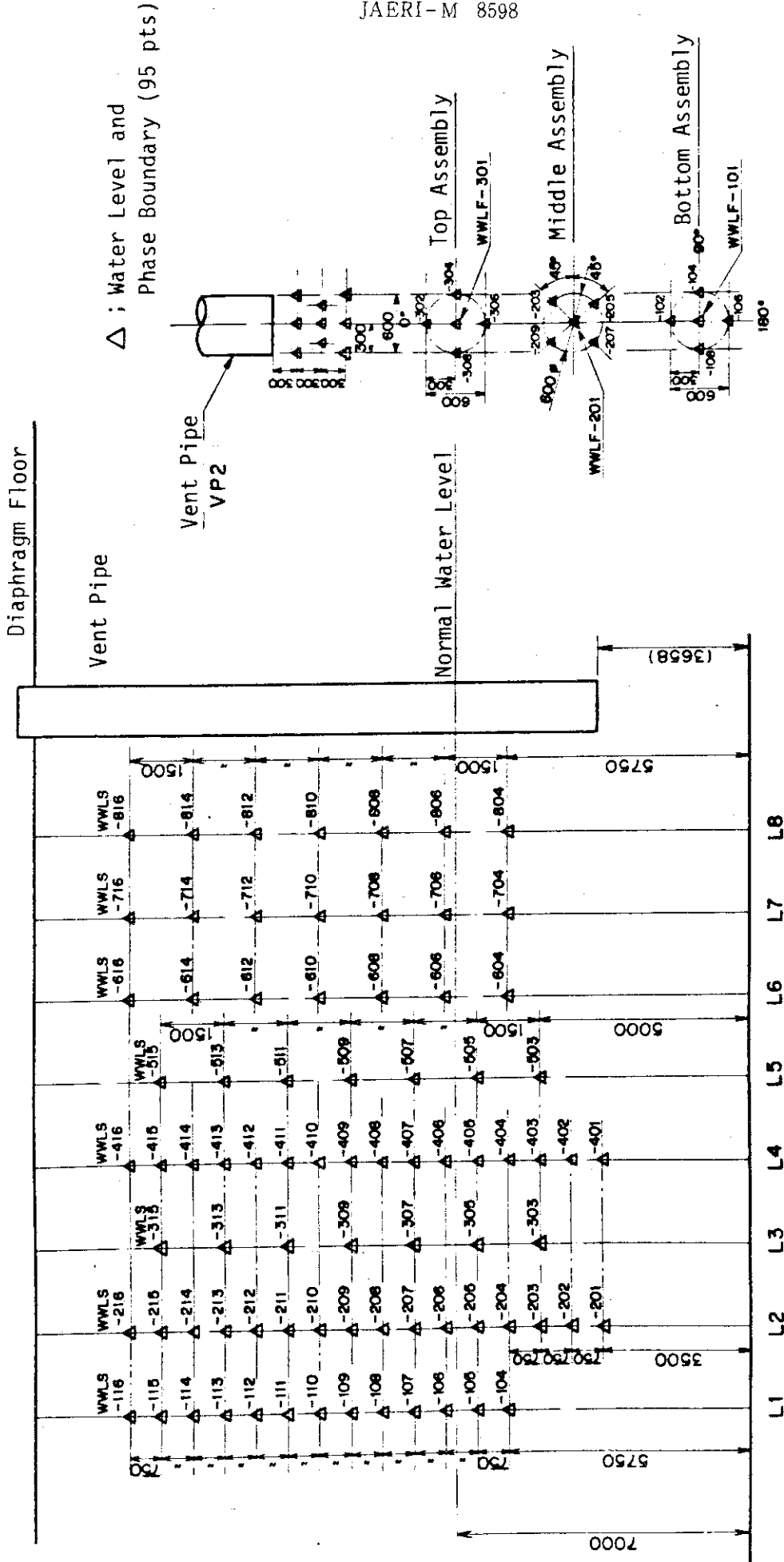
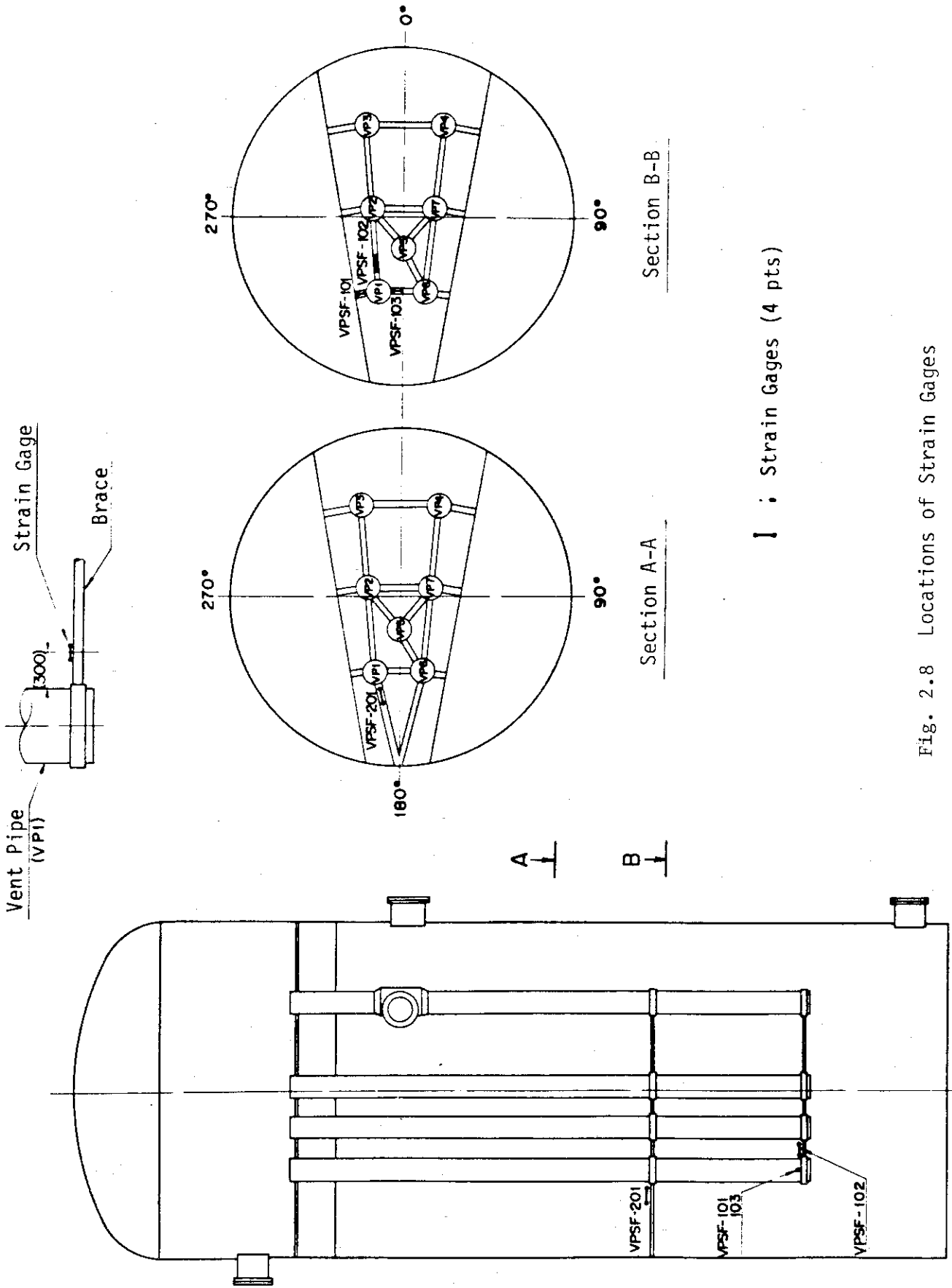


Fig. 2.6 Pressure and Differential Pressure Transducer Locations for Wetwell



PHASE BOUNDARY DETECTOR ASSEMBLIES

Fig. 2.7 Water Level Detector and Phase Boundary Detector Locations for Metwell



I : Strain Gages (4 pts)

Fig. 2.8 Locations of Strain Gages

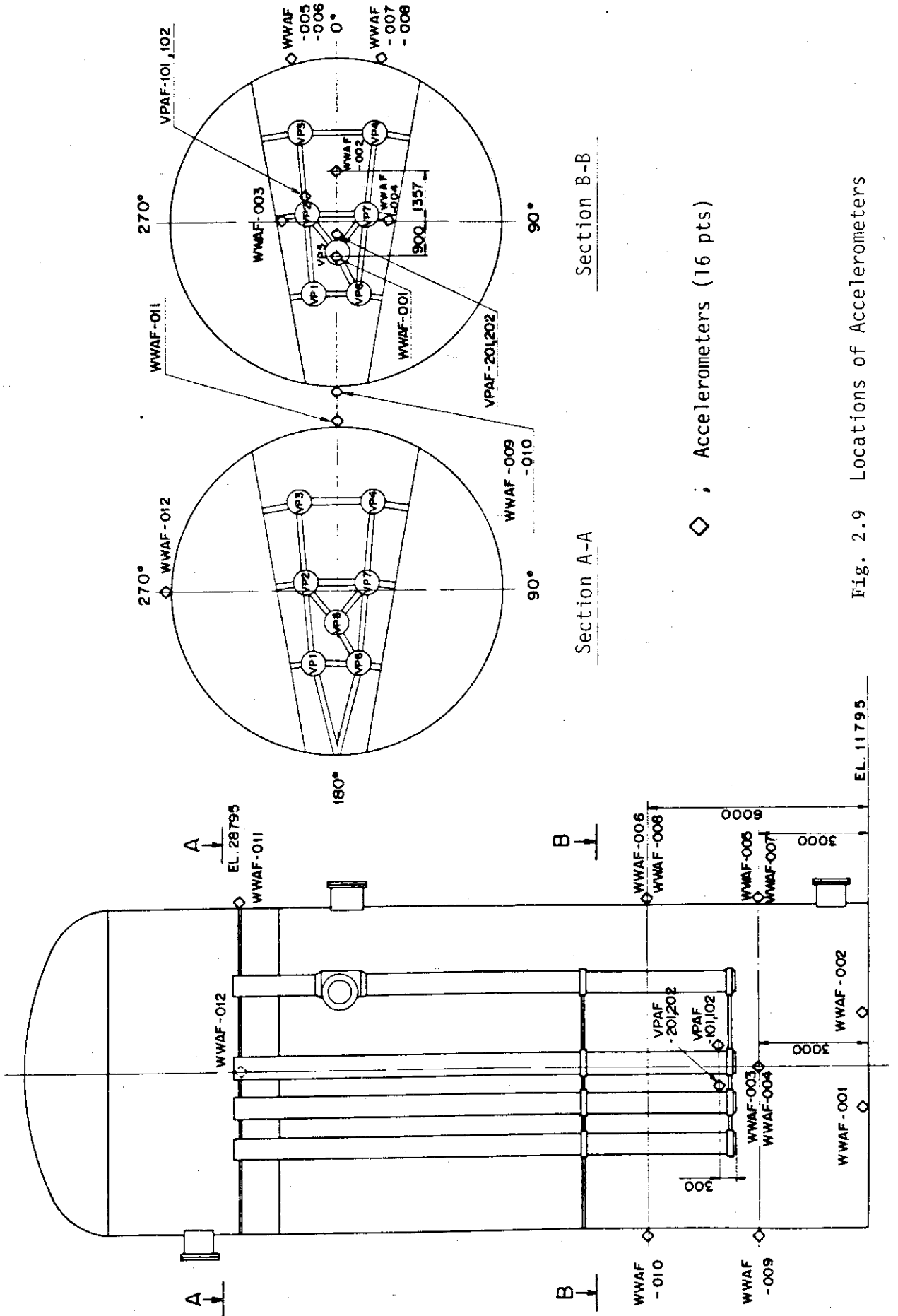


Fig. 2.9 Locations of Accelerometers

Table 2.8 State of Measurement Equipment (Computer Recorded Channels)

Channel No.	Channel Code	Status		Remarks
		o Good	o Bad	
1	BPMS-001	o		
2	BPMS-002	o		
3	VPMS-001	o		Spurious signal before 64 s
4				
5	BPPS-001	o		
6	PVPS-002	o		
7	PVPS-001	o		
8	BPPS-002	o		
9	DWPS-001	o		
10	WWPS-001	o		
11				
12	PVDS-001	o		
13	PVDS-002	o		
14	PVDS-003	o		
15	PVDS-004	o		
16	PVDS-005	o		
17	PVDS-006	o		
18	BPDS-001	o		Unreasonable data
19	WWDS-001	o		
20	WWDS-002	o		
21				
22	PVTS-001	o		
23	PVTS-002	o		
24	PVTS-003	o		
25	PVTS-004	o		
26	PVTS-005	o		
27	PVTS-006	o		
28	BPTS-001	o		
29	BPTS-002	o		
30	BPTS-003	o		

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
31	DWTS-101	o		} Overranged and saturated at 150 °C
32	DWTS-102	o		
33	DWTS-103	o		
34	DWTS-201	o		} Overranged and saturated at 150 °C
35	DWTS-202	o		
36	DWTS-203	o		
37	DWTS-301	o		
38	DWTS-302	o		
39	VPTS-101	o		
40	VPTS-102	o		
41	VPTS-201	o		
42	VPTS-202	o		
43	VPTS-301	o		
44	VPTS-302	o		
45	WWTS-101	o		
46	WWTS-102	o		
47	WWTS-103	o		
48	WWTS-104	o		
49	WWTS-105	o		Wetted during pool swell
50	WWTS-106	o		
51	WWTS-107	o		
52	WWTS-108	o		Thin wire (20 μm) T/C
53	WWTS-201	o		
54	WWTS-202	o		
55	WWTS-203	o		
56	WWTS-204	o		
57	WWTS-205	o		Wetted during pool swell
58	WWTS-206	o		
59	WWTS-207	o		
60	WWTS-208	o		

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
61	WWTS-301	o		
62	WWTS-302	o		
63	WWTS-303	o		
64	WWTS-304	o		
65	WWTS-305	o		Wetted during pool swell
66	WWTS-306	o		
67	WWTS-307	o		
68	WWTS-308	o		
69	WWTS-401	o		
70	WWTS-402	o		
71	WWTS-403	o		
72	WWTS-404	o		
73	WWTS-405	o		Wetted during pool swell
74	WWTS-406	o		
75	WWTS-407	o		
76	WWTS-408	o		Thin wire (20 μ m) T/C
77				
78	PVLS-001	o		
79	PVLS-002	o		
80	PVLS-003	o		
81	PVLS-004	o		
82	PVLS-005	o		
83	PVLS-006	o		
84	DWLS-001	o		
85	DWLS-002	o		
86	DWLS-003	o		
87	DWLS-004	o		
88	VPLS-101	o		
89	VPLS-103	o		
90	VPLS-105	o		

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	o Bad	
91	VPLS-201	o		
92	VPLS-203	o		
93	VPLS-205	o		
94	VPLS-301	o		
95	VPLS-302	o		
96	VPLS-303	o		
97	VPLS-304	o		
98	VPLS-305	o		
99	VPLS-401	o		
100	VPLS-403	o		
101	VPLS-405	o		
102	VPLS-501	o		
103	VPLS-502	o		
104	VPLS-503	o		
105	VPLS-504	o		
106	VPLS-505	o		
107	WWLS-104	o		
108	WWLS-105	o		
109	WWLS-106	o		
110	WWLS-107	o		
111	WWLS-108	o		
112	WWLS-109	o		
113	WWLS-110	o		
114	WWLS-111	o		
115	WWLS-112	o		
116	WWLS-113	o		
117	WWLS-114	o		
118	WWLS-115	o		
119	WWLS-116	o		
120	WWLS-201	o		

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
121	WWLS-202	o		
122	WWLS-203	o		
123	WWLS-204	o		
124	WWLS-205	o		
125	WWLS-206	o		
126	WWLS-207	o		
127	WWLS-208	o		
128	WWLS-209	o		
129	WWLS-210	o		
130	WWLS-211	∅		
131	WWLS-212	o		
132	WWLS-213	o		
133	WWLS-214	o		
134	WWLS-215	o		
135	WWLS-216	o		
136	WWLS-303	o		
137	WWLS-305	o		
138	WWLS-307	o		
139	WWLS-309	o		
140	WWLS-311	o		
141	WWLS-313	o		
142	WWLS-315	o		
143	WWLS-401	o		
144	WWLS-402	o		
145	WWLS-403	∅	} Cable connector failure	
146	WWLS-404	∅		
147	WWLS-405	∅		
148	WWLS-406	∅		
149	WWLS-407	∅		
150	WWLS-408	∅		

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
151	WWLS-409		∅	} Cable connector failure
152	WWLS-410		∅	
153	WWLS-411		∅	
154	WWLS-412		∅	
155	WWLS-413		∅	
156	WWLS-414		∅	
157	WWLS-415		∅	
158	WWLS-416		∅	
159	WWLS-503		∅	
160	WWLS-505		∅	
161	WWLS-507		o	
162	WWLS-509		o	
163	WWLS-511		o	
164	WWLS-513		o	
165	WWLS-515		o	
166	WWLS-604		o	
167	WWLS-606		o	
168	WWLS-608		o	
169	WWLS-610		o	
170	WWLS-612		o	
171	WWLS-614		o	
172	WWLS-616		o	
173	WWLS-704		o	
174	WWLS-706		o	
175	WWLS-708		o	
176	WWLS-710		o	
177	WWLS-712		o	
178	WWLS-714		o	
179	WWLS-716		o	
180	WWLS-804		o	

Table 2.8 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
181	WWLS-806	o		
182	WWLS-808	o		
183	WWLS-810	o		
184	WWLS-812	o		
185	WWLS-814	o		
186	WWLS-816	o		
187				
188				
189				
190				
191				
192				
193				
194				
195				
196				

Table 2.9 State of Measurement Equipment (PCM Track-1 Channels)

Channel No.	Channel No.	Status		Remarks
		o Good	∅ Bad	
1	BPMF-001	o		
2	BPMF-002	o		
3				
4	DWPF-001	o		
5	VPPF-101	∅		Sensor insulation failure
6	VPPF-201	o		
7	VPPF-301	∅		Sensor insulation failure
8	VPPF-302	o		
9	VPPF-303	o		
10	VPPF-401	o		
11	VPPF-501	o		
12	VPPF-502	o		
13	VPPF-503	o		
14	WWPF-101	∅		Sensor insulation failure
15	WWPF-102	o		Overranged and saturated at 600 kPa
16	WWPF-103	o		"
17	WWPF-104	o		"
18	WWPF-105	o		"
19	WWPF-106	o		"
20	WWPF-107	o		"
21	WWPF-201	o		
22	WWPF-202	o		
23	WWPF-203	∅		Sensor insulation failure
24	WWPF-301	∅		Sensor insulation failure
25	WWPF-302	o		
26	WWPF-303	∅		Sensor insulation failure
27	WWPF-401	o		
28	WWPF-402	o		
29	WWPF-501	o		
30	WWPF-502	o		

Table 2.9 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
31	WWPF-602	o		
32	WWPF-702	o		
33	WWPF-001	o		
34				
35	VPSF-101	o		
36	VPSF-102	∅		Cable failure
37	VPSF-103	o		
38	VPSF-201	o		
39				

Table 2.10 State of Measurement Equipment (PCM Track-2 Channels)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
1	BPMF-001	o		
2	BPMF-002	o		
3				
4	VPAF-101	o		
5	VPAF-102	o		Overloaded and saturated at 1000 m/s ²
6	VPAF-201	o		High noise level, overloaded
7	VPAF-202	∅		
8	WWAF-001	∅		Sensor insulation failure
9	WWAF-002	o		Unreasonable data, overranged
10	WWAF-003	∅		Sensor insulation failure
11	WWAF-004	o		Unreasonable data, overranged
12	WWAF-005	o		Overranged and saturated at 50 m/s ²
13	WWAF-006	o		"
14	WWAF-007	o		"
15	WWAF-008	o		"
16	WWAF-009	o		"
17	WWAF-010	o		"
18	WWAF-011	∅		Unreasonable data
19	WWAF-012	∅		Unreasonable data
20				
21	WWLF-101	o		
22	WWLF-102	o		
23	WWLF-104	∅		Sensor insulation failure
24	WWLF-106	o		
25	WWLF-108	o		
26	WWLF-201	o		
27	WWLF-203	o		
28	WWLF-205	o		
29	WWLF-207	o		
30	WWLF-209	o		

Table 2.10 (continued)

Channel No.	Channel Code	Status		Remarks
		o Good	∅ Bad	
31	WWLF-301	o		Insulation failure after 61 s
32	WWLF-302		∅	Sensor insulation failure
33	WWLF-304		∅	Sensor insulation failure
34	WWLF-306	o		
35	WWLF-308		∅	Sensor insulation failure
36				
37				
38				
39				

Table 2.11 Calibration Data

DIFFERENTIAL PRESSURE CHANNELS (COMPUTER RECORDED)

Pressure Vessel

Date of Calibration Feb. 24, 1979

Calibration Conducted by Filling Water into Vessel.

Test Containment

Date of Calibration Feb. 24, 1979

Calibration Conducted by:

Filling Water into Containment

Applying Known Pressure on Transducer

PRESSURE CHANNELS (COMPUTER RECORDED)

Pressure Vessel

Date of Calibration Feb. 16, 1979

Range of Calibration Pressure (kPa) 101 - 6995

Water Level in Pressure Vessel (m) Full

Test Containment

Date of Calibration Mar. 29, 1979*

Range of Calibration Pressure (kPa) 101 - 483

Water Level in Wetwell (m) 7.6

Channel No.	Channel Code	kPa/Digit	Max. Deviation kPa
System Computer			
5	BPPS-001	4.818	19.6
6	PVPS-002	4.791	9.8
7	PVPS-001	4.791	9.8
8	BPPS-002	4.800	Manufacturer's data
9	DWPS-001	0.2389	2.0
10	WWPS-001	0.2387	5.9

* Performed between Test 0004 and Test 1101.

Channel No.	Channel Code	kPa/Digit	Max. Deviation kPa
System Computer			
12	PVDS-001	0.04431	
13	PVDS-002	0.02284	
14	PVDS-003	0.02278	
15	PVDS-004	0.02203	
16	PVDS-005	0.02243	
17	PVDS-006	0.02258	
18	BPDS-001	4.630	Manufacturer's data
19	WWDS-001	0.04443	
20	WWDS-002	0.04491	

Table 2.11 (Continued)
PRESSURE CHANNELS (PCM RECORDED)

Test Containment

Date of Calibration Mar. 29, 1979*
Range of Calibration Pressure (kPa) 101 - 483
Water Level in Wetwell (m) 7.6

*Performed between Test 0004 and Test 1101.

Channel No.	Channel Code	kPa/Digit	Max. Deviation kPa
PCM Track-1			
17	WWPF-104	0.9672	
18	WWPF-105	0.9590	
19	WWPF-106	0.9505	
20	WWPF-107	0.9524	
21	WWPF-201	0.9605	
22	WWPF-202	0.9549	
23	WWPF-203		
24	WWPF-301		
25	WWPF-302	0.9531	
26	WWPF-303		
27	WWPF-401	0.9543	
28	WWPF-402	0.9540	
29	WWPF-501	0.9615	
30	WWPF-502	0.9549	
31	WWPF-602	0.9531	
32	WWPF-702	0.9580	
33	WWPF-001	0.9478	

Channel No.	Channel Code	kPa/Digit	Max. Deviation kPa
PCM Track-1			
4	DWPF-001	0.9521	
5	VPPF-101		
6	VPPF-201	0.9605	
7	VPPF-301		
8	VPPF-302	0.9577	
9	VPPF-303	0.9496	
10	VPPF-401	0.9571	
11	VPPF-501	0.9487	
12	VPPF-502	0.9558	
13	VPPF-503	0.9508	
14	WWPF-101		
15	WWPF-102	0.9494	
16	WWPF-103	0.9602	

Table 2.12 Measurement Ranges.

Ch. No.	Item ⁺	Location ⁺	Measurement Range			LPF Cut-Off Freq. (Hz)
			Manufacturer's Specification for Transducer	Expected Overall Range	Unit	
Computer Recorded Channels						
5 -8	P	PV/BP	100 - 9800	100 - 9800	kPa	
9	P	DW	0 - 590	0 - 600 [*]	kPa	
10	P	WW	0 - 590	0 - 600 [*]	kPa	
12	D	PV			kPa	
13-17	D	PV			kPa	
18	D	BP			kPa	
19	D	WW			kPa	
20	D	DW-WW			kPa	
22-30	T	PV/BP		0 - 300	°C	
31-38	T	DW		0 - 150	°C	
39-44	T	VP		0 - 150	°C	
45-76	T	WW		0 - 150	°C	
PCM Track-1 Channels						
4	P	DW	0 - 590	0 - 600 [*]	kPa	
5-33	P	WW	0 - 590	0 - 600 [*]	kPa	
34-38	S	VP		-2300 - +2300	μm/m	
PCM Track-2 Channels						
4- 7	A	VP	-980 - +980	-980 - +980	m/s ²	
8-19	A	WW	-980 - +980	-50 - +50	m/s ²	

⁺ For meaning of the abbreviations see Table 2-2.

^{*} Linear response of transducer beyond the manufacturer-specified range is assumed.

3. 試験条件と試験結果

TEST 0002 は、株式会社日立製作所によって実施された計4回の検収試験の第2回目であり、この試験においてはじめて圧力容器内の保有水を実炉相当の圧力・温度まで昇圧・昇温し、ラプチャディスクの破断による放出試験を行った。

本試験は、放出配管入口ノズルを圧力容器初期水面より下位に設けたいわゆる水放出試験であり、ブローダウン過程の巨視的様相は実炉における再循環系配管破断事故の場合に類似している。本試験における破断口面積とドライウェル容積（ベント管内気相部容積を含む）の比は $2.45 \times 10^{-5} \text{ 1/m}$ 、破断口面積とベント管総断面積の比は0.00805であり、これらの値は、試験装置の設計にあたって参照したわが国の Mark II プラントの再循環系配管両端破断事故において想定されている値のそれぞれ約47%および約41%に相当する。

圧力容器の昇温・昇圧は2月20日、21日の2日間にわたって行った。放出開始に先立って主放出弁（AV-1）を閉じ冷水放出弁（CV-2）を開いて主放出弁下流側を約2.4 MPaまで減圧し、放出配管内に窒素ガスを注入して圧力容器圧力とほぼ等しい圧力まで加圧し、再び主放出弁を開いて放出配管内の流体の温度上昇を待った後、ラプチャディスクを破断して放出を開始した。窒素ガスの充てんは、ラプチャディスクの直上流に気相部を設けることにより、破断後のラプチャディスクの展開を確実にすることを目的としている。放出開始前後の運転記録を Fig 3.1 に示す。また、圧力容器、放出配管内の初期温度分布を Fig 3.2 に、ドライウェル、ウェットウェル内の初期および放出終了後の温度分布をそれぞれ Fig 3.3、Fig 3.4 に示す。

試験結果の定量的評価・解析は後報にゆずり、ここでは結果の概要のみを述べる。

放出開始直後、放出配管内には一時的に最大約1.2 MPaの減圧が生じた。なお放出開始前に窒素ガスの充てんを行ったため、放出配管内の初期水位は明らかでない。放出配管内流体の初期温度は飽和温度を最大50°C下回った。圧力容器内の水位は放出開始後約56秒で放出配管入口レベルまで下降し、以後放出流体のクオリティが上昇した。

放出初期のドライウェル圧力上昇率（放出開始からベントクリアリングまでの期間の平均値）は約50 kPa/sであった。この値は、実炉の再循環系配管両端破断事故時において想定されている値の約 $\frac{1}{3}$ ないし $\frac{1}{4}$ である。

ベントクリアリングは、放出開始約1.3秒後に、各ベント管においてほぼ同時に生じた。本試験では、ドライウェル圧力上昇率が小さいためベントクリアリング時のプール底面・壁面の圧力上昇、ベントクリアリング後のプール水位上昇（プールのスウェル）はいずれも小さく、プール最高水位は計測点L7において11.75 m（初期水位から4.225 m上方）、他の計測点では11.0 m以下であった。

ドライウェル温度は、放出開始前ほぼ層状に分布し、最大20°Cの不均一を示した。放出開始後約40秒で温度分布は均一になり飽和温度にはほぼ一致する値となった。また約120秒以後ドライウェル雰囲気は過熱状態となり、ベント管内の熱電対の一部も過熱状態を示した。ドライウェ

ル内の蓄積水量は、全放出流量とプール水重量（水位）の増加の差から約 6.6×10^3 kg と評価され、これは全放出量の約 30 % に相当する。

試験開始前のウェットウェル気相部温度、圧力抑制プール温度はそれぞれほぼ均一であった。試験開始後、プールのスウェルによる気相部圧縮、およびベント管、ダイアフラムフロアからの熱伝達により気相部温度が上昇した。プール底面から 9 m 以下の位置に設置された熱電対はプールのスウェルに際して冠水し、以後の出力は気相温度を正しく示していないと考えられる。プール水の混合は不完全であり、プール底面および水面付近の温度上昇はベント管出口高さ付近の温度上昇より遅れた。ブローダウンの後半、ベント管内の蒸気中の空気分率が低下しチャギングが発生しはじめるとプール内の混合は良好となった。

本試験における最大放出流量は約 200 kg/s、ベント流中の蒸気の最大質量速度は約 $30 \text{ kg/m}^2\text{-s}$ と評価される。プールのスウェル終了直後から、格納容器各部ではほぼ周期的な圧力振動が観察され、この圧力振動に同期してベント管内にプール水が間欠的に流入した。放出開始後約 55 秒から典型的なチャギングが発生し、約 55 秒から約 100 秒にかけてプール内の圧力振動の振幅は特に大きな値を示した。いずれの場合も、各ベント管内の水位変動はほぼ同位相であった。大振幅のチャギングに際してベント管内の圧力がウェットウェル気相部圧力を一時的に下回り、ベント管 VP3 に設置されたバキュームブレーカが少なくとも 1 回動作した。

放出開始約 220 秒後に主放出弁を全閉とし、試験を終了した。

謝 辞

本報告は、先に作成した非公開資料 JAERI - memo 8255 の内容に検討・修正を加えたものを、科学技術庁原子力局技術振興課の指導のもとに公開に付するものである。

本報告で報告する TEST 0002 は、試験装置の第 2 回検収試験として、株式会社日立製作所をはじめとする装置製作者各社により実施された

また、原研内では、安全工学部安全試験技術室の関口一雄室長、三森武男氏、宮本善夫氏、千葉辰夫氏、伊藤秀雄氏、大崎秀機氏、塚本導雄氏が、試験装置の設計・製作を担当した。

本報告の刊行にあたり、これらの各位に深甚なる謝意を表する。

Table 3.1 Test Matrix

(As of October 1979)

Test Number	DISCHARGE CONDITIONS				INITIAL CONDITIONS					Vacuum Breaker Functionability	Date of Performance	Ref. Report Number JAERI-M	REMARKS		
	Disch. Fluid	Nozzle Diam. (mm)	Pipe Inlet Level (m)	Drywell Prepurge (%)	Time of Blowdown (s)	Pressure Vessel		Water Level (m)	Pool Temp. (°C)					Vent Subm. (m)	
						Press. (kPa)	Temp. (°C)								
0001	water	100	2.105	none		ca. 600			22.5	3.342	7	yes	2/18/79		Shakedown test performed by Hitachi Ltd. Excluded from reporting.
0002	water	100	2.105	none		7015	286	6.28	24.6	3.867	7	yes	2/21	present	Shakedown test performed by Hitachi Ltd.
0003	water	100	2.105	none		6976	286	7.35	27.8	3.802	7	yes	2/23		Shakedown test performed by Hitachi Ltd.
0004	water	200	2.105	none		7005	286	6.89	9.9	3.852	7	yes	2/28		Shakedown test performed by Hitachi Ltd.
1101	water	200	2.105	none	72	7020	286	7.17	29.9	3.632	7	yes	3/30		
2101	water	74	2.105	none	343	6966	287	7.99	14.2	3.345	7	yes	4/27		
3101	water	74	2.105	23	298	6887	286	7.79	18.9	3.347	7	yes	5/25		
3102	water	200	2.105	98	68.5	6966	287	7.73	33.2	3.622	7	yes	6/29		
1201	steam	200	9.105	none	85	6894	286	5.71	52.3	3.327	7	yes	8/24		
1202	steam	240	9.105	none			286		53.5	3.342	7	yes	9/14		
1203	steam	220	9.105	none			286		53.9	3.340	7	yes	10/05		

TEST NO. = A B C D

A = 1 Pool Swell Test

A = 2 Condensation Oscillation Test without Prepurge

A = 3 Condensation Oscillation Test with Prepurge

B = 1 Water Blowdown

B = 2 Steam Blowdown

B = 3 Air Blowdown

CD = Sequential Number

Table 3.2 Test Specifications

FULL-SCALE MARK II CRT DATA SHEET (TEST SPECIFICATIONS)

TEST NUMBER 0002 DATE OF PERFORMANCE Feb. 21, 1979

(A) SPECIFICATIONS FOR TEST FACILITY CONFIGURATION AND TEST PROCEDURE

- (1) Diameter of Discharge Nozzle (mm) 100
- (2) Inlet Level of Blowdown Pipe (m) 2.105
- (3) Percentage of Prepurge, Specified/Performed (%) None
- (4) Number of Open Vent Pipes 7
- (5) Vacuum Breaker Functionability yes

(B) SPECIFICATIONS FOR INITIAL CONDITIONS

(1) Pressure Vessel

Item	Specified	Performed
Pressure (kPa)	6966	7015
Temperature (°C)	285	286
Water Level (m)	5.0	6.3

(2) Test Containment

Item		Specified	Performed	
			Before Prepurge	Before Break
Pressure (kPa)	Drywell	101		101
	Wetwell	101		101
Pool Temp. (°C)		25		24
Pool Level (m)		7.5		7.525

(C) Ambient Conditions

Pressure (kPa) _____ Temperature (°C) _____

Table 3.3 Summary of Data Recording

(A) Structure of Computer Processed Tapes

Tape No.		00020		00021		00022	
File No.	Index	Contents	Period (s)	Contents	Period (s)	Contents	Period (s)
1		Tape No. Heading		Tape No. Heading		Tape No. Heading	
2	1	R0		R0		R0	
3	2	R1		R1		R1	
4	3	R2		R2		R2	
5	4	Data	-8 - 378	Data		Data	
6	5						

(B) STRUCTURE OF PCM TAPE

Record No.	Tape Counter	Time Code	Contents
1	4050 - 4100		R0
2	4100 - 4151		R1
3	4151 - 4201		R2
4	4201 - 6104		Data
5			
6			

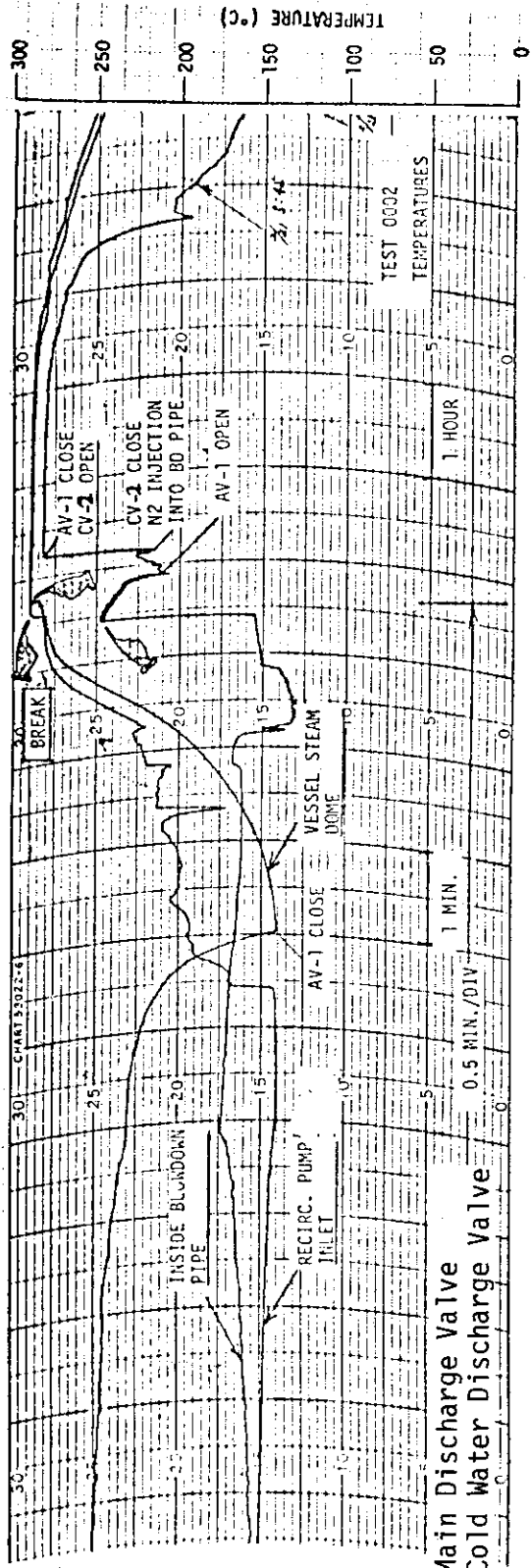
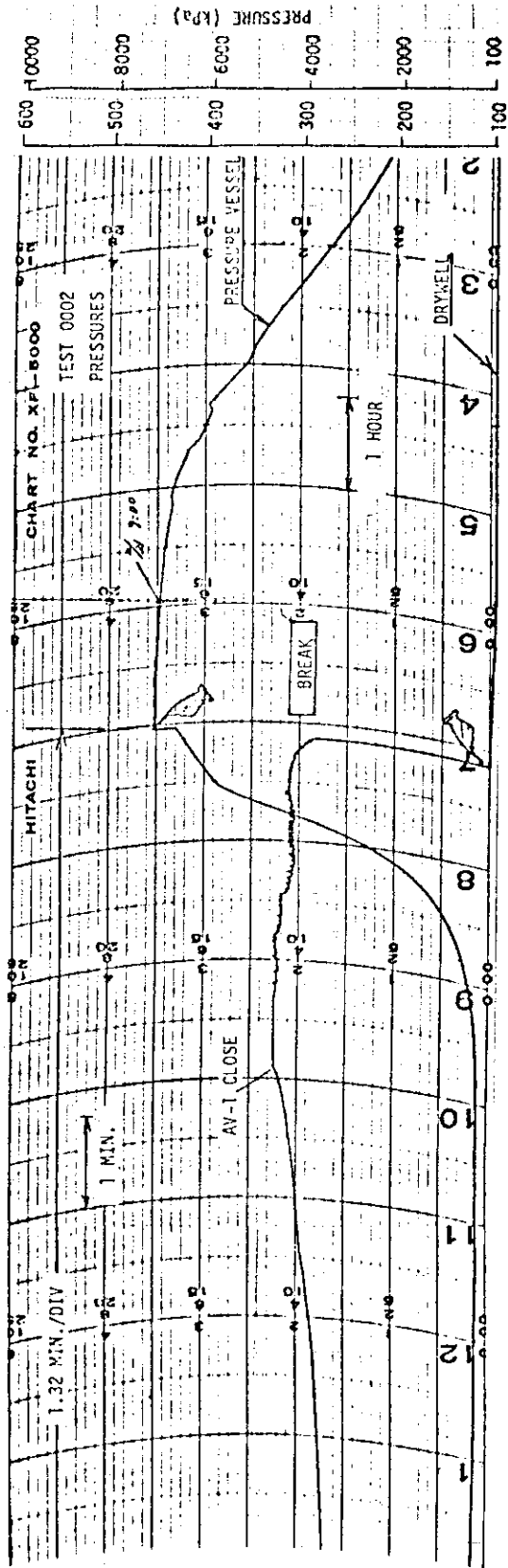
- Notes: 1. Last digit of tape number indicates contents of the tape;
 0 Online data recorded by the system computer.
 1 Data transferred from PCM recorder track 1.
 2 Data transferred from PCM recorder track 2.
 2. R0, R1, R2 are records for calibration of data channels;
 R0 Zero scale calibration outputs.
 R1 Full scale calibration outputs.
 R2 Initial values.

Table 3.4 Initial and Final Conditions
 TEST NUMBER 0002 DATE OF PERFORMANCE Feb. 21, 1979

	Unit	Before Test	390 s after* Break	Change
<u>PRESSURE VESSEL</u>				
Pressure	kPa	7015		
Averaged Liquid Temperature	°C	286.1	134.6	
Max./Min. Liquid Temperature	°C	286.8/285.6		
Averaged Steam Temperature	°C	286.2	245.4	
Sat. Press. Based on Liquid Temp.	kPa	7035	411.2	
Liquid Level Based on PVDS-001	m	6.651	0.897	
Liquid Level Based on PVDS-002 - 006	m	6.278	0.780	
Mass of Water	kg	1.81×10^4	3.35×10^3	-1.48×10^4
Energy of Water	kJ	2.29×10^7	1.89×10^6	-2.10×10^7
<u>BLOWDOWN PIPE</u>				
Max./Min. Temperature	°C	267.0/236.0		
<u>DRYWELL</u>				
Pressure	kPa	101	295 (275)	
Sat. Temp. Based on Pressure	°C		132.8	
Averaged Gas Phase Temperature	°C	38.6	136.8	
Max./Min. Gas Phase Temperature	°C	45.9/28.3	142.0/133.1	
Liquid Level	m	0	0.042 - 0.090	
<u>VENT PIPES</u>				
Max./Min. Inlet Temperature	°C	16.0/15.4	133.4/133.1	
Max./Min. Outlet Temperature	°C	24.7/24.6	39.0/38.4	
<u>WETWELL</u>				
Pressure	kPa	101	272 (265)	
Averaged Pool Temperature	°C	24.6	38.7	
Max./Min. Pool temperature	°C	24.8/24.2	41.5/35.4	
Averaged Airspace Temperature	°C	16.0	60.1	
Max./Min. Airspace Temperature	°C	16.5/15.6	67.5/50.1	
Liquid Level	m	7.525	7.920 (7.825)	
Mass of Water	kg	2.06×10^5	2.14×10^5	8.21×10^3
Energy of Water	kJ	2.12×10^7	3.47×10^7	1.35×10^7
Mass of Air	kg			

REMARKS

* Numbers in parentheses are data measured after opening the equalizer valve between drywell and wetwell.



AV-1 : Main Discharge Valve
CV-2 : Cold Water Discharge Valve

← TIME

Fig. 3.1 Operation Records

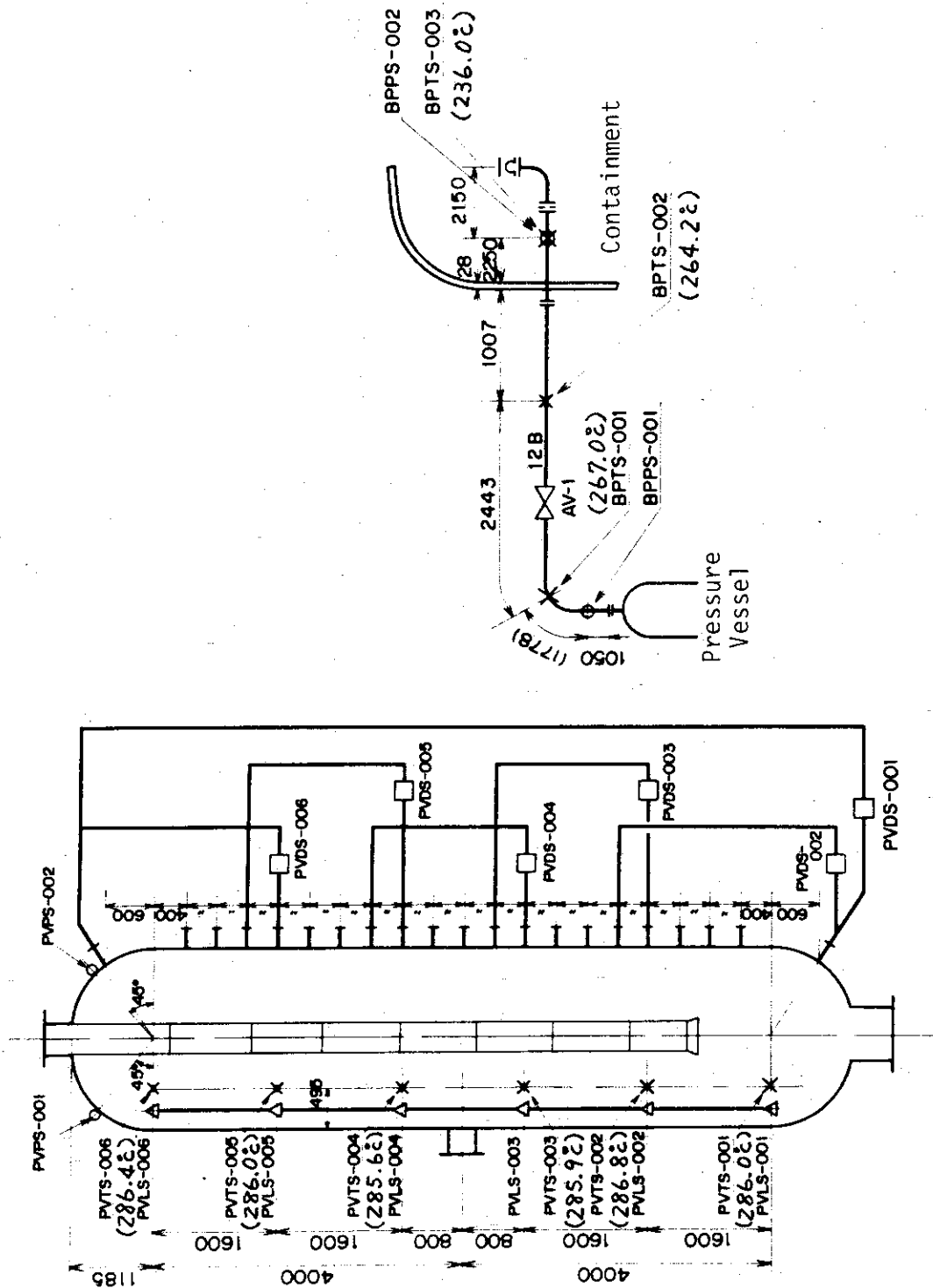


Fig. 3.2 Initial Temperature Distribution in Primary System

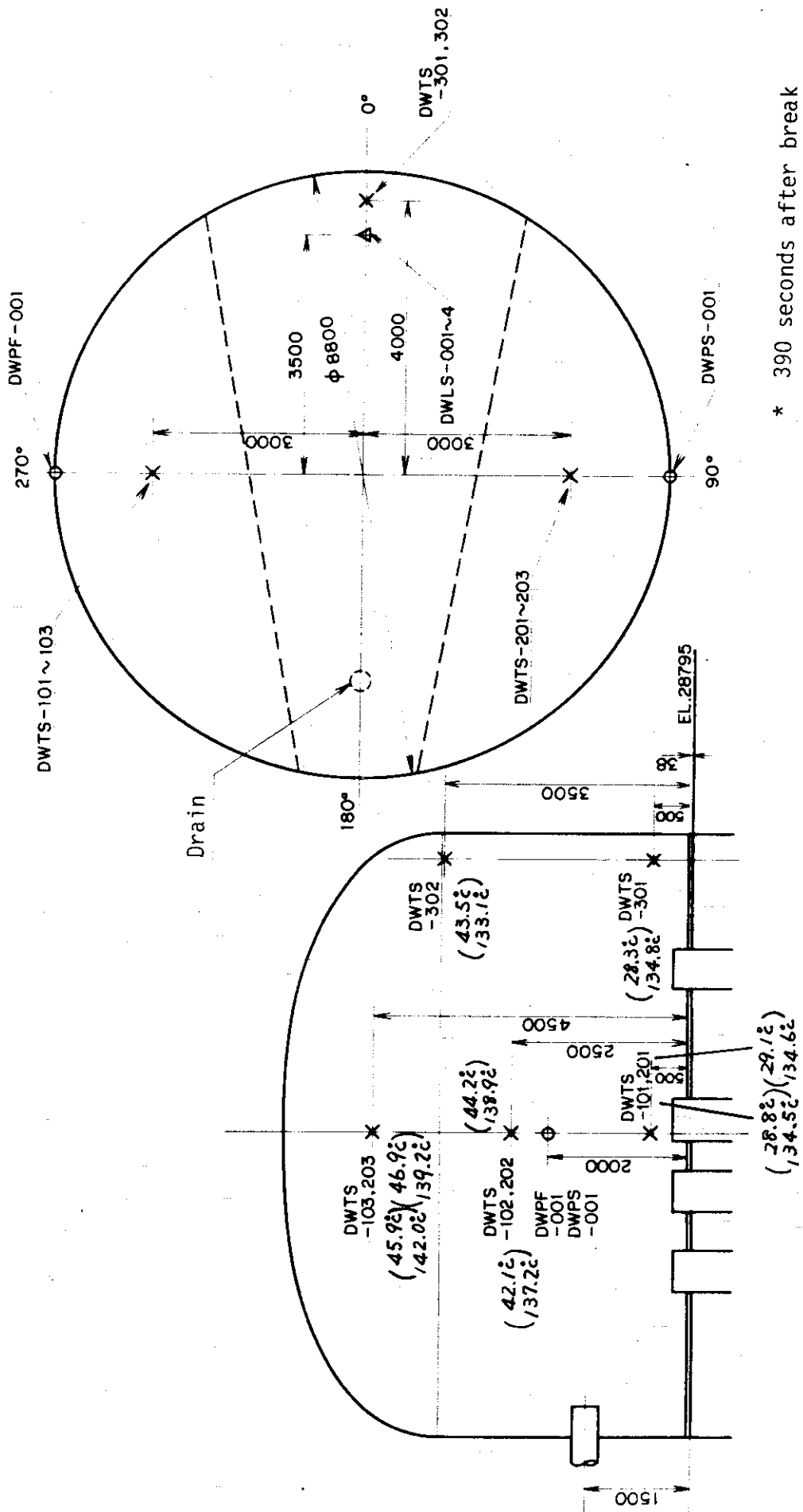
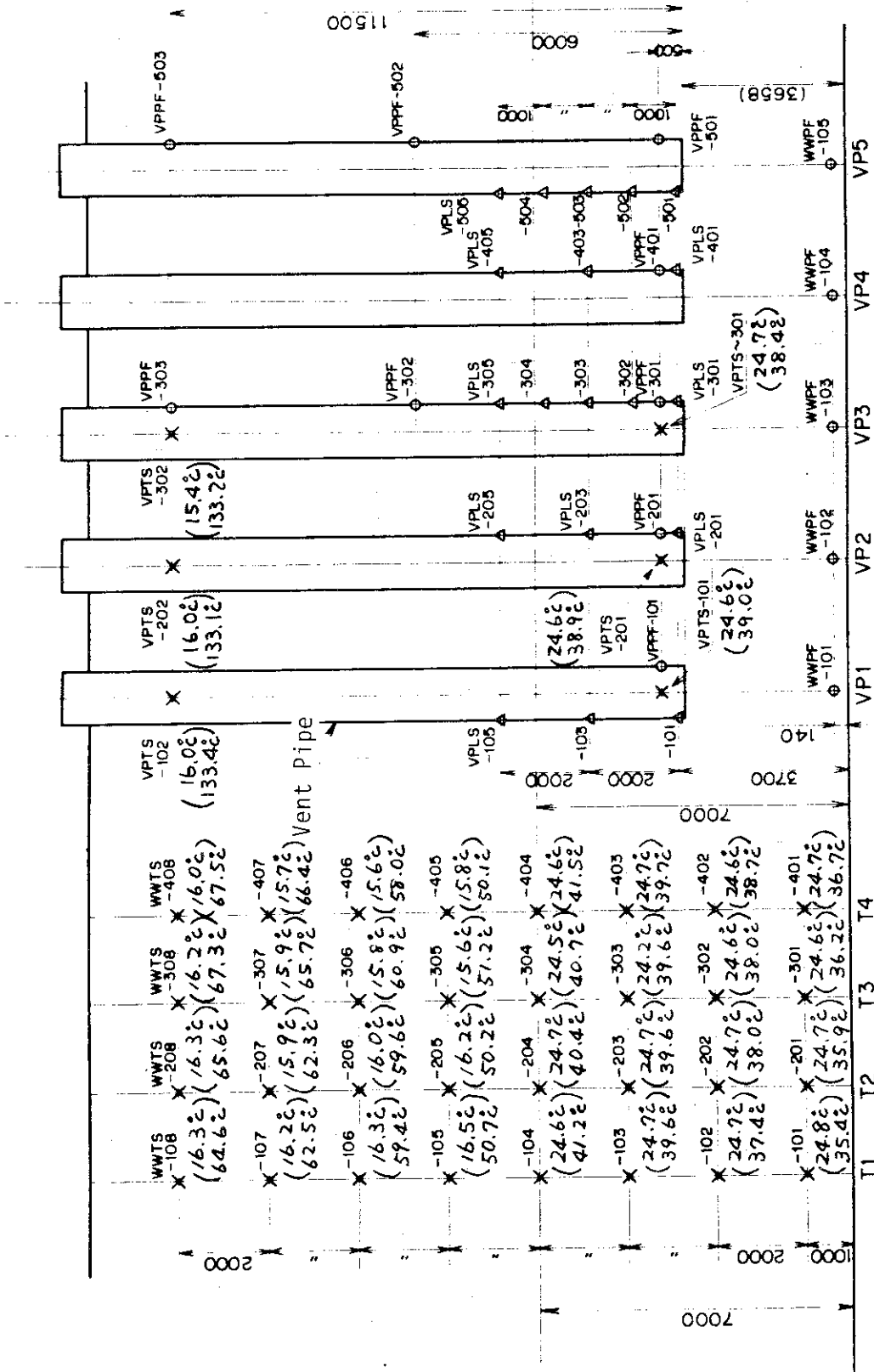


Fig. 3.3 Initial and Final* Temperature Distributions in Drywell



* 390 seconds after break

Fig. 3.4 Initial and Final* Temperature Distributions in Wetwell

Long Term Plots of Data

Long Term Plot Specification

Period 0 - 200 s

Plot No.	Recording System	Recording Rate (data/s)	Sampling Rate for Plots	Interval for Envelope Plots (s)	Remarks
L-1 - L-31	Computer	50	1/6	/	
L-32 - L-57	PCM Track-1	455.55	1/52	2.397	
L-58 - L-71	PCM Track-2	455.55	1/52	2.397	

List of Long Term Plots

Computer Recorded Channels

Plot	L- 1	Actuation Signals	
	L- 2	Pressures in Pressure Vessel and Blowdown Pipe	
	L- 3	Pressures in Drywell and Wetwell Airspace	
	L- 4	DP over Pressure Vessel	
	L- 5	DP across Wetwell Pool Surface	
	L- 6	DP across Diaphragm Floor	
	L- 7	Temperatures in Pressure Vessel	
	L- 8	Temperatures in Pressure Vessel and Blowdown Pipe	
	L- 9	Temperatures in Drywell	(DWTS-101 - 103)
	L-10	Temperatures in Drywell	(DWTS-201 - 203)
	L-11	Temperatures in Drywell	(DWTS-301 - 302)
	L-12	Temperatures in Vent Pipe	(VP1)
	L-13	Temperatures in Vent Pipe	(VP2)
	L-14	Temperatures in Vent Pipe	(VP3)
	L-15	Temperatures in Wetwell	(WWTS-101 - 108)
	L-16	Temperatures in Wetwell	(WWTS-201 - 208)
	L-17	Temperatures in Wetwell	(WWTS-301 - 308)
	L-18	Temperatures in Wetwell	(WWTS-401 - 408)
	L-19	Water Level in Pressure Vessel	
	L-20	Water Level in Drywell	
	L-21	Water Level in Vent Pipe	(VP's 1 and 2)
	L-22	Water Level in Vent Pipe	(VP's 3 and 4)
	L-23	Water Level in Vent Pipe	(VP5)
	L-24	Water Level in Wetwell	(WWLS-104 - 116)
	L-25	Water Level in Wetwell	(WWLS-201 - 216)
	L-26	Water Level in Wetwell	(WWLS-303 - 315)
	L-27	Water Level in Wetwell	(WWLS-401 - 416)
	L-28	Water Level in Wetwell	(WWLS-503 - 515)
	L-29	Water Level in Wetwell	(WWLS-604 - 616)
	L-30	Water Level in Wetwell	(WWLS-704 - 716)
	L-31	Water Level in Wetwell	(WWLS-804 - 816)

List of Long Term Plots (continued)

PCM Track-1 Channels

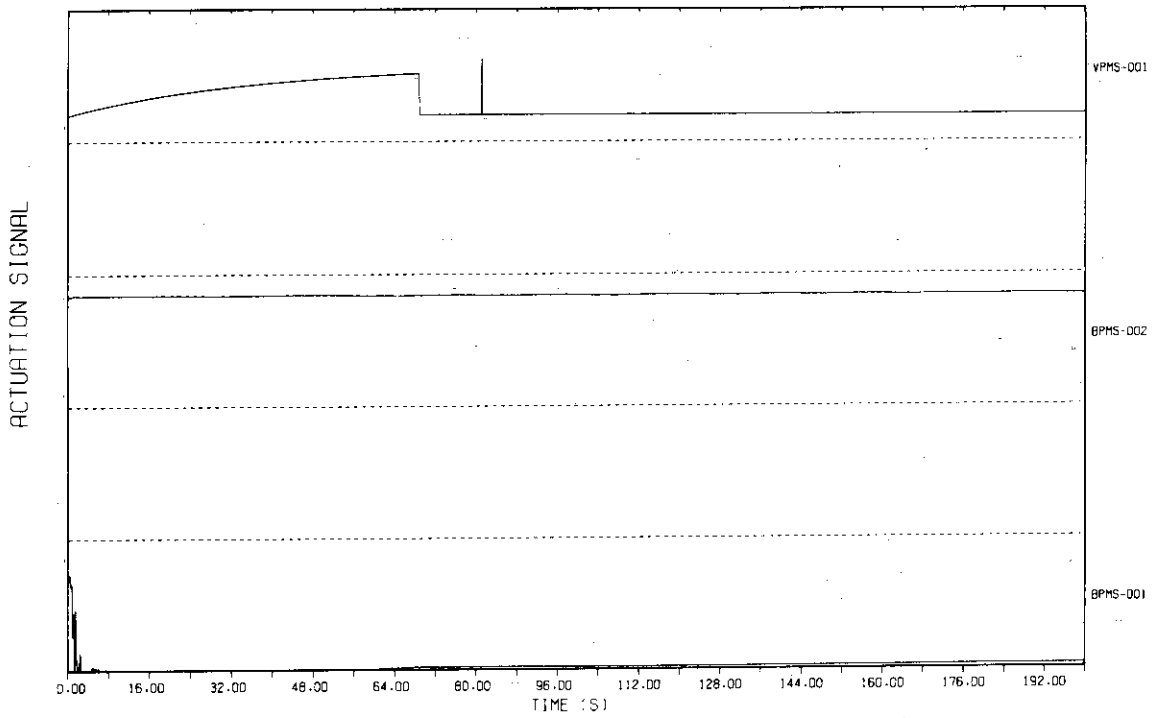
Plot	L-32	Pressures in Drywell and Wetwell Airspace	
	L-33	Pressure in Vent Pipe	(VPPF-201)
	L-34	Pressure in Vent Pipe	(VPPF-302)
	L-35	Pressure in Vent Pipe	(VPPF-303)
	L-36	Pressure in Vent Pipe	(VPPF-401)
	L-37	Pressure in Vent Pipe	(VPPF-501)
	L-38	Pressure in Vent Pipe	(VPPF-502)
	L-39	Pressure in Vent Pipe	(VPPF-503)
	L-40	Pressure in Wetwell	(WWPF-102)
	L-41	Pressure in Wetwell	(WWPF-103)
	L-42	Pressure in Wetwell	(WWPF-104)
	L-43	Pressure in Wetwell	(WWPF-105)
	L-44	Pressure in Wetwell	(WWPF-106)
	L-45	Pressure in Wetwell	(WWPF-107)
	L-46	Pressure in Wetwell	(WWPF-201)
	L-47	Pressure in Wetwell	(WWPF-202)
	L-48	Pressure in Wetwell	(WWPF-302)
	L-49	Pressure in Wetwell	(WWPF-401)
	L-50	Pressure in Wetwell	(WWPF-402)
	L-51	Pressure in Wetwell	(WWPF-501)
	L-52	Pressure in Wetwell	(WWPF-502)
	L-53	Pressure in Wetwell	(WWPF-602)
	L-54	Pressure in Wetwell	(WWPF-702)
	L-55	Strain of Vent Pipe Brace	(VPSF-101)
	L-56	Strain of Vent Pipe Brace	(VPSF-102)
	L-57	Strain of Vent Pipe Brace	(VPSF-201)

PCM Track-2 Channels

Plot	L-58	Acceleration of Vent Pipe Outlet	(VPAF-101)
	L-59	Acceleration of Vent Pipe Outlet	(VPAF-103)
	L-60	Acceleration of Vent Pipe Outlet	(VPAF-201)
	L-61	Acceleration of Containment Structure	(WWAF-005)
	L-62	Acceleration of Containment Structure	(WWAF-006)
	L-63	Acceleration of Containment Structure	(WWAF-007)
	L-64	Acceleration of Containment Structure	(WWAF-008)
	L-65	Acceleration of Containment Structure	(WWAF-009)
	L-66	Acceleration of Containment Structure	(WWAF-010)
	L-67	Phase Boundary Signals	(WWLF-101 - 108)
	L-68	Phase Boundary Signals	(WWLF-201 - 209)
	L-69	Phase Boundary Signals	(WWLF-301 - 308)

TEST 2

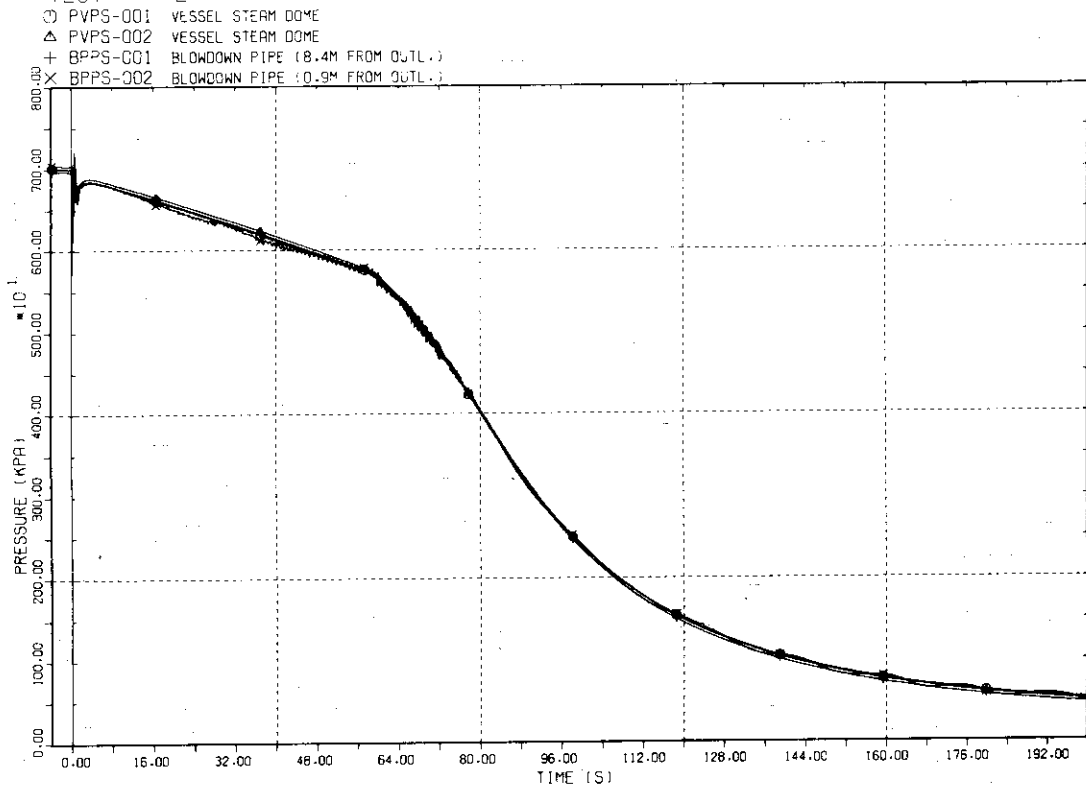
FULL-SCALE MARK II CRT



Plot L-1 Actuation Signals

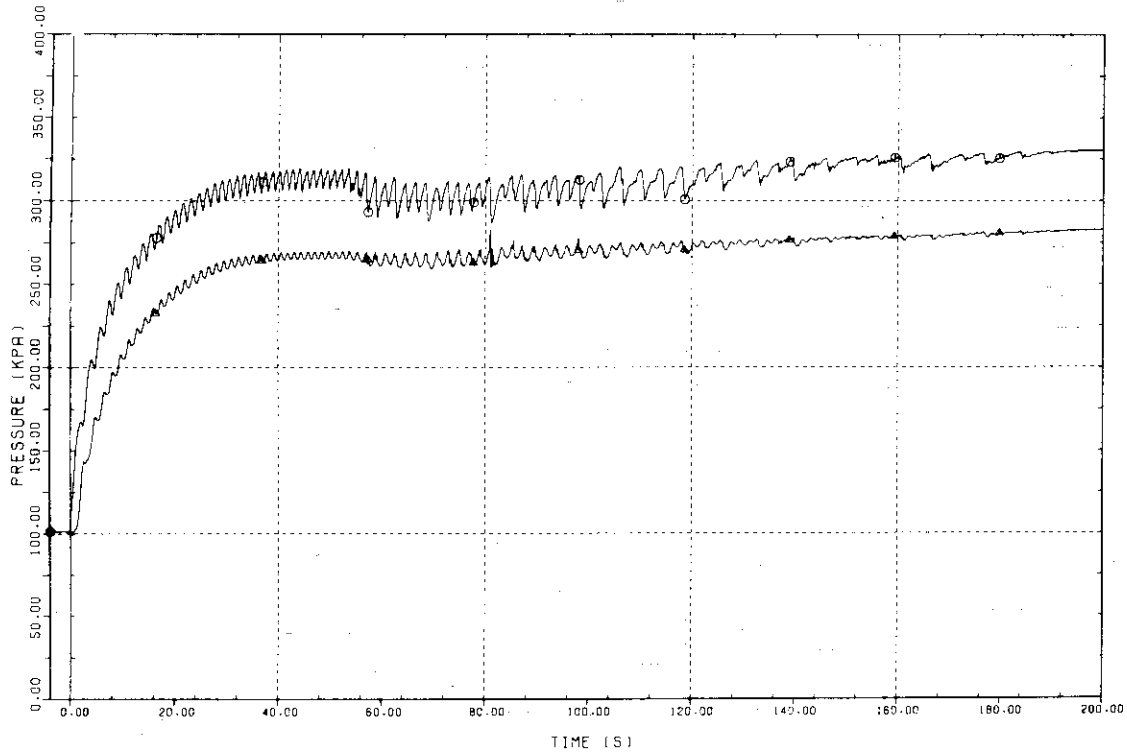
TEST 2

FULL-SCALE MARK II CRT



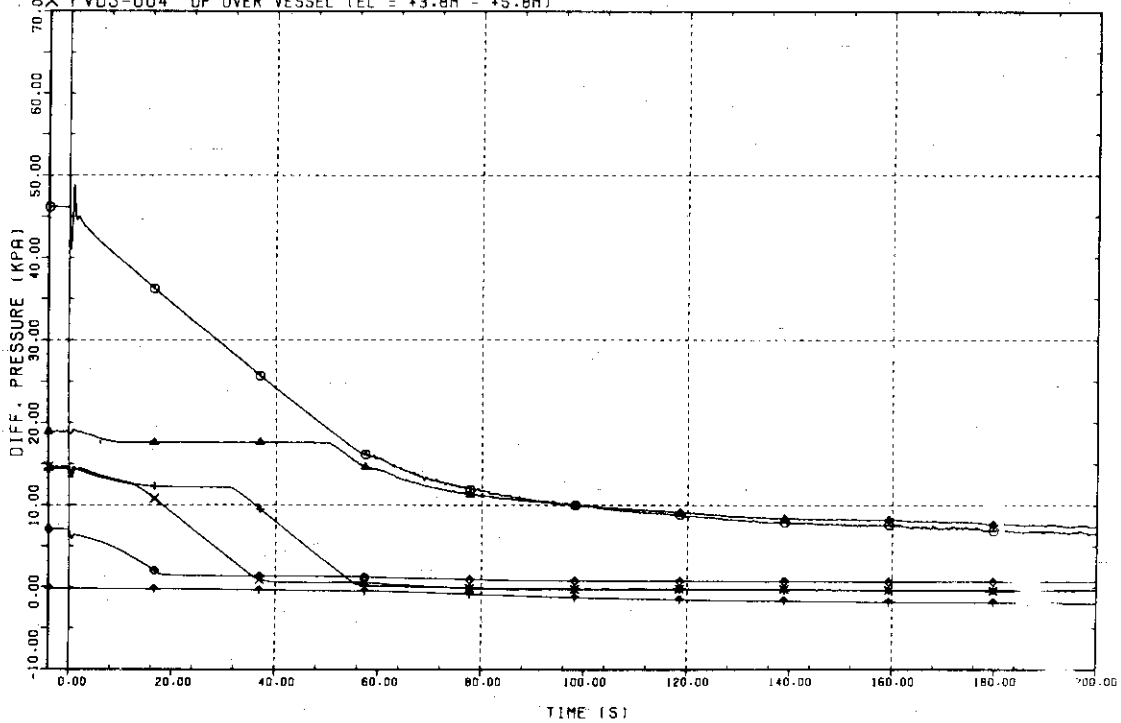
Plot L-2 Pressures in Pressure Vessel and Blowdown Pipe

TEST 2 FULL-SCALE MARK II CRT
 ○ DWPS-001 DRYWELL
 ▲ WWPS-001 WETWELL AIRSPACE (15.0M ABOVE BOT.)



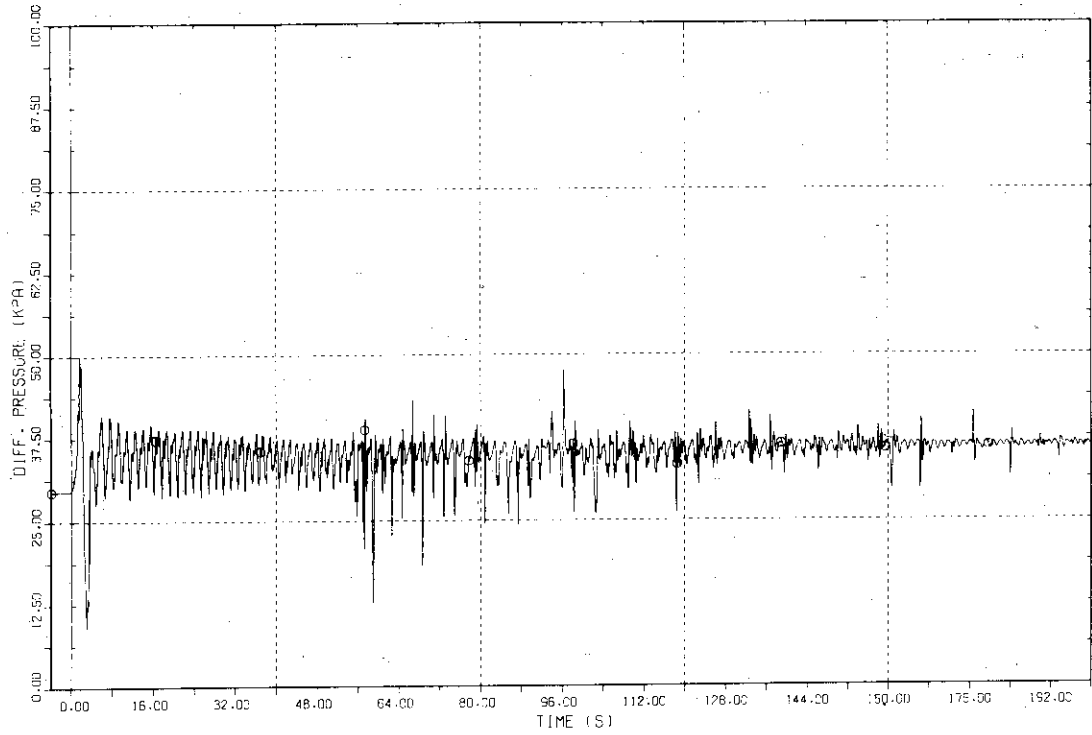
Plot L-3 Pressures in Drywell and Wetwell Airspace

TEST 2 FULL-SCALE MARK II CRT
 ○ PVDS-001 DP OVER VESSEL (EL = 0.0M - +9.2M) ◇ PVDS-005 DP OVER VESSEL (EL = +5.4M - +7.4M)
 ▲ PVDS-002 DP OVER VESSEL (EL = 0.0M - +2.6M) ♣ PVDS-006 DP OVER VESSEL (EL = +7.0M - +9.2M)
 + PVDS-003 DP OVER VESSEL (EL = +2.2M - +4.2M)
 X PVDS-004 DP OVER VESSEL (EL = +3.8M - +5.8M)



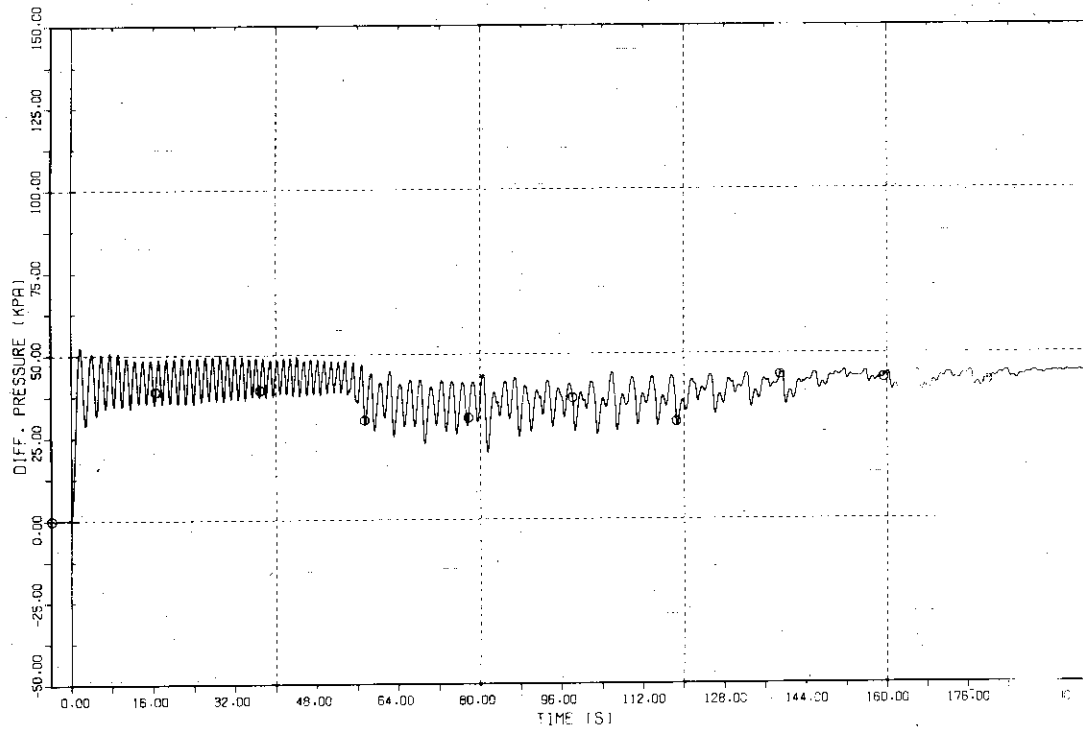
Plot L-4 DP over Pressure Vessel

TEST 2 FULL-SCALE MARK II CRT
O WWS-001 DP OVER POOL (E.L. = 4.5M - 15.5M)

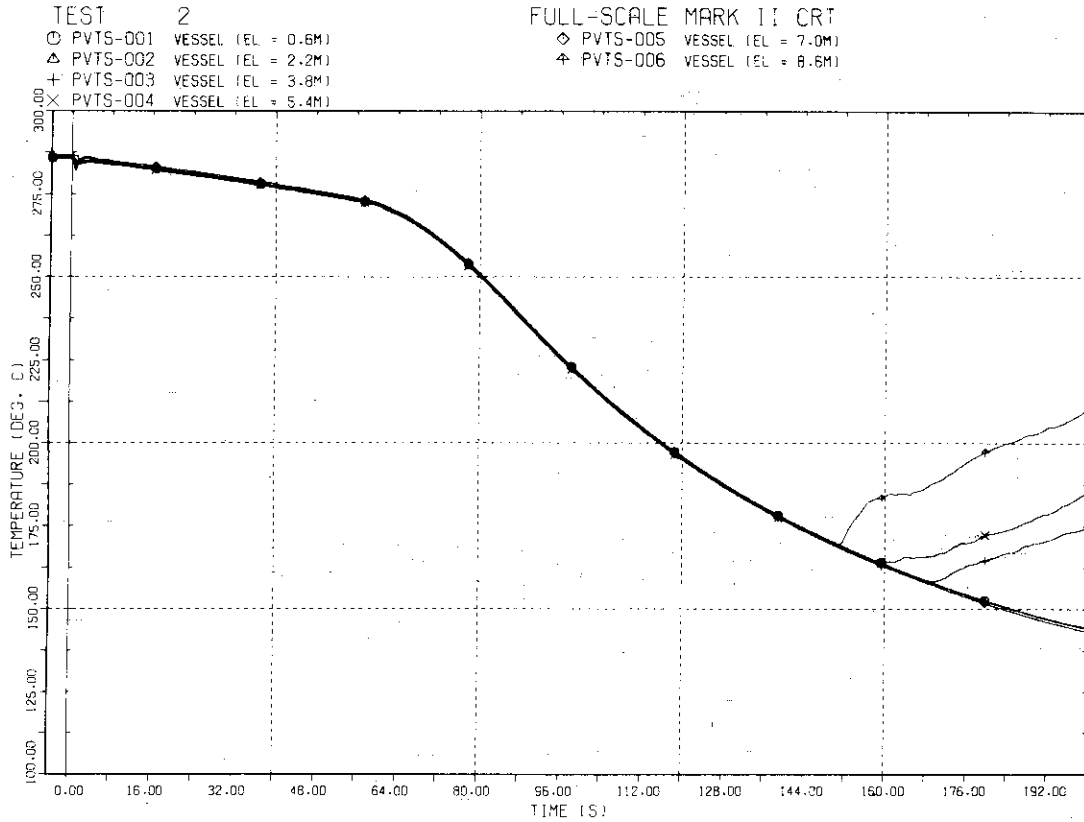


Plot L-5 DP across Wetwell Pool Surface

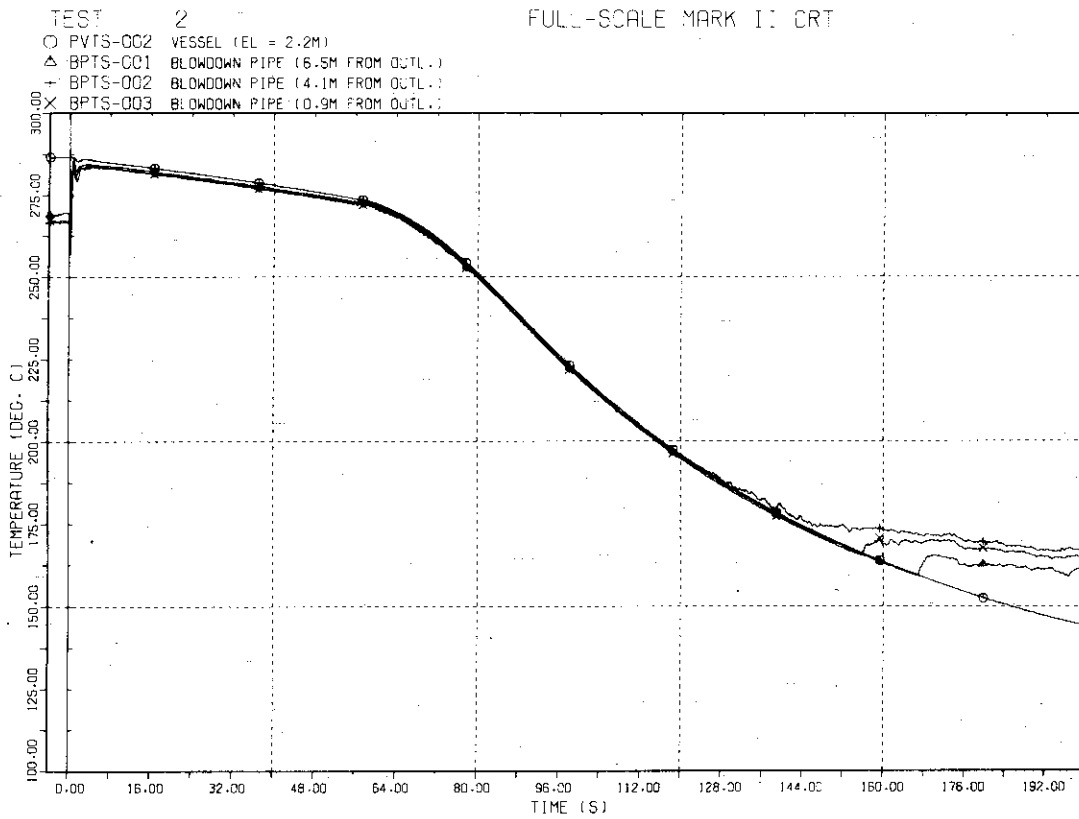
TEST 2 FULL-SCALE MARK II CRT
O WWS-002 DP ACROSS DIAPHRAGM FLOOR



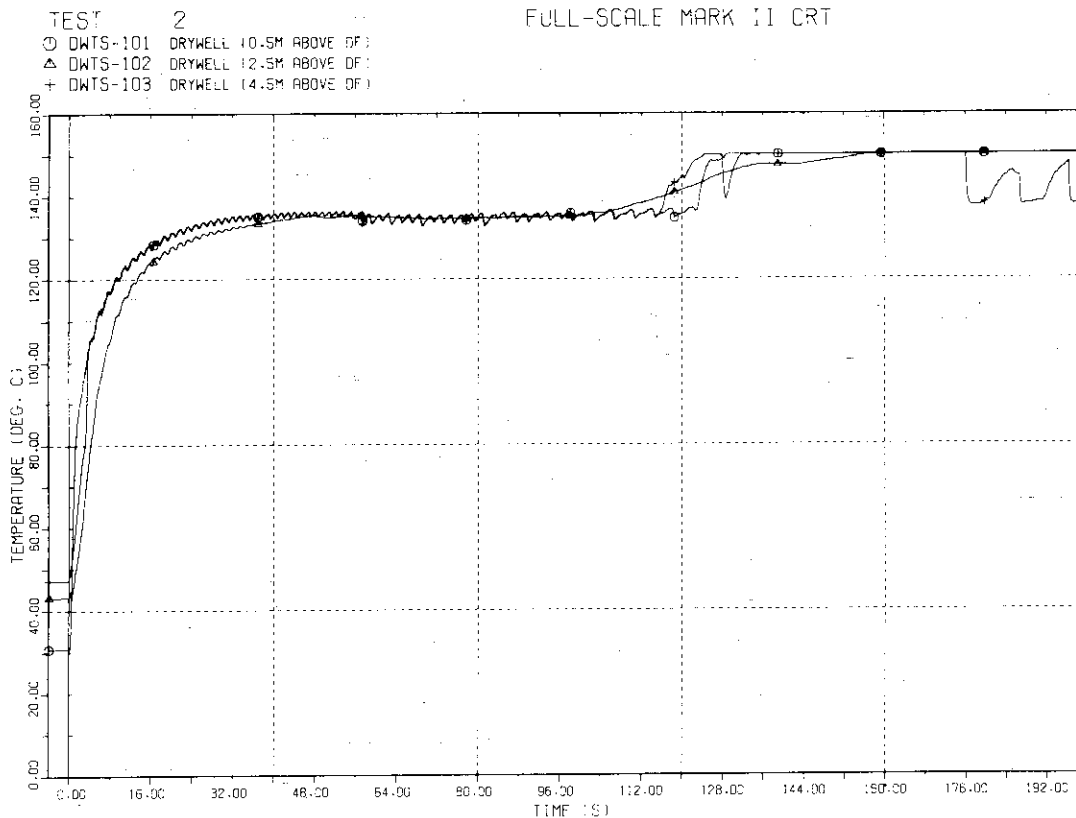
Plot L-6 DP across Diaphragm Floor



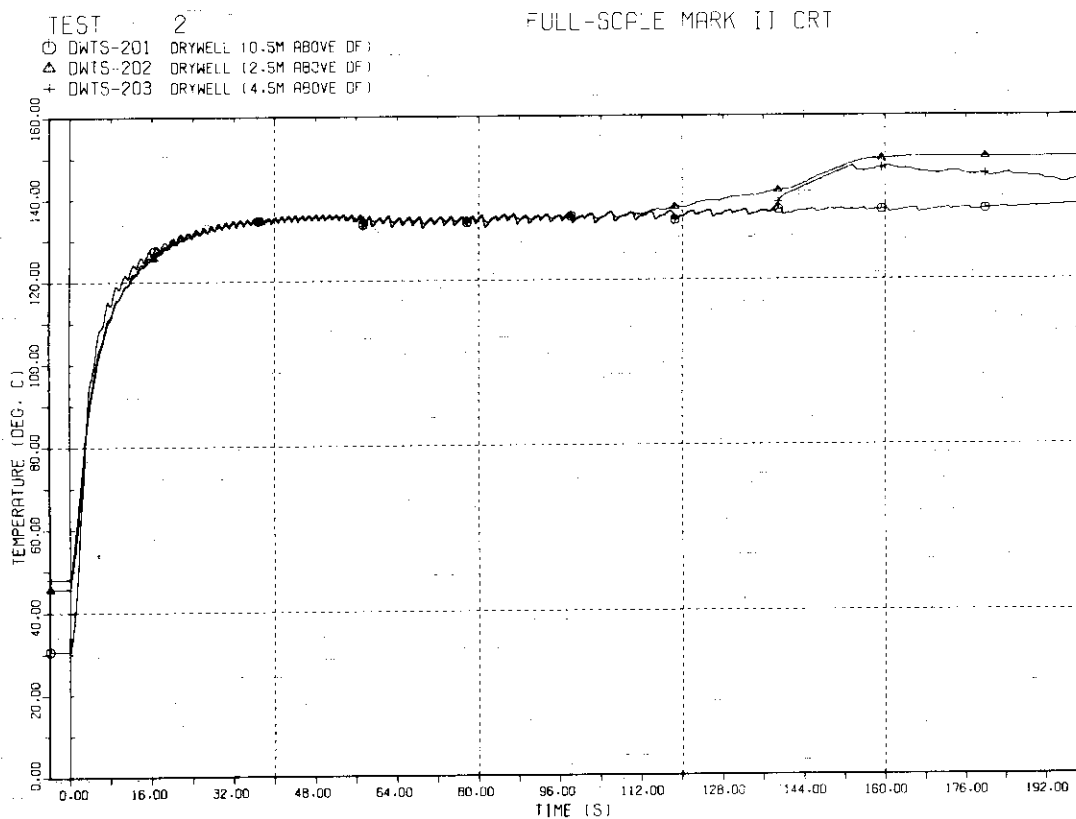
Plot L-7 Temperatures in Pressure Vessel



Plot L-8 Temperatures in Pressure Vessel and Blowdown Pipe



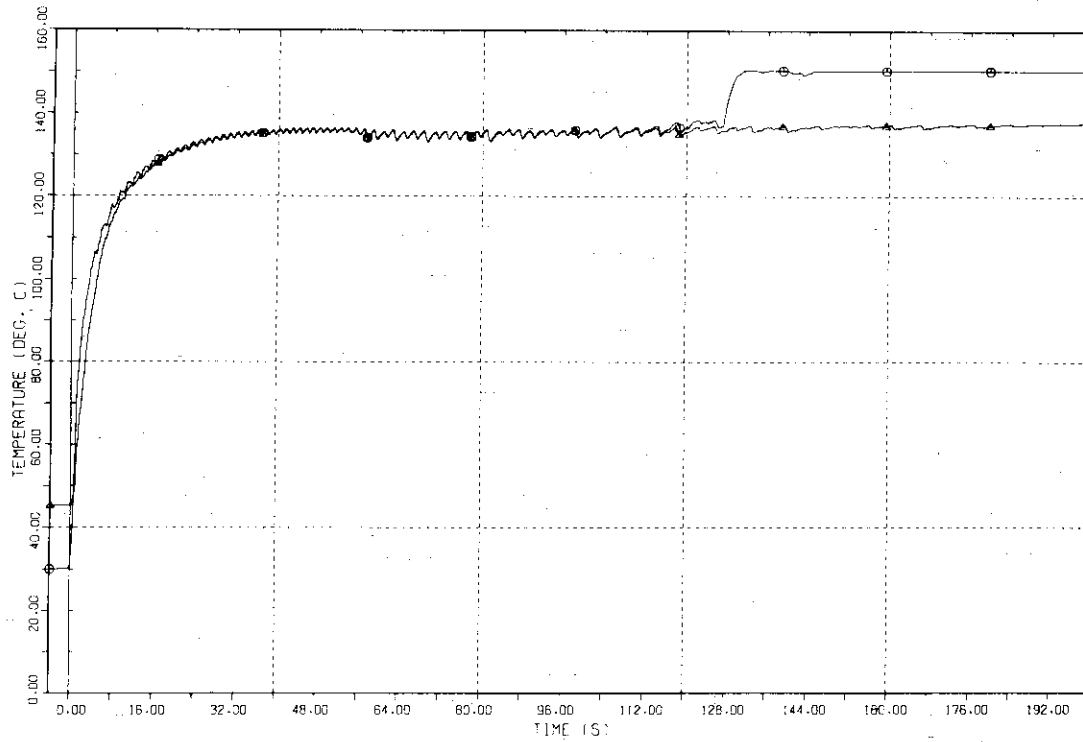
Plot L-9 Temperatures in Drywell



Plot L-10 Temperatures in Drywell

TEST 2
 ○ DWTS-301 DRYWELL (0.5M ABOVE DF)
 △ DWTS-302 DRYWELL (3.5M ABOVE DF)

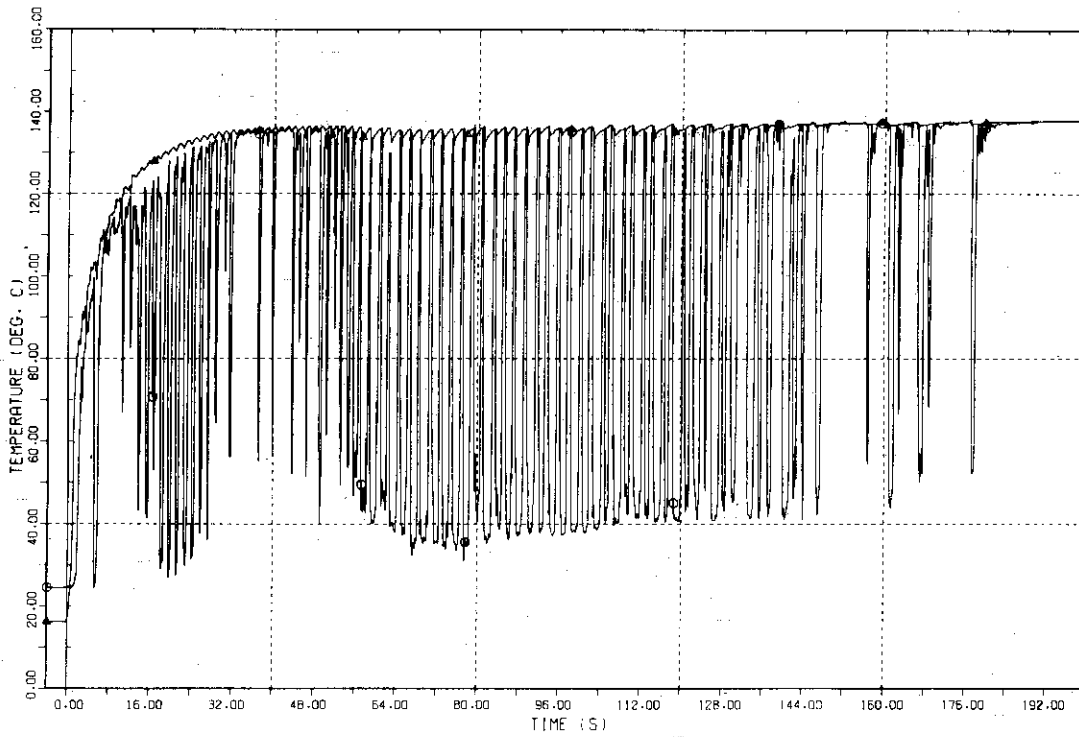
FULL-SCALE MARK II CRT



Plot L-11 Temperatures in Drywell

TEST 2
 ○ VPTS-101 VP1 (0.5M ABOVE OUTL.)
 △ VPTS-102 VP1 (11.5M ABOVE OUTL.)

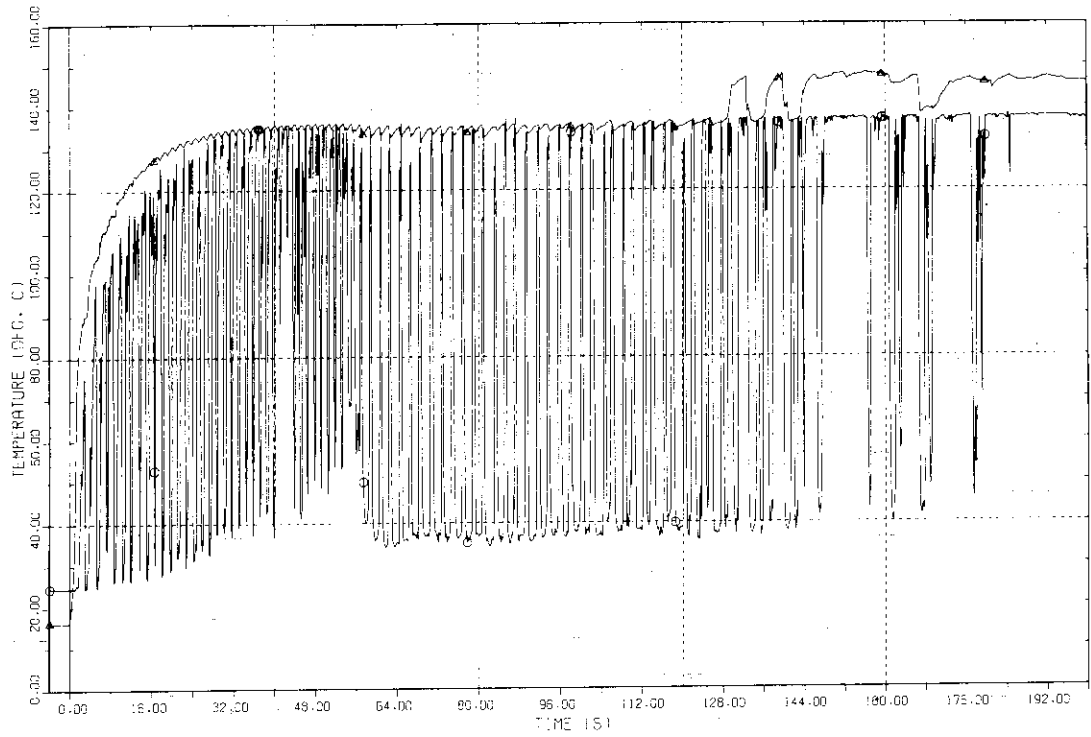
FULL-SCALE MARK II CRT



Plot L-12 Temperatures in Vent Pipe

TEST 2
 ○ VPTS-201 VP2 (0.5M ABOVE OUTL.)
 △ VPTS-202 VP2 (11.5M ABOVE OUTL.)

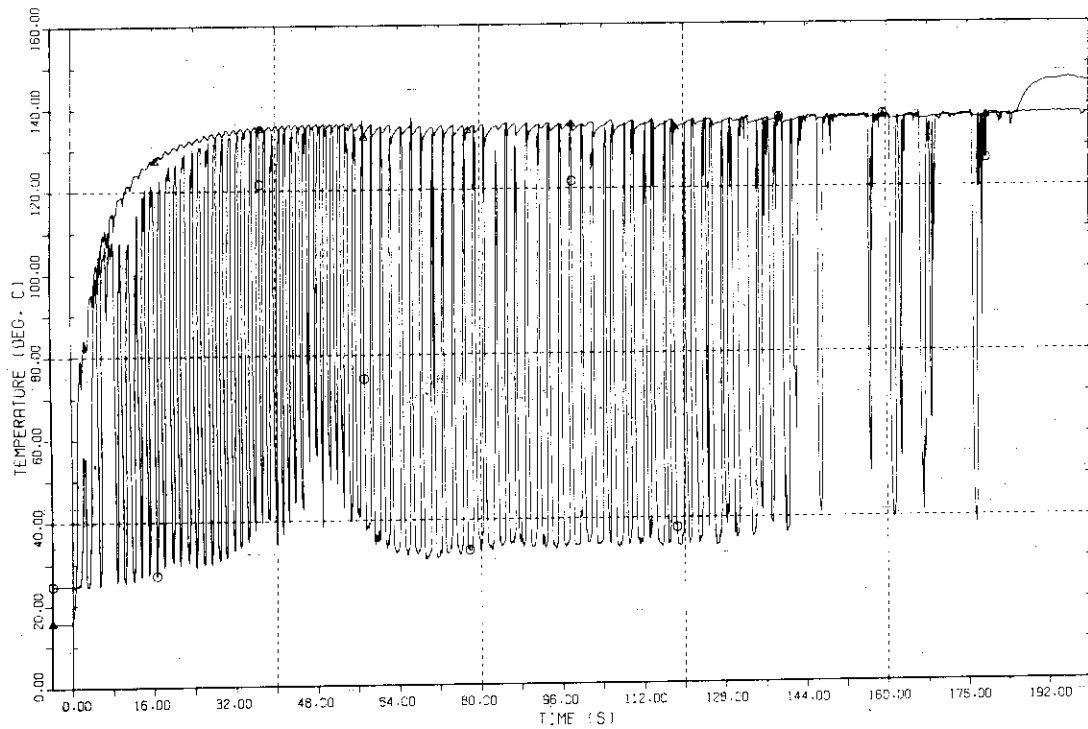
FULL-SCALE MARK II CRT



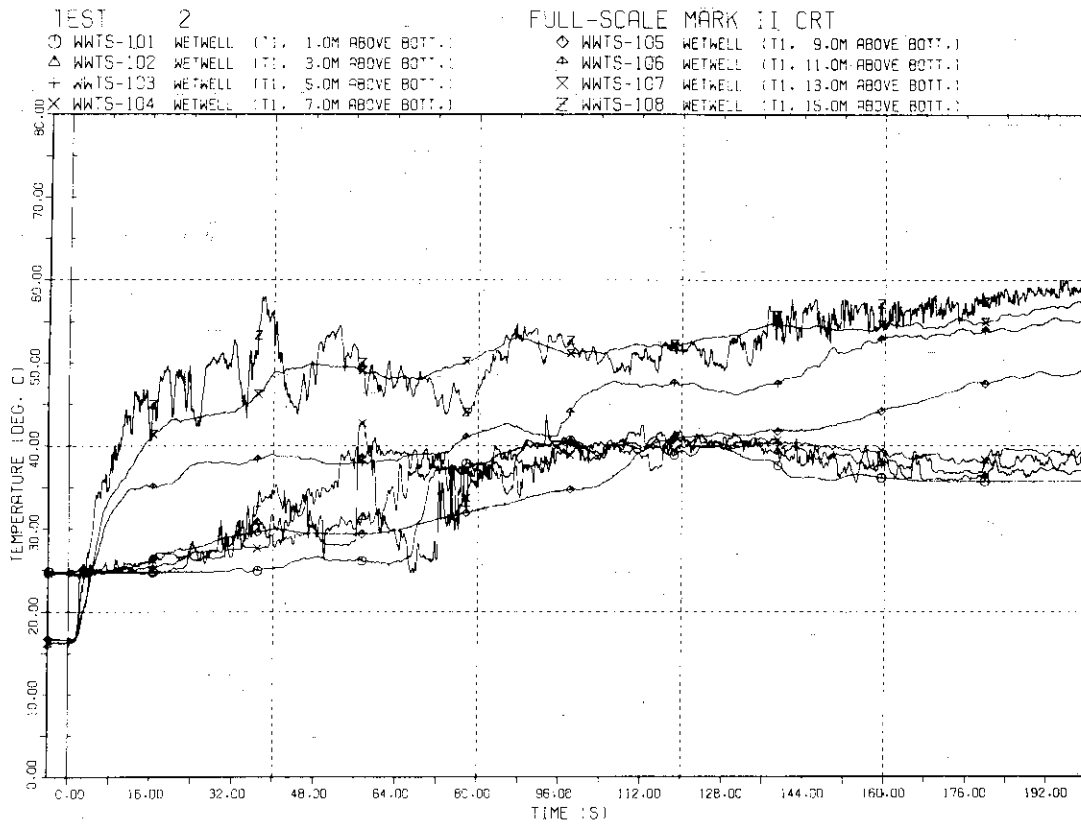
Plot L-13 Temperatures in Vent Pipe

TEST 2
 ○ VPTS-301 VP3 (0.5M ABOVE OUTL.)
 △ VPTS-302 VP3 (11.5M ABOVE OUTL.)

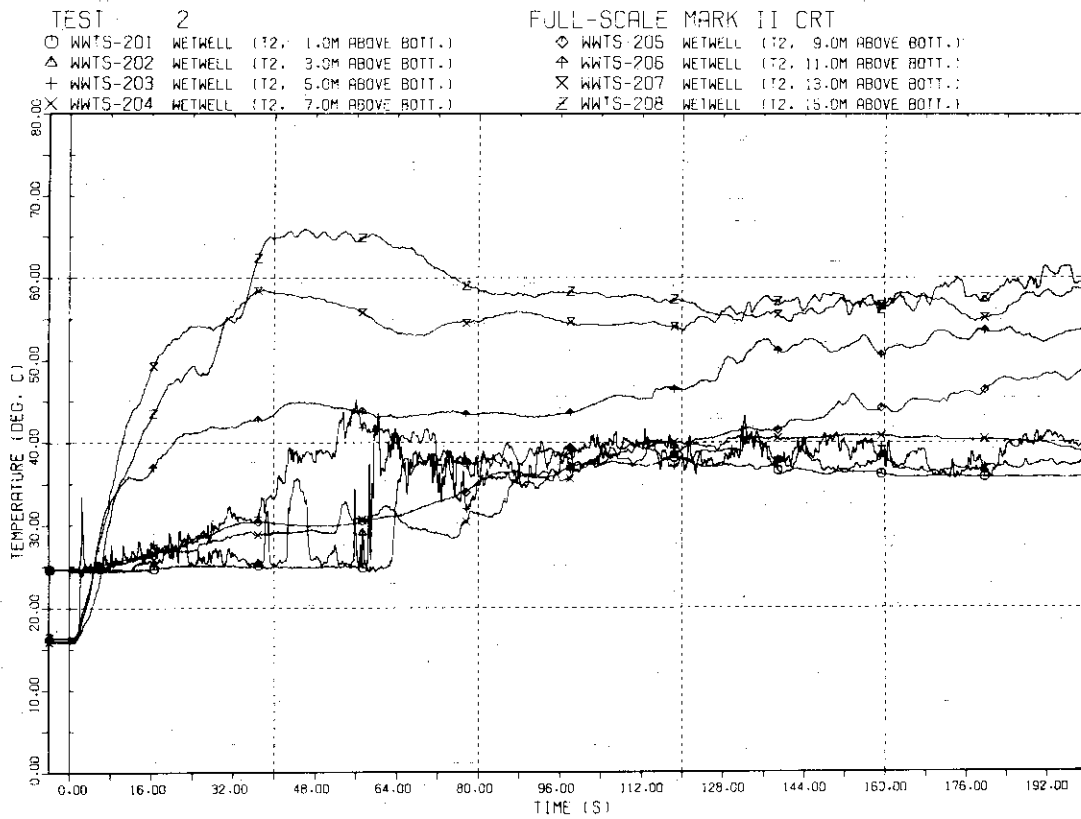
FULL-SCALE MARK II CRT



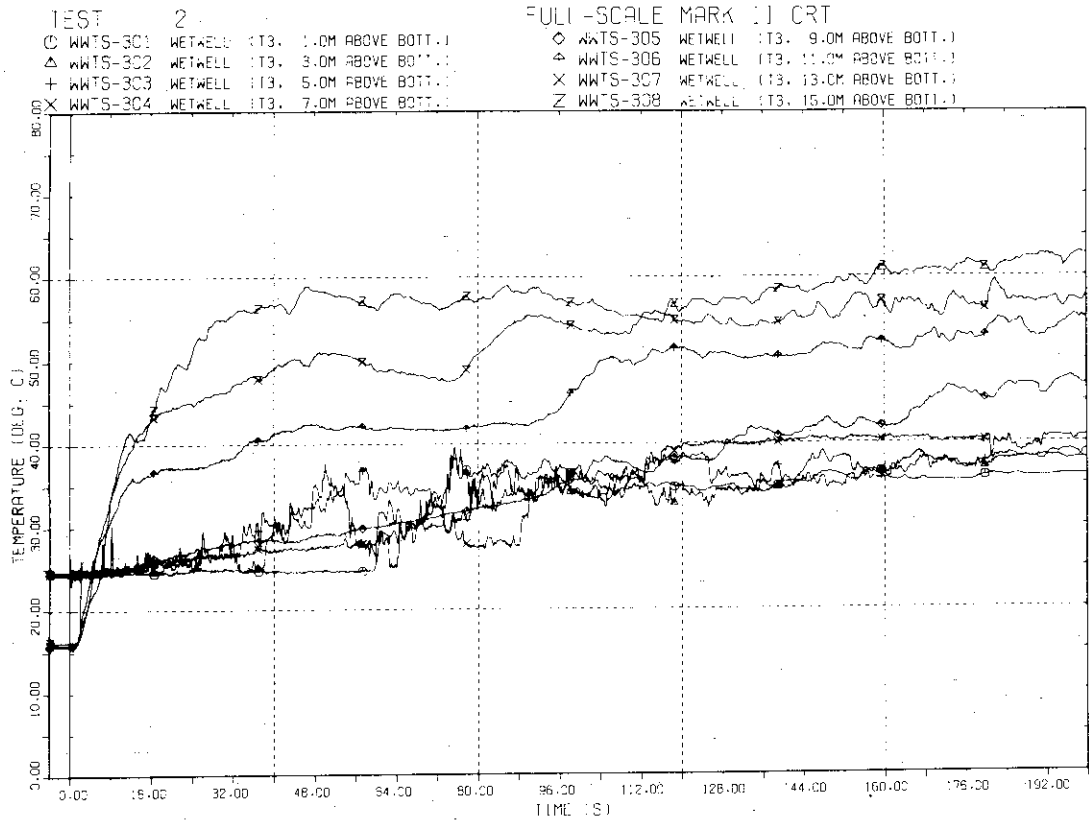
Plot L-14 Temperatures in Vent Pipe



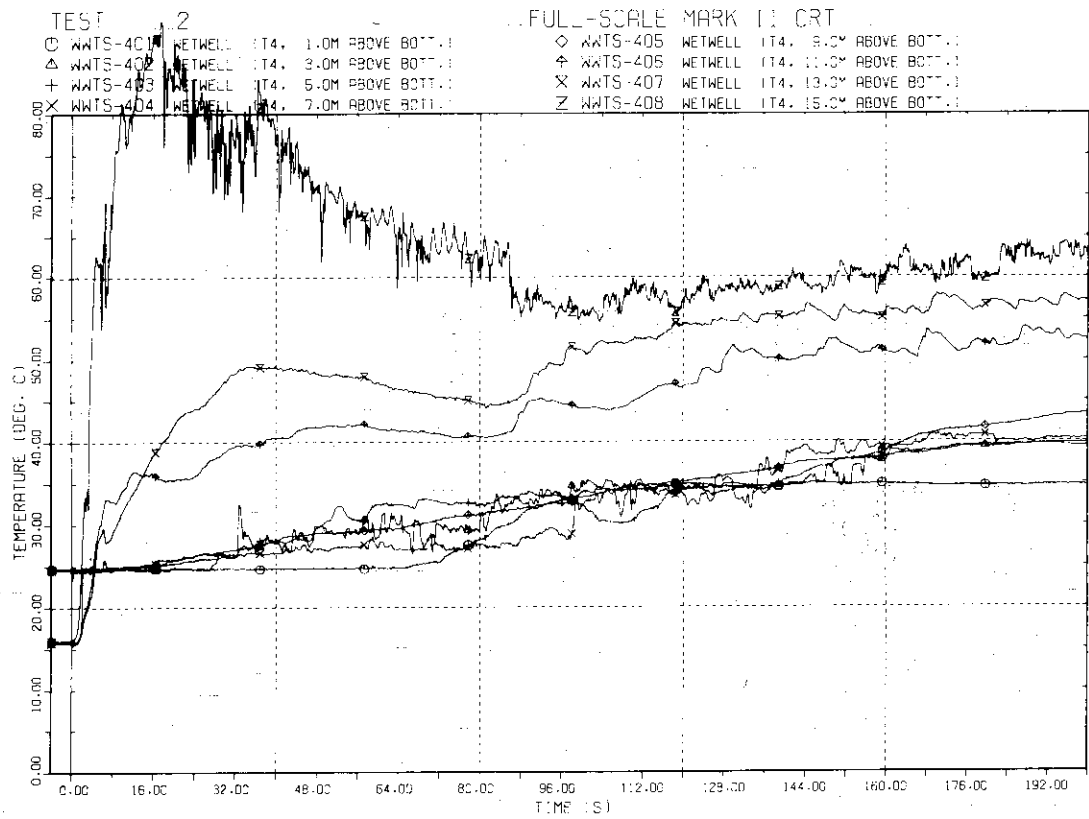
Plot L-15 Temperatures in Wetwell



Plot L-16 Temperatures in Wetwell



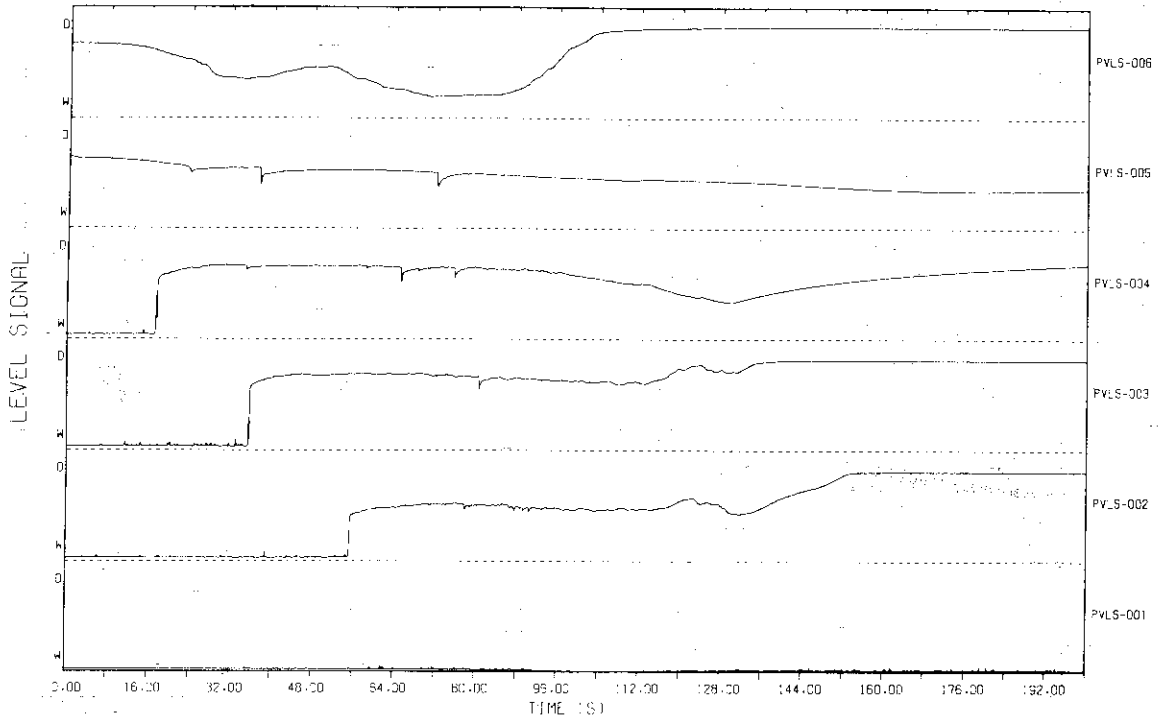
Plot L-17 Temperatures in Wetwell



Plot L-18 Temperatures in Wetwell

TEST 2

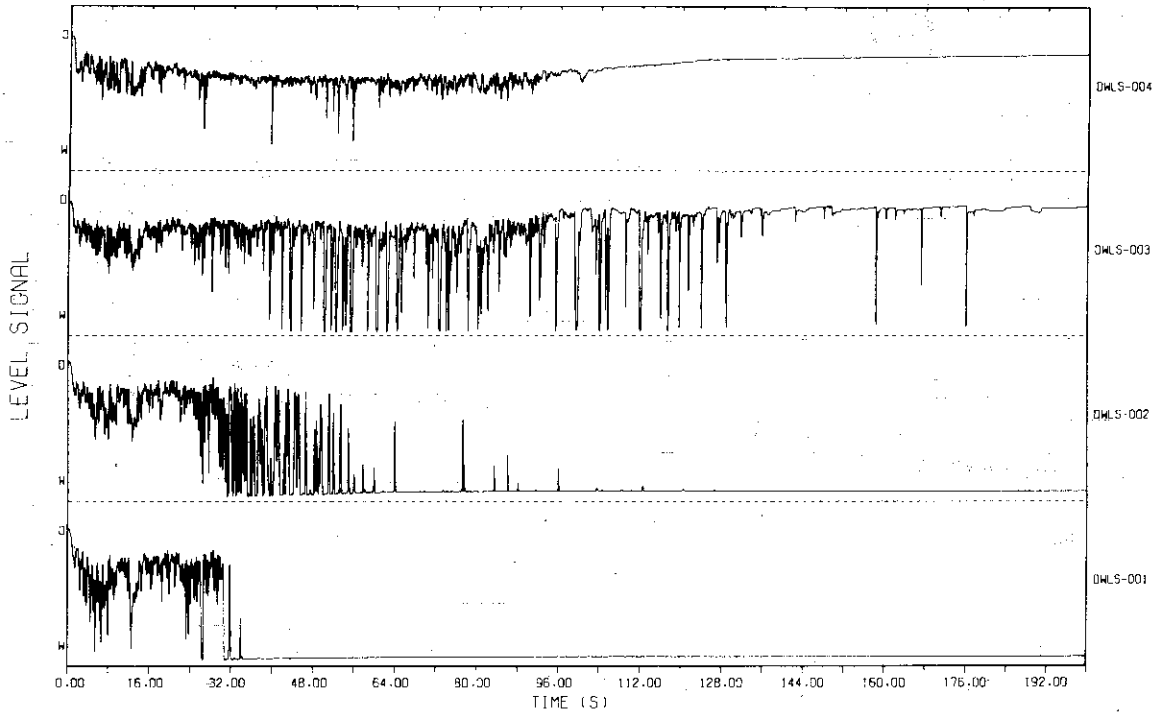
FULL-SCALE MARK II CRT



Plot L-19 Water Level in Pressure Vessel

TEST 2

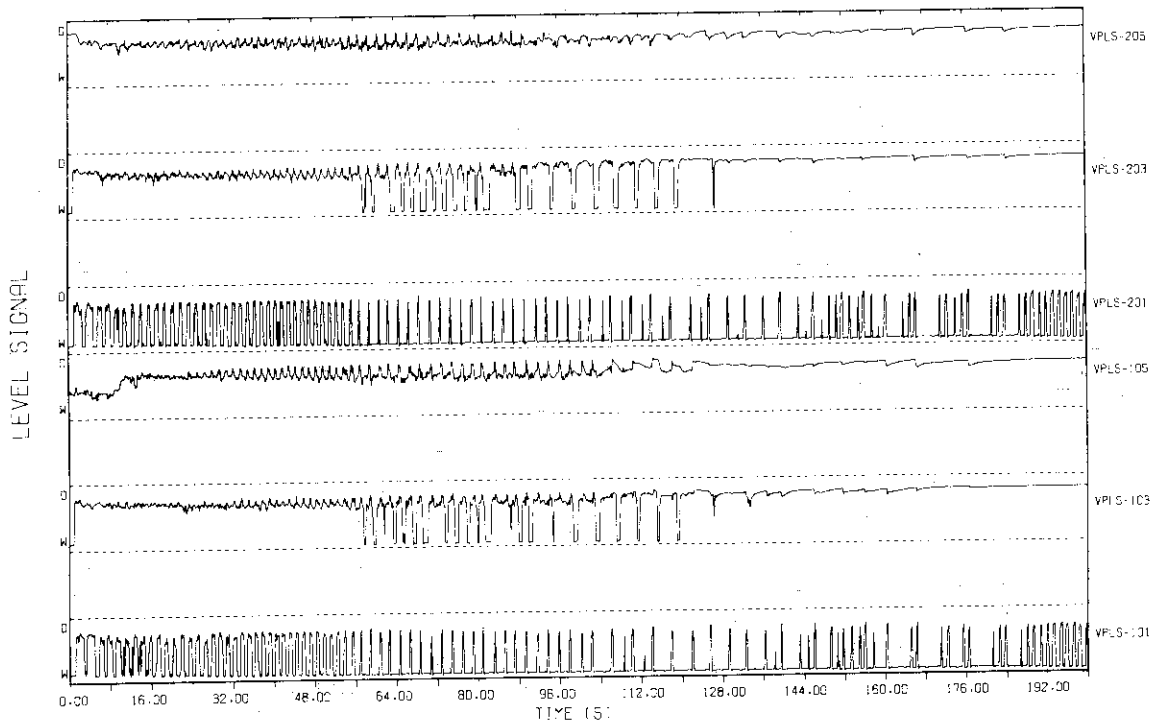
FULL-SCALE MARK II CRT



Plot L-20 Water Level in Drywell

TEST 2

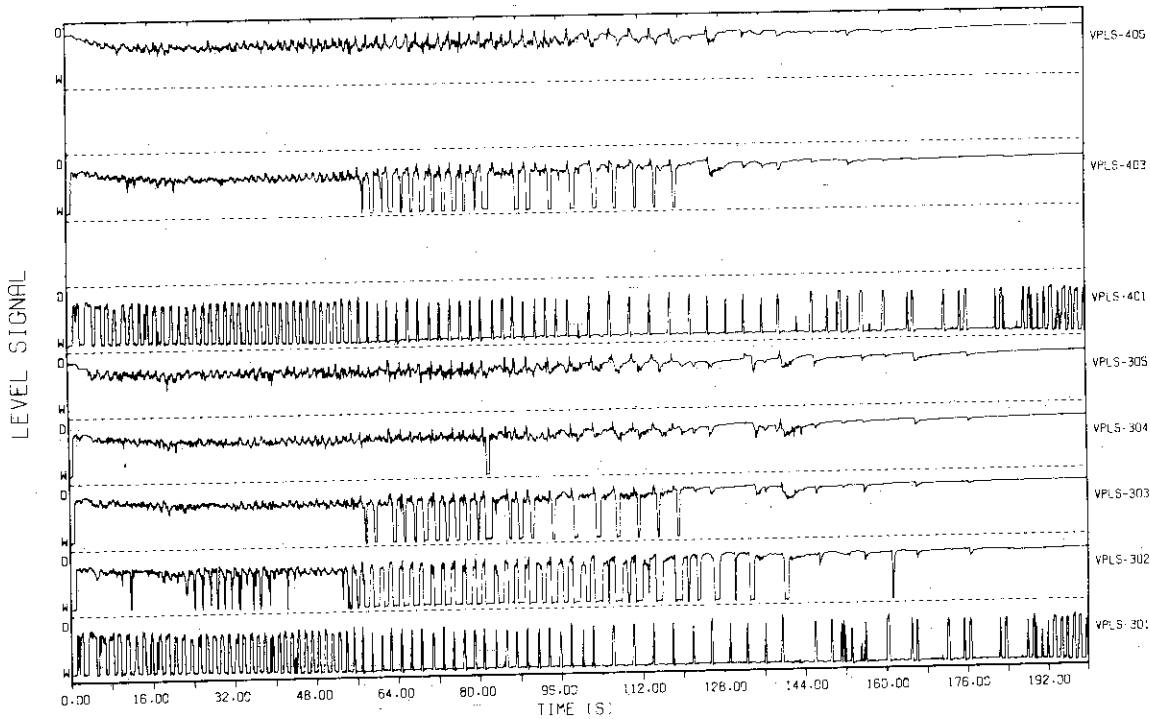
FULL-SCALE MARK II CRT



Plot L-21 Water Level in Vent Pipe

TEST 2

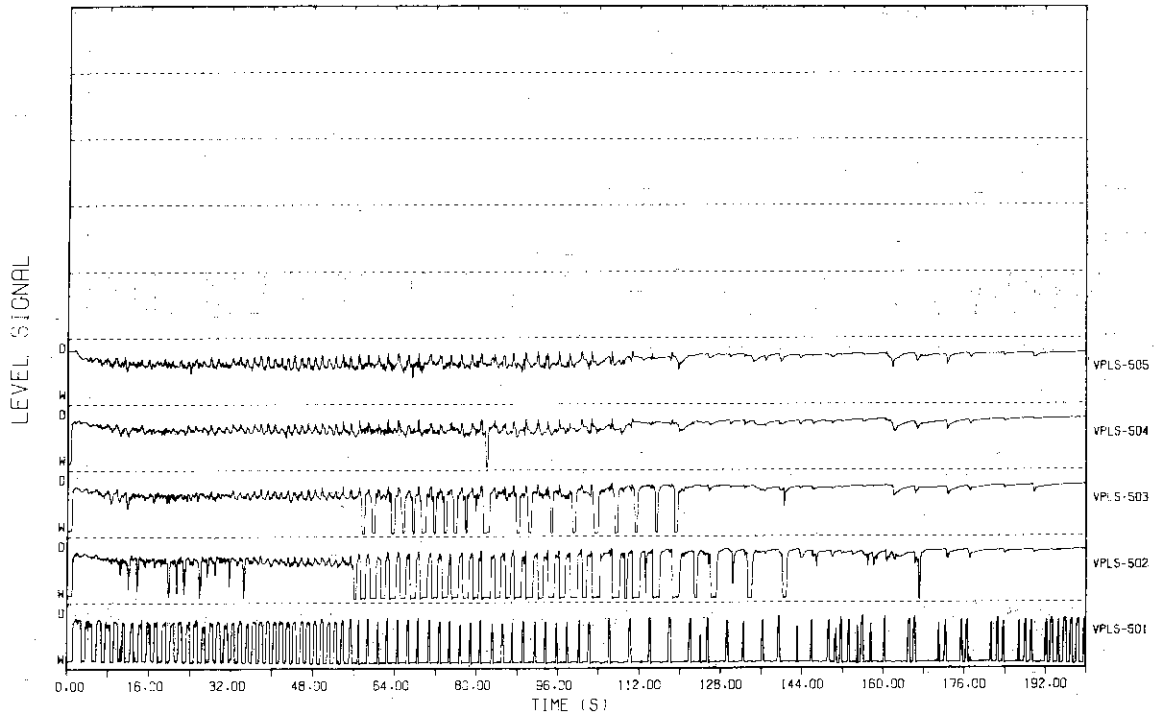
FULL-SCALE MARK II CRT



Plot L-22 Water Level in Vent Pipe

TEST 2

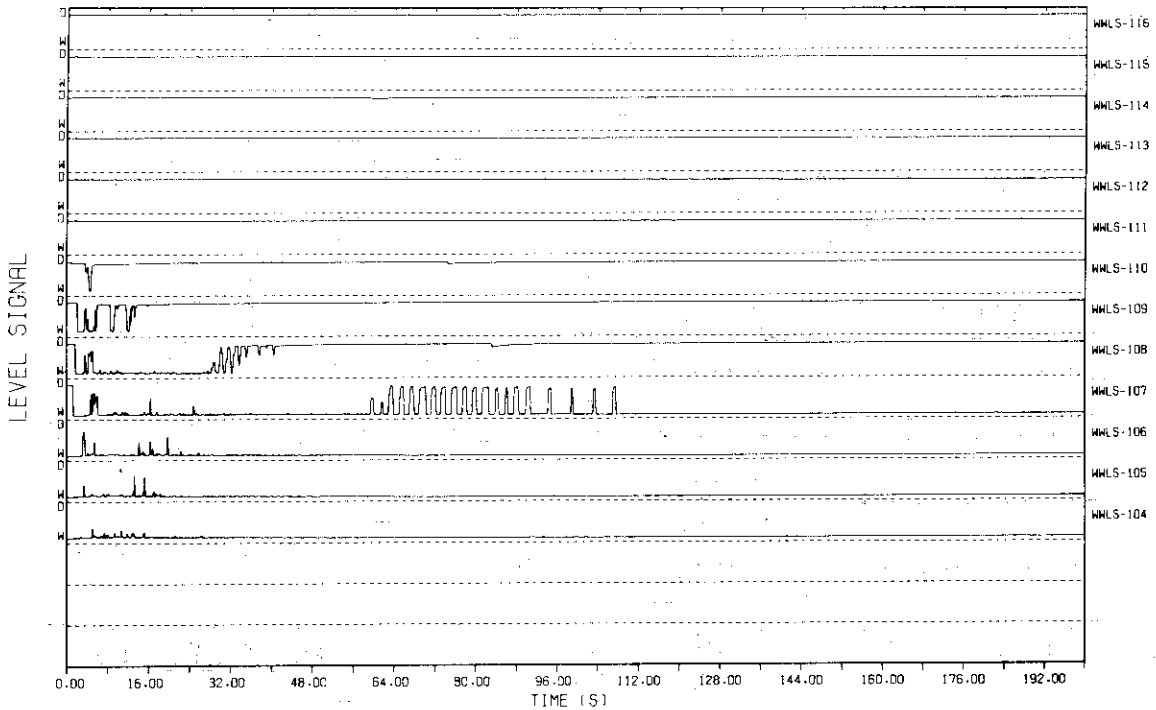
FULL-SCALE MARK II CRT



Plot L-23 Water Level in Vent Pipe

TEST 2

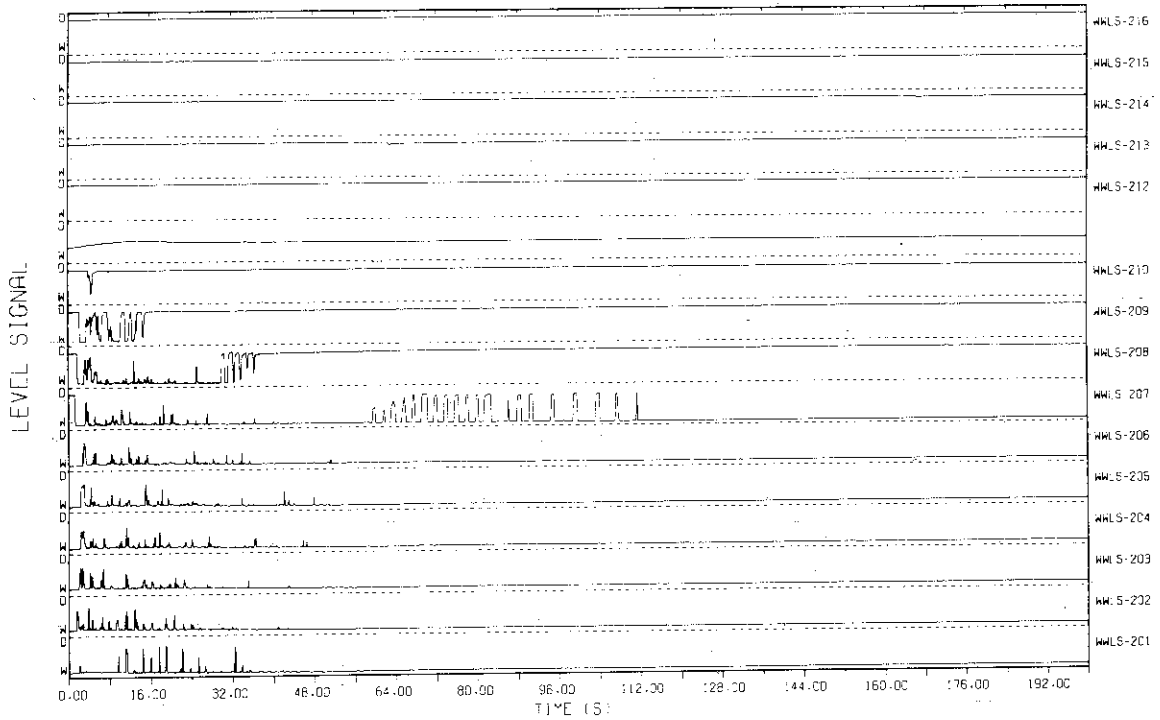
FULL-SCALE MARK II CRT



Plot L-24 Water Level in Wetwell

TEST 2

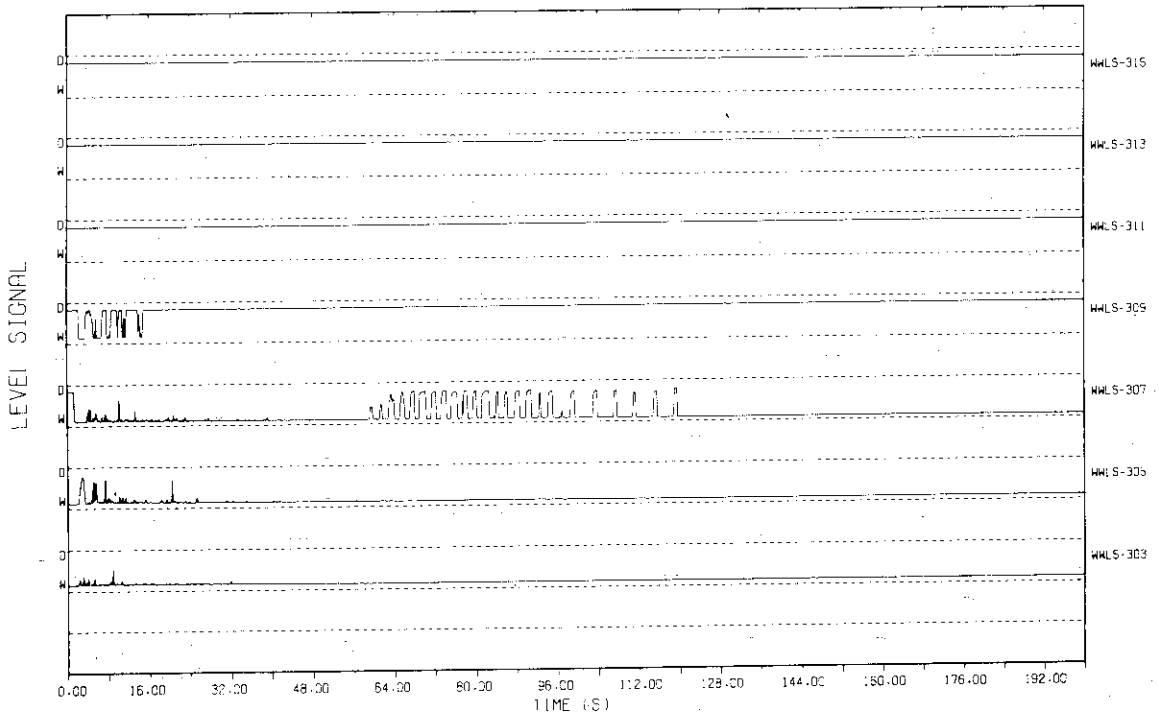
FULL-SCALE MARK 11 CRT



Plot L-25 Water Level in Wetwell

TEST 2

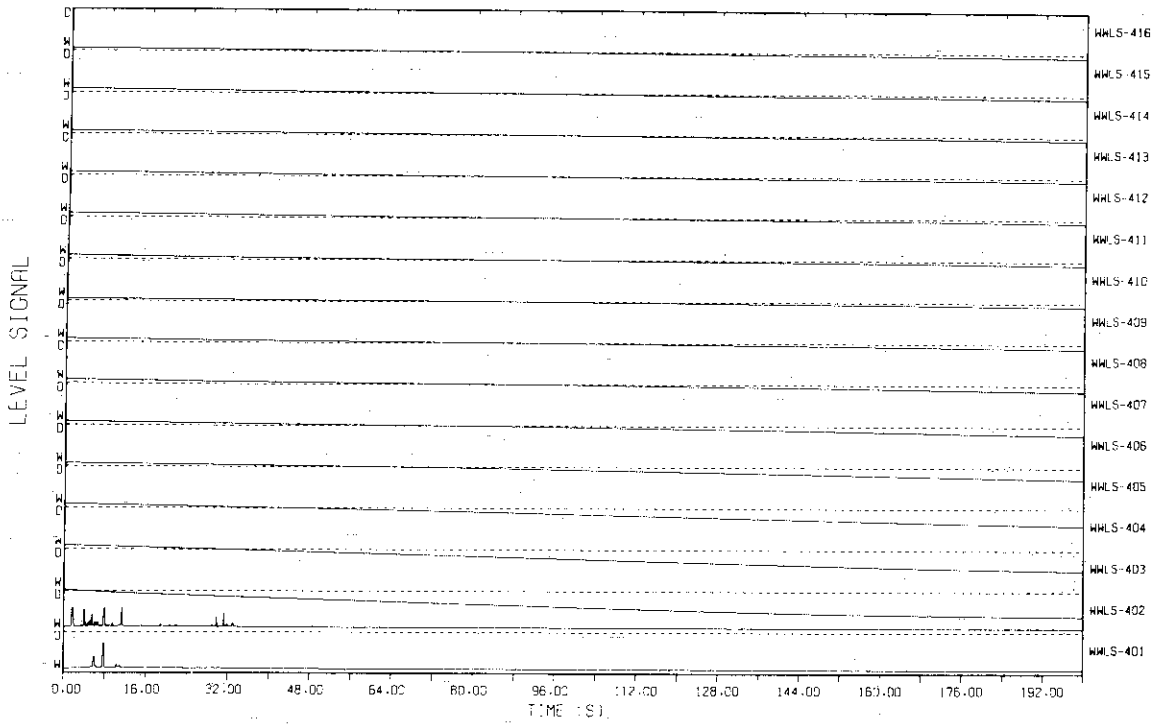
FULL-SCALE MARK 11 CRT



Plot L-26 Water Level in Wetwell

TEST 2

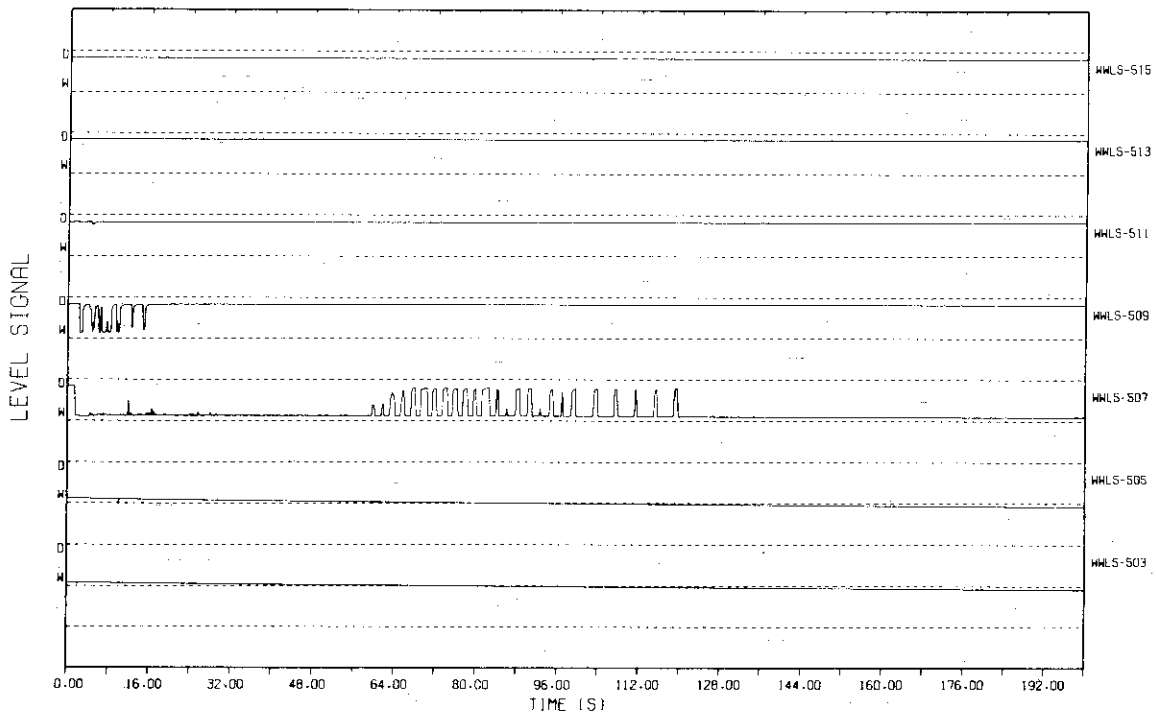
FULL-SCALE MARK 11 CRT



Plot L-27 Water Level in Wetwell

TEST 2

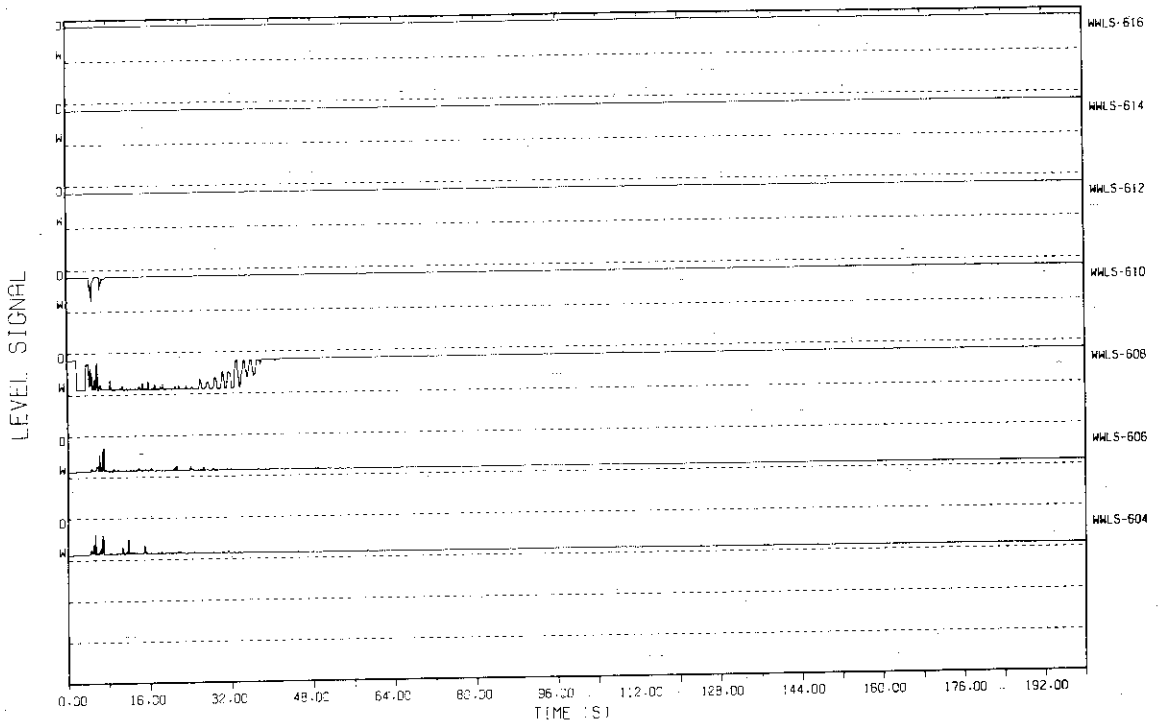
FULL-SCALE MARK 11 CRT



Plot L-28 Water Level in Wetwell

TEST 2

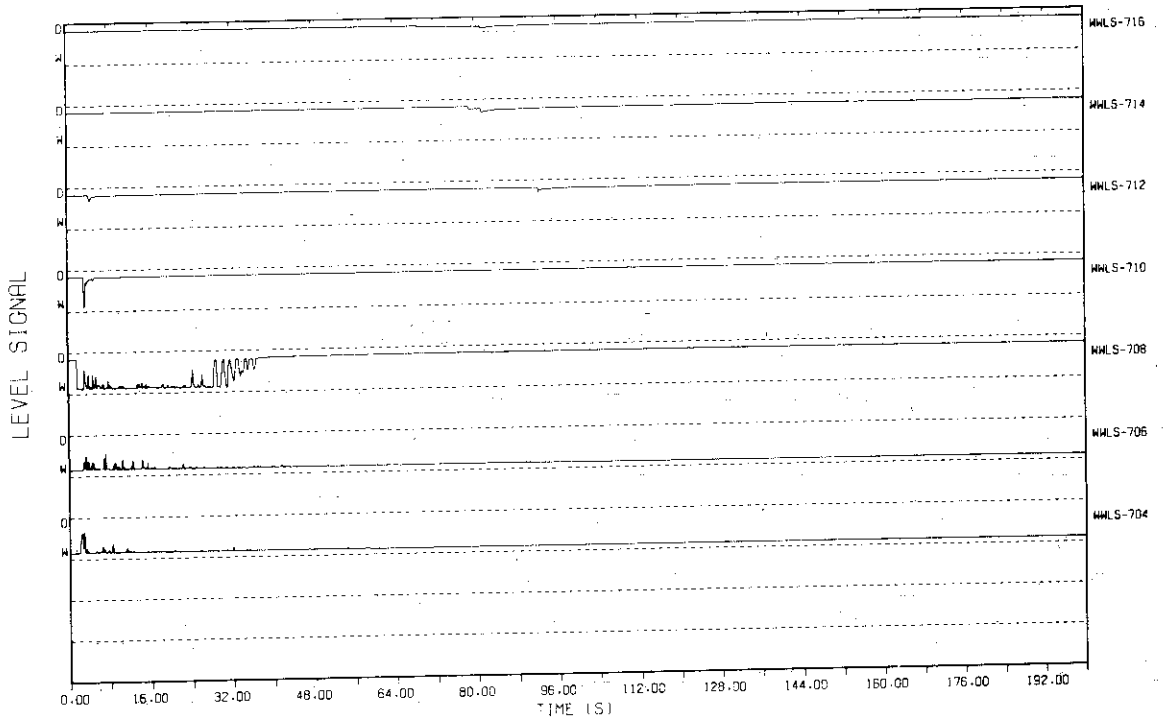
FULL-SCALE MARK II CRT



Plot L-29 Water Level in Wetwell

TEST 2

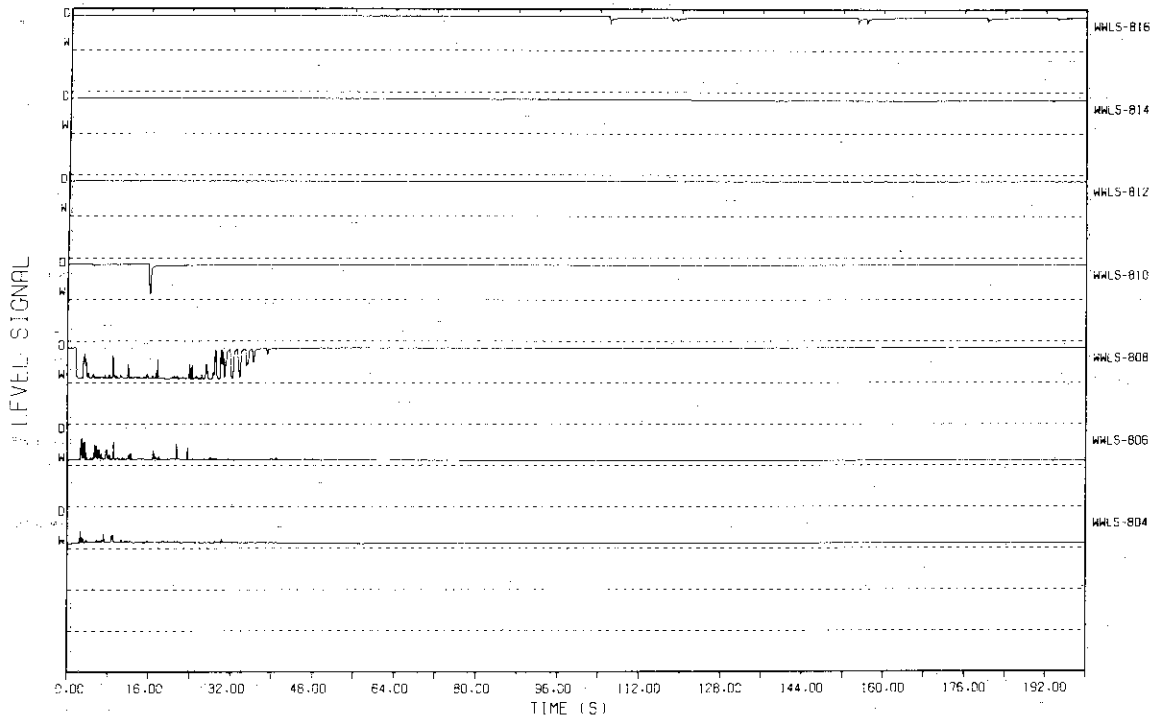
FULL-SCALE MARK II CRT



Plot L-30 Water Level in Wetwell

TEST 2

FULL-SCALE MARK I] CRT

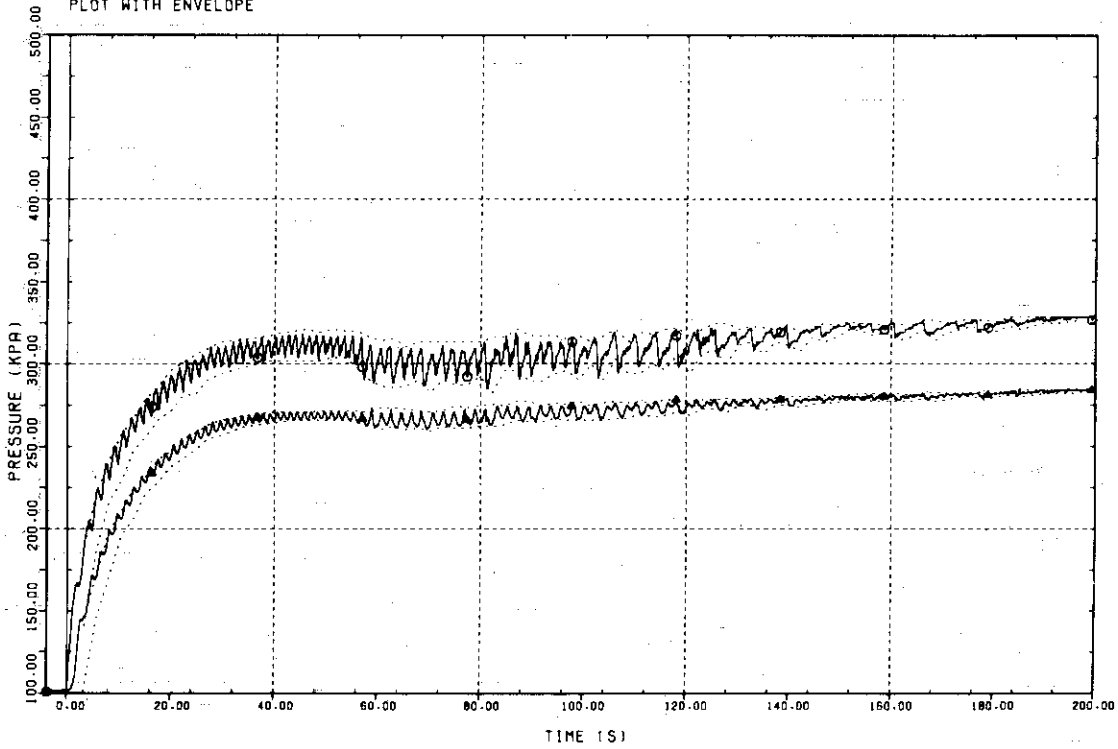


Plot L-31 Water Level in Wetwell

TEST 2

FULL-SCALE MARK II CRT

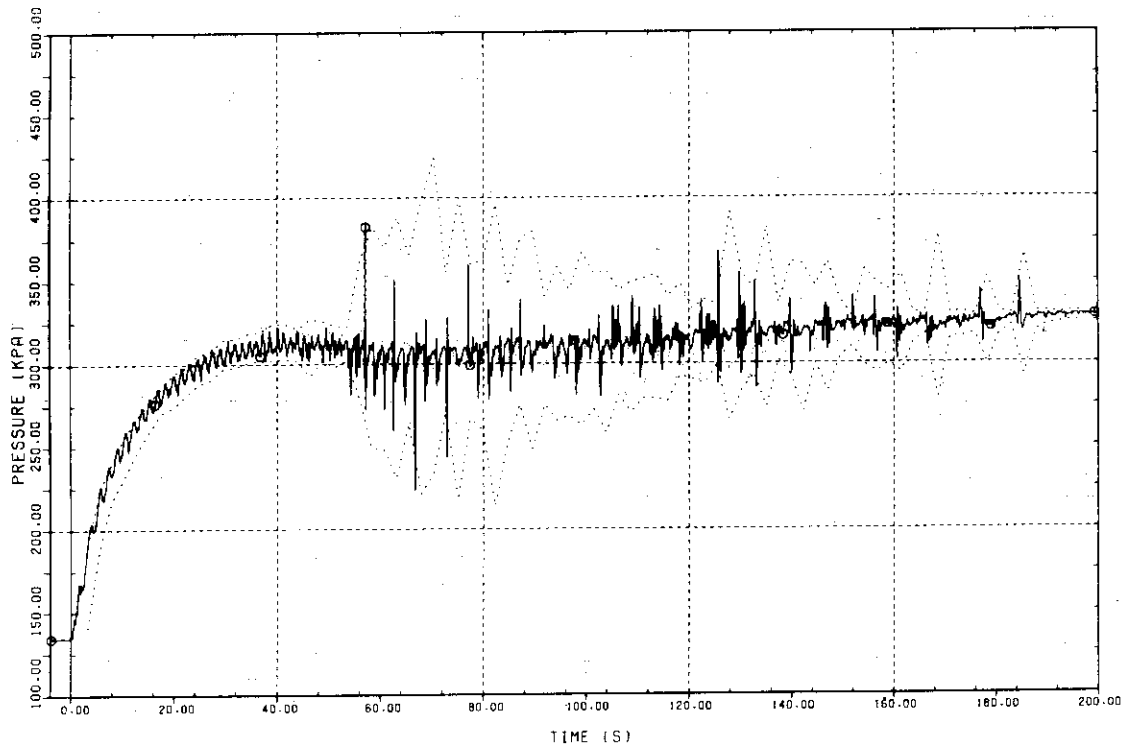
○ DWPF-001 DRYWELL
 ▲ HWPF-001 WETWELL AIRSPACE (15.0M ABOVE BOTT.)
 PLOT WITH ENVELOPE



Plot L-32 Pressures in Drywell and Wetwell Airspace

TEST 2
○ VPPF-201 VP2 (0.5M ABOVE OUTL.)
PLOT WITH ENVELOPE

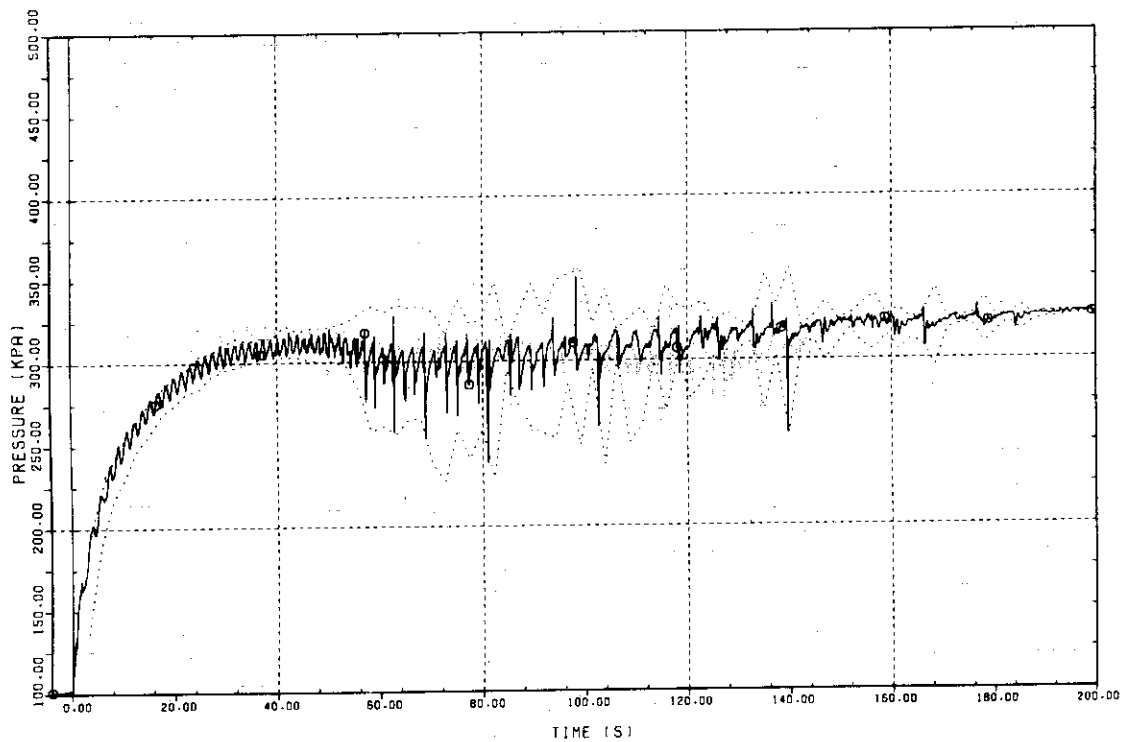
FULL-SCALE MARK II CRT



Plot L-33 Pressure in Vent Pipe

TEST 2
○ VPPF-302 VP3 (6.0M ABOVE OUTL.)
PLOT WITH ENVELOPE

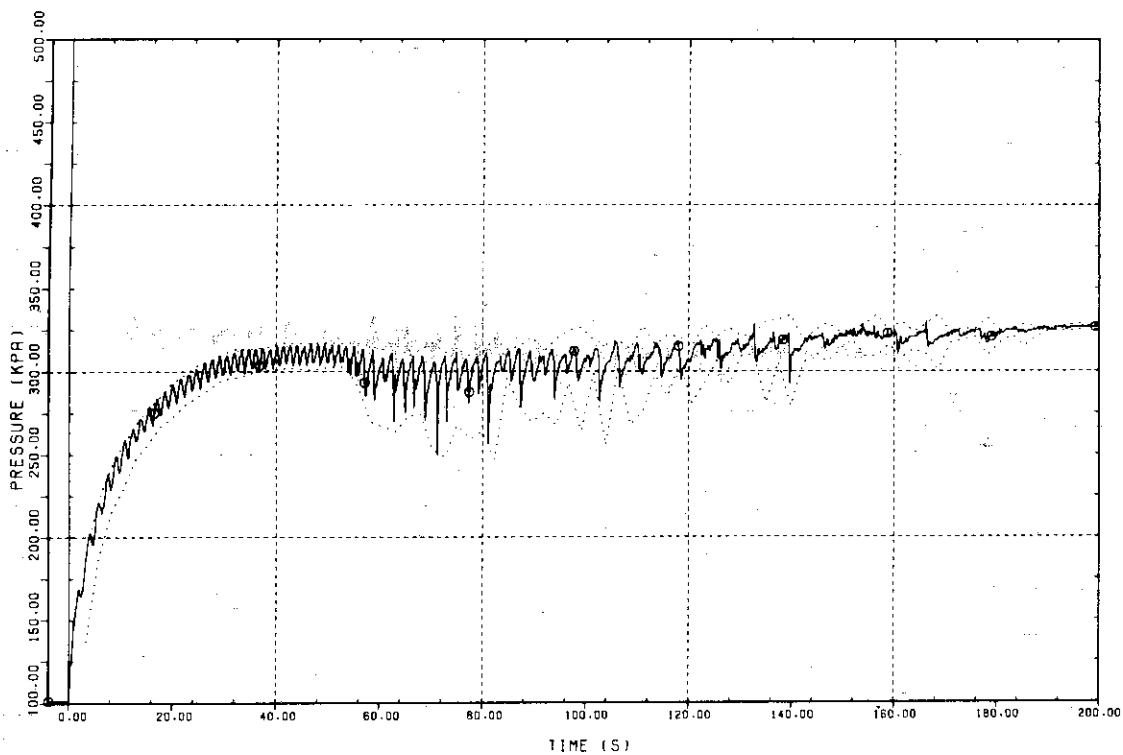
FULL-SCALE MARK II CRT



Plot L-34 Pressure in Vent Pipe

TEST 2
○ VPPF-303 VP3 (11.5M ABOVE OUTL.)
PLOT WITH ENVELOPE

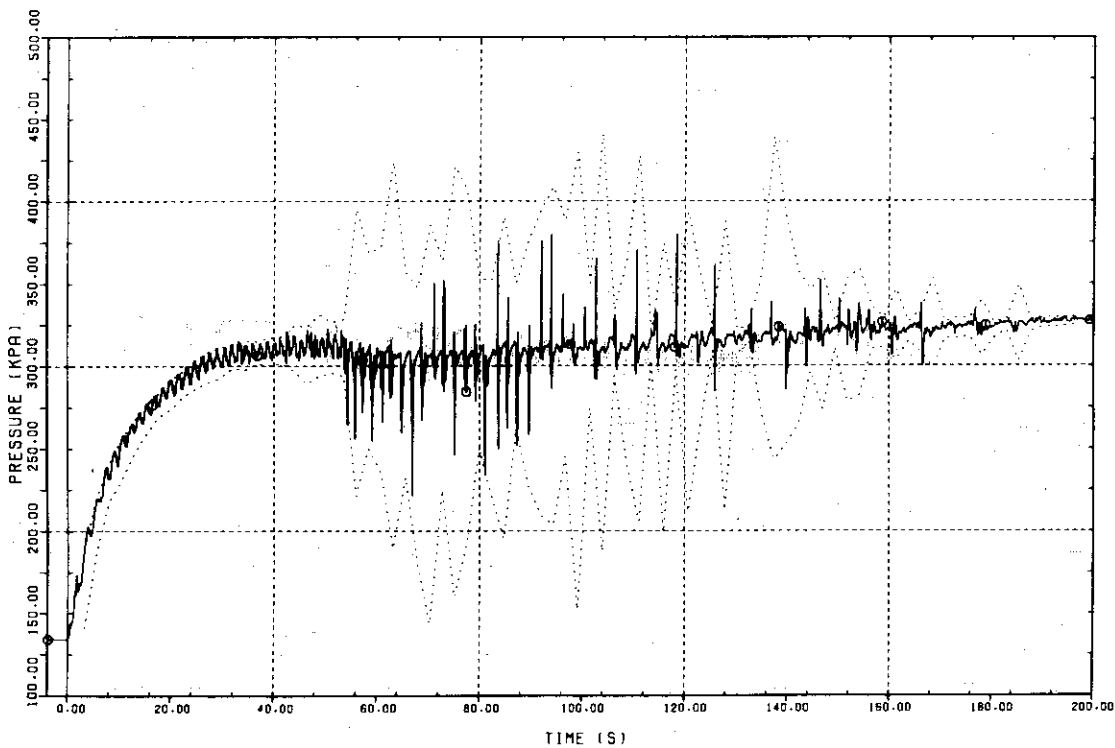
FULL-SCALE MARK II CRT



Plot L-35 Pressure in Vent Pipe

TEST 2
○ VPPF-401 VP4 (0.5M ABOVE OUTL.)
PLOT WITH ENVELOPE

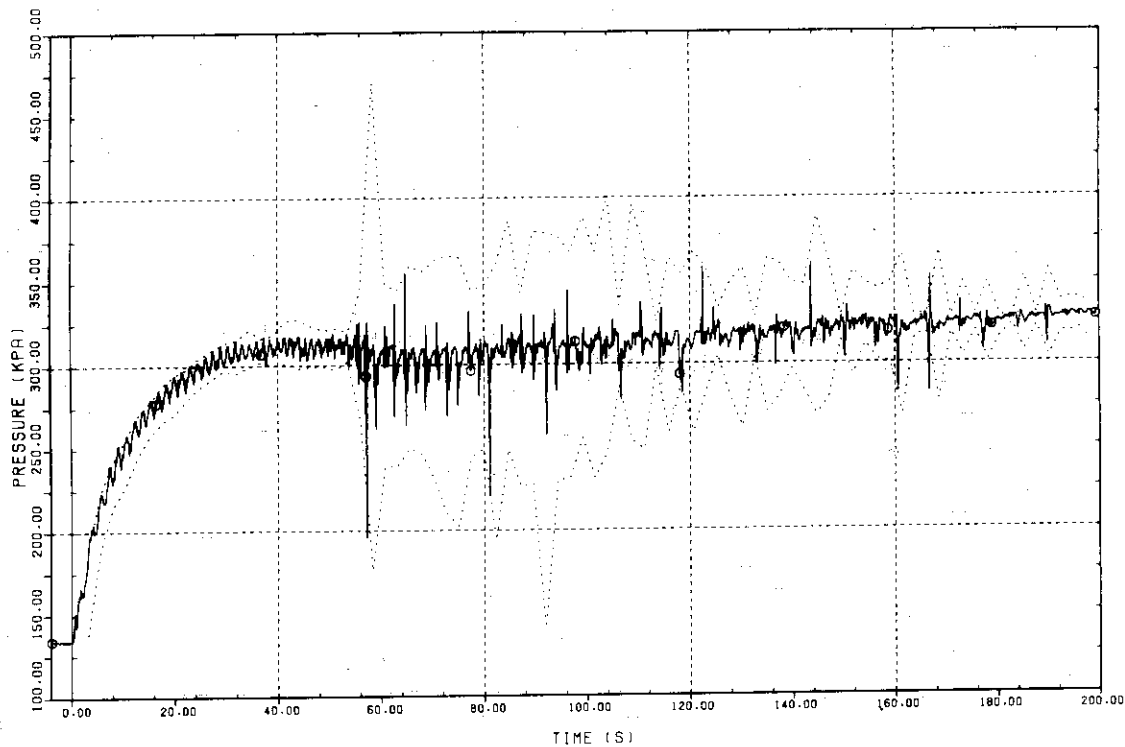
FULL-SCALE MARK II CRT



Plot L-36 Pressure in Vent Pipe

TEST 2
○ VPPF-501 VPS (0.5M ABOVE OUTL.)
PLOT WITH ENVELOPE

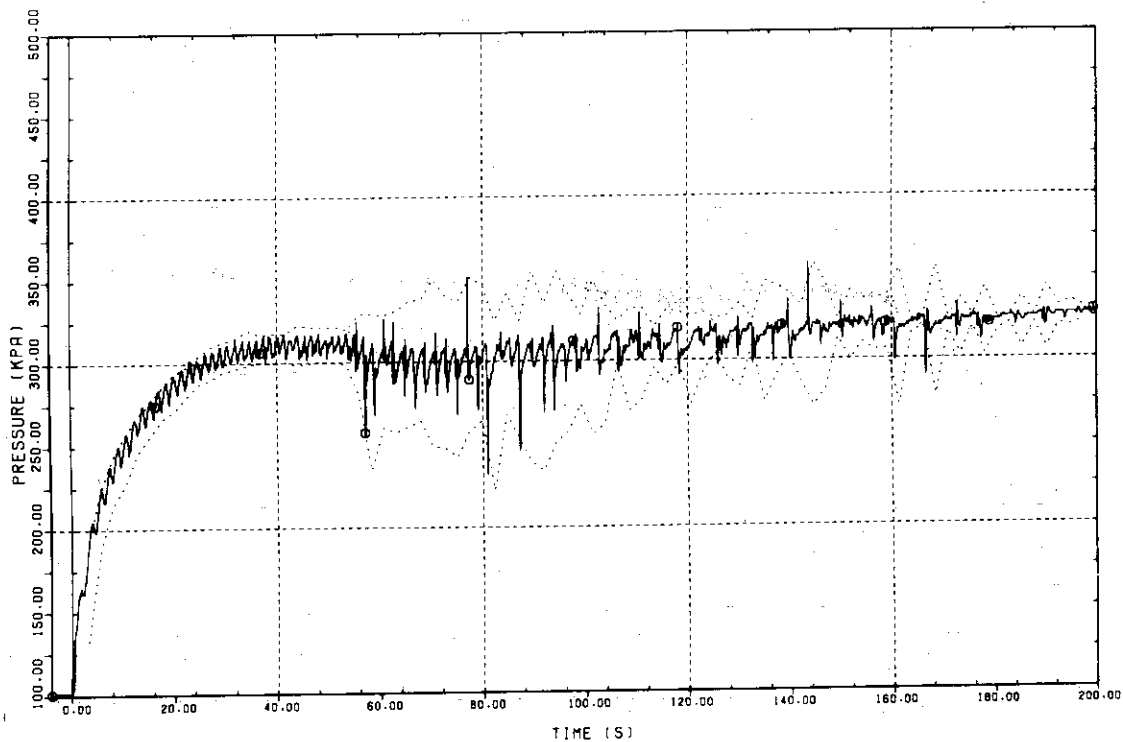
FULL-SCALE MARK II CRT



Plot L-37 Pressure in Vent Pipe

TEST 2
○ VPPF-502 VPS (6.0M ABOVE OUTL.)
PLOT WITH ENVELOPE

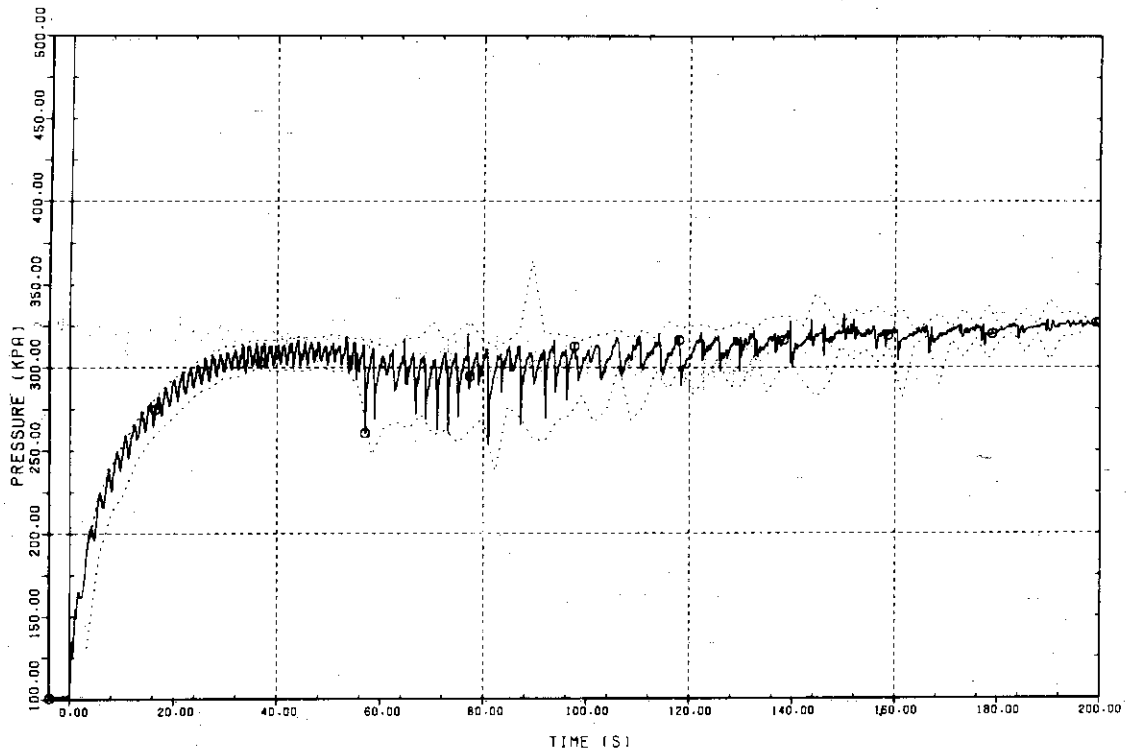
FULL-SCALE MARK II CRT



Plot L-38 Pressure in Vent Pipe

TEST 2
○ VPPF-503 VPS (11.5M ABOVE OUTL.)
PLOT WITH ENVELOPE

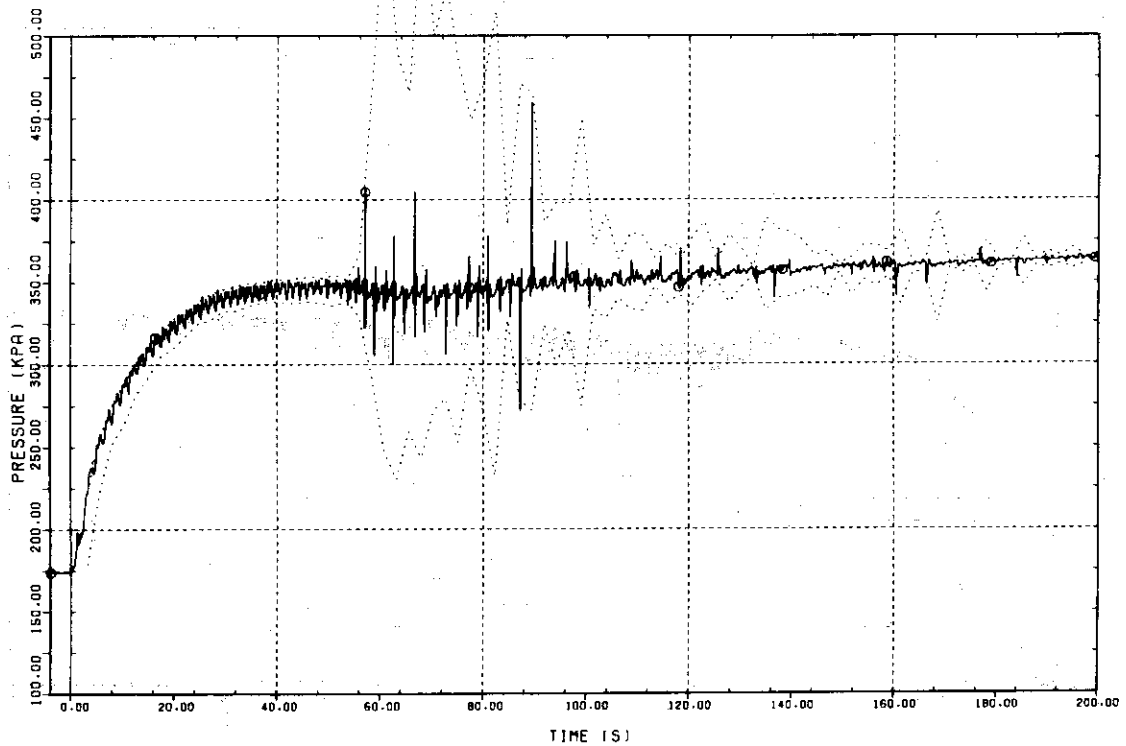
FULL-SCALE MARK II CRT



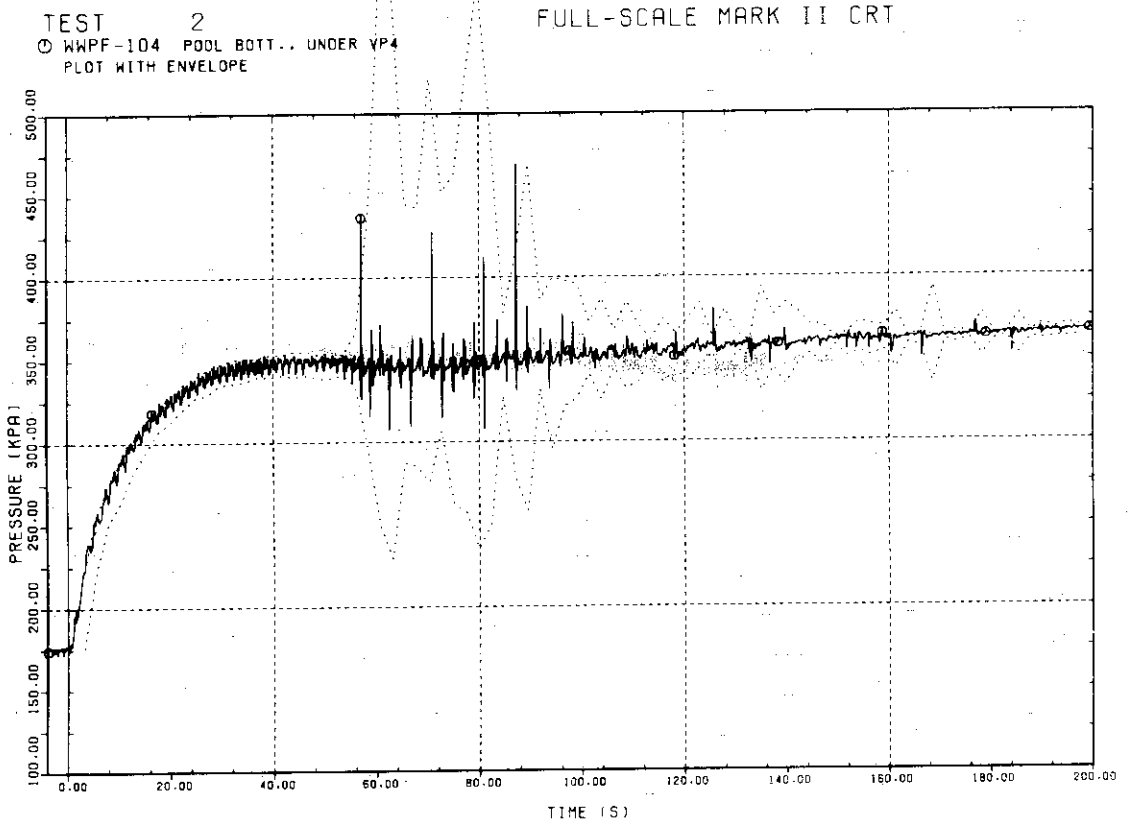
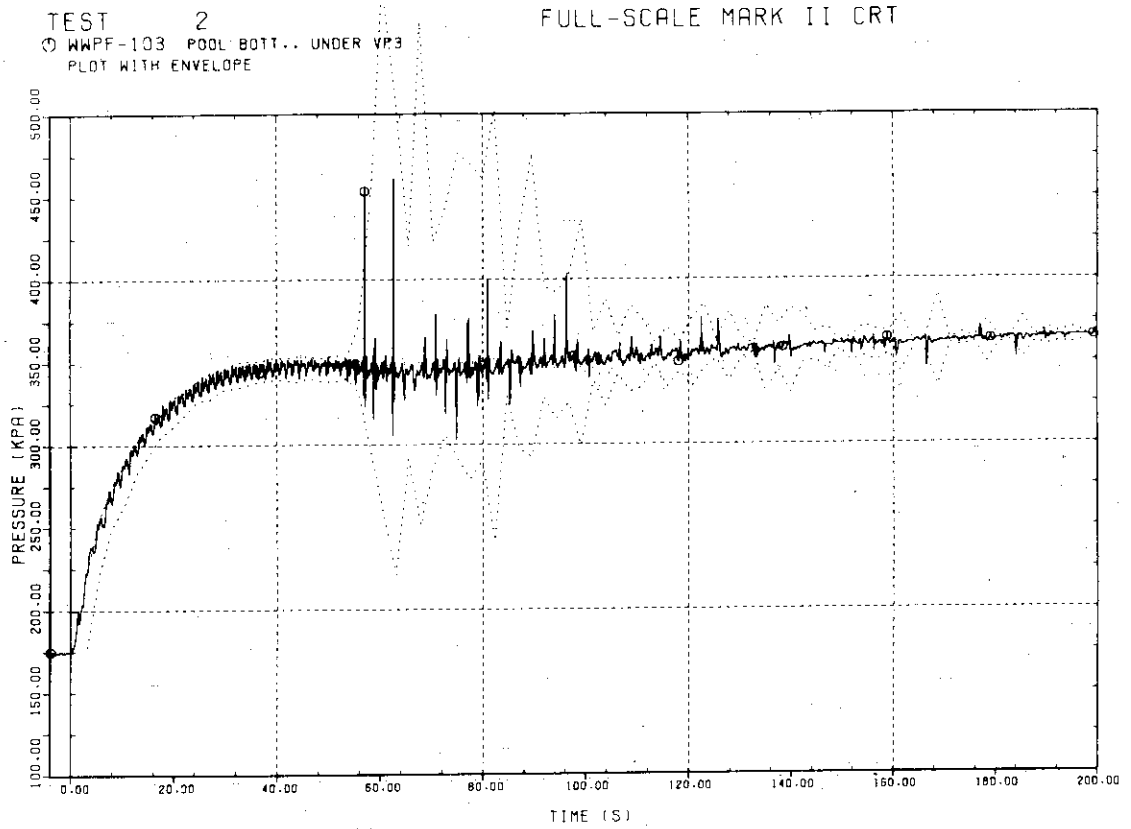
Plot L-39 Pressure in Vent Pipe

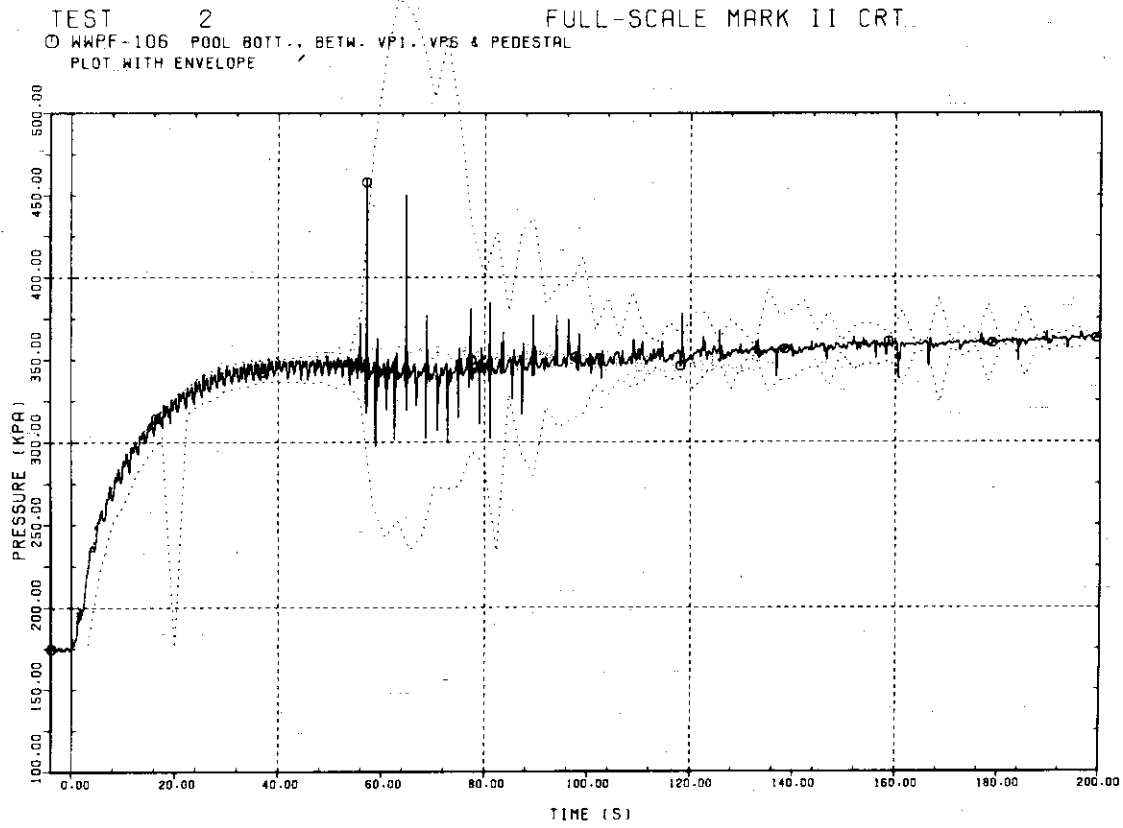
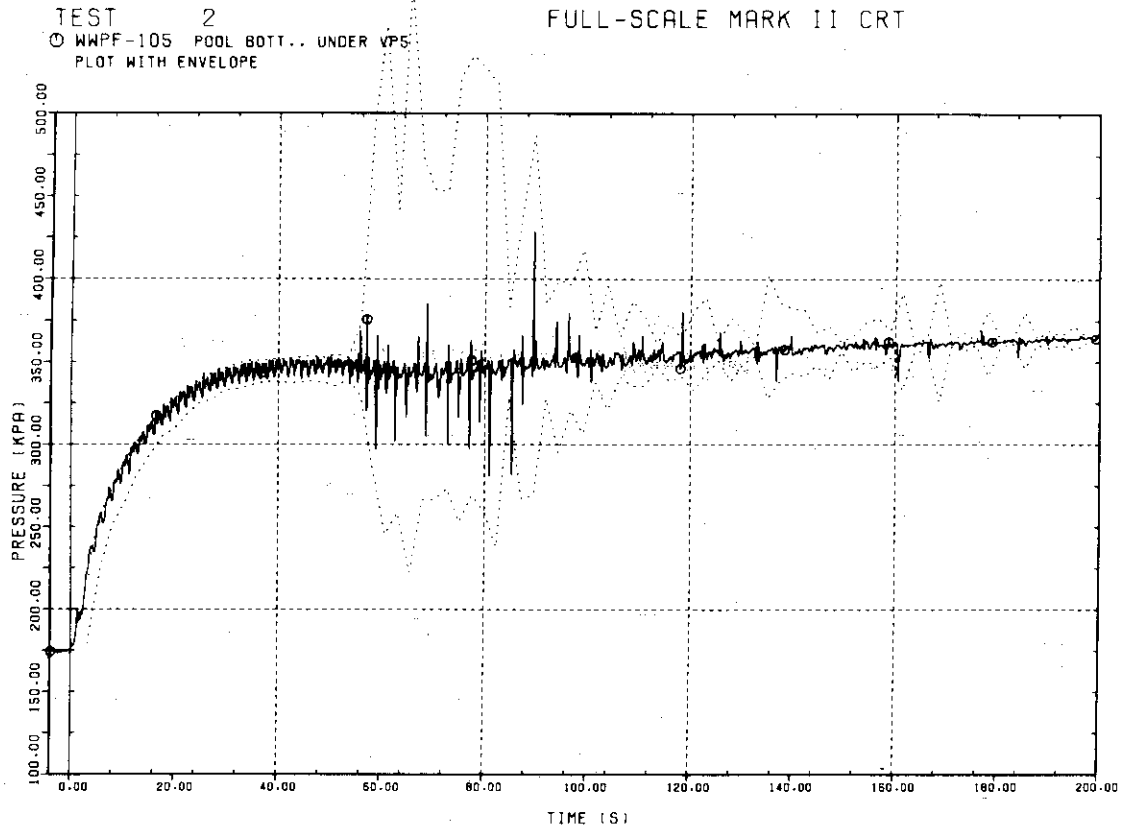
TEST 2
○ WMPF-102 POOL BOTT.. UNDER VP2
PLOT WITH ENVELOPE

FULL-SCALE MARK II CRT



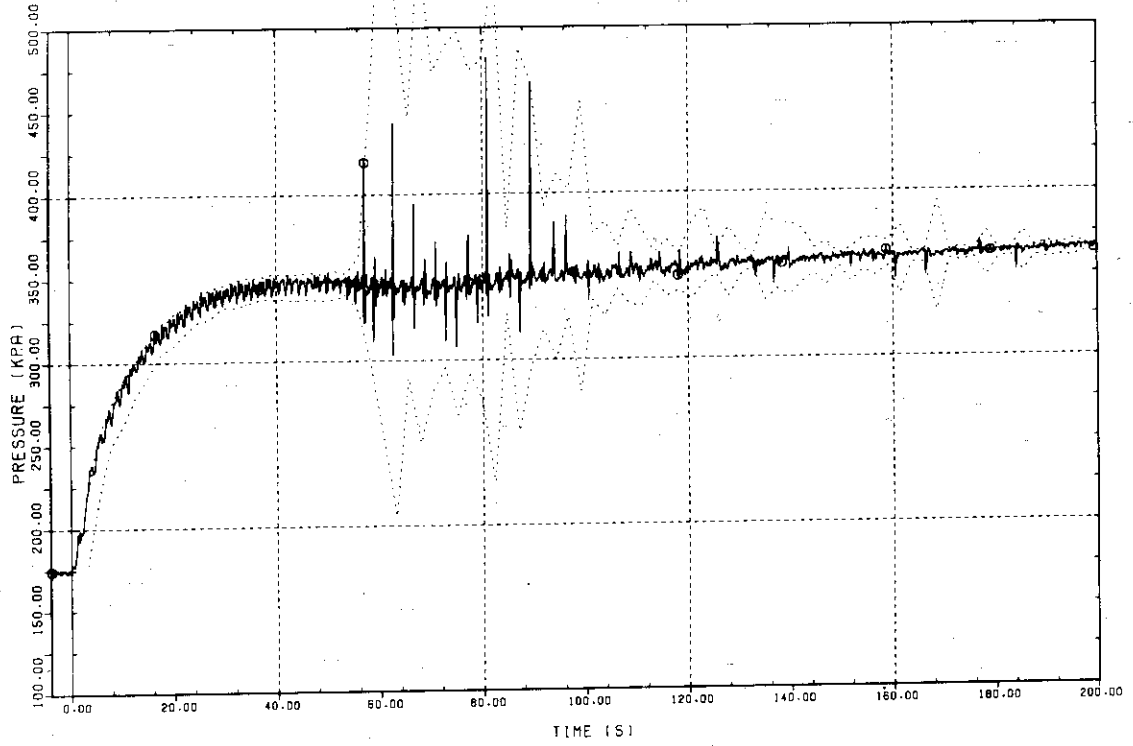
Plot L-40 Pressure in Wetwell





TEST 2
○ WMPF-107 POOL BOTT. BETW. VP2 & VP3
PLOT WITH ENVELOPE

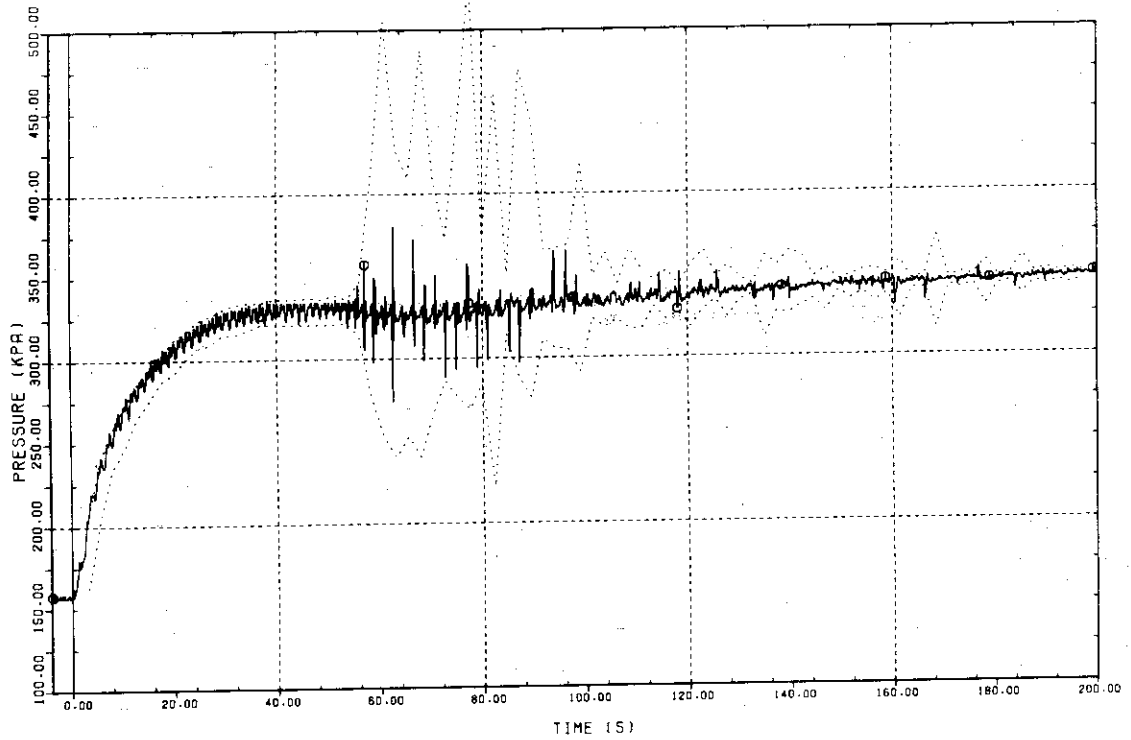
FULL-SCALE MARK II CRT



Plot L-45 Pressure in Wetwell

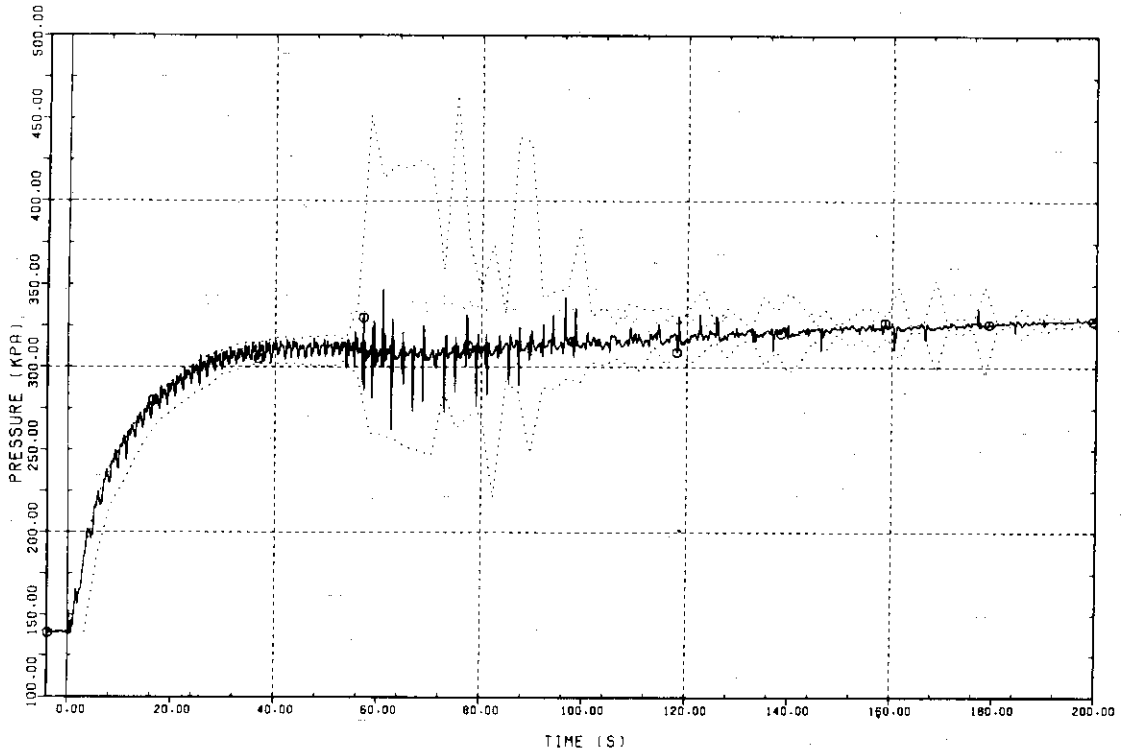
TEST 2
○ WMPF-201 WALL BESIDE VP2 (P1, 1.8M ABOVE BOTT.)
PLOT WITH ENVELOPE

FULL-SCALE MARK II CRT



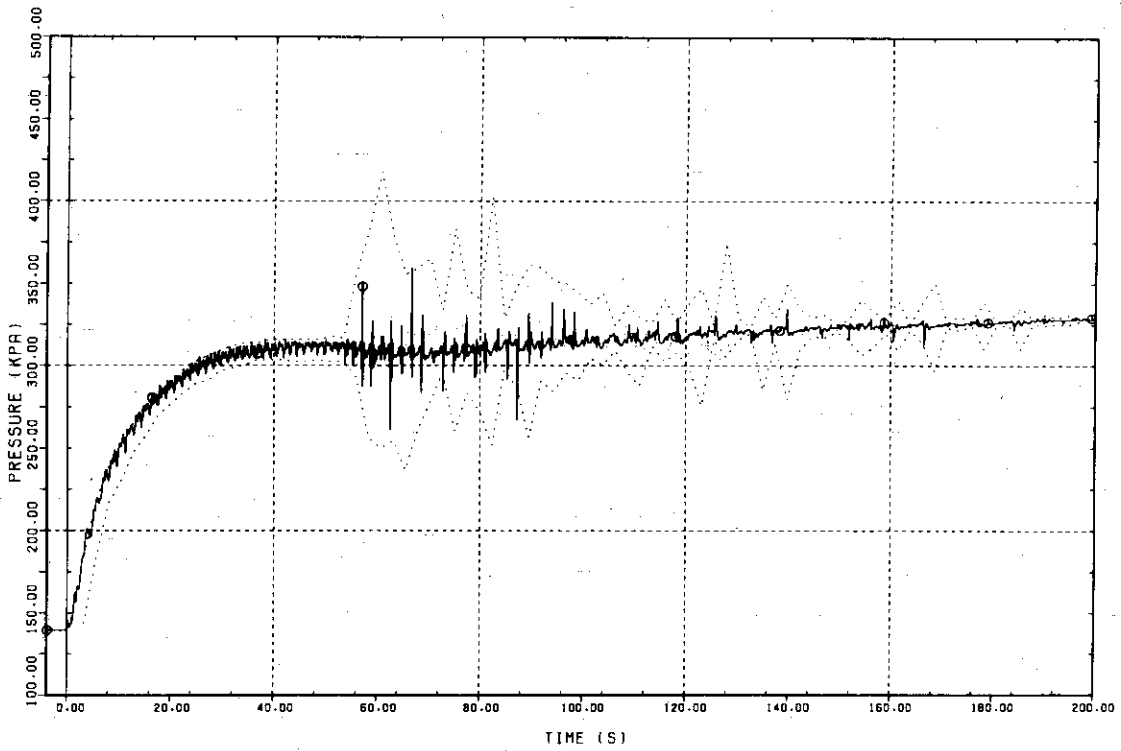
Plot L-46 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
WMPF-202 WALL BESIDE VP2 (P1, 3.5M ABOVE BOTT.)
PLOT WITH ENVELOPE



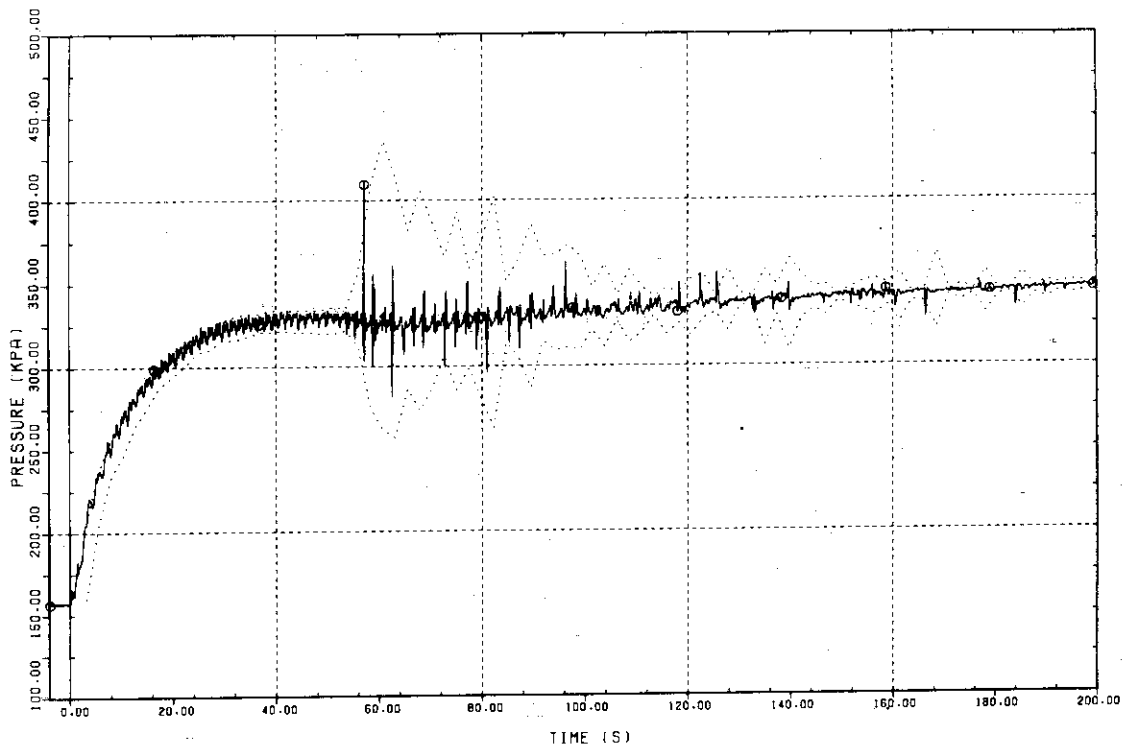
Plot L-47 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
WMPF-302 WALL BESIDE VP3 (P2, 3.6M ABOVE BOTT.)
PLOT WITH ENVELOPE



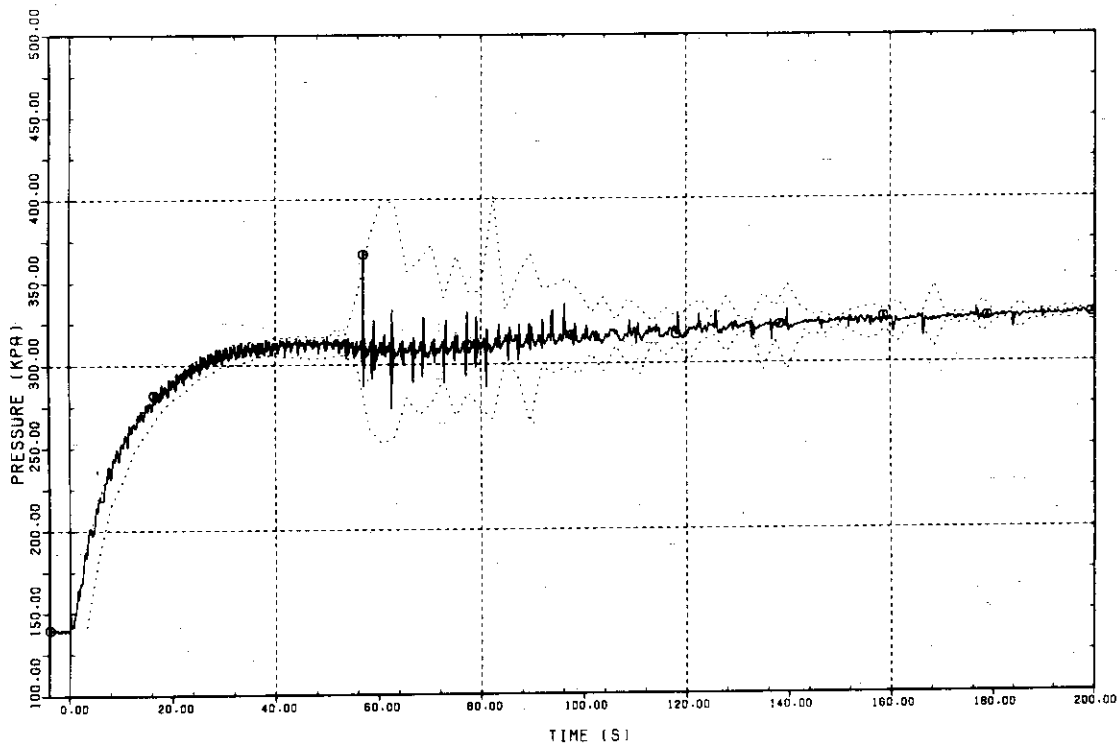
Plot L-48 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
○ WWPf-401 SHELL BESIDE VP3 (P3, 1.8M ABOVE BOTT.)
PLOT WITH ENVELOPE



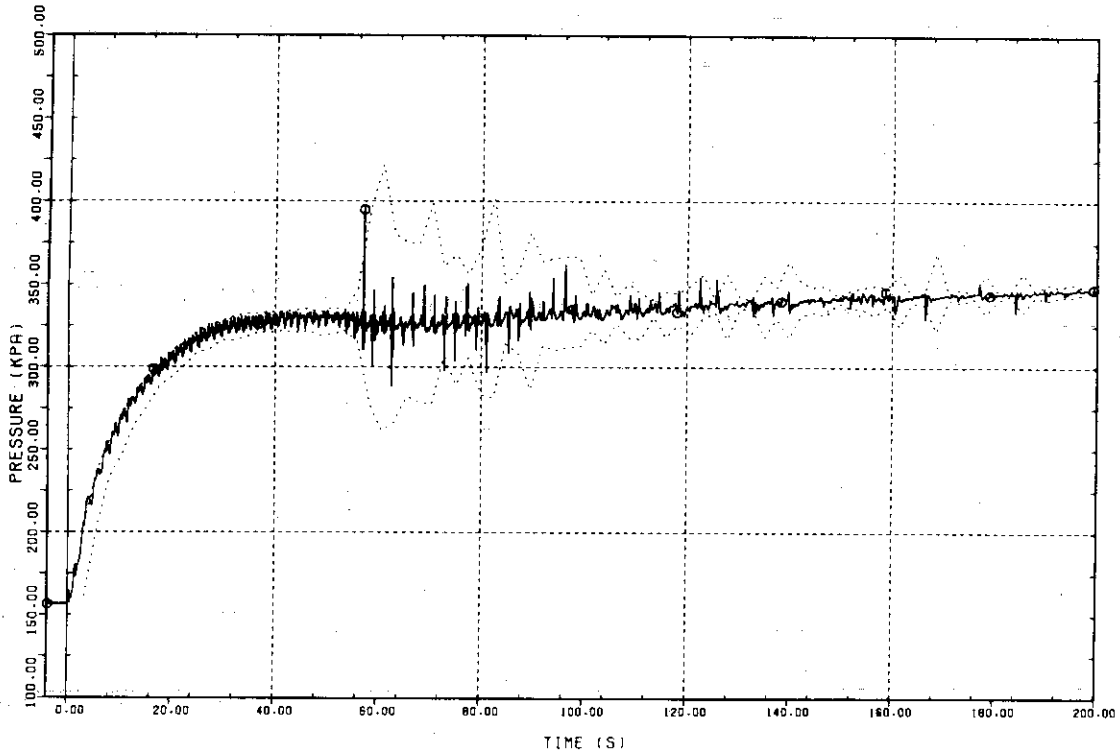
Plot L-49 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
○ WWPf-402 SHELL BESIDE VP3 (P3, 3.6M ABOVE BOTT.)
PLOT WITH ENVELOPE



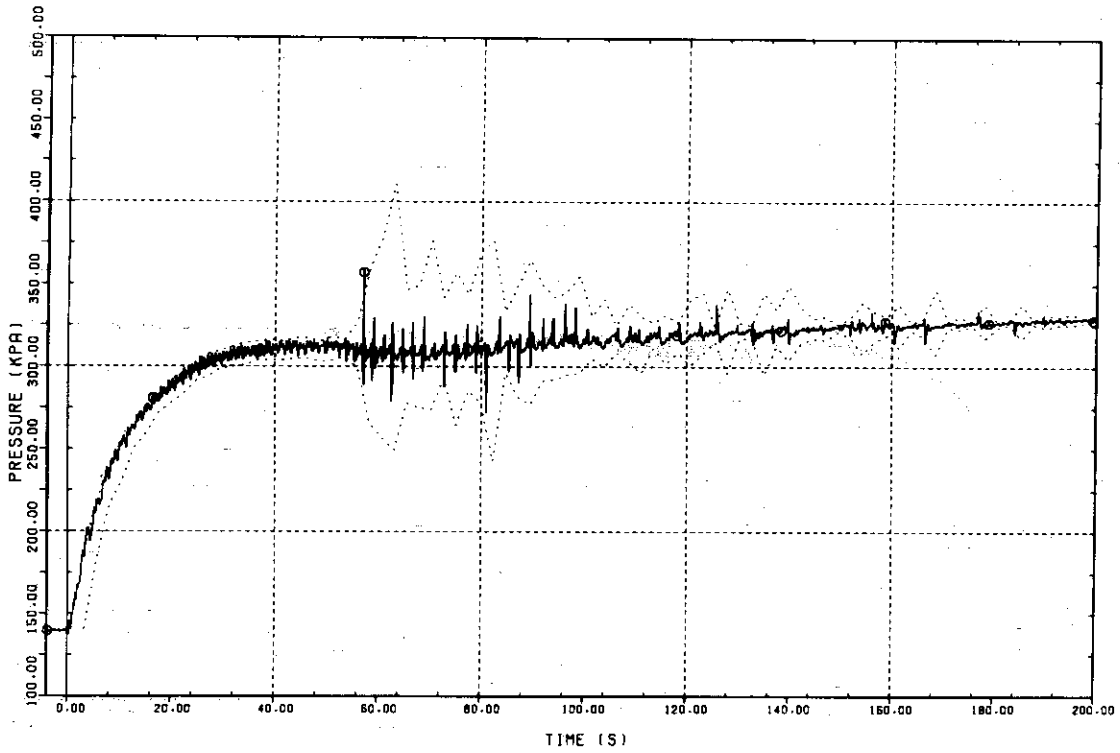
Plot L-50 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
① WHPF-501 SHELL BESIDE VP4 (P4, 1.8M ABOVE BOTT.)
PLOT WITH ENVELOPE



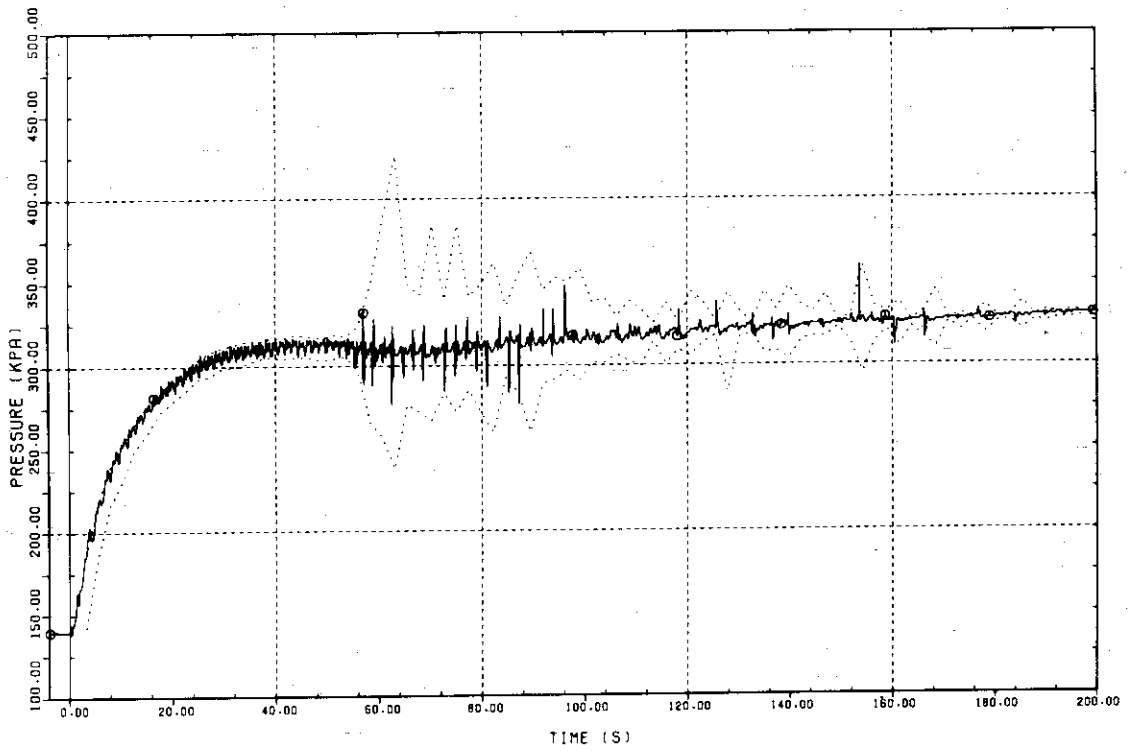
Plot L-51 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
① WHPF-502 SHELL BESIDE VP4 (P4, 3.6M ABOVE BOTT.)
PLOT WITH ENVELOPE



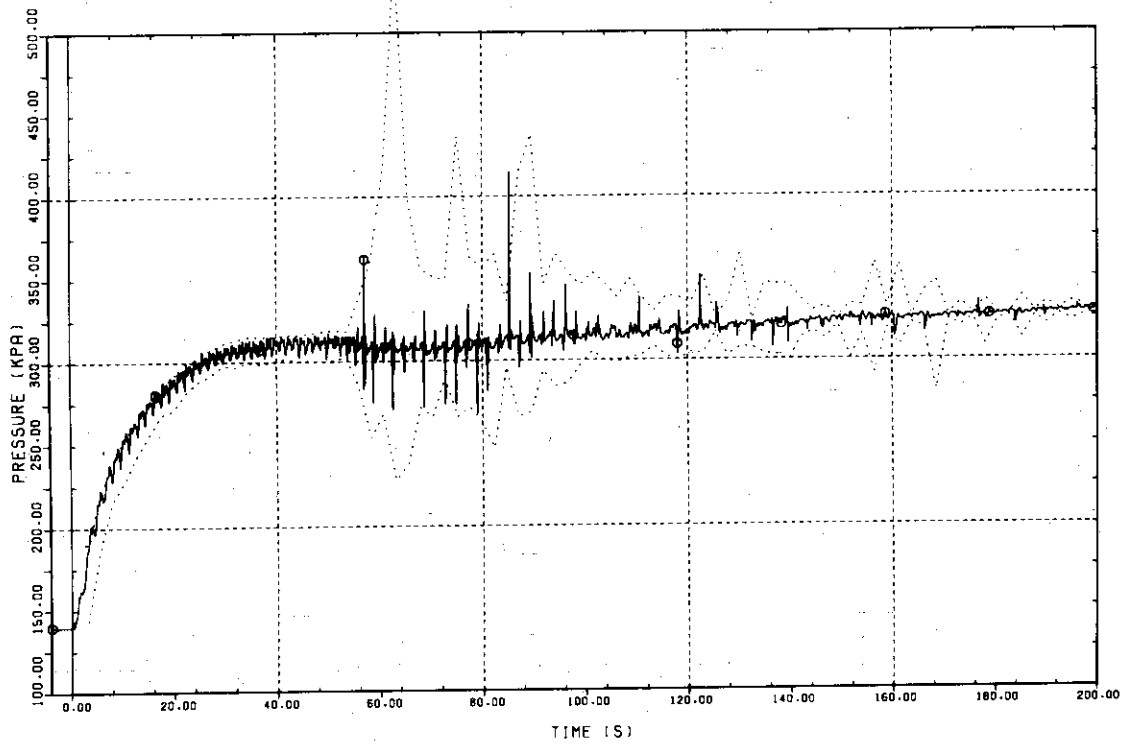
Plot L-52 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
○ WMPF-602 WALL BESIDE VP4 (P5. 3.6M ABOVE BOTT.)
PLOT WITH ENVELOPE



Plot L-53 Pressure in Wetwell

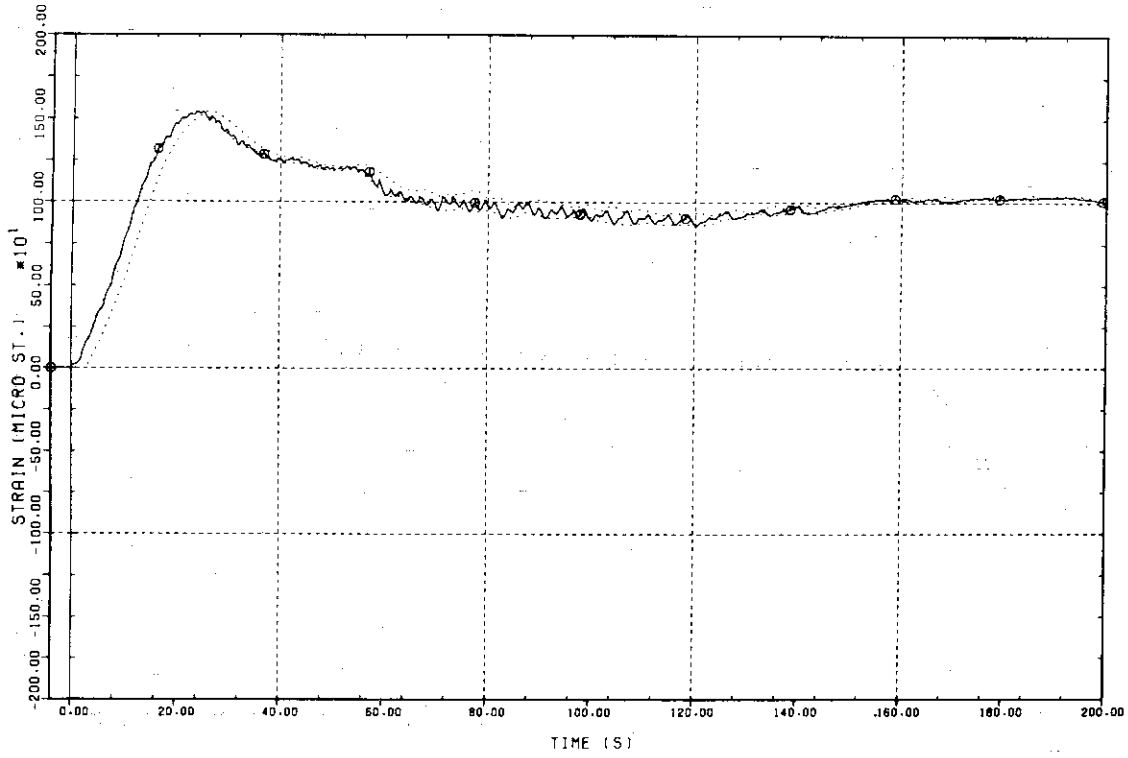
TEST 2 FULL-SCALE MARK II CRT
○ WMPF-702 WALL BESIDE VP7 (P6. 3.6M ABOVE BOTT.)
PLOT WITH ENVELOPE



Plot L-54 Pressure in Wetwell

TEST 2
○ VPSF-101 LOWER BRACE BETW. VP1 & WALL
PLOT WITH ENVELOPE

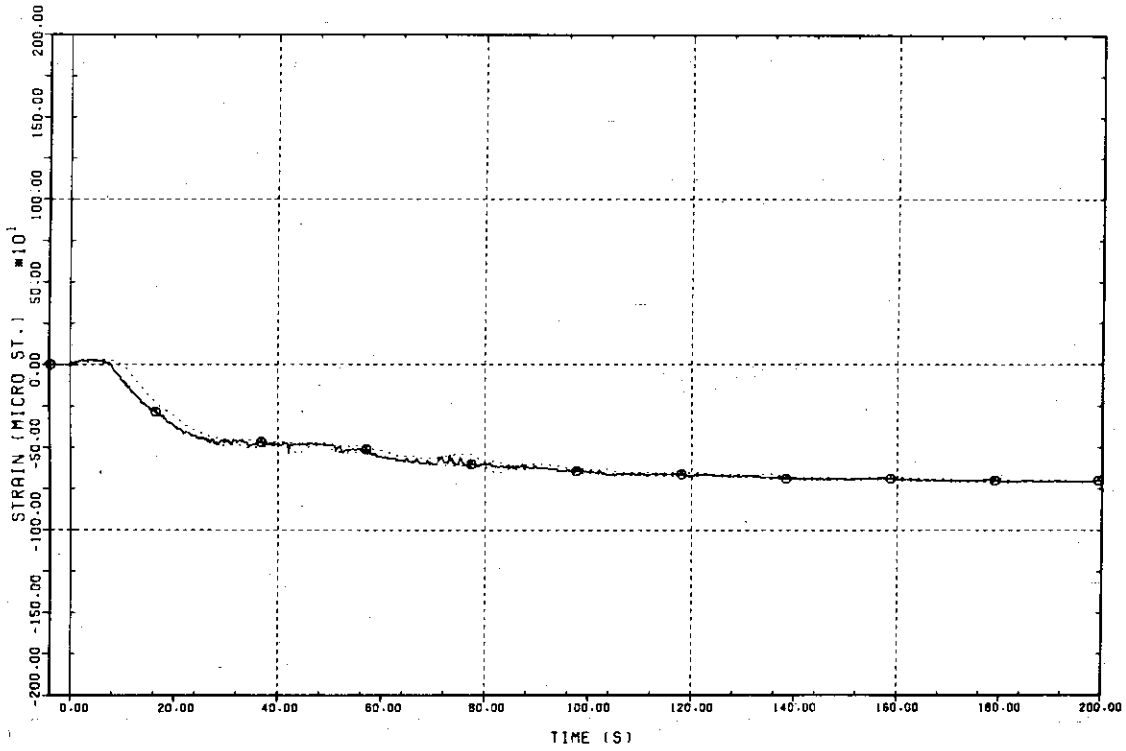
FULL-SCALE MARK II CRT



Plot L-55 Strain of Vent Pipe Brace

TEST 2
○ VPSF-103 LOWER BRACE BETW. VP1 & VP6
PLOT WITH ENVELOPE

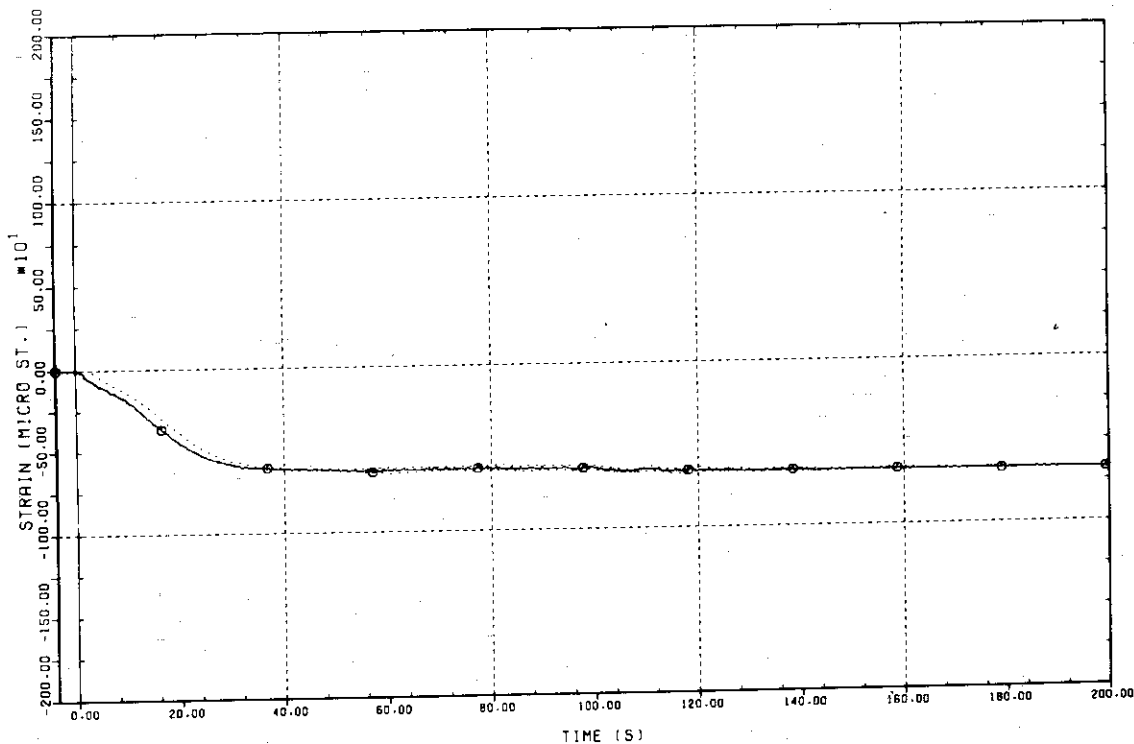
FULL-SCALE MARK II CRT



Plot L-56 Strain of Vent Pipe Brace

TEST 2
○ VPSF-201 UPPER BRACE BETW. VP1 & PEDESTAL
PLOT WITH ENVELOPE

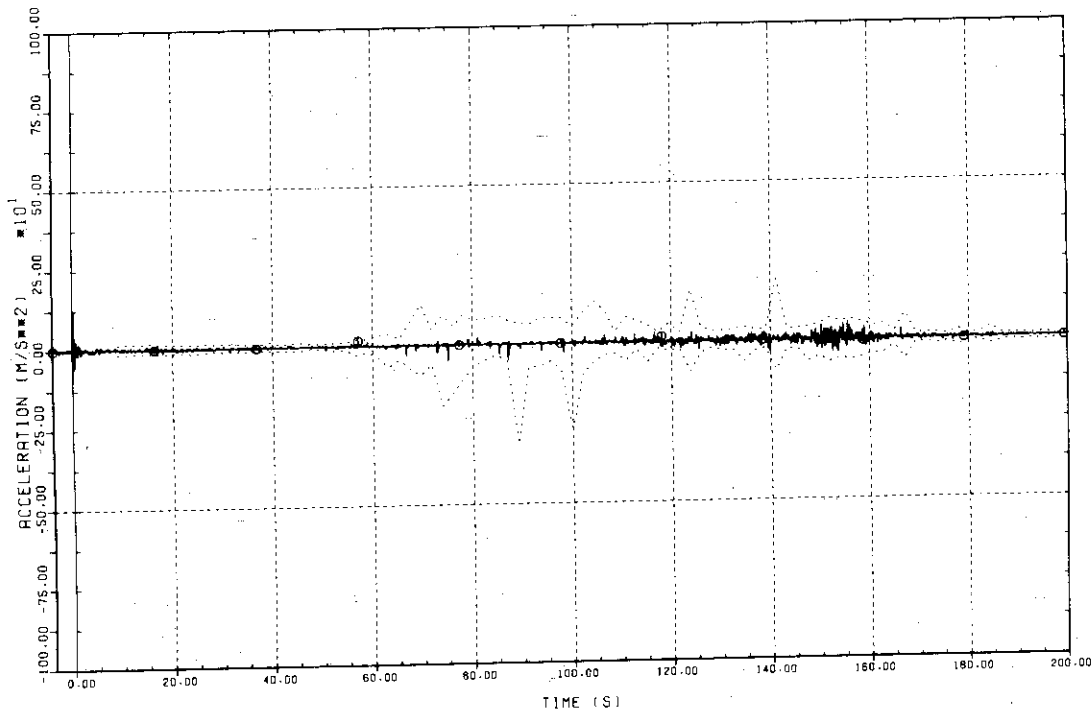
FULL-SCALE MARK II CRT



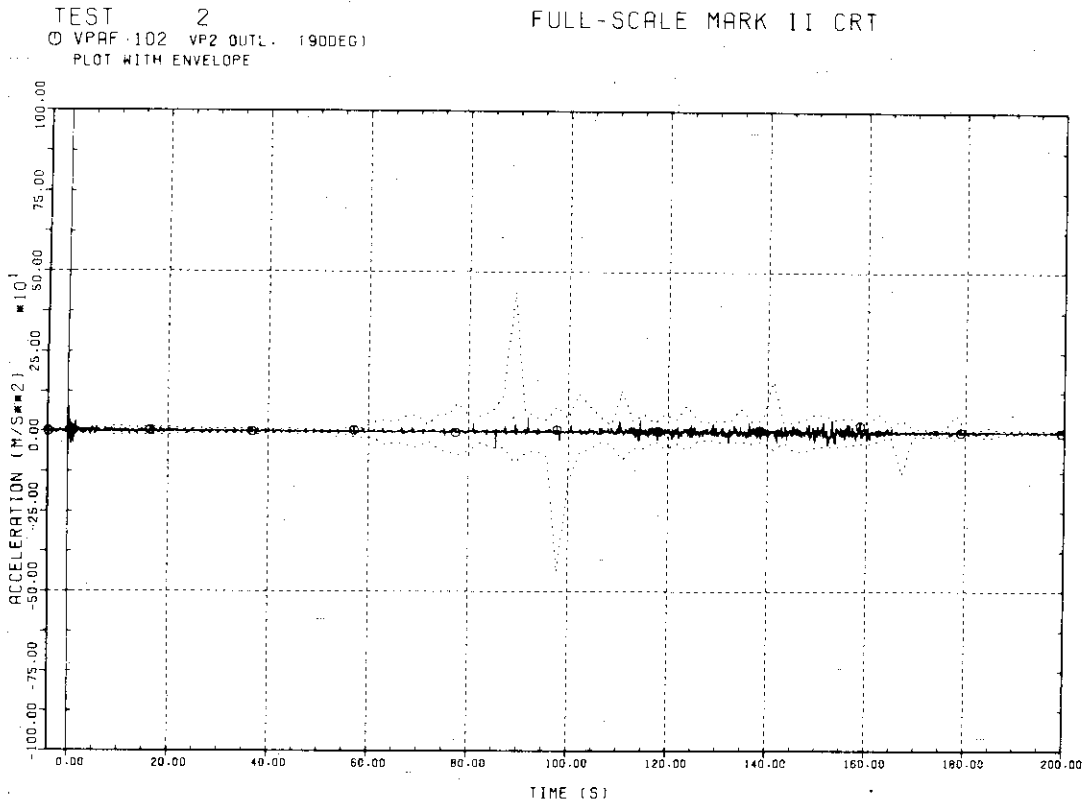
Plot L-57 Strain of Vent Pipe Brace

TEST 2
○ VPAF-101 VP2 OUTL. (00EG)
PLOT WITH ENVELOPE

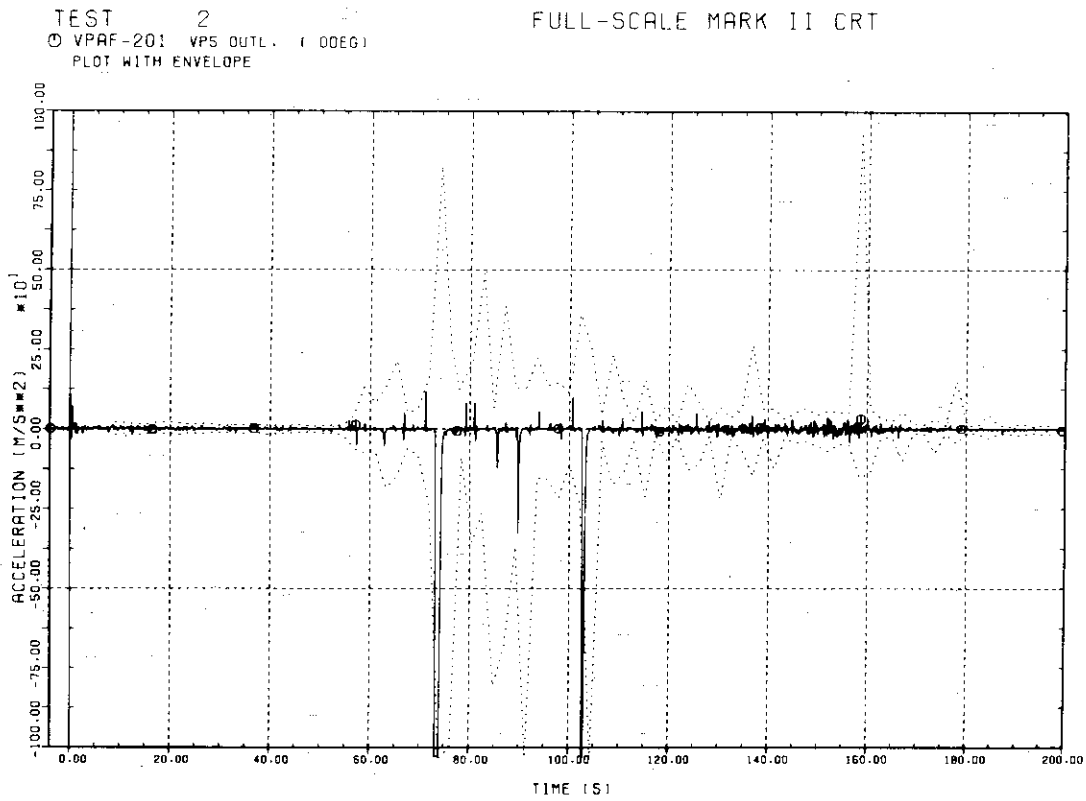
FULL-SCALE MARK II CRT



Plot L-58 Acceleration of Vent Pipe Outlet

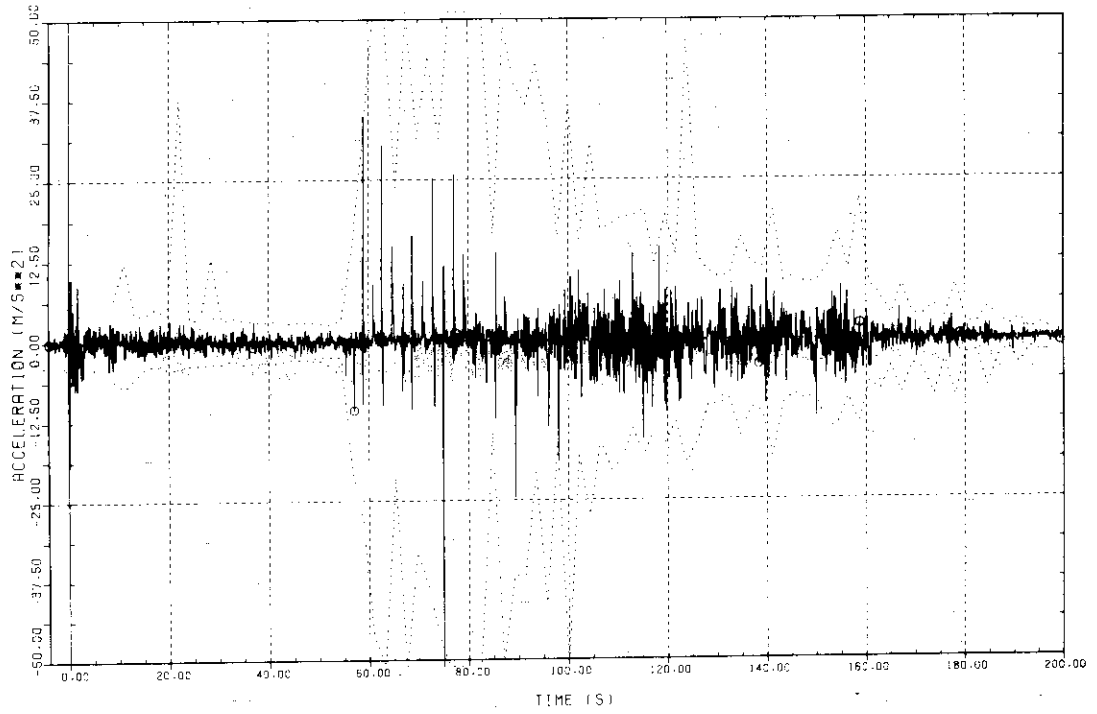


Plot L-59 Acceleration of Vent Pipe Outlet



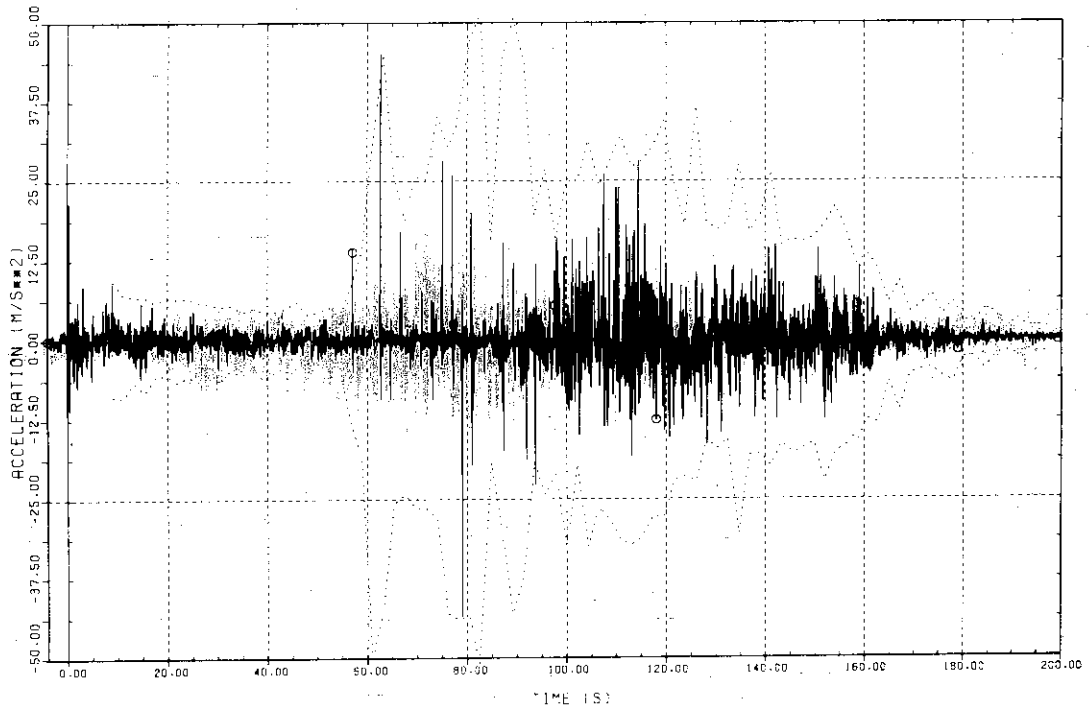
Plot L-60 Acceleration of Vent Pipe Outlet

TEST 2 FULL-SCALE MARK II CRT
① WRAF-005 SHELL BESIDE VP3 (3.0M ABOVE BOTT.)
PLOT WITH ENVELOPE



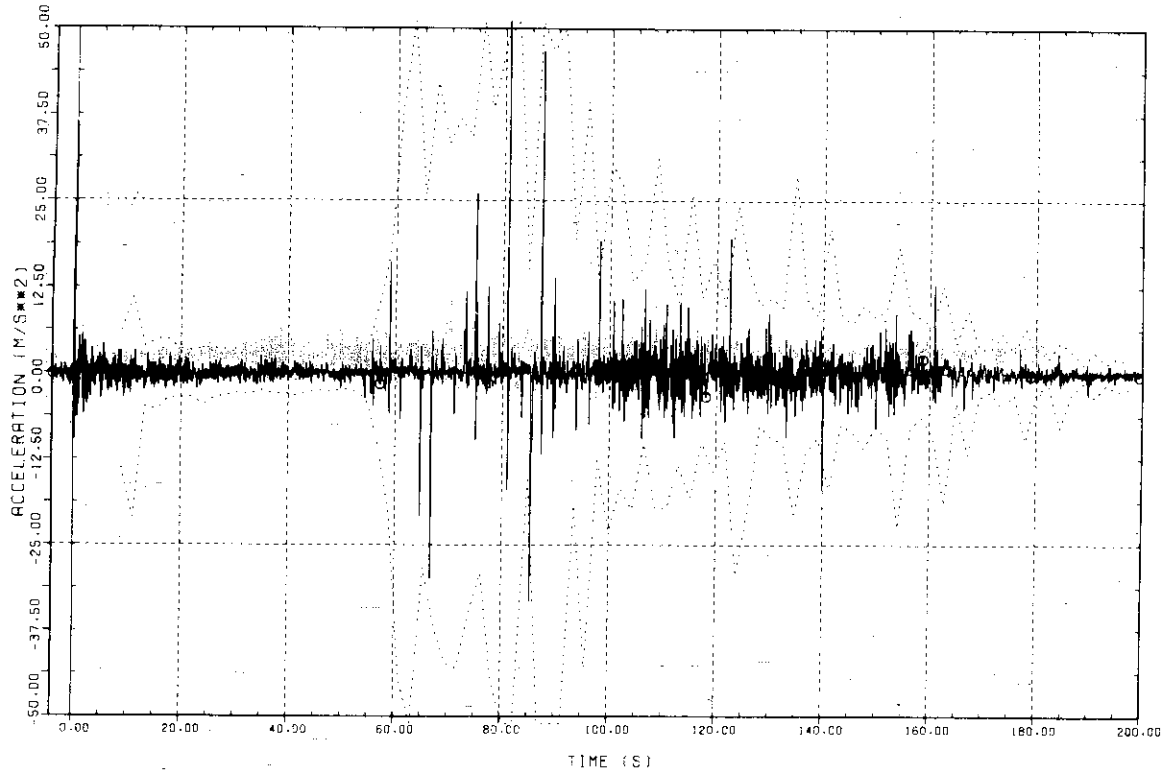
Plot L-61 Acceleration of Containment Structure

TEST 2 FULL-SCALE MARK II CRT
① WRAF-006 SHELL BESIDE VP3 (6.0M ABOVE BOTT.)
PLOT WITH ENVELOPE



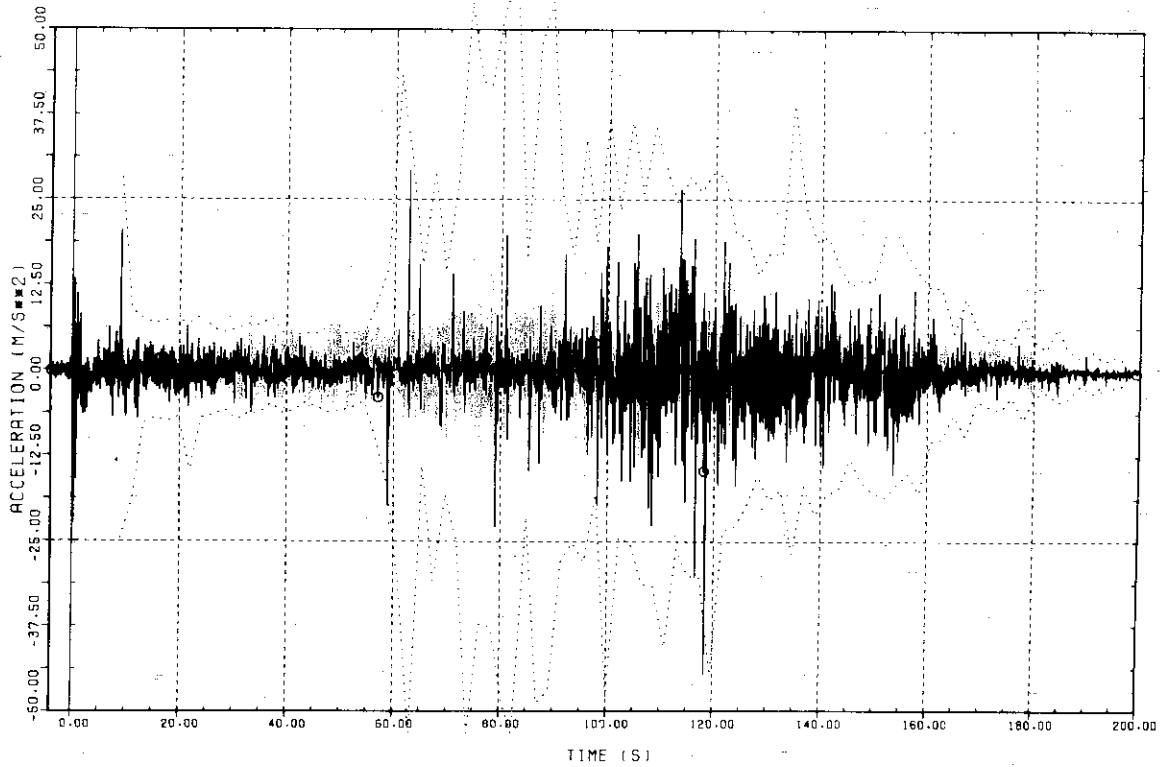
Plot L-62 Acceleration of Containment Structure

TEST 2 FULL-SCALE MARK II CRT
 ○ WRAF-007 SHELL BESIDE VP4 (3.0M ABOVE BOTT.)
 PLOT WITH ENVELOPE



Plot L-63 Acceleration of Containment Structure

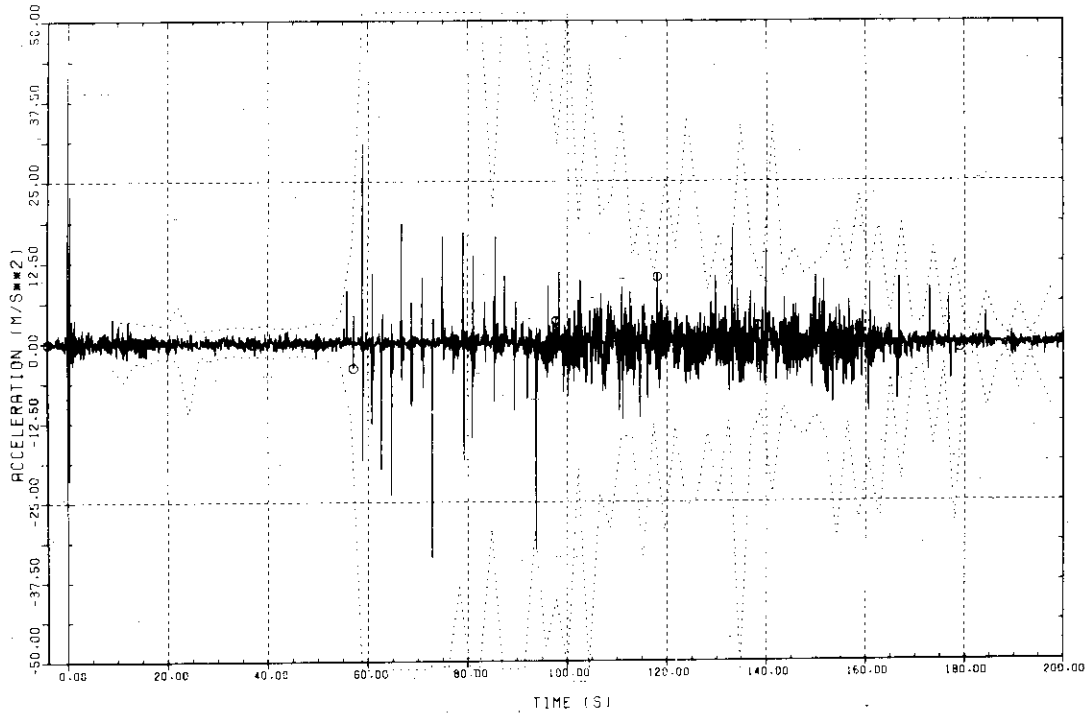
TEST 2 FULL-SCALE MARK II CRT
 ○ WRAF-008 SHELL BESIDE VP4 (6.0M ABOVE BOTT.)
 PLOT WITH ENVELOPE



Plot L-64 Acceleration of Containment Structure

TEST 2
⊙ WRAF-009 PEDESTAL (3.0M ABOVE BOTT.)
PLOT WITH ENVELOPE

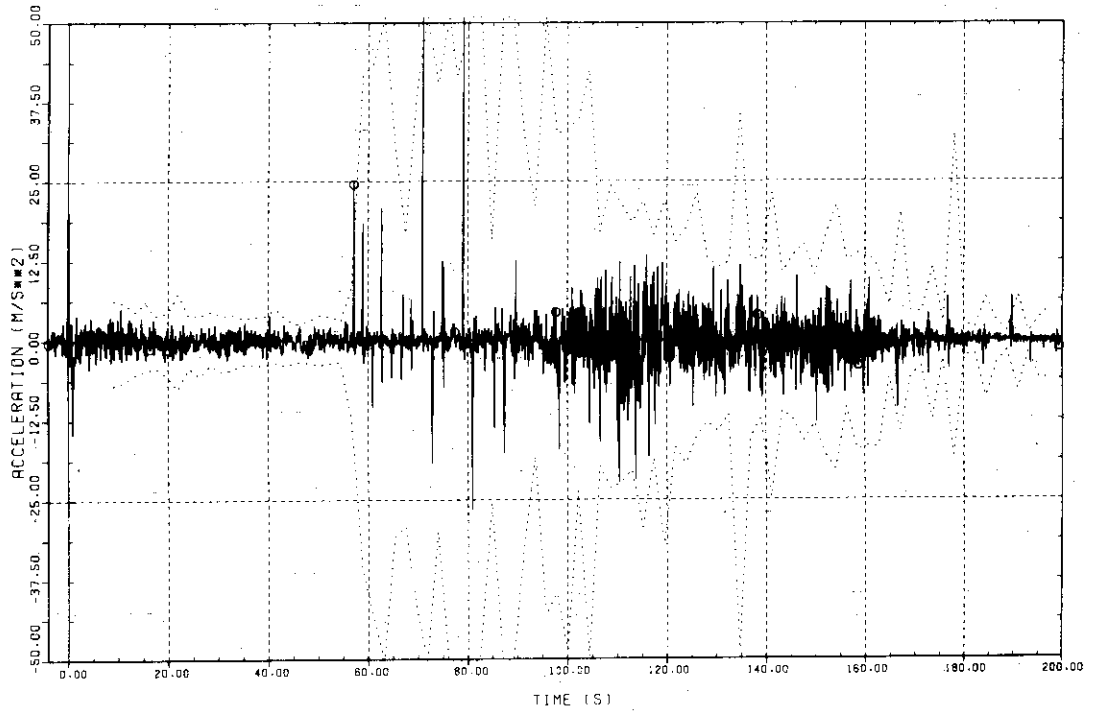
FULL-SCALE MARK II CRT



Plot L-65 Acceleration of Containment Structure

TEST 2
⊙ WRAF-010 PEDESTAL (6.0M ABOVE BOTT.)
PLOT WITH ENVELOPE

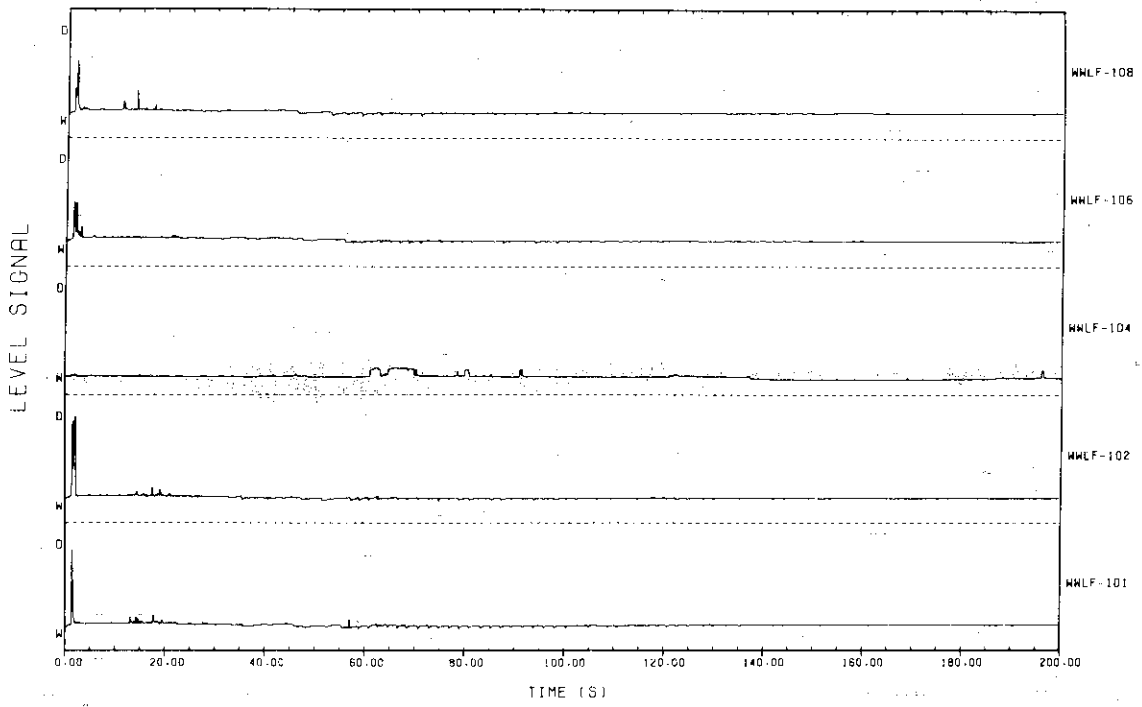
FULL-SCALE MARK II CRT



Plot L-66 Acceleration of Containment Structure

TEST 2

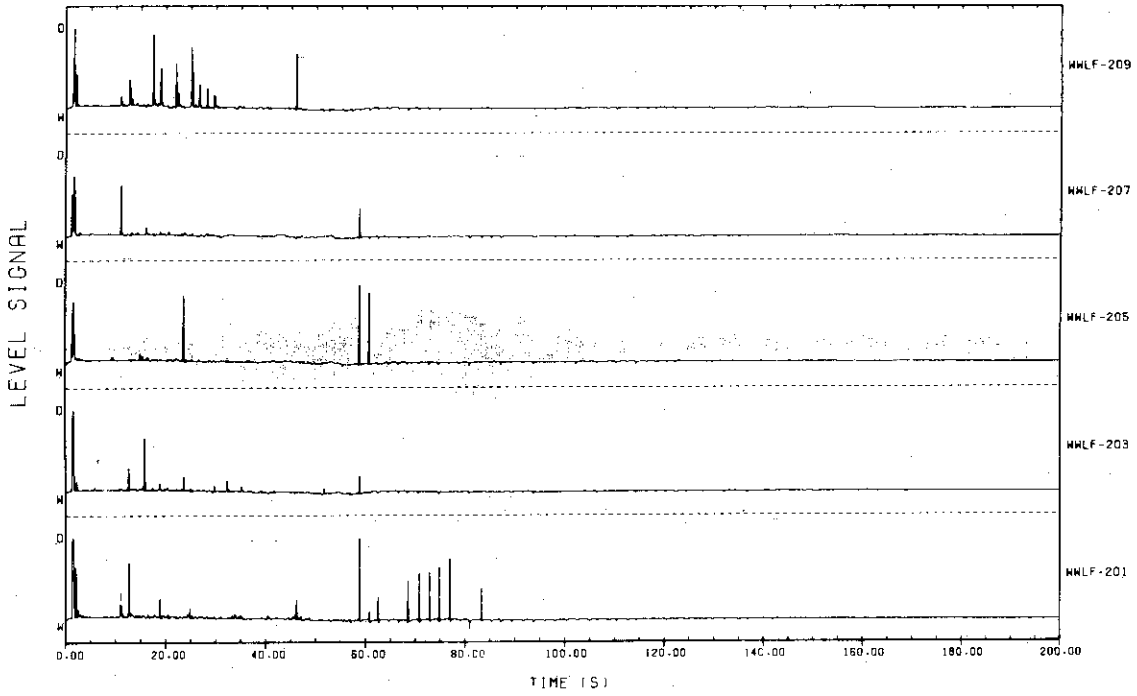
FULL-SCALE MARK II CRT



Plot L-67 Phase Boundary Signals

TEST 2

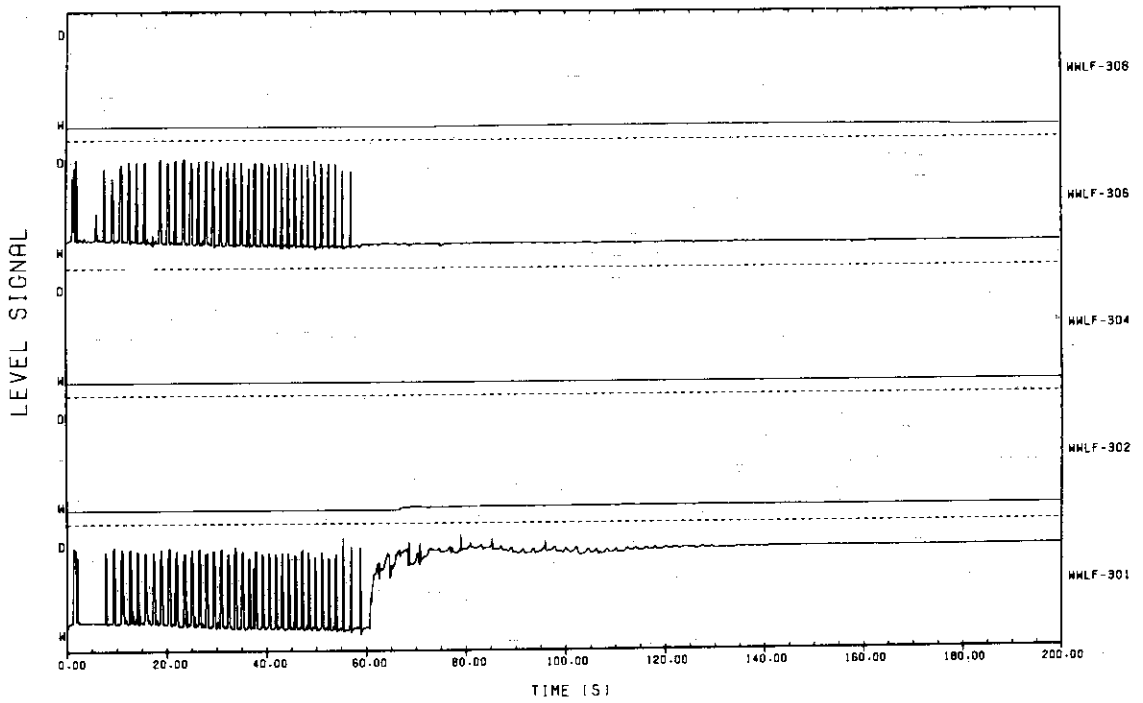
FULL-SCALE MARK II CRT



Plot L-68 Phase Boundary Signals

TEST 2

FULL-SCALE MARK II CRT



Plot L-69 Phase Boundary Signals

Short Term Plots of Data

Short Term Plot Specification

Period 75 - 85 s

Objective : Detailed Presentation of Pool Swell.
 High and Medium Steam Flux
 Condensation Oscillation.
 Chugging.

Plot No.	Recording System	Recording Rate (data/s)	Sampling Rate for Plots	Remarks
S-1 - S-4	Computer	50	1/1	Level inside Vent pipes.
S-4 - S-29	PCM Track-1	455.55	1/1	
S-30 - S-41	PCM Track-2	455.55	1/1	

List of Short Term Plots

Computer Recorded Channels

Plot	S- 1	Water Level in Vent Pipe	(VP's 1 and 2)
	S- 2	Water Level in Vent Pipe	(VP's 3 and 4)
	S- 3	Water Level in Vent Pipe and Vacuum Breaker Actuation Signal	(VP5)

PCM Track-1 Channels

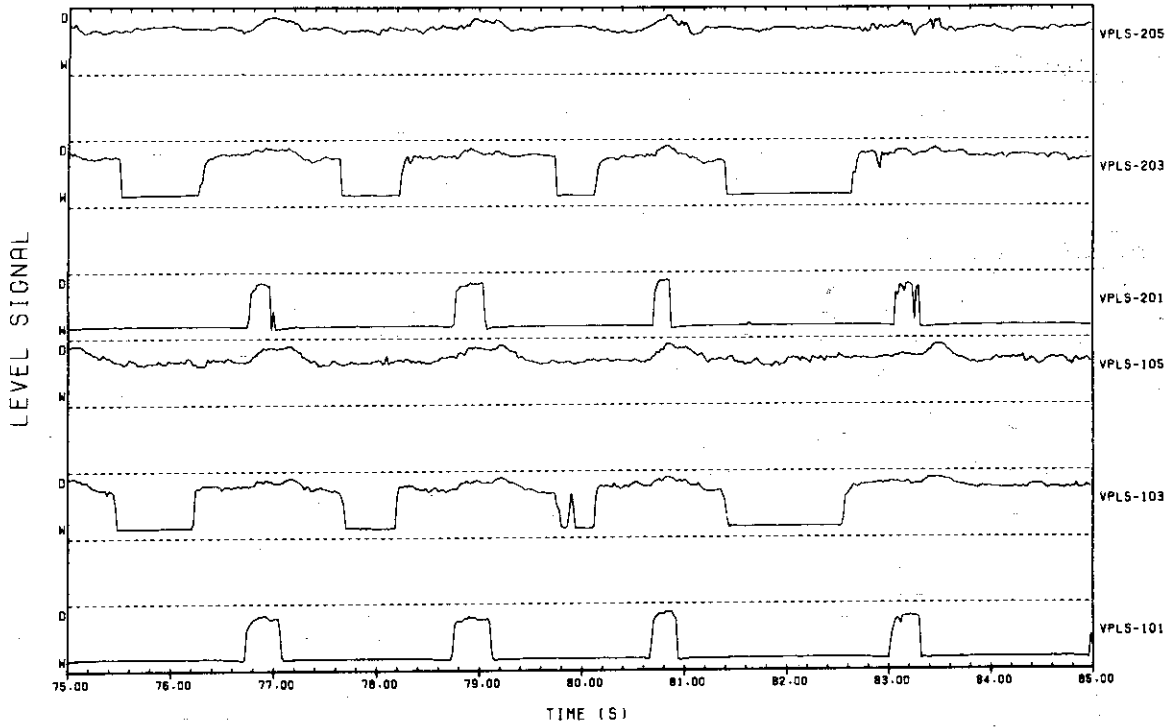
Plot	S- 4	Pressures in Drywell and Wetwell Airspace	
	S- 5	Pressure in Vent Pipe	(VPPF-201)
	S- 6	Pressure in Vent Pipe	(VPPF-302)
	S- 7	Pressure in Vent Pipe	(VPPF-303)
	S- 8	Pressure in Vent Pipe	(VPPF-401)
	S- 9	Pressure in Vent Pipe	(VPPF-501)
	S-10	Pressure in Vent Pipe	(VPPF-502)
	S-11	Pressure in Vent Pipe	(VPPF-503)
	S-12	Pressure in Wetwell	(WWPF-102)
	S-13	Pressure in Wetwell	(WWPF-103)
	S-14	Pressure in Wetwell	(WWPF-104)
	S-15	Pressure in Wetwell	(WWPF-105)
	S-16	Pressure in Wetwell	(WWPF-106)
	S-17	Pressure in Wetwell	(WWPF-107)
	S-18	Pressure in Wetwell	(WWPF-201)
	S-19	Pressure in Wetwell	(WWPF-202)
	S-20	Pressure in Wetwell	(WWPF-302)
	S-21	Pressure in Wetwell	(WWPF-401)
	S-22	Pressure in Wetwell	(WWPF-402)
	S-23	Pressure in Wetwell	(WWPF-501)
	S-24	Pressure in Wetwell	(WWPF-502)
	S-25	Pressure in Wetwell	(WWPF-602)
	S-26	Pressure in Wetwell	(WWPF-702)
	S-27	Strain of Vent Pipe Brace	(VPSF-101)
	S-28	Strain of Vent Pipe Brace	(VPSF-102)
	S-29	Strain of Vent Pipe Brace	(VPSF-201)

PCM Track-2 Channels

Plot	S-30	Acceleration of Vent Pipe Outlet	(VPAF-101)
	S-31	Acceleration of Vent Pipe Outlet	(VPAF-103)
	S-32	Acceleration of Vent Pipe Outlet	(VPAF-201)
	S-33	Acceleration of Containment Structure	(WWAF-005)
	S-34	Acceleration of Containment Structure	(WWAF-006)
	S-35	Acceleration of Containment Structure	(WWAF-007)
	S-36	Acceleration of Containment Structure	(WWAF-008)
	S-37	Acceleration of Containment Structure	(WWAF-009)
	S-38	Acceleration of Containment Structure	(WWAF-010)
	S-39	Phase Boundary Signals	(WWLF-101 - 108)
	S-40	Phase Boundary Signals	(WWLF-201 - 209)
	S-41	Phase Boundary Signals	(WWLF-301 - 308)

TEST 2

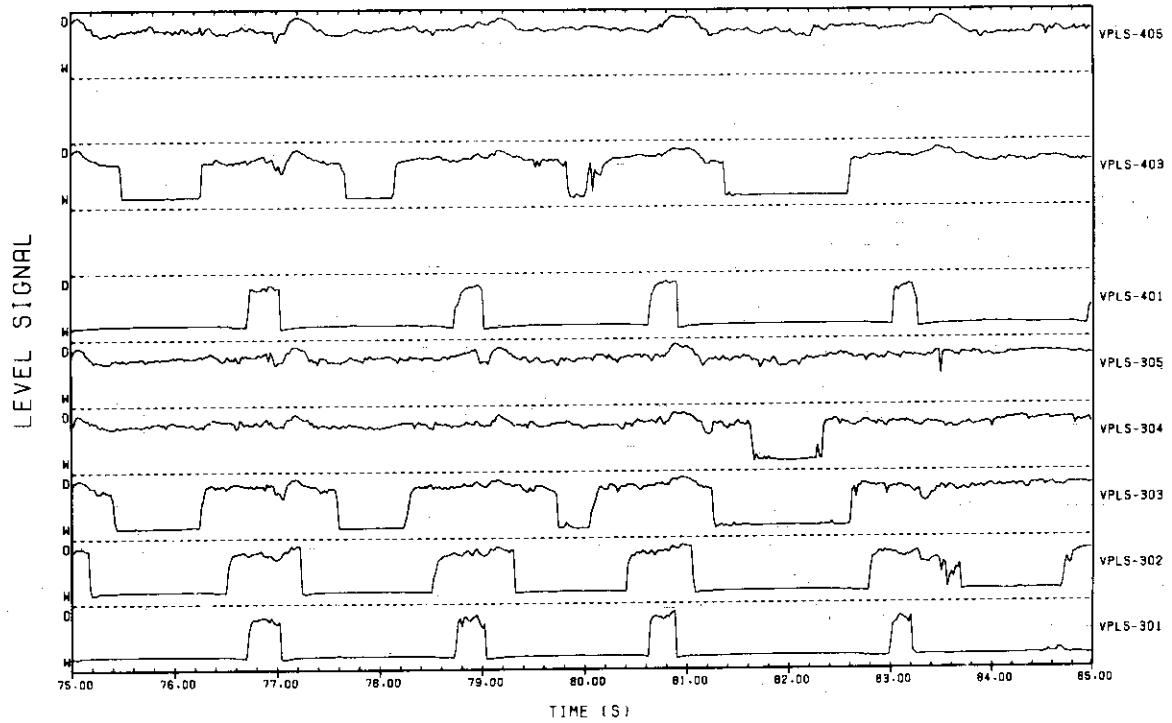
FULL-SCALE MARK II CRT



Plot S-1 Water Level in Vent Pipe

TEST 2

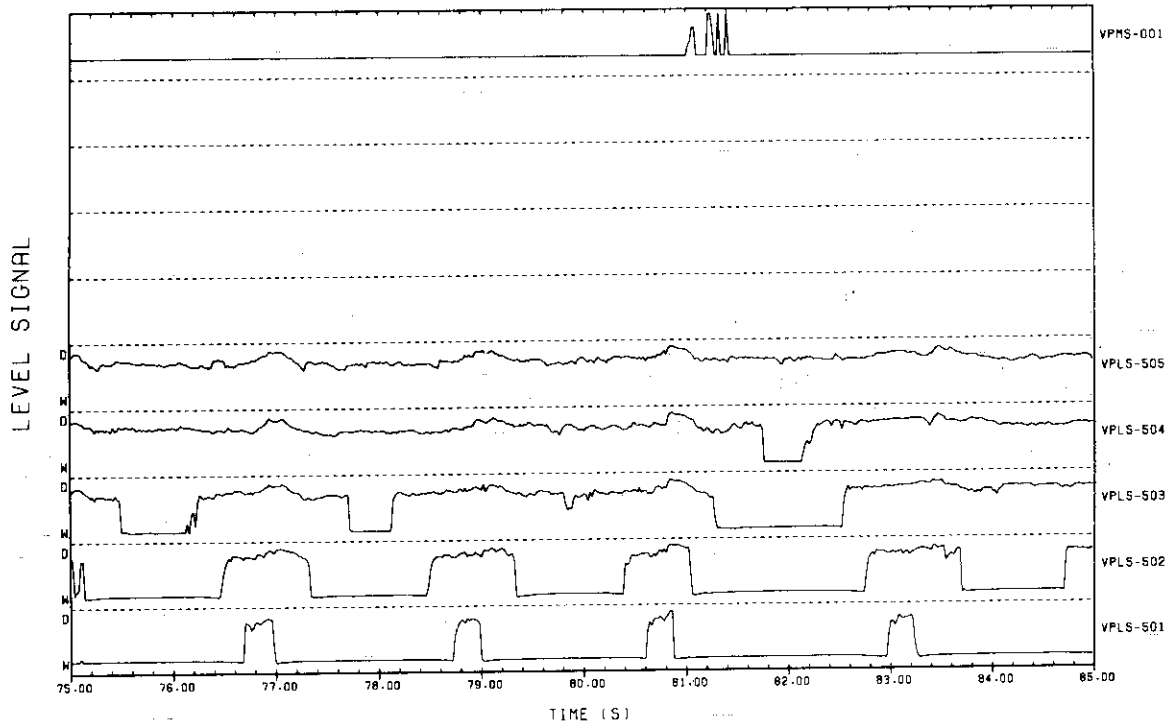
FULL-SCALE MARK II CRT



Plot S-2 Water Level in Vent Pipe

TEST 2

FULL-SCALE MARK II CRT

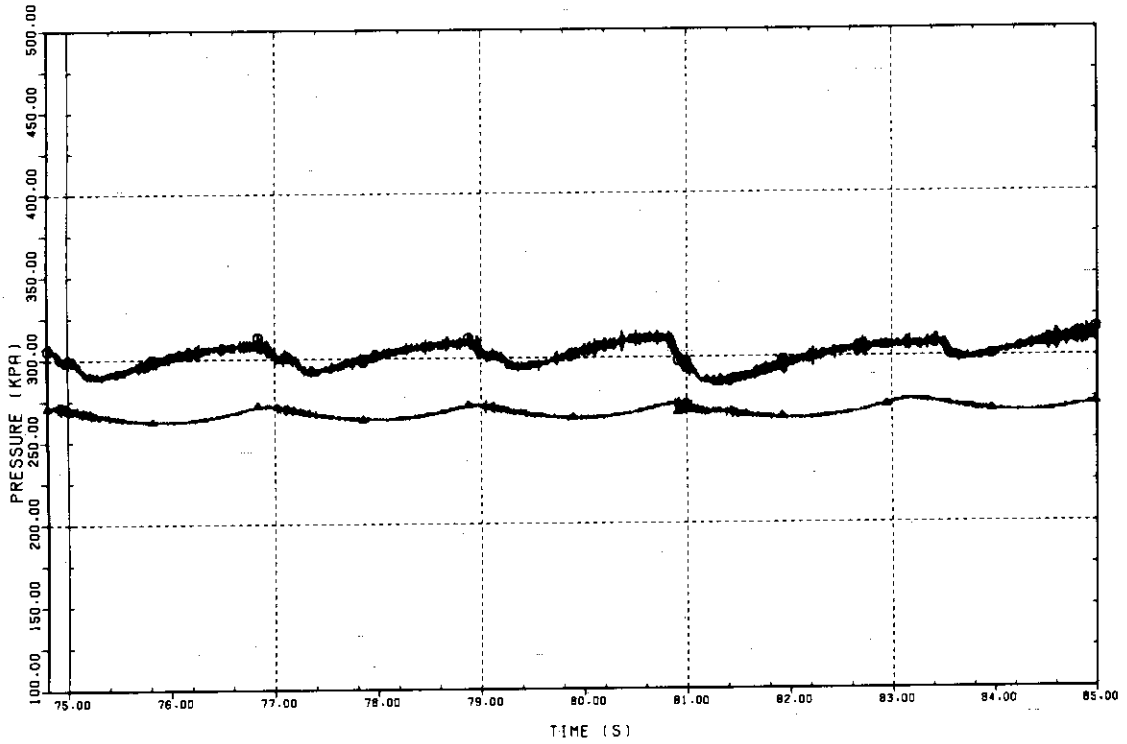


Plot S-3 Water Level in Vent Pipe and Vacuum Breaker Actuation Signal

TEST 2

FULL-SCALE MARK II CRT

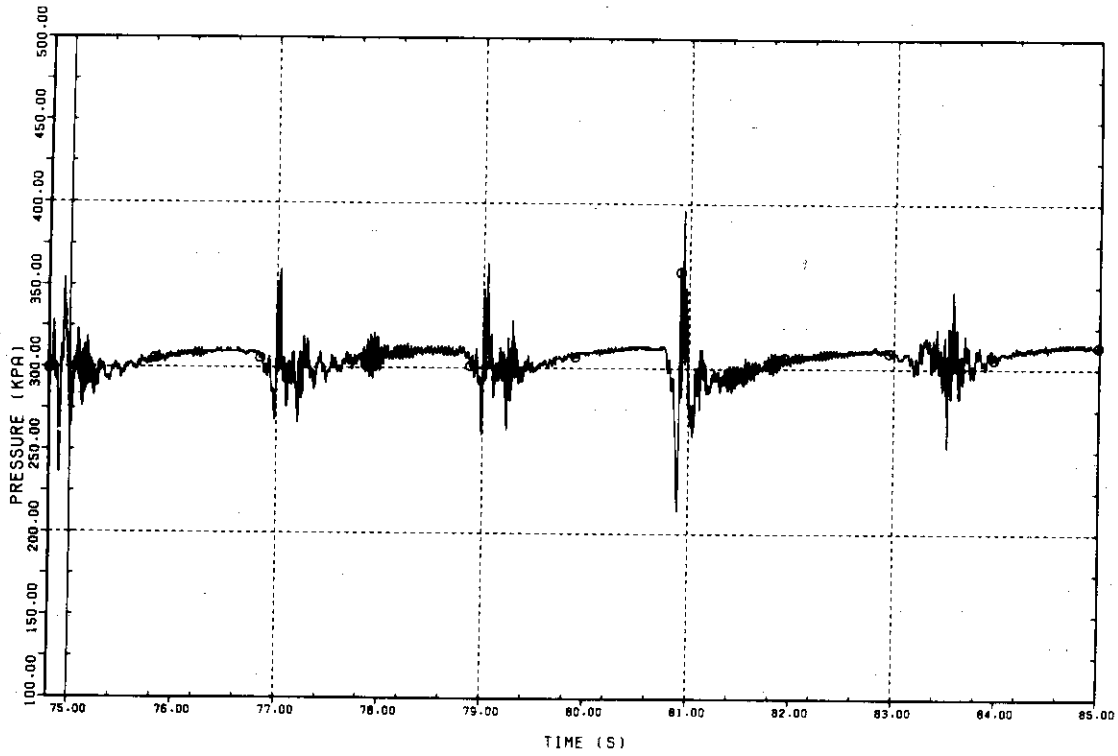
○ DMPF-001 DRYWELL
 △ WMPF-001 WETWELL AIRSPACE (15.0M ABOVE BOTT.)



Plot S-4 Pressures in Drywell and Wetwell Airspace

TEST 2
○ VPPF-201 VP2 (0.5M ABOVE OUTL.)

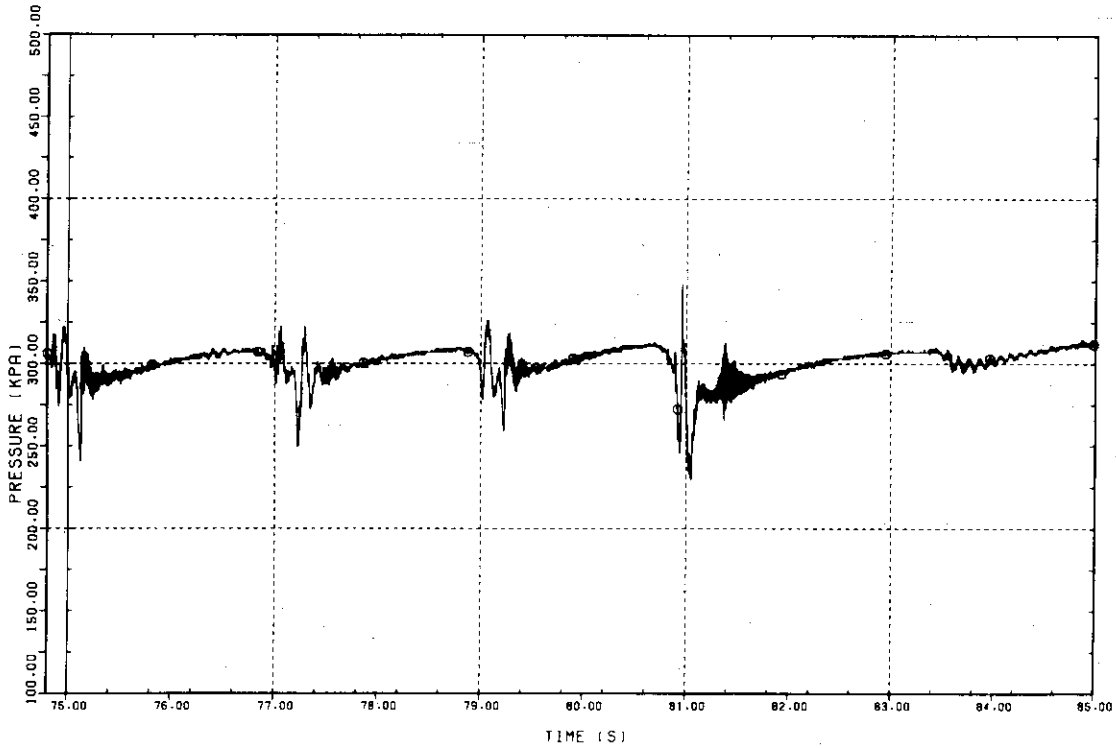
FULL-SCALE MARK II CRT



Plot S-5 Pressure in Vent Pipe

TEST 2
○ VPPF-302 VP3 (6.0M ABOVE OUTL.)

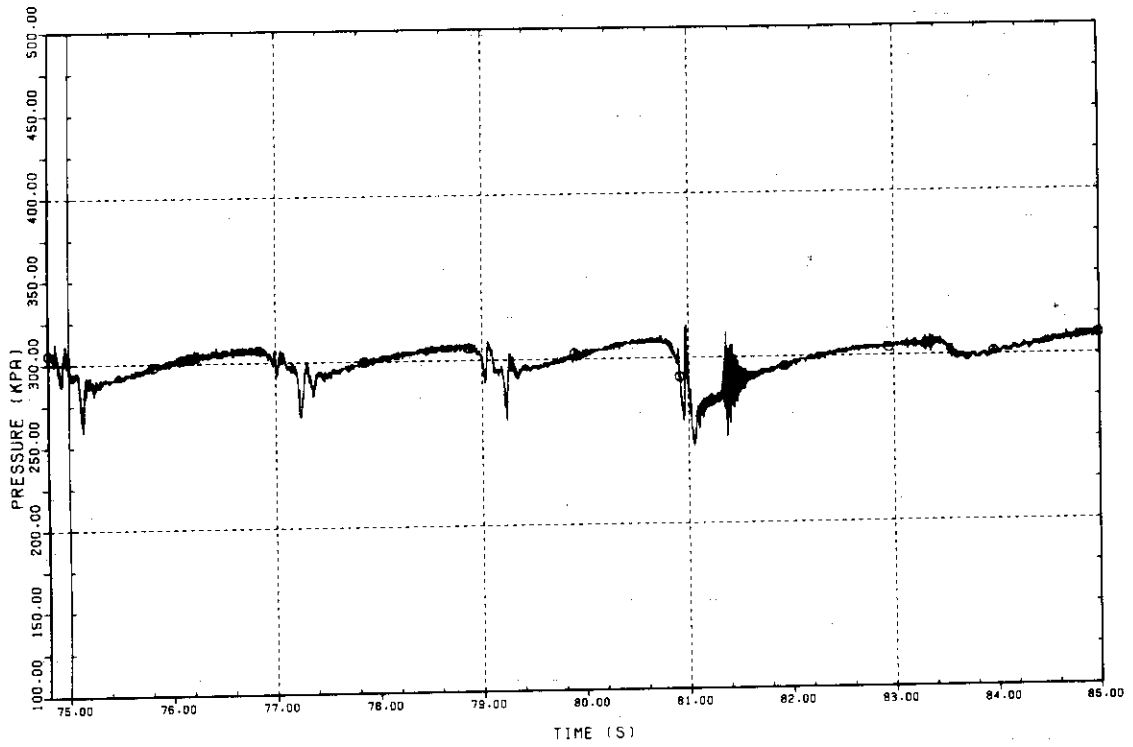
FULL-SCALE MARK II CRT



Plot S-6 Pressure in Vent Pipe

TEST 2
① VPPF-303 VP3 (11.5M ABOVE OUTL.)

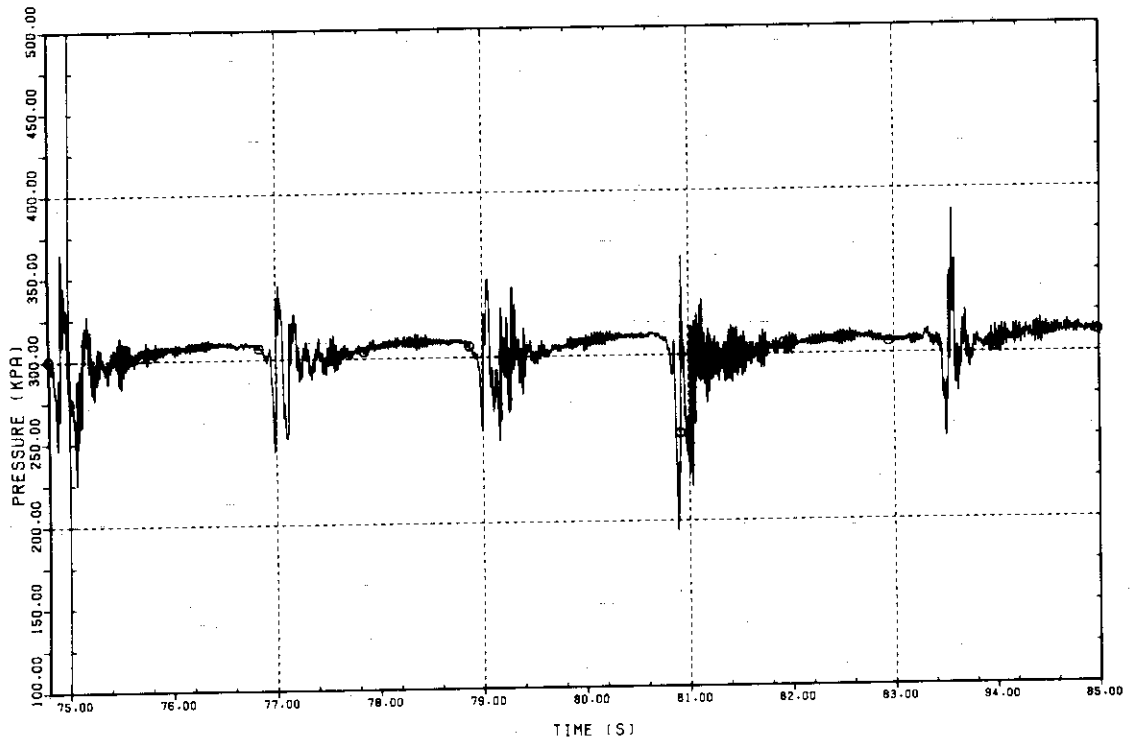
FULL-SCALE MARK II CRT



Plot S-7 Pressure in Vent Pipe

TEST 2
① VPPF-501 VPS (0.5M ABOVE OUTL.)

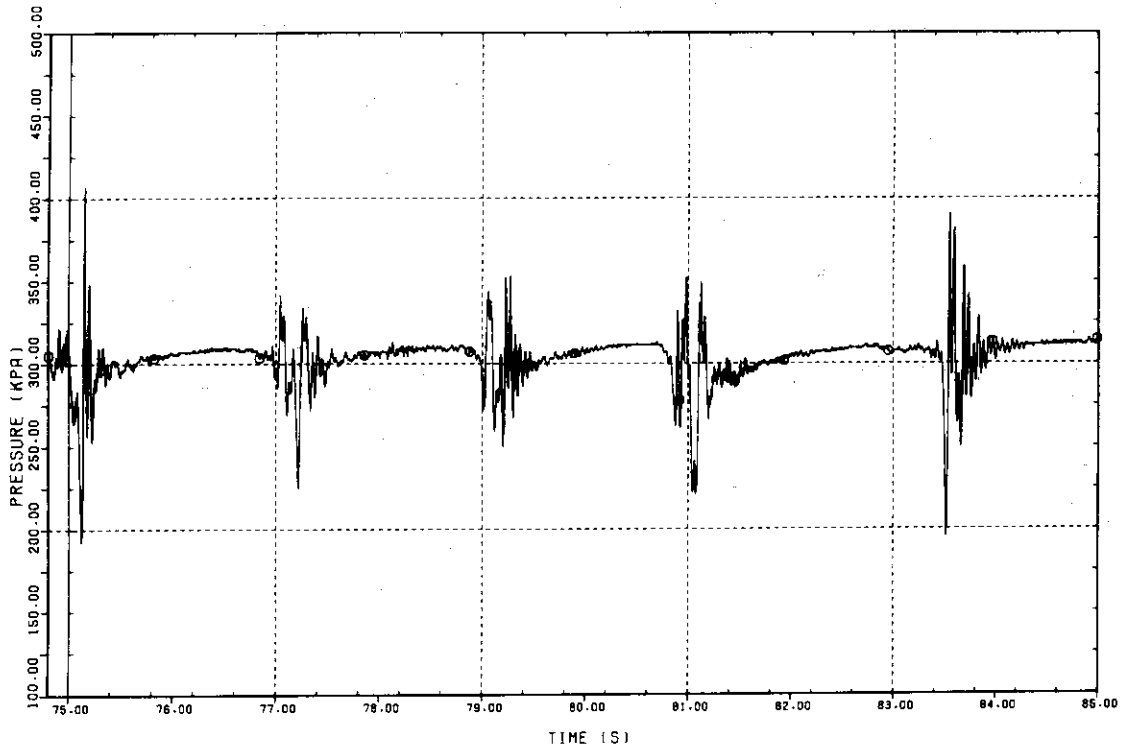
FULL-SCALE MARK II CRT



Plot S-8 Pressure in Vent Pipe

TEST 2
○ VPPF-401 VP4 (0.5M ABOVE OUTL.)

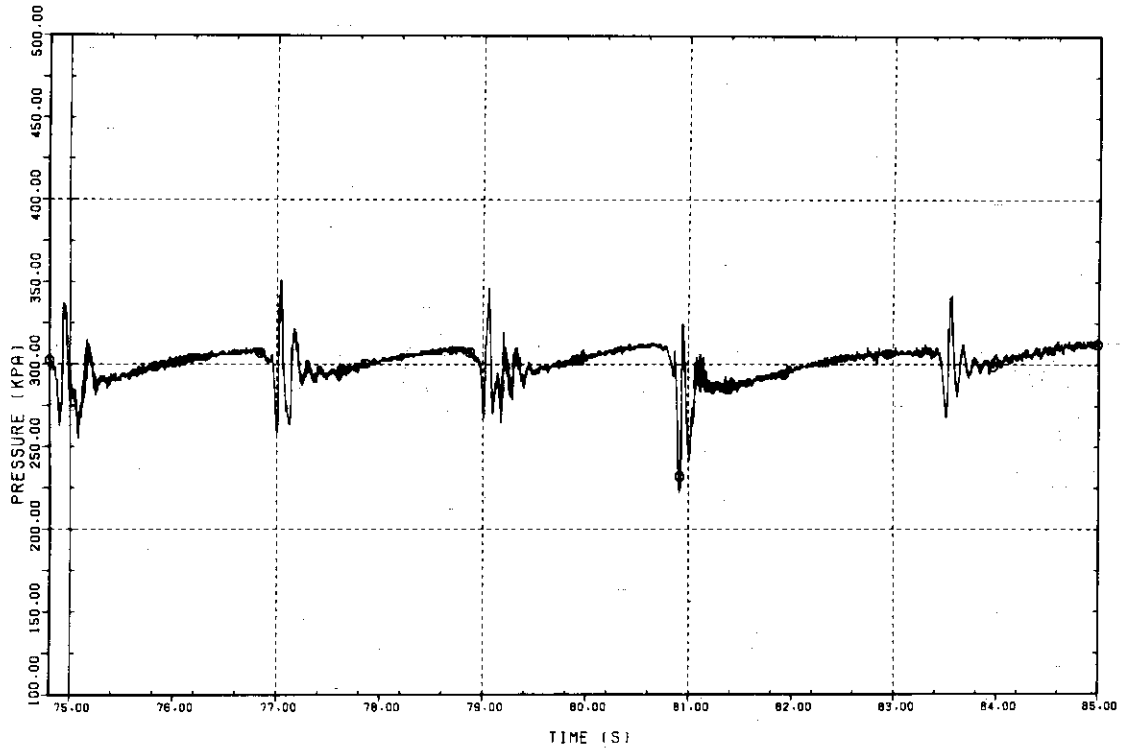
FULL-SCALE MARK II CRT



Plot S-9 Pressure in Vent Pipe

TEST 2
○ VPPF-502 VP5 (6.0M ABOVE OUTL.)

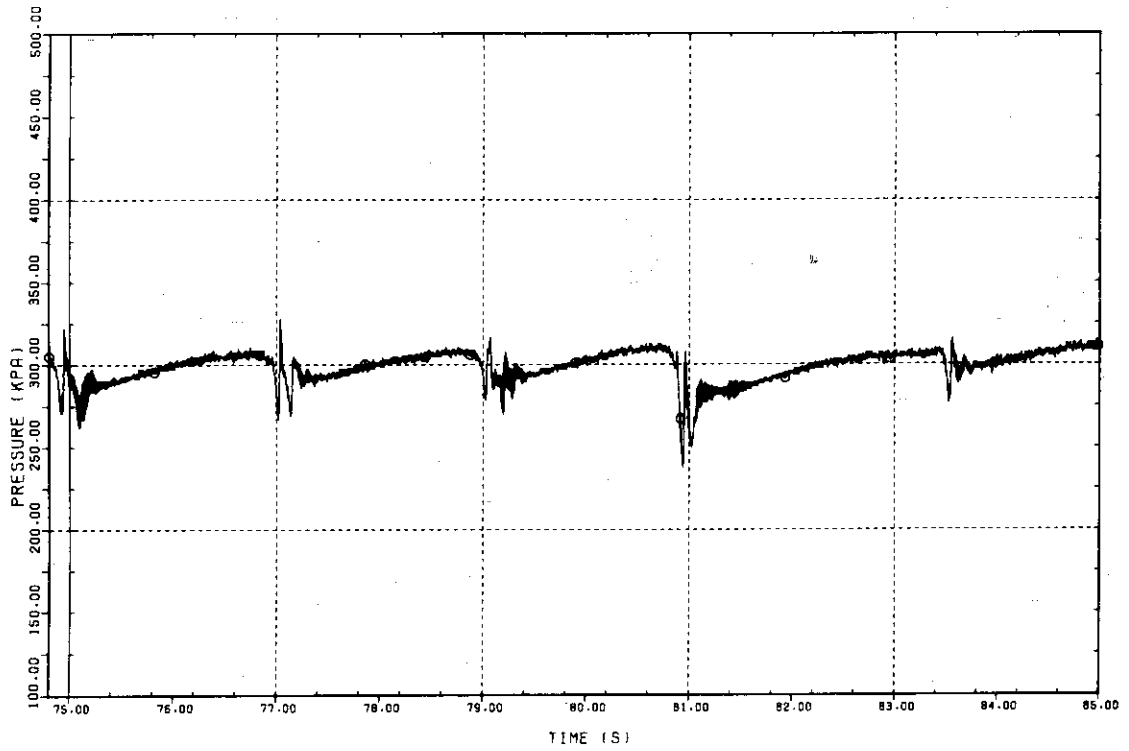
FULL-SCALE MARK II CRT



Plot S-10 Pressure in Vent Pipe

TEST 2
① VPPF-503 VPS (11.5M ABOVE OUTL.)

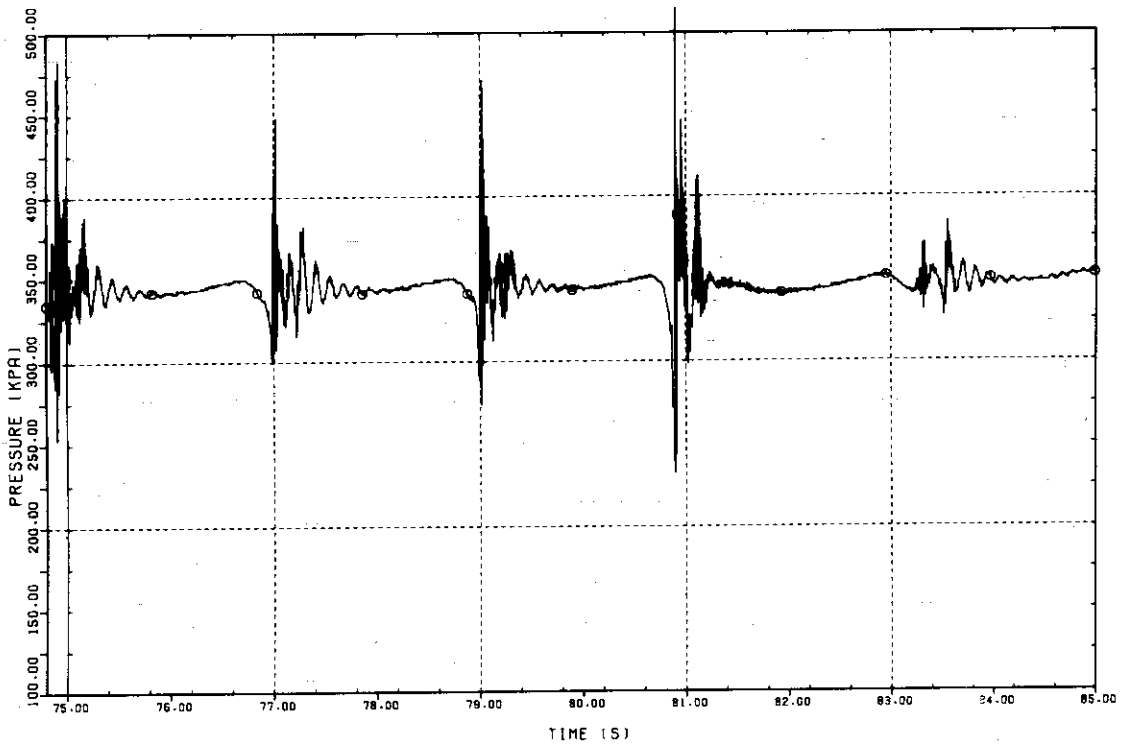
FULL-SCALE MARK II CRT



Plot S-11 Pressure in Vent Pipe

TEST 2
① WVPF-102 POOL BOTTL. UNDER VP2

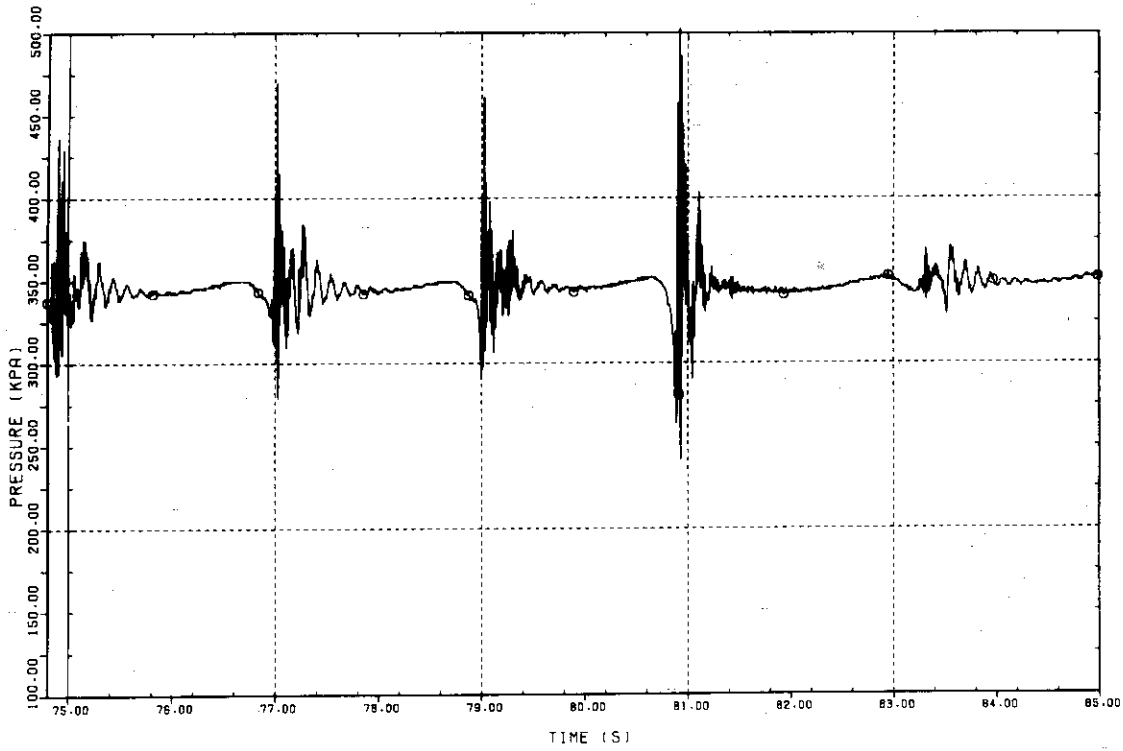
FULL-SCALE MARK II CRT



Plot S-12 Pressure in Wetwell

TEST 2
○ WWPF-103 POOL BOTT. UNDER VP3

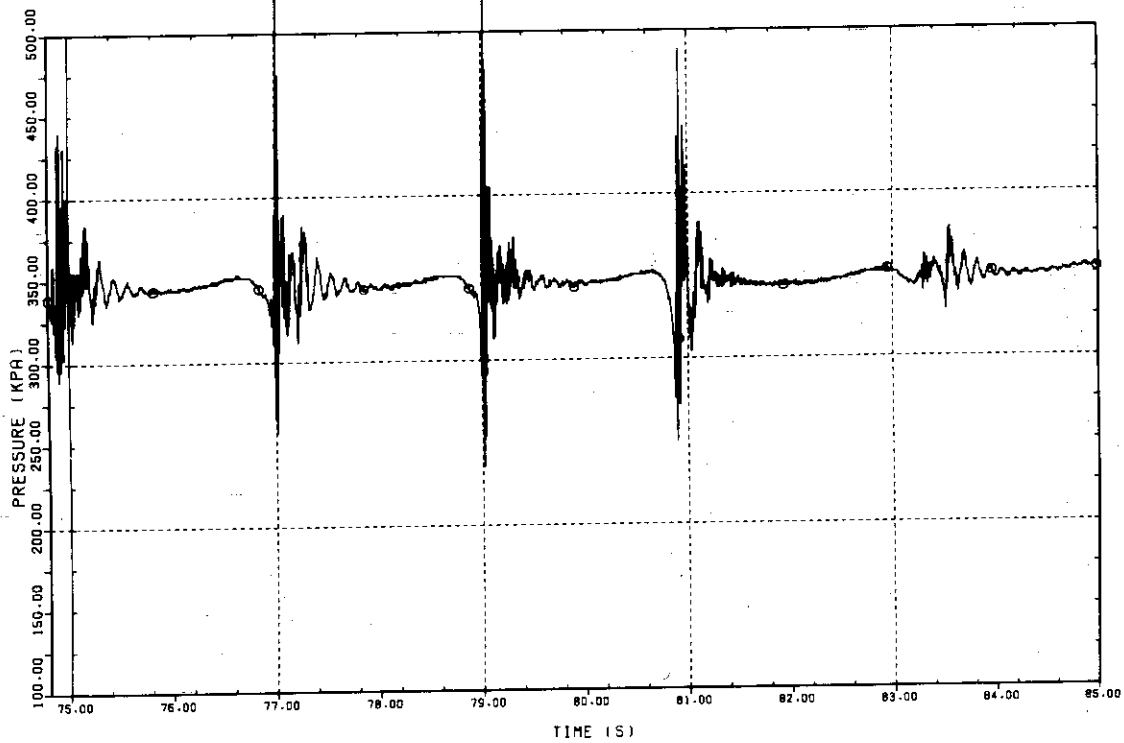
FULL-SCALE MARK II CRT



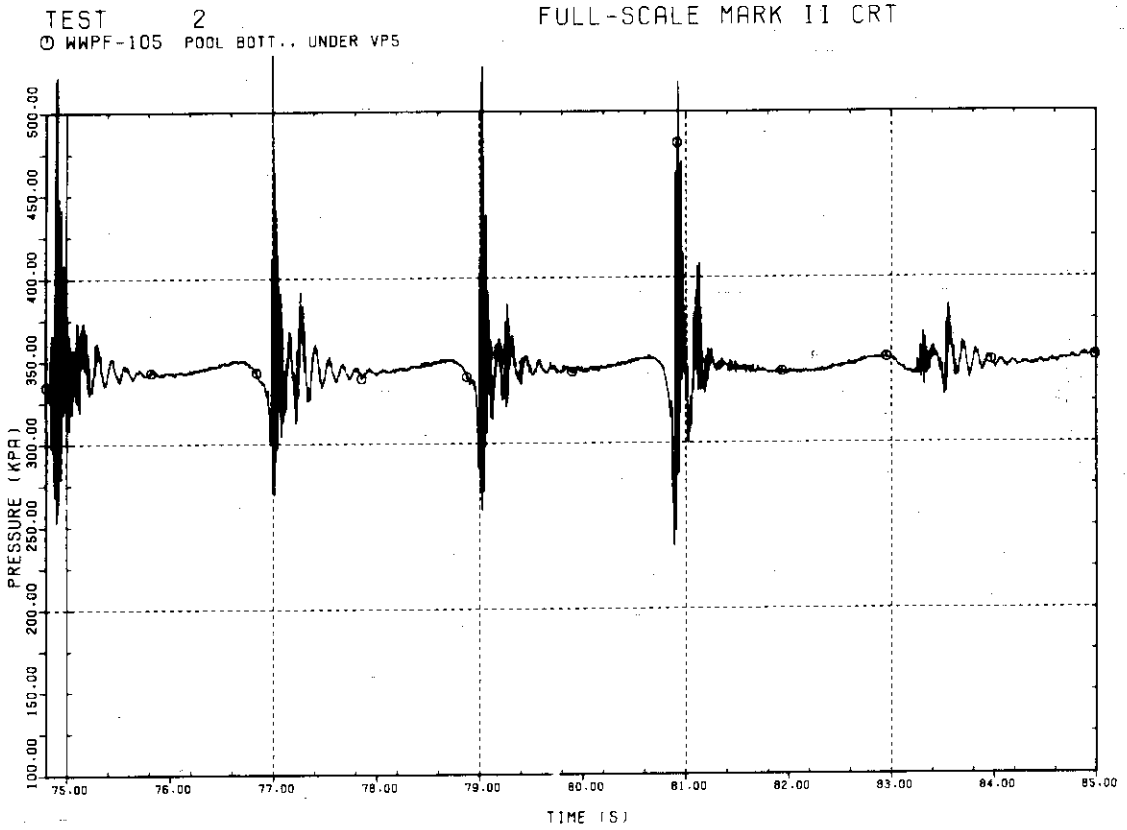
Plot S-13 Pressure in Wetwell

TEST 2
○ WWPF-104 POOL BOTT. UNDER VP4

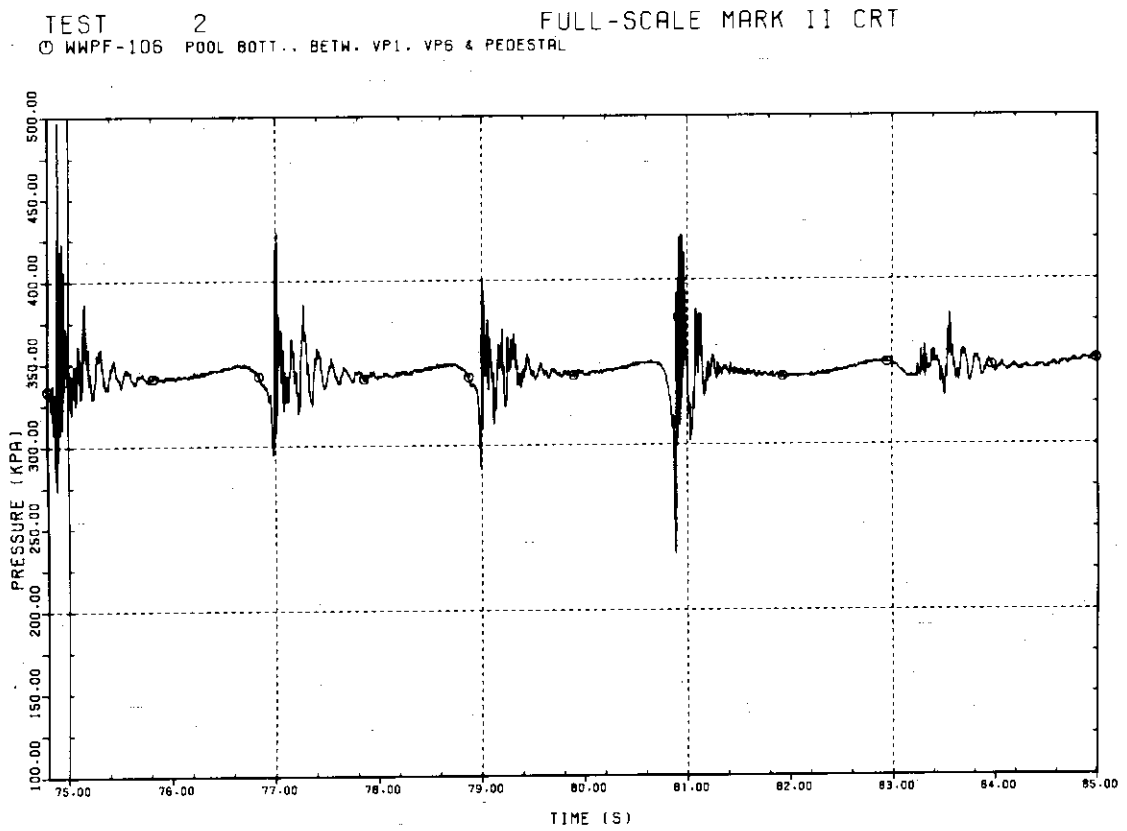
FULL-SCALE MARK II CRT



Plot S-14 Pressure in Wetwell



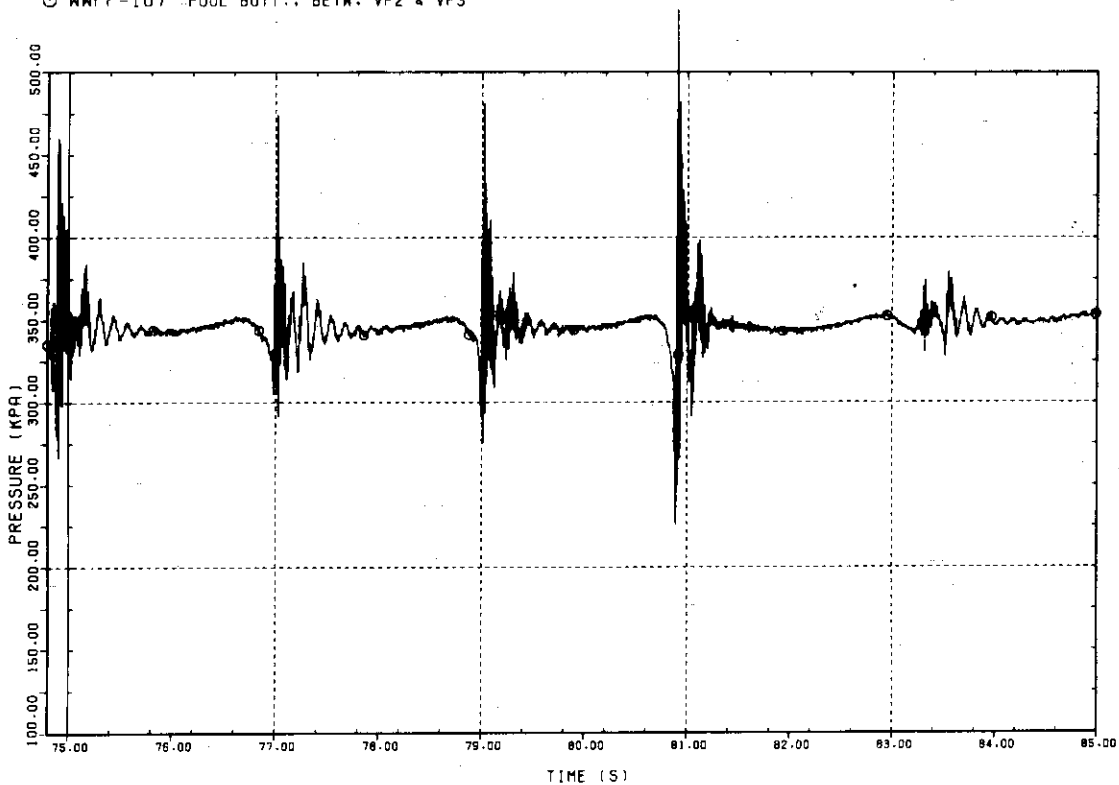
Plot S-15 Pressure in Wetwell



Plot S-16 Pressure in Wetwell

TEST 2
○ WMPF-107 POOL BOTT., BETW. VP2 & VP3

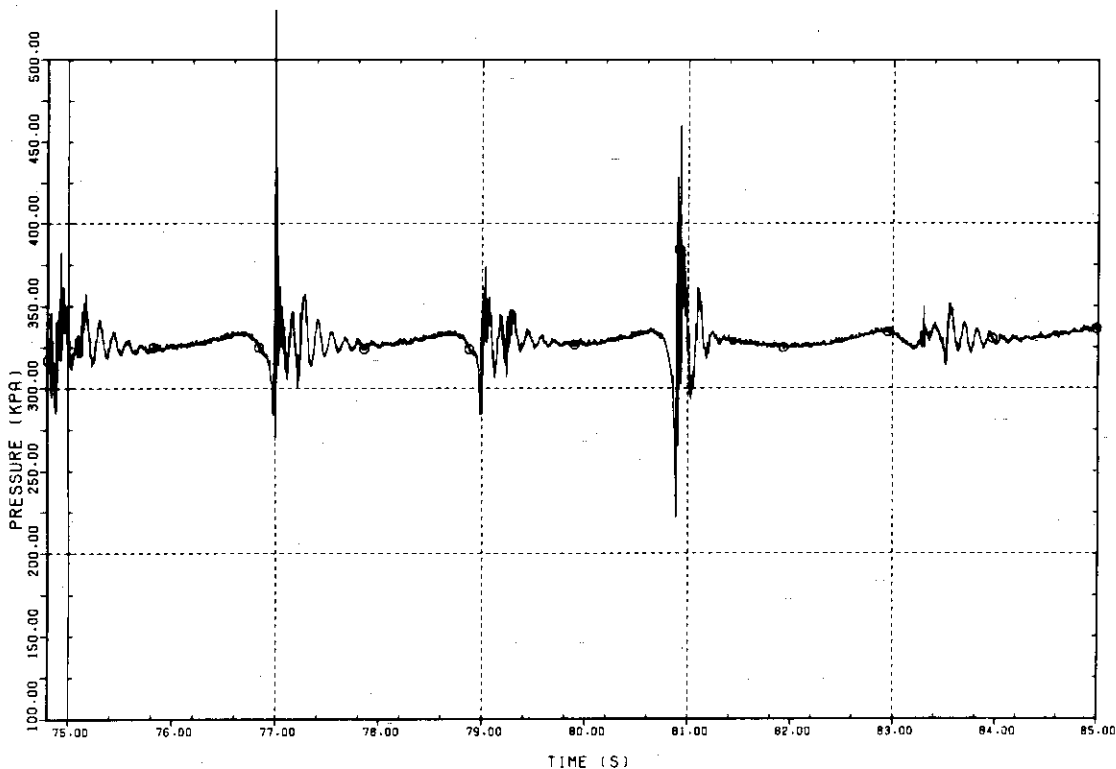
FULL-SCALE MARK II CRT



Plot S-17 Pressure in Wetwell

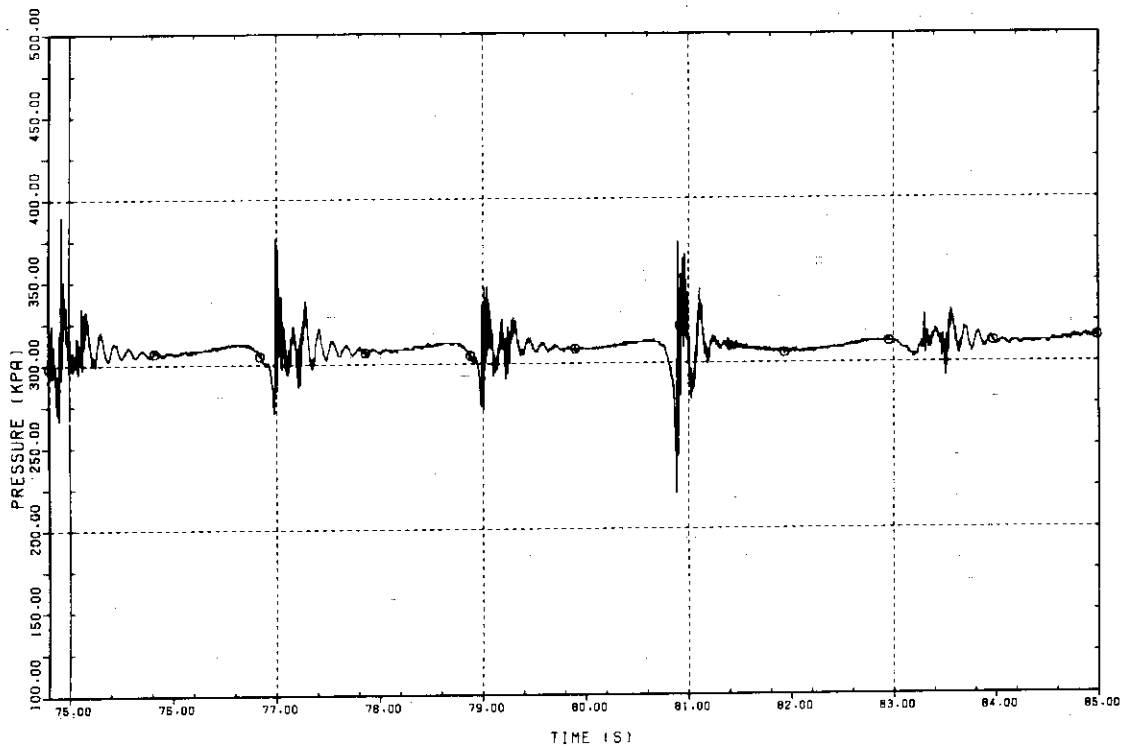
TEST 2
○ WMPF-201 WALL BESIDE VP2 (P1, 1.8M ABOVE BOTT.)

FULL-SCALE MARK II CRT



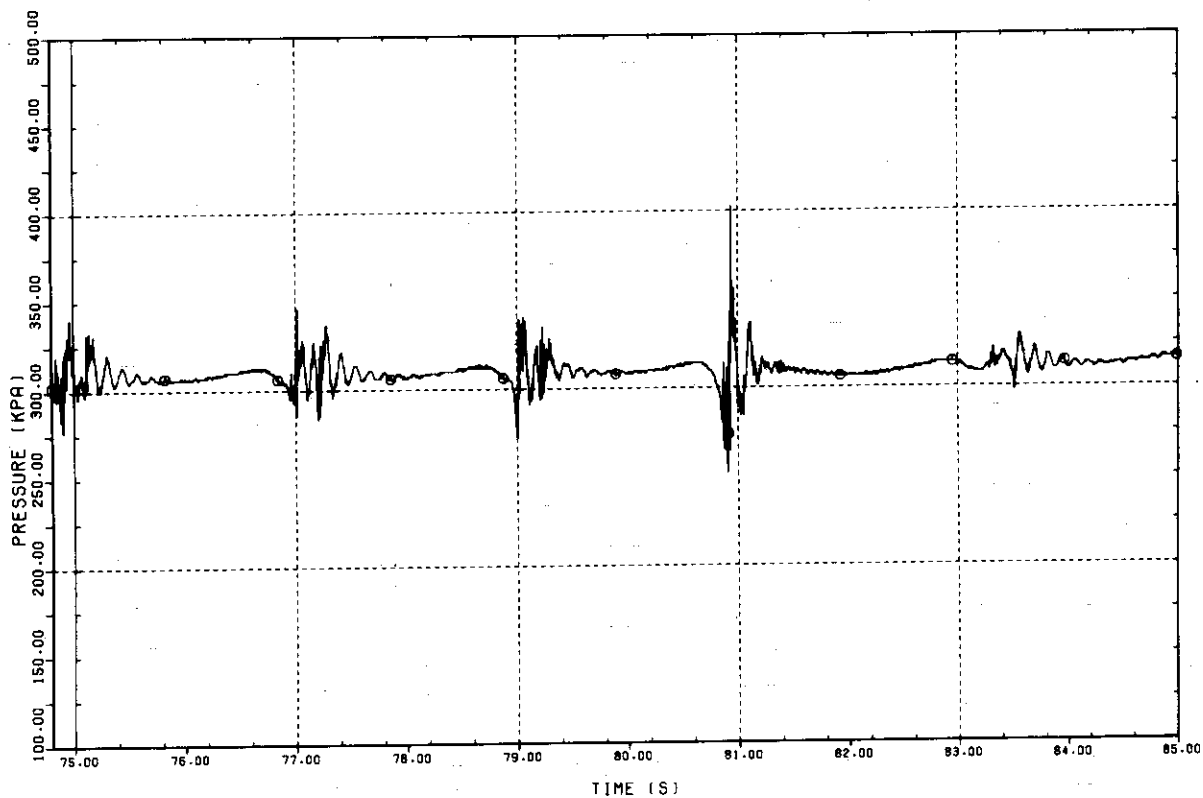
Plot S-18 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
① WWP-202 WALL BESIDE VP2 (P1, 3.6M ABOVE BOTT.)



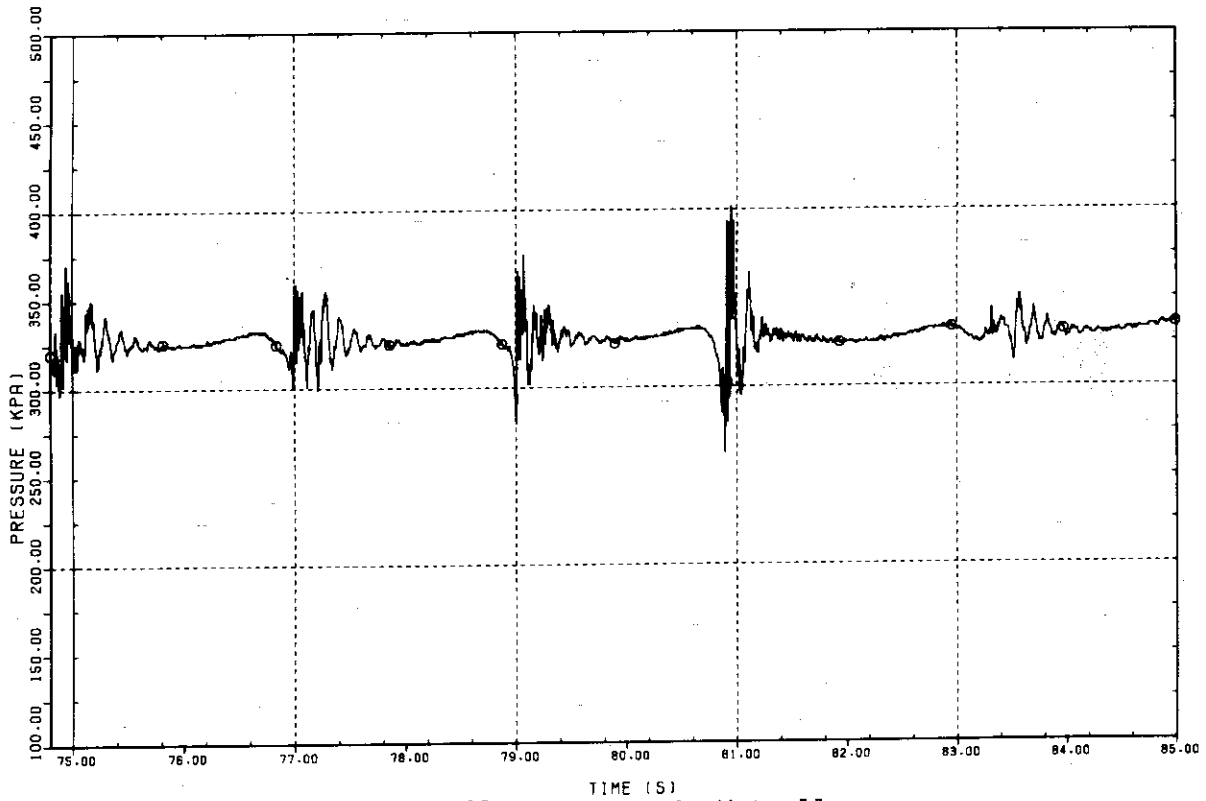
Plot S-19 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
① WWP-302 WALL BESIDE VP3 (P2, 3.6M ABOVE BOTT.)

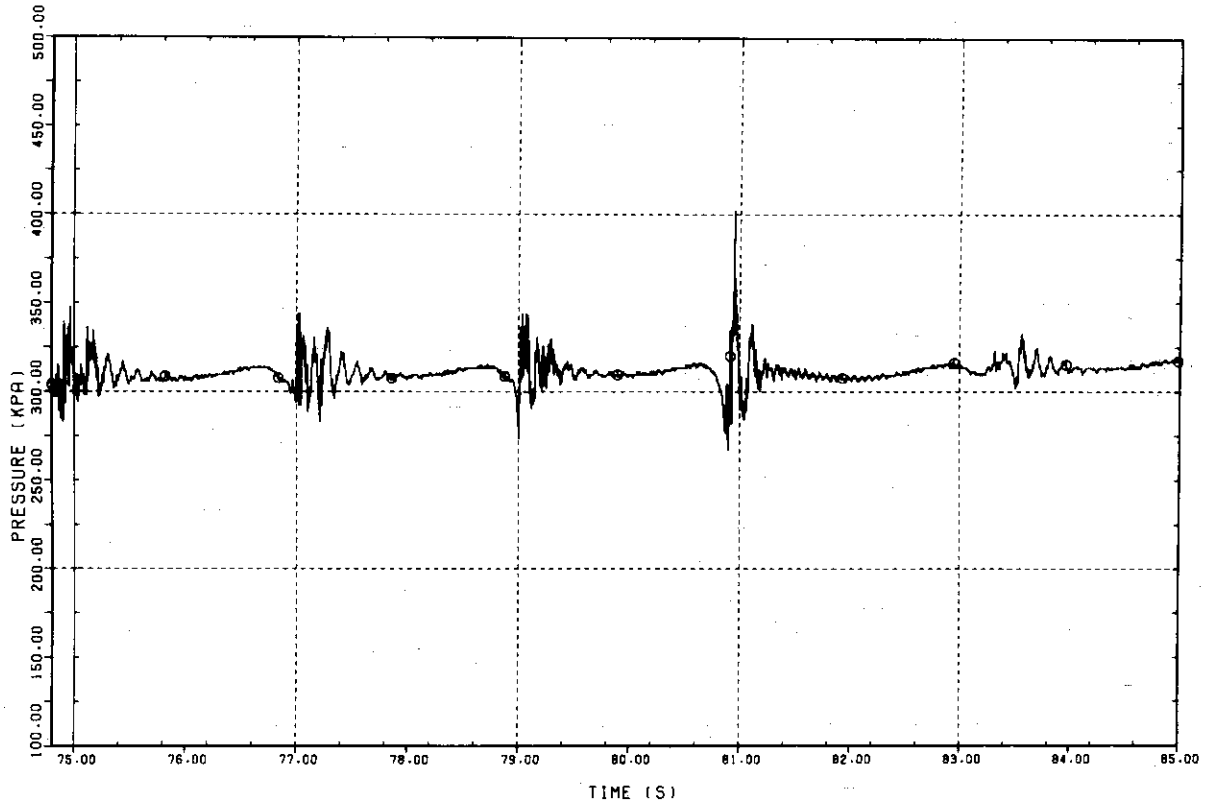


Plot S-20 Pressure in Wetwell

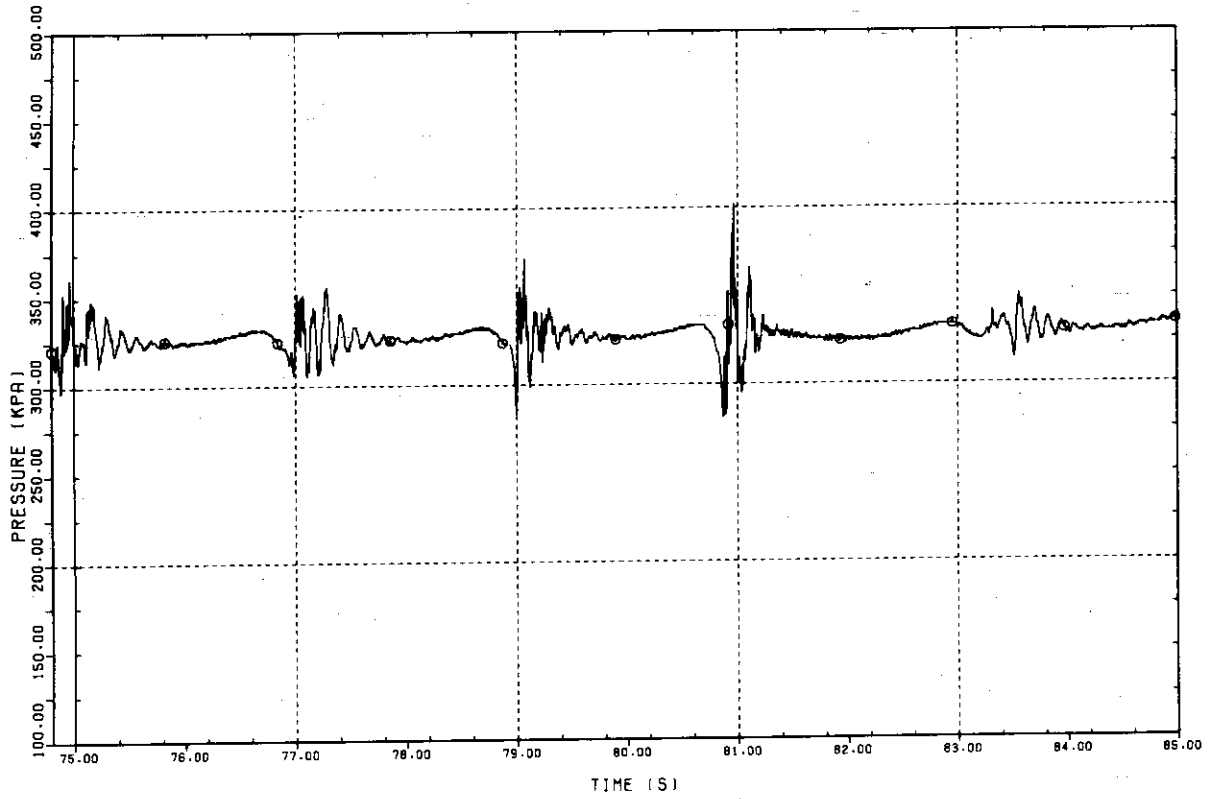
TEST 2 FULL-SCALE MARK II CRT
○ WWPF-401 SHELL BESIDE VP3 (P3, 1.8M ABOVE BOTT.)



TEST 2 FULL-SCALE MARK II CRT
○ WWPF-402 SHELL BESIDE VP3 (P3, 3.5M ABOVE BOTT.)

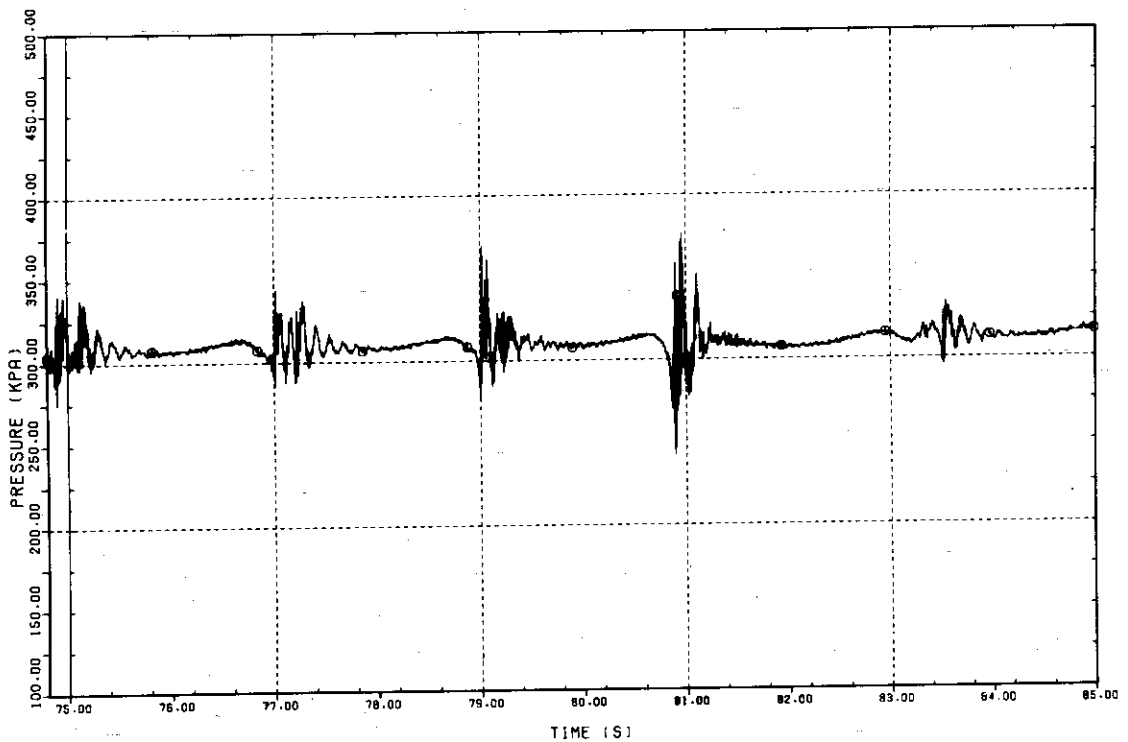


TEST 2 FULL-SCALE MARK II CRT
① WMPF-501 SHELL BESIDE VP4 (P4, 1.8M ABOVE BOTT.)



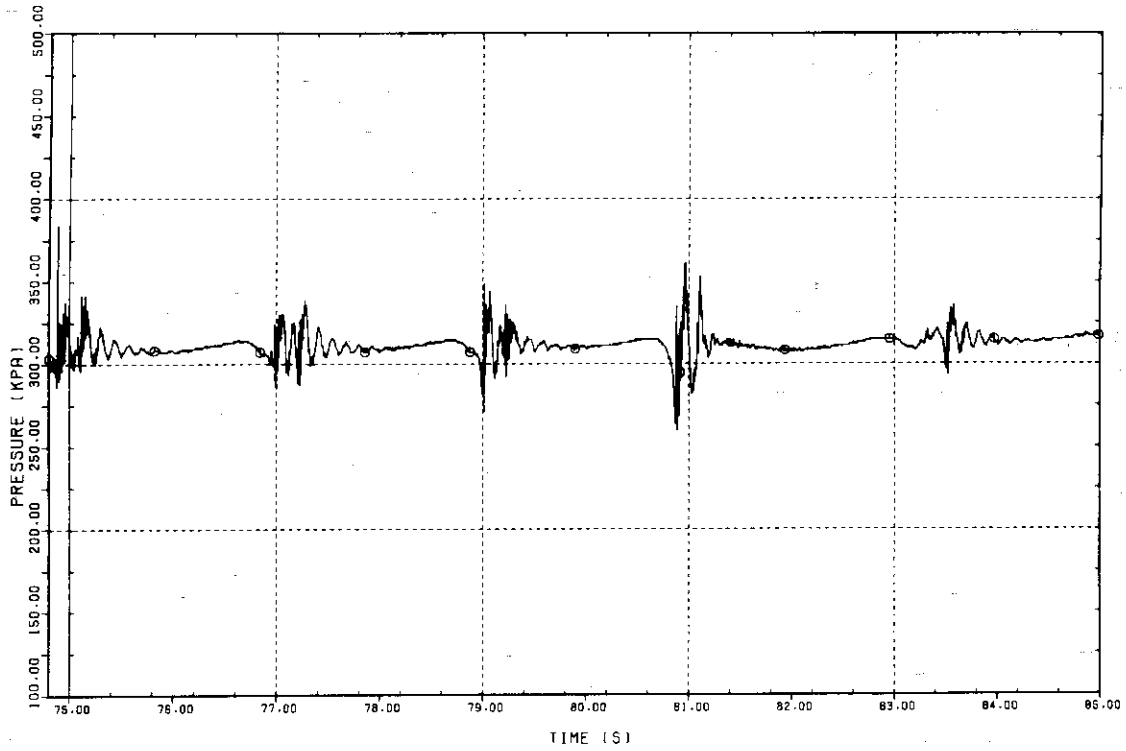
Plot S-23 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
① WMPF-502 SHELL BESIDE VP4 (P4, 3.6M ABOVE BOTT.)



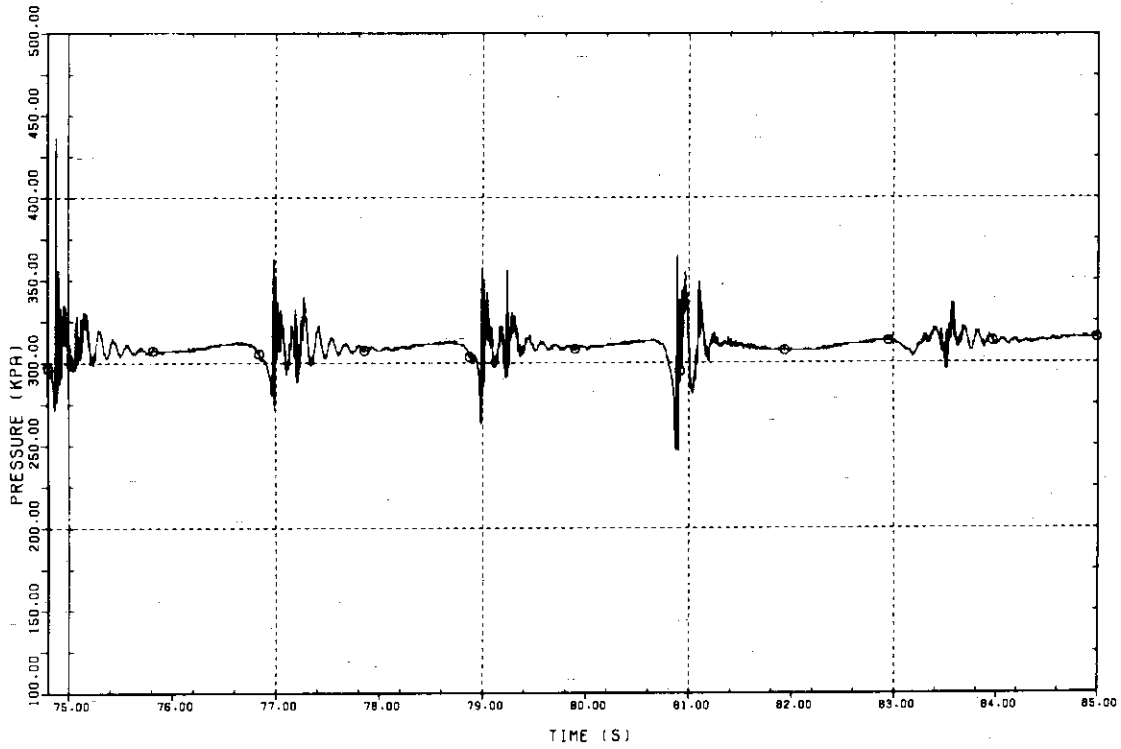
Plot S-24 Pressure in Wetwell

TEST 2 FULL-SCALE MARK II CRT
⊙ WWPf-602 WALL BESIDE VP4 (P5, 3.6M ABOVE BOTT.)



Plot S-25 Pressure in Wetwell

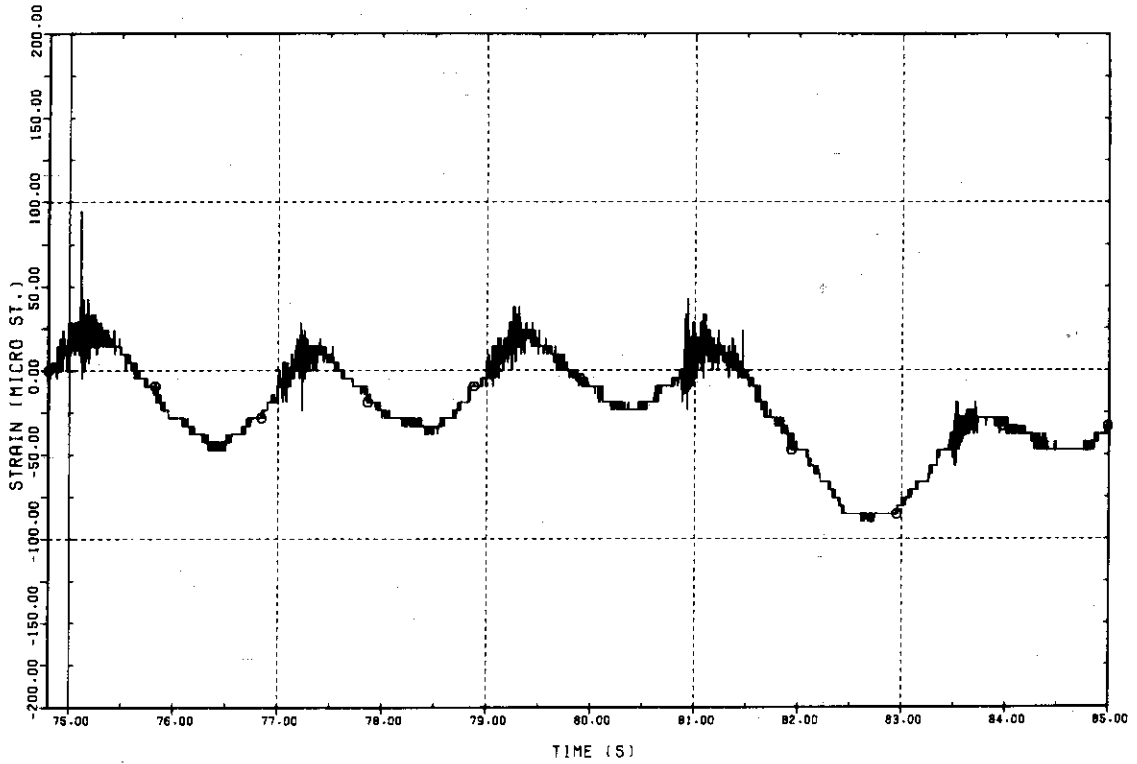
TEST 2 FULL-SCALE MARK II CRT
⊙ WWPf-700 WALL BESIDE VP7 (P6, 3.6M ABOVE BOTT.)



Plot S-26 Pressure in Wetwell

TEST 2
○ VPSF-101 LOWER BRACE BETH. VP1 AND WALL

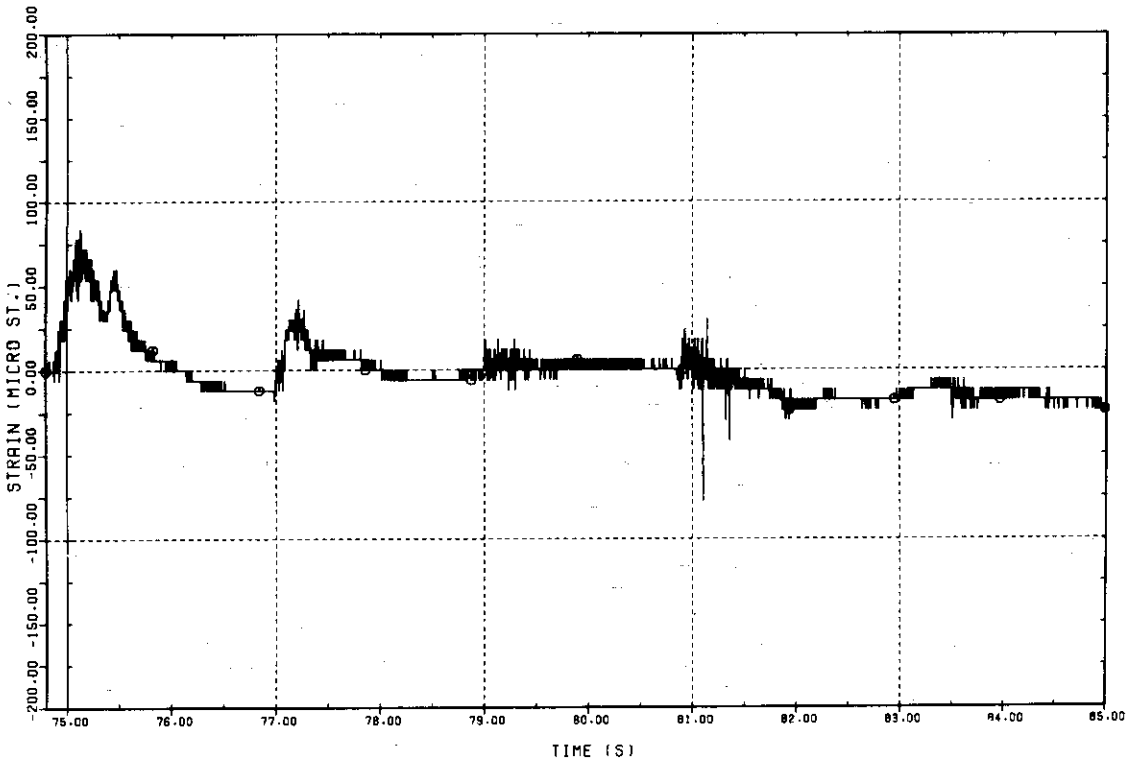
FULL-SCALE MARK II CRT



Plot S-27 Strain of Vent Pipe Brace

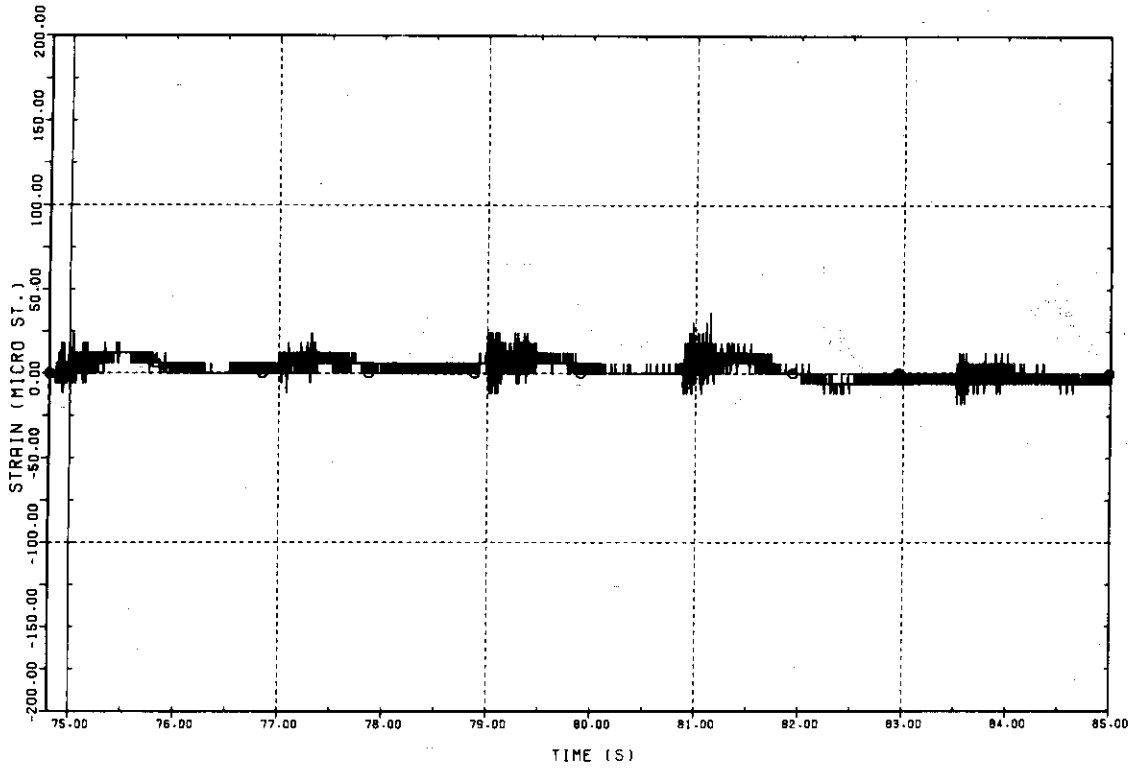
TEST 2
○ VPSF-103 LOWER BRACE BETH. VP1 AND VP6

FULL-SCALE MARK II CRT



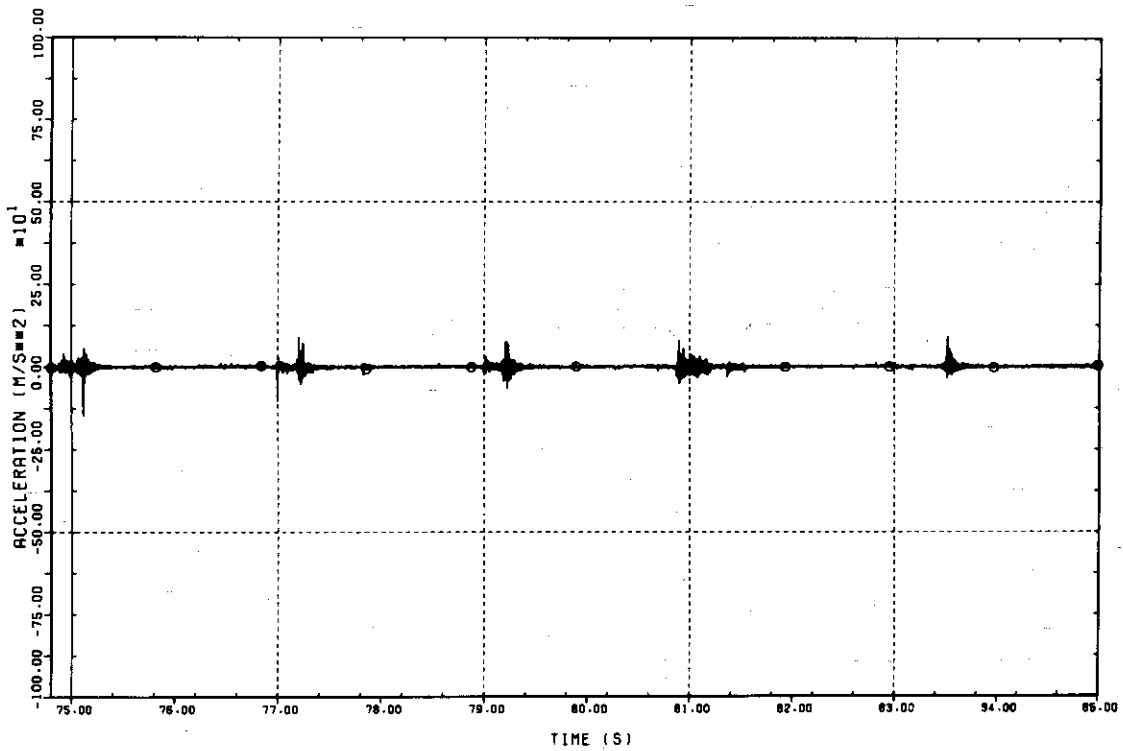
Plot S-28 Strain of Vent Pipe Brace

TEST 2 FULL-SCALE MARK II CRT
① VPSF-201 UPPER BRACE BETW. VP1 AND PEDESTAL



Plot S-29 Strain of Vent Pipe Brace

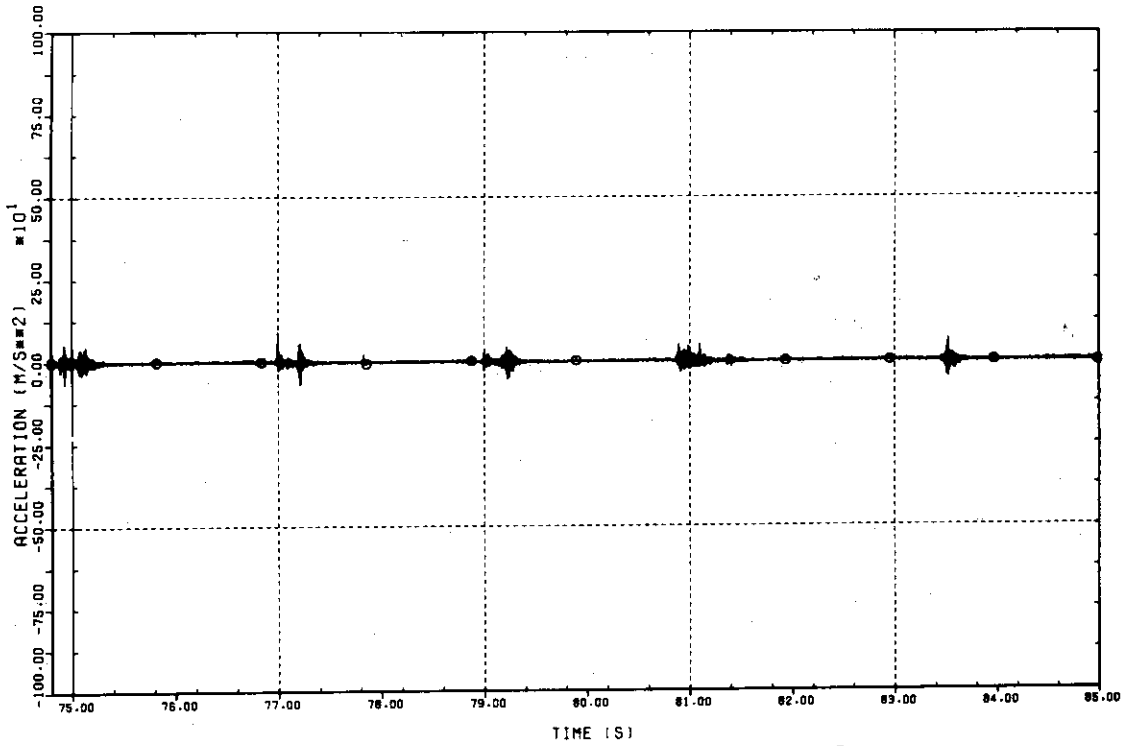
TEST 2 FULL-SCALE MARK II CRT
① VPAF-101 VP2 OUTL. (00EG)



Plot S-30 Acceleration of Vent Pipe Outlet

TEST 2
① VPAF-102 VP2 OUTL (90DEG)

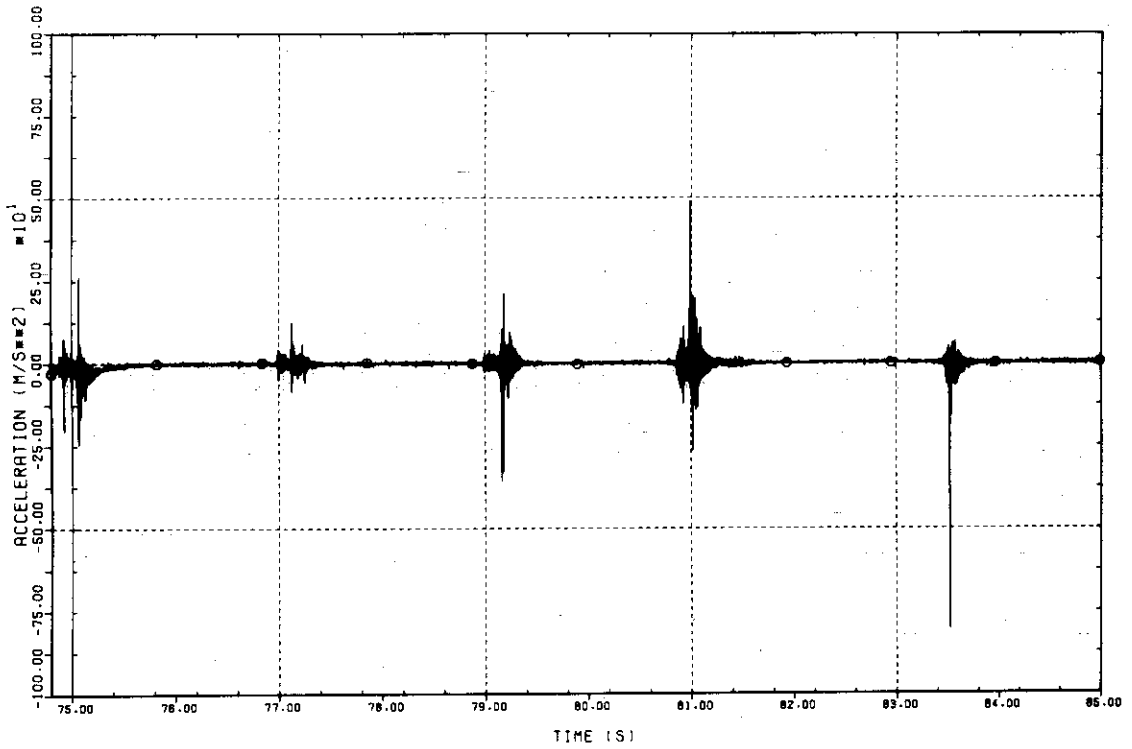
FULL-SCALE MARK II CRT



Plot S-31 Acceleration of Vent Pipe Outlet

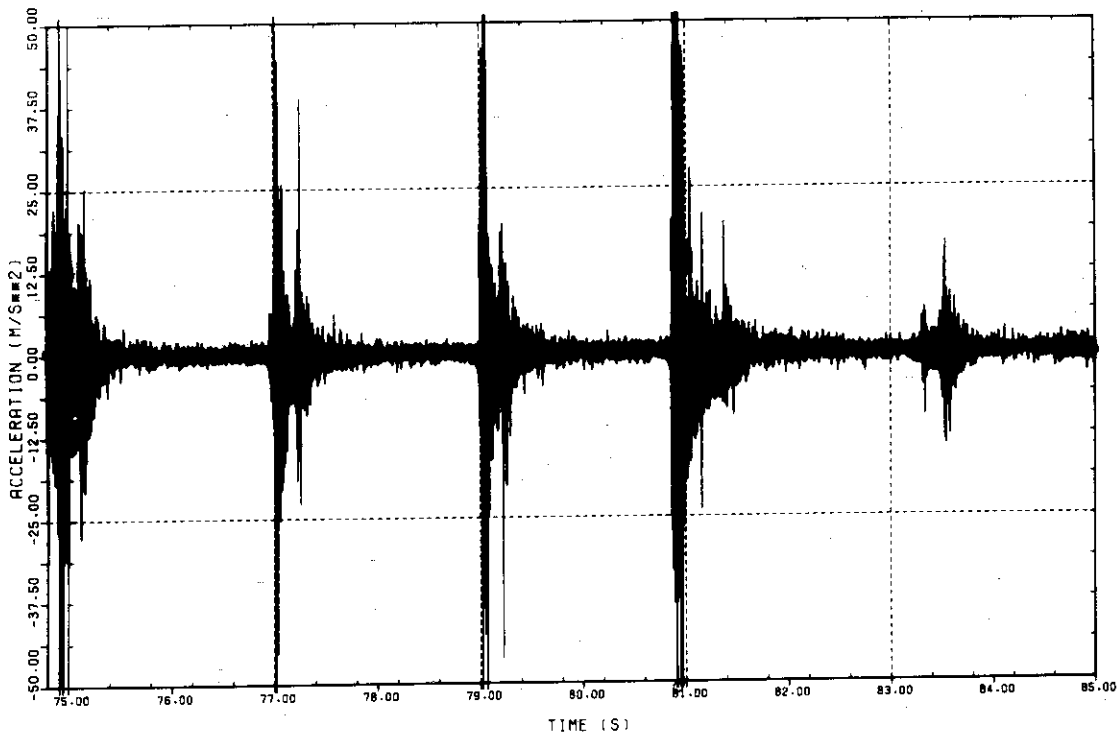
TEST 2
① VPAF-201 VP5 OUTL (0DEG)

FULL-SCALE MARK II CRT



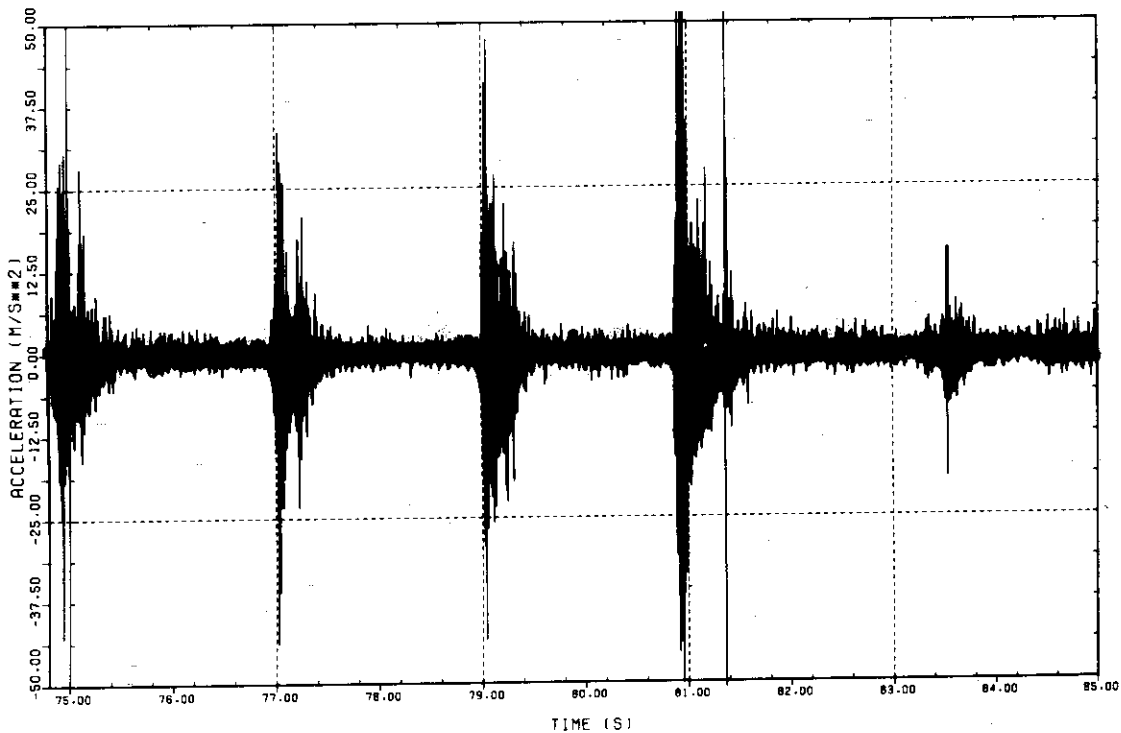
Plot S-32 Acceleration of Vent Pipe Outlet

TEST 2 FULL-SCALE MARK II CRT
O WRAF-005 SHELL BESIDE VP3 (3.0M ABOVE BOTT.)



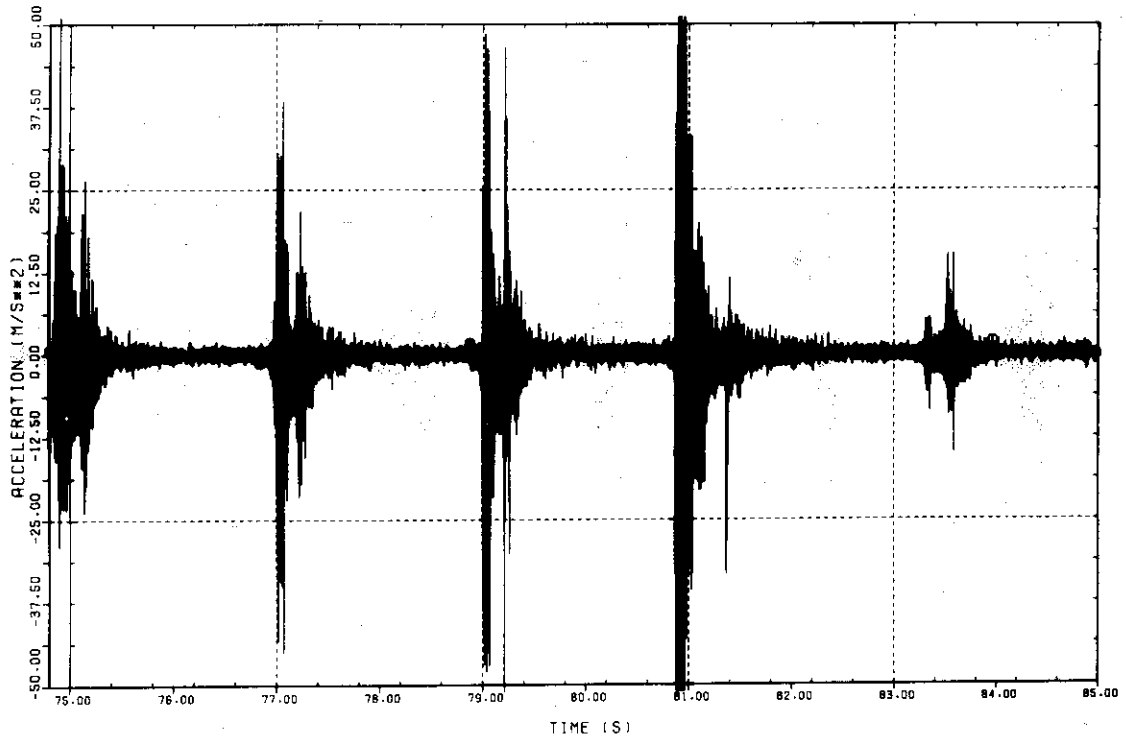
Plot S-33 Acceleration of Containment Structure

TEST 2 FULL-SCALE MARK II CRT
O WRAF-006 SHELL BESIDE VP3 (6.0M ABOVE BOTT.)



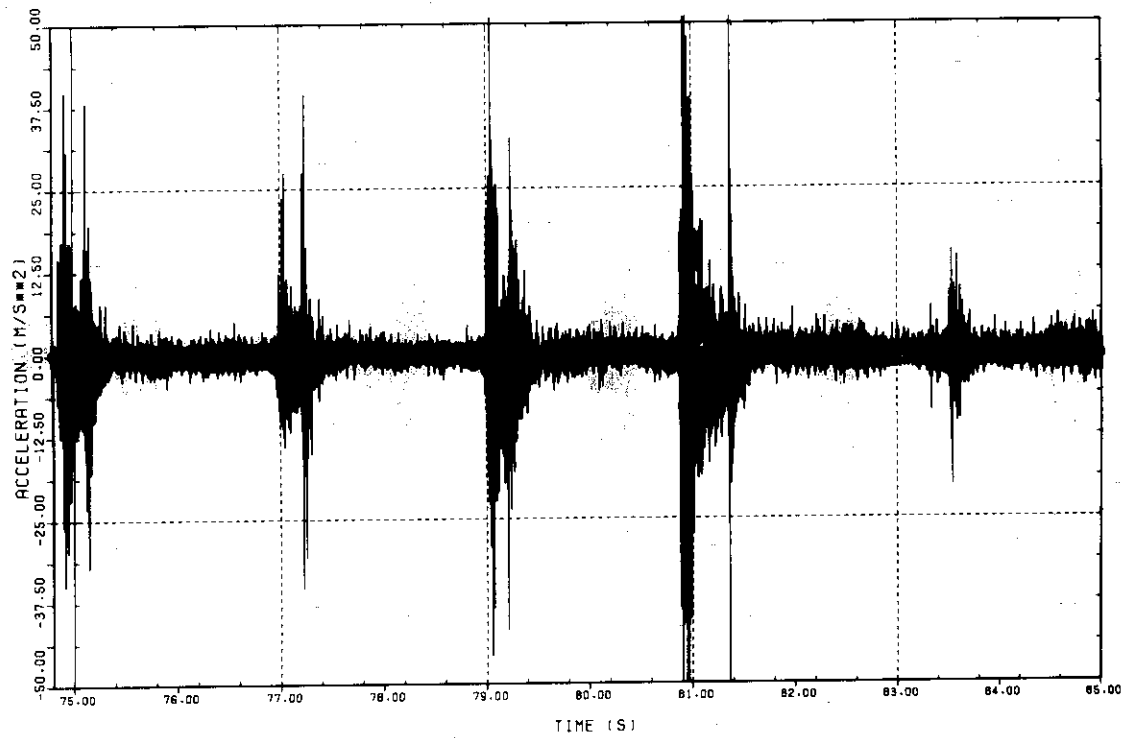
Plot S-34 Acceleration of Containment Structure

TEST 2 FULL-SCALE MARK II CRT
① WRAF-007 SHELL BESIDE VP4 (13.0M ABOVE BOTT.)



Plot S-35 Acceleration of Containment Structure

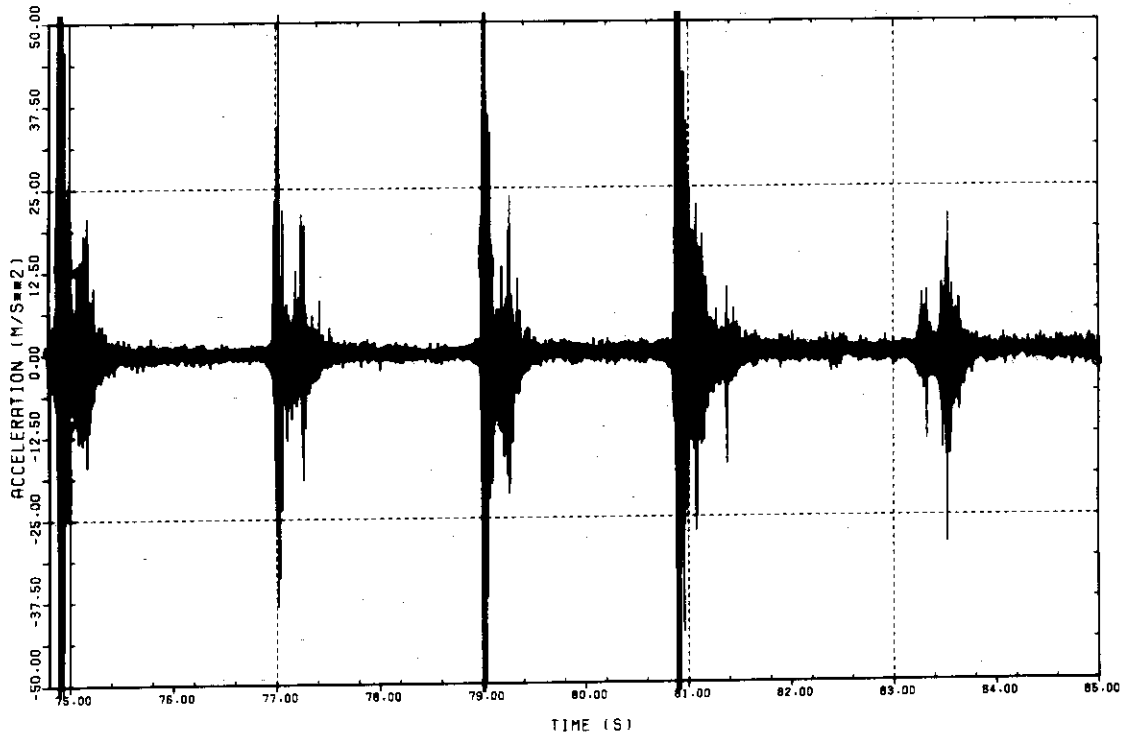
TEST 2 FULL-SCALE MARK II CRT
① WRAF-008 SHELL BESIDE VP4 (16.0M ABOVE BOTT.)



Plot S-36 Acceleration of Containment Structure

TEST 2
O WRAF-009 PEDESTAL (3.0M ABOVE BOTT.)

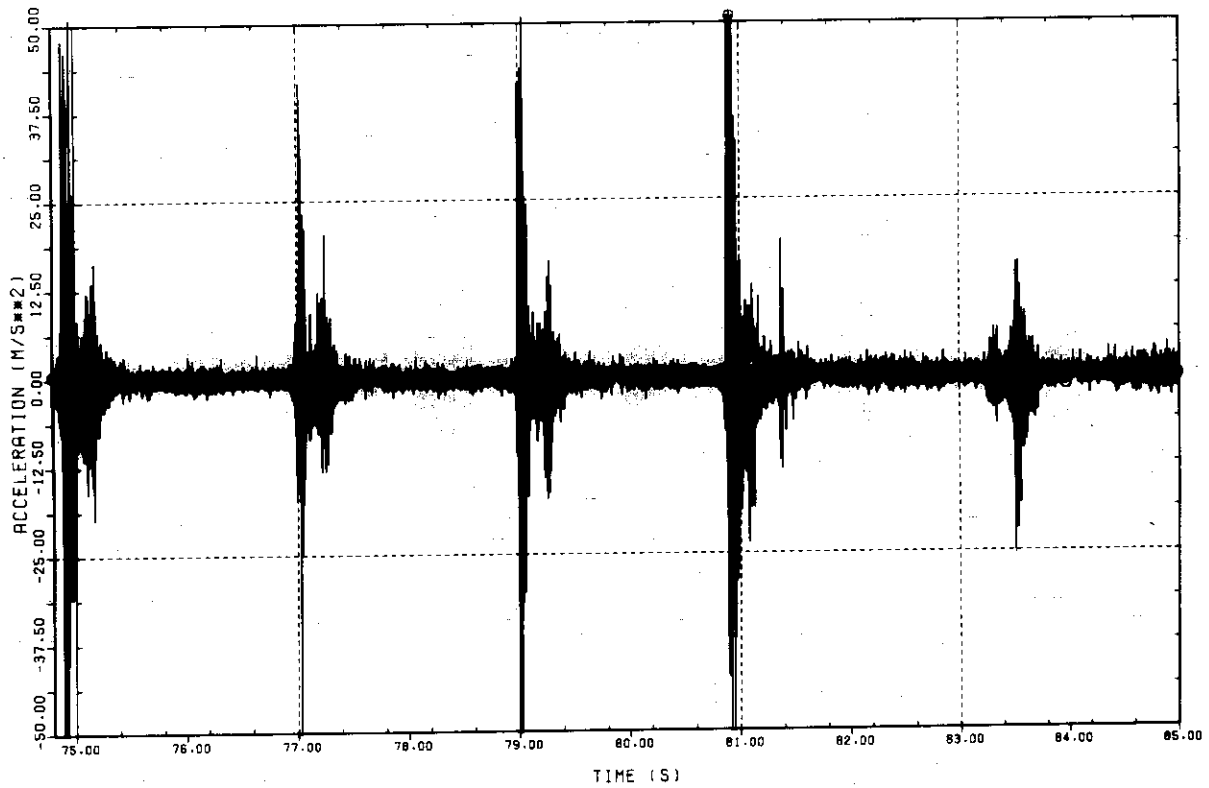
FULL-SCALE MARK II CRT



Plot S-37 Acceleration of Containment Structure

TEST 2
O WRAF-010 PEDESTAL (6.0M ABOVE BOTT.)

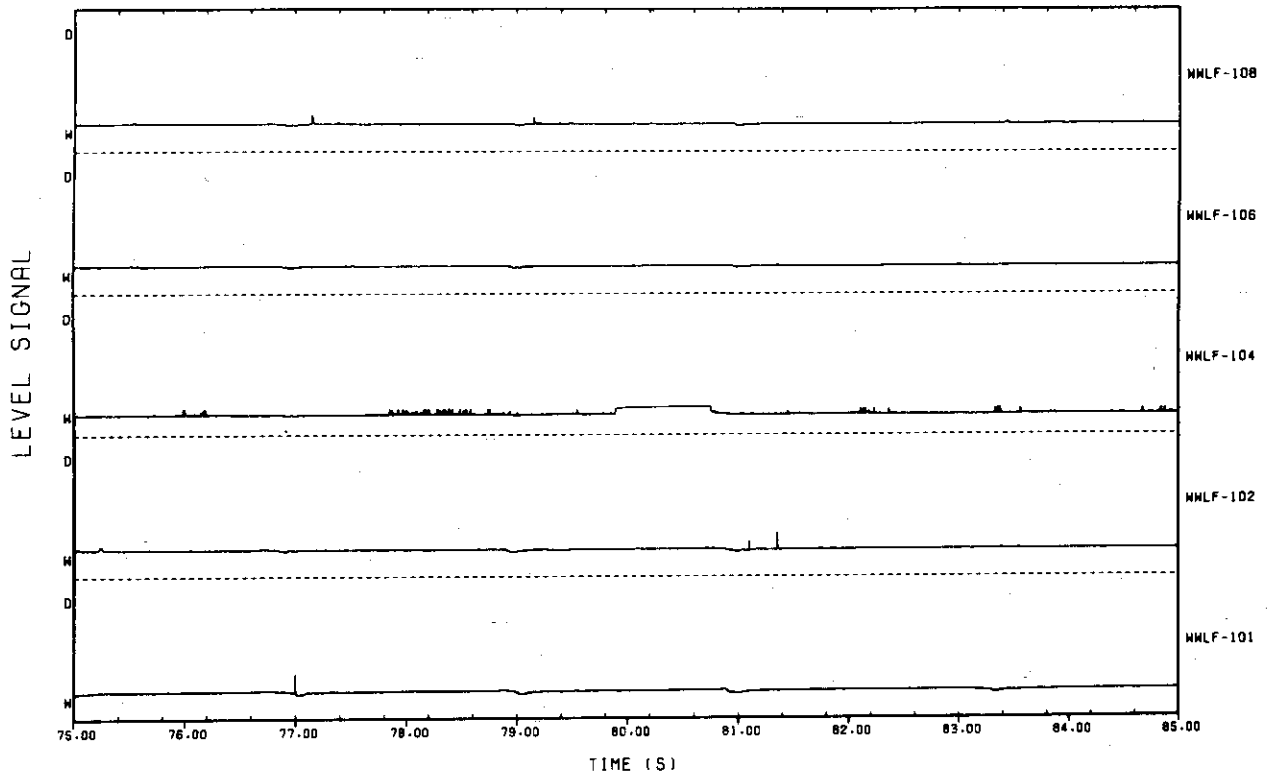
FULL-SCALE MARK II CRT



Plot S-38 Acceleration of Containment Structure

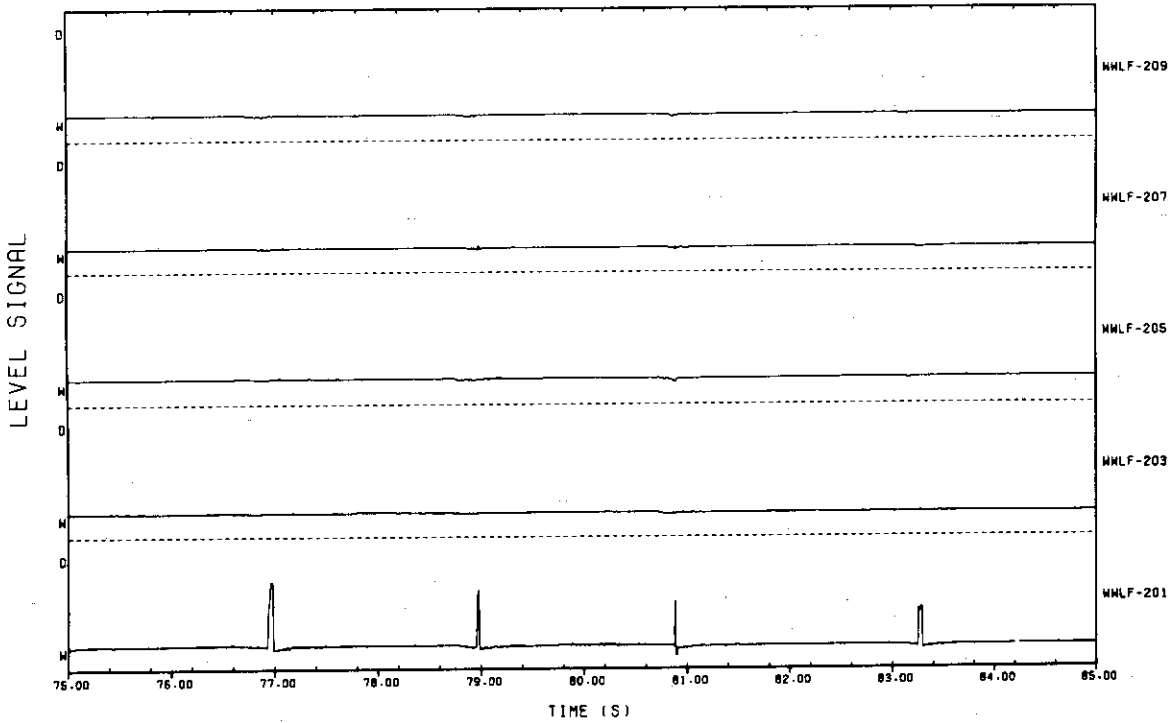
TEST 2

FULL-SCALE MARK II CRT



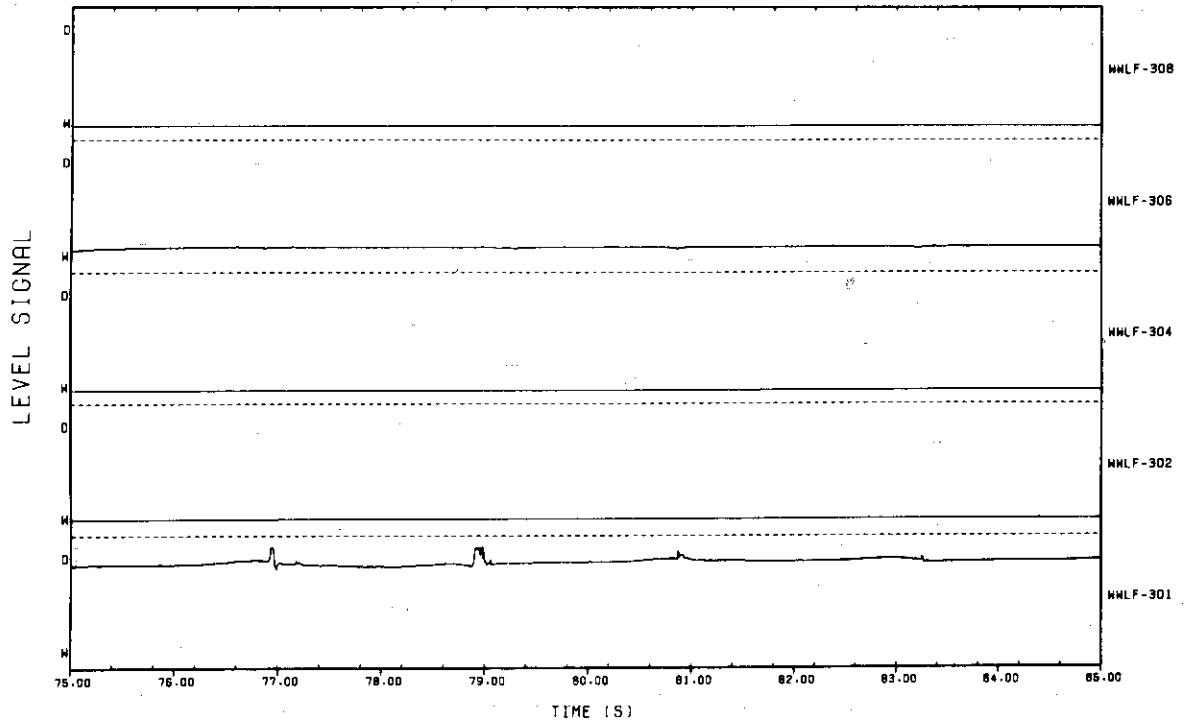
TEST 2

FULL-SCALE MARK II CRT



TEST 2

FULL-SCALE MARK II CRT



Plot S-41 Phase Boundary Signals