GPU NUCLEAR CORPORATION
OYSTER CREEK NUCLEAR GENERATING STATION

Provisional Operating
License No. DPR-16

Technical Specification
Change Request No. 198
Docket No. 50-219

Applicant submits, by this Technical Specification Change Request No. 198 to the Oyster Creek Nuclear Generating Station Technical Specifications, a proposed change to page 5.2-1.

By [signature] for
J. J. Barton
Vice President and Director
Oyster Creek

Sworn and Subscribed to before me this 22nd day of July, 1991.

Judith M. Crowe
JUDITH M. CROWE
Notary Public of New Jersey
My Commission Expires 1/25/95

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter	)	Docket No. 50-219
GPU Nuclear Corporation	)	

CERTIFICATE OF SERVICE

This is to certify that a copy of Technical Specification Change Request No. 198 for Oyster Creek Nuclear Generating Station Technical Specifications, filed with the U.S. Nuclear Regulatory Commission on July 22, 1991, has this day of July 22, 1991, been served on the Major of Lacey Township, Ocean County, New Jersey by deposit in the United States mail, addressed as follows:

The Honorable Debra Madensky
Mayor of Lacey Township
818 West Lacey Road
Forked River, NJ 08731

By [signature] for
J. J. Barton
Vice President and Director
Oyster Creek

OYSTER CREEK NUCLEAR GENERATING STATION
PROVISIONAL OPERATING LICENSE NO. DPR-16
DOCKET NO. 50-219
TECHNICAL SPECIFICATION CHANGE REQUEST NO. 198

Applicant hereby requests the Commission to change Appendix A to the above captioned license as below, and pursuant to 10 CFR 50.92, an analysis concerning the determination of no significant hazards considerations is also presented:

1.0 SECTION TO BE CHANGED

Section 5.2.

2.0 EXTENT OF CHANGE

Revise Technical Specification 5.2.A.

3.0 CHANGES REQUESTED

The requested change is shown on attached Technical Specifications page 5.2-1. Related changes to Technical Specifications Bases are required on pages 4.5-12 and 4.5-16. In addition, editorial changes unrelated to the basis of this request are needed on pages 3.4-7 and 3.5-8.

4.0 PURPOSE

The Oyster Creek drywell internal design pressure is presently 62 psig. This design pressure value is based on loss-of-coolant accident (LOCA) simulation tests which were conducted to confirm the adequacy of the pressure suppression containment design of the Bodega Bay plant (Ref. 1). However, a comparison of Oyster Creek and Bodega Bay containment design features shows that the Oyster Creek drywell pressure should be less than that for Bodega Bay (Ref. 6).

Corrosion in the drywell shell has prompted GPUN to establish an Oyster Creek specific design pressure. This new value would be used for any future drywell repair decisions. To develop such a design pressure, state-of-the-art analytical tools were used in conjunction with experimental data. This evaluation includes a recalculation of the reactor vessel blowdown into the drywell as well as the corresponding containment response.

Reactor vessel blowdown was calculated using both TRACG and RELAP5. TRACG is a GE computer code that has been qualified for use in evaluating boiling water reactor (BWR) LOCA response (Ref. 8-10). RELAP5 (Ref. 2) is a computer code which has been developed to simulate light water reactor transients as well as large and small break loss-of-coolant accidents. Therefore, both of these computer codes are appropriate for this analysis.

The containment response to the reactor vessel blowdown was calculated using M3CPT and CONTEMPT. M3CPT is a GE computer code used to evaluate the short term containment response to a design basis LOCA. It is the same code that was used to evaluate the Oyster Creek LOCA containment pressure response for the Mark I Long Term Program analysis (Ref. 5). CONTEMPT

(Ref. 3) is a nuclear reactor containment analysis code which is used to evaluate pressure temperature response to mass and energy inputs (blowdown of reactor vessel). These containment codes in conjunction with the vessel blowdown results provide a complete method for establishing an Oyster Creek specific design pressure.

The results of this evaluation show that the peak drywell pressure following a design basis loss of coolant accident (DBLOCA) is 38.1 psig. To establish a design pressure value, an additional 15% allowance is added to give a conservative value of 44.0 psig.

In addition to the drywell pressure change, unrelated revisions are needed to two Bases pages. The last paragraph in Section 3.4 Bases on Page 3.4-7 is revised to clarify that the containment spray system may be inoperable when primary containment integrity is not required. In addition, the statement concerning chromated torus water is deleted since chromates are no longer used to treat torus water. The chromated water has been replaced. Also, on page 3.5-8 of Section 3.5 Bases, an editorial change is necessary to properly state the 2 psig external design pressure of the drywell.

5.0 ORIGINAL DESIGN PRESSURE

The Oyster Creek drywell design pressure was originally established at 62 psig. This pressure was first established as a design value for the Bodega Bay plant and later specified for Oyster Creek. The Bodega Bay design pressure value is based on LOCA simulation tests. These tests were conducted to confirm the adequacy of the pressure suppression containment design of the Bodega Bay BWR. The tests showed that the maximum drywell pressure for those tests which were representative of the Bodega Bay design was 52 psig. An additional 10 psi was added when establishing the Bodega Bay design pressure of 62 psig.

This value was assigned to Oyster Creek even though there are major differences in the design of the two plants. The differences between the plants are such that the peak drywell pressure for Oyster Creek is less than that for Bodega Bay. The Oyster Creek Updated Final Safety Analysis Report (FSAR) correlates the Bodega Bay test values for peak drywell pressure as a function of the ratio for drywell to wetwell vent area to break area (Ref. 6, Fig. 6.2-6). This particular plant parameter plays a key role in determining the peak drywell pressure. The larger this ratio is, the greater the impact of the suppression system on reducing peak drywell pressure. This correlation produced an estimate of the peak Oyster Creek drywell pressure to be 37 psig.

Additionally, the Oyster Creek FSAR (Section 6.2.1.3) presents calculated results of the Oyster Creek response to a DBLOCA. The FSAR states that this model tends to overpredict maximum containment pressures when compared with Bodega Bay and Humbolt Bay pressure suppression tests (Ref. 6, Figs. 6.2-8 and 6.2-9). The result of this analytical model when applied to Oyster Creek was a peak drywell pressure of 33 psig. Both of these peak drywell pressures presented in the FSAR are less than the 52 psig value established for Bodega Bay. It was thus previously recognized that the 62 psig design value was significantly larger than that which would be adequate for Oyster Creek.

6.0 RE-EVALUATION OF THE DRYWELL DESIGN PRESSURE

To establish an appropriate design pressure for the Oyster Creek drywell, it is necessary to simulate containment response to the DBLOCA. For peak drywell pressure, this is the double-ended guillotine break of a recirculation loop pipe. The simulation must, therefore, include a reactor vessel model of this accident.

In addition, it is necessary to simulate the Mark I pressure suppression containment. From this simulation, the drywell pressure response to the double-ended guillotine break can be determined.

6.1 Methods

In order to simulate the peak drywell pressure for Oyster Creek, four computer codes were used (refer to Fig. 1). The first two of these include the GE BWR version of TRAC (TRACG, Refs. 8, 9, 10) and RELAP5 MOD3 (Ref. 2). These codes were independently used to calculate the Oyster Creek reactor vessel blowdown for the DBLOCA.

The results from these analyses were then used as input to a second set of codes. These codes were used to evaluate the drywell pressure response to the blowdown. The first of these, M3CPT, (GE containment code) was used to predict the containment response to the TRACG blowdown. The second code used in the containment analysis is CONTEMPT/EI28C. CONTEMPT was used to evaluate the containment response to both the RELAP5 and TRACG blowdowns. Thus, the CONTEMPT results provide a comparison of two different blowdown models as well as two containment models.

6.2 TRACG Best Estimate Vessel Blowdown Model

TRACG was used to establish a best estimate blowdown for Oyster Creek. A multi-node reactor vessel model was developed for Oyster Creek as part of the revised 10 CFR 50 Appendix K analysis program. This same model was used for this evaluation (Ref. 4). The nodalization was performed with vessel geometry as well as governing phenomena in mind.

The initial conditions assumed (Table 1) are the same as those used for the OC Mark I Long Term Program containment analysis (Ref. 5). They are also consistent with how the plant is currently operated. The resulting mass and energy release are provided in Table 2 and Figure 2. This represents the TRACG best estimate blowdown.

In order to insure confidence in the TRACG break flow model, a comparative analysis was performed. This analysis (Ref. 4) compared the TRACG best estimate results with a number of actual blowdown tests. The tests included:

- o Simple vessel blowdown tests (PSTF)
- o Scaled integral BWR tests (TLTA, FIST, FIX II)
- o Full size reactor vessel tests (Marviken)

Each blowdown was divided for analytical purposes, into two regimes. The first regime represents the period during which the vessel conditions at the break are subcooled liquid. The second represents a two phase condition at the break. An average break mass flow rate was obtained in each flow regime for the test data and the TRACG prediction. From these values, a break flow multiplier was developed for each regime. The multipliers were defined to be the ratio of the measured to predicted average break flow rate. The maximum multiplier (multiplier=1.25) was then applied to the best estimate TRACG break flow from the Oyster Creek LOCA analysis (Table 2). This produced what will be referred to as the TRACG best estimate blowdown for Oyster Creek. It should be noted that this multiplier will increase the total mass and energy into the containment by 25%. This is not physically possible since the source of this mass is the reactor vessel which transports a clearly defined quantity of mass and energy through the break. The multiplier addresses uncertainty of TRACG prediction in the rate of transport only.

6.3 <u>RELAP5 Best Estimate Vessel Blowdown Model</u>

To independently confirm the TRACG blowdown results, a RELAP5 MOD2 blowdown model was developed. This model was nodalized with the same considerations as those used for the TRACG model. The blowdown results are provided in Figure 3 and Table 3. This will be referred to as the RELAP5 best estimate blowdown. A graphical comparison with TRACG is shown in Figure 4. The results presented in Figure 4 show that TRACG predicts a somewhat higher peak flow rate out of the vessel. However, the RELAP5 code predicts a larger initial rate of change of blowdown flow. Therefore, the impact on the containment response is expected to be different.

The RELAP5 blowdown model was compared with actual test data from Marviken tests (Ref. 7). This comparison was used to establish a multiplier for the RELAP5 blowdown. As was the case for the TRACG blowdown, the multiplier addresses uncertainty in the rate of break mass flow rate only. As a result, the integrated mass and energy into the containment model is in excess of what would actually occur. For the RELAP5 blowdown, this multiplier is conservatively set at 1.30.

6.4 <u>Containment Model (M3CPT)</u>

The containment response to the TRACG blowdown was evaluated with the GE code M3CPT. This code is used to evaluate short term DBLOCA response of the containment. M3CPT was used in the evaluation of the Oyster Creek LOCA containment pressure response for the Mark I Long Term Program analysis (Ref. 5).

Three separate cases were run using this code. The initial conditions for these cases are provided in Table 4. Case 1 is the same set of conditions used in the Mark I Long Term Program analysis. The vent system downcomers are assumed to be submerged 4.06 feet (Ref. 5) below the suppression pool surface. This value corresponds to the highest water level allowed for continuous operation of the plant. This assumption increases the drywell pressure required to clear the vents and thus increases the peak pressure. It is also consistent with the volume assumed for the torus vapor space. This volume is minimized by setting the suppression pool at the high level. The non-condensibles which are swept into this air space will produce a higher torus back pressure because of the smaller available volume. Finally, a zero pressure differential between the drywell and the wetwell is assumed. This assumption is consistent with allowed plant operation. In addition, this will contribute to the maximum water leg length inside of the vent's downcomers. With the drywell at an initially higher pressure than the wetwell, water in the downcomer will be partially forced out of the pipe. This reduces the water leg inside of the downcomer. With a zero pressure differential, water will not be forced out of the pipe.

Case 2 is a variation of Case 1. The only difference is that the initial containment pressure is increased to 16.1 psia, and the wetwell air space is reduced by 400 ft^3. The increased pressure corresponds to the highest operating pressure expected (high drywell pressure alarm setpoint) under normal conditions for Oyster Creek. (This maximizes the mass of non-condensible gases in the containment). The reduction of the air space volume is an added conservatism.

Both Cases 1 and 2 are run using the best estimate blowdown calculated by the TRACG computer model. Case 3 is identical to Case 2 except that 1.25 times (refer to Section 6.2 discussion of multiplier) the TRACG best estimate blowdown is used.

The results of these cases (Ref. 4) are provided in Figures 5 through 7. The peak calculated pressures are provided in Table 5.

6.5 CONTEMPT CONTAINMENT MODEL

The CONTEMPT computer code was used to evaluate the M3CPT results. This is accomplished by running the three previously described cases with the TRACG blowdown. The results are then compared with those calculated by M3CPT. In addition, the code was used to compare the impact of the different blowdown models on the containment response. This is accomplished by running the three cases previously described with each blowdown. The CONTEMPT results were then compared for each blowdown.

The results obtained using the TRACG blowdown (Figs. 8 to 10) show good agreement with that calculated by M3CPT (Figs. 5 to 7). A graphical comparison shows that both models exhibit similar pressure profiles. This indicates that the containment's pressure suppression phenomenon is modeled properly. The peak pressures are compared with M3CPT in Table 6. The comparison shows that CONTEMPT calculates a slightly lower pressure than M3CPT. It is concluded that the models are in good agreement.

The same three cases were run using the RELAP5 blowdown results, however, a 1.3 multiplier was used (refer to Section 6.3). As can be seen from Figures 11 to 13 (Table 7), the peak pressure occurs somewhat earlier than for the TRACG blowdown. This is a result of the containment's dynamic response to the different blowdowns depicted in Figure 4.

The peak drywell pressures calculated using these different methods are in good agreement and confirm what was described in the FSAR (discussed previously). It is concluded that following a DBLOCA, the peak drywell pressure will not exceed 38.1 psig. Therefore, after applying a 15% allowance, the design pressure for the OCNGS drywell can be adequately established at 44.0 psig.

7.0 DETERMINATION

We have determined that the proposed Technical Specification change involves no significant hazards considerations as discussed below.

1. The change will not involve a significant increase in the probability or consequence of any accident previously evaluated.

   The change in drywell design pressure has no effect on the probability of loss of coolant accidents which the containment is designed to help mitigate. The consequence of the design basis LOCA is not changed since adequate structural integrity is maintained. The drywell design pressure value of 44 psig is greater than the calculated peak pressure of 38.1 psig.

2. The proposed change does not create the possibility of a new or different accident from any accident previously evaluated.

   The primary containment functions to minimize the release of radioactive materials during a loss of coolant accident. The change in drywell design pressure will continue to ensure this function is maintained. Since the containment mitigates not initiates LOCAs, new or different accidents are not created.

3. A significant reduction in margin of safety is not involved.

   The margin of safety for drywell structural integrity is based upon compliance with ASME code limits at a given design pressure. The drywell design pressure change to 44 psig maintains the margin of safety since the vessel will still be required to comply with ASME code limits. The change in design pressure reflects a reduction in uncertainties and conservatisms which resulted in the design pressure of 62 psig. Therefore, it is concluded that the drywell design pressure change will not reduce the margin of safety.

8.0 CONCLUSIONS

The peak drywell pressure is calculated conservatively to be 38.1 psig. This value should be used with an additional 15% allowance added to give a drywell design pressure of 44 psig. The change in design pressure will not impact plant safety following any design basis accident.

9.0 REFERENCES

1. "Preliminary Hazards Summary Report, Bodega Bay Atomic Park Unit No. 1", Docket No. 50-205, December 28, 1962.

2. NUREG/CR-4312 EGG-2396 - Appendix A RELAP5 Input Data Requirements Prepared for Release of RELAP5 MOD3 EG&G Idaho Inc., Idaho Falls, ID, January 1990.

3. CONTEMPT EI/28C - A Computer Program for Predicting Containment Pressure - Temperature Transients.

4. GENE 770-07-1090 February 1991, 'Oyster Creek LOCA Drywell Pressure Response'.

5. NEDO-24572, 'Oyster Creek Plant Unique Load Definition, July 1982'.

6. OCNGS FSAR

7. Intermountain Technologies Division SAIC, 'Transmittal of RELAP5-MARVIKEN Comparison Summary', DC[illegible]-638-90 from Don Slaughterbeck to N. Trikouros.

8. NUREG/CR-4127-1, EPRI NP-3987-1, GEAP-30875-1, "BWR Full Integral Simulation Test (FIST) Program: TRAC-BWR Model Development, Volume 1 - Numerical Methods", July 1985.

9. NUREG/CR-4127-2, EPRI NP-3987-2, GEAP-30875-2, "BWR Full Integral Simulation Test (FIST) Program: TRAC-BWR Model Development, Volume 2 - Models", August 1985.

10. NUREG/CR-4127-3, EPRI NP-3987-3, GEAP-30875-3, "BWR Full Integral Simulation Test (FIST) Program: TRAC-BWR Model Development, Volume 3 - Developmental Assessment", September 1985.

TABLE 1

TRACG/RELAP5 INITIAL CONDITIONS

	TRACG	RELAP5
Reactor Power (% Rated)	102	100
Dome Pressure (PSIA)	1035	1035
Reactor Core Flow (MLB/HR)	61.0	55.56 *
Steam Flow (MLB/HR)	7.395	7.506
Core Inlet Temperature (°F)	525.0	512.0
Feedwater Temperature (°F)	317.0	316.5
Break Area (FT^2)		
Vessel Side Area	3.109 (limiting flow area just upstream of break)	3.11
Pipe Side Area	3.149 at break 1.547 at flow venturi	3.11 at break 1.55 at flow venturi

* Does not include the core bypass flow.

TABLE 2

TRACG BEST-ESTIMATE BREAK MASS FLOW RATE (WITHOUT MULTIPLIER) AND ASSOCIATED ENTHALPY FOR INPUT TO M3CPT05 AND CONTEMPT CONTAINMENT RESPONSE ANALYSIS

TIME (SEC)	MASS FLOW RATE (LBM/SEC)	ENTHALPY (BTU/LBM)
0.0	0.	519.3
0.49365	42045	518.1
0.65958	40896	518.2
0.85506	41883	518.1
1.073	40381	518.2
1.671	38102	518.1
2.1645	34566	518.1
2.9583	29654	518.9
3.9009	24818	520.8
5.1141	23000	523.9
5.9771	22997	525.0
6.9483	22553	526.8
7.9597	22133	527.7
9.0245	21335	529.9
9.9242	20052	534.7
12.137	15376	572.1
14.937	9476	745.6
20.936	6945	714.4
25.192	4165	832.4
30.0	854	871.2

NOTE: M3CPT05 ACCEPTS 20 BREAK MASS FLOW RATE AND ENTHALPY POINTS.

TABLE 3

RELAP5 BREAK FLOW RATE (WITHOUT MULTIPLIER) AND ASSOCIATED ENTHALPY FOR INPUT TO CONTEMPT CONTAINMENT RESPONSE ANALYSIS

TIME (SEC)	MASS FLOW RATE (LBM/SEC)	ENTHALPY (BTU/LBM)
0	0	0
0.1	23970	527.7
0.2	31710	528.9
0.3	30110	525.9
0.4	31640	526.7
0.6	32860	527.6
1.1	32930	528.2
1.3	33300	529.6
1.5	32580	527.4
2.1	31670	530.4
2.6	30060	534.5
3.2	28380	534.6
3.6	27700	538.8
4	27100	540.5
4.7	25900	544.3
5	25070	547.5
6	22360	544.6
7	19670	550.3
8	17550	553.5
9	16520	553.7
10	15890	548.1
11	15380	545.4
12	14750	547.8
13	14000	558.3
14	11930	596.2
15	11570	583.9
16	11200	586.2
17	10450	581.5
18	8612	608.1
19	7498	614.1
20	6656	625.8
21	5924	638.2
22	5376	639.4
23	4946	631.4
24	4469	632.9
25	4006	640.6
26	3471	672.2
27	3078	687
28	2768	692.4
29	2681	652.9
30	2111	768.5

TABLE 4

KEY CONTAINMENT PARAMETERS

	CASE 1	CASES 2 & 3
1. WETWELL AIRSPACE AND SUPPRESSION POOL		
Wetwell Airspace Free Volume (FT^3)	121,400	121,000
Initial Wetwell Airspace Pressure (PSIA)	14.7	16.1
Initial Wetwell Airspace Temperature (°F)	77.5	77.5
Initial Wetwell Airspace Relative Humidity (%)	100	100
Suppression Pool Volume at HWL (FT^3)	92,000	92,000
Initial Suppression Pool Temperature (°F)	77.5	77.5
2. DRYWELL AND VENT SYSTEM		
Drywell Free Volume (FT^3)	180,000	180,000
Initial Drywell Pressure (PSIA)	14.7	16.1
Initial Drywell Temperature (°F)	135.0	135.0
Initial Drywell Relative Humidity (%)	20.0	20.0
Number of Downcomers	120	120
Inside Diameter of Each Downcomer (FT)	1.958	1.958
Downcomer Submergence	4.06	4.06
Total Downcomer Loss Coefficient (Including entrance, exit, turning and friction losses)	5.06	5.06

TABLE 5

SUMMARY OF PEAK DRYWELL PRESSURES

TRACG BREAK FLOW CASES/M3CPT CONTAINMENT MODEL

CASE NO.	FLOW RATE MULTIPLIER	PEAK DRYWELL PRESSURE (PSIG)	TIME (SEC)
1	1.0	20.5	9.5
2	1.0	32.9	9.7
3	1.25	38.1	3.0

TABLE 6

COMPARISON OF M3CPT AND CONTEMPT PEAK DRYWELL PRESSURE

CASE	FLOW RATE MULTIPLIER	M3CPT/TRACG	CONTEMPT/TRACG
1	1.0	30.5 psig / 9.5 sec	28.8 psig / 8.9 sec
2	1.0	32.9 psig / 9.7 sec	31.4 psig / 9.2 sec
3	1.25	38.1 psig / 3.0 sec	36.8 psig / 3.1 sec

TABLE 7

COMPARISON OF RELAP5 AND TRACG BLOWDOWN IMPACT ON PEAK DRYWELL PRESSURE

CASE	FLOW RATE MULTIPLIER	TRACG	FLOW RATE MULTIPLIER	RELAP5
1	1.0	28.8 psig/8.9 sec	1.0	29.6 psig/5.2 sec
2	1.0	31.4 psig/9.2 sec	1.0	31.6 psig/5.4 sec
3	1.25	38.1 psig/3.0 sec	1.3	38.4 psig/5.1 sec

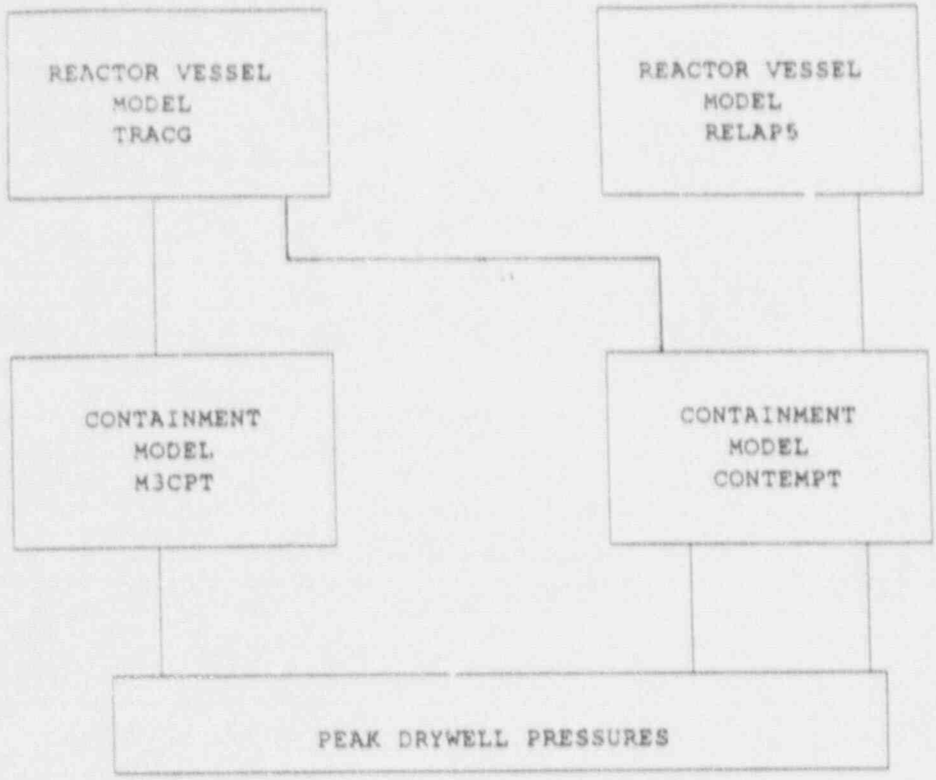

FIGURE 1

DESIGN BASIS ACCIDENT EVALUATION

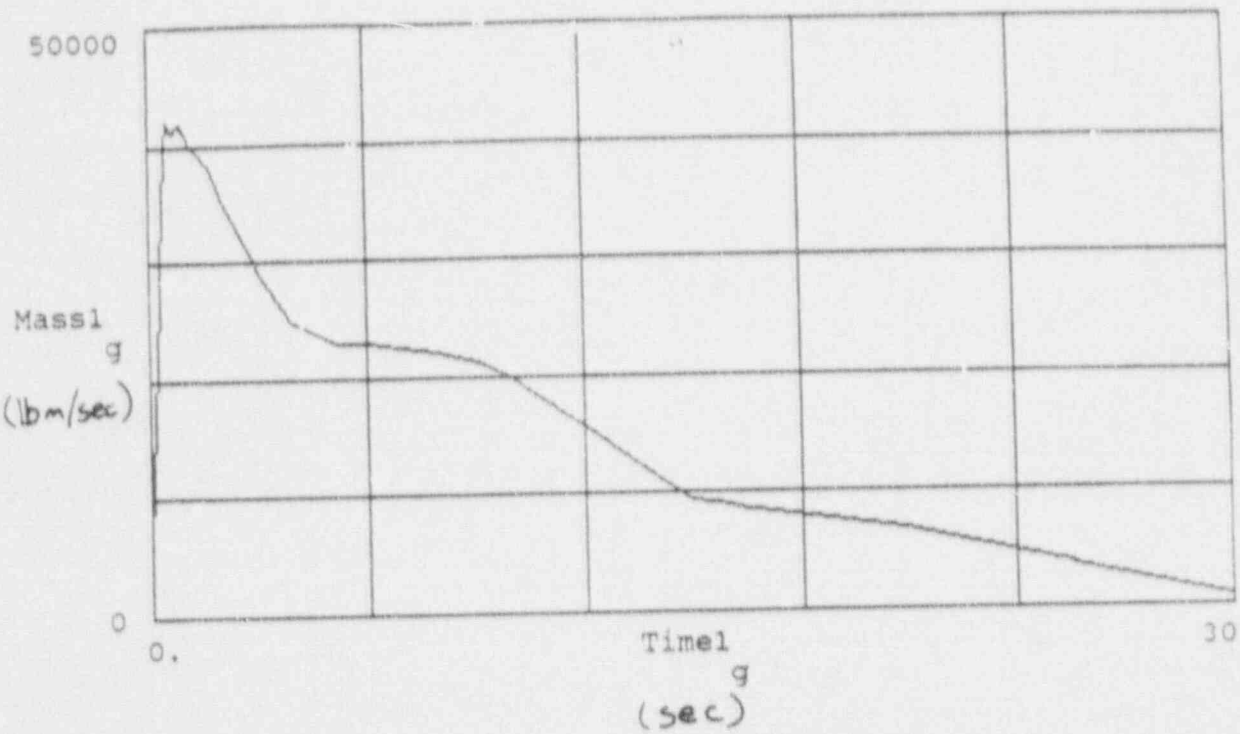

FIGURE 2

TRACG BEST ESTIMATE DB-LOCA BREAK FLOW RATE

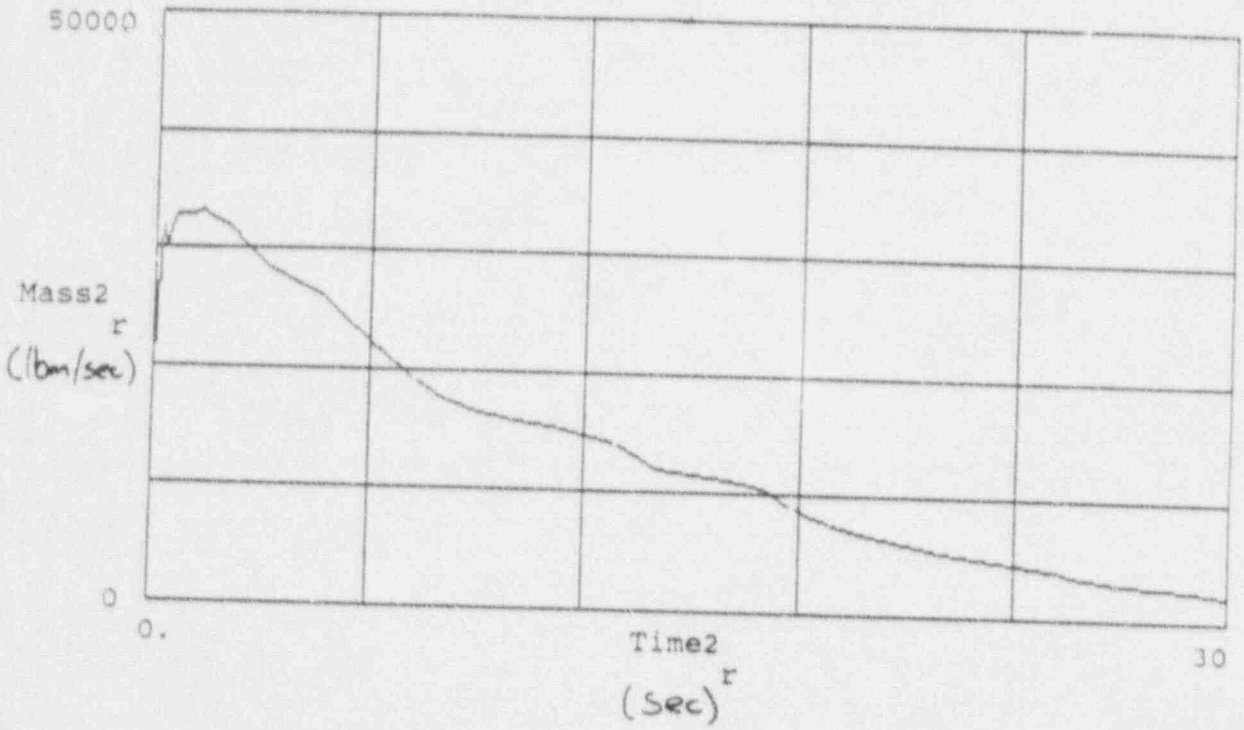

FIGURE 3

RELAP5 BEST ESTIMATE DB-LOCA BREAK FLOW RATE

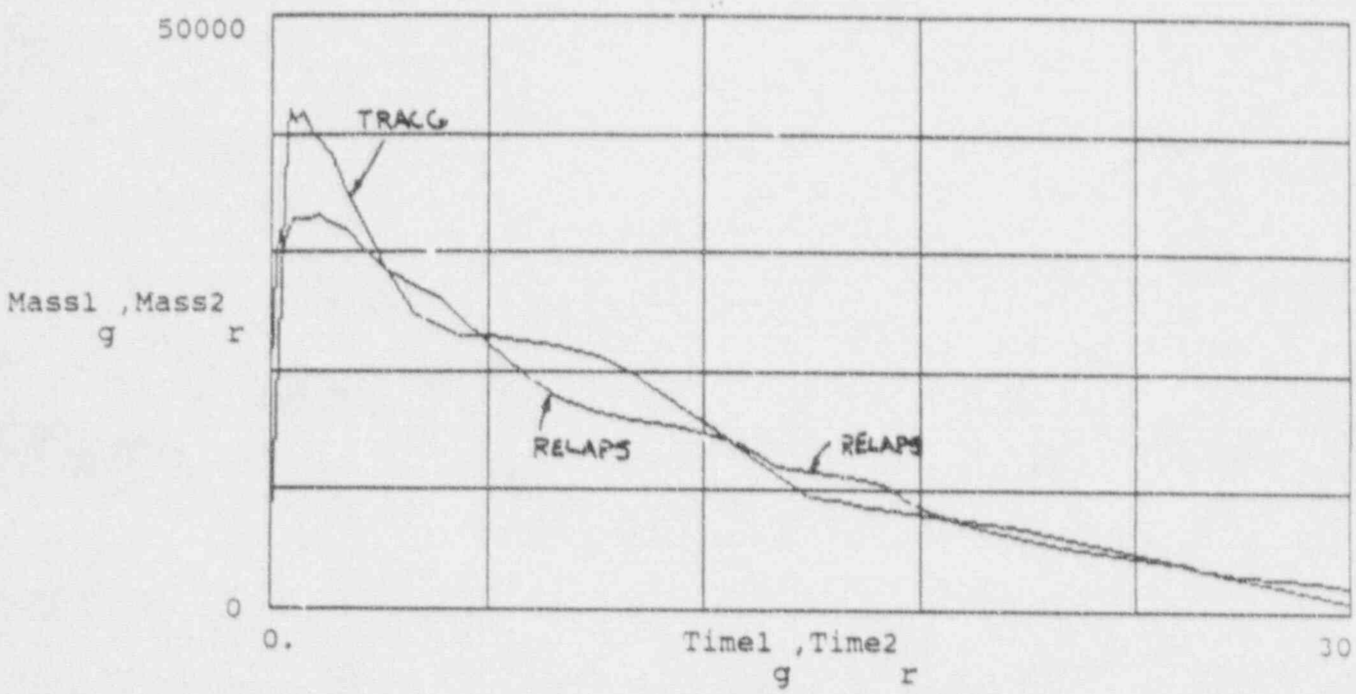

FIGURE 4

COMPARISON OF RELAP5 AND TRACG BREAK FLOW RATES

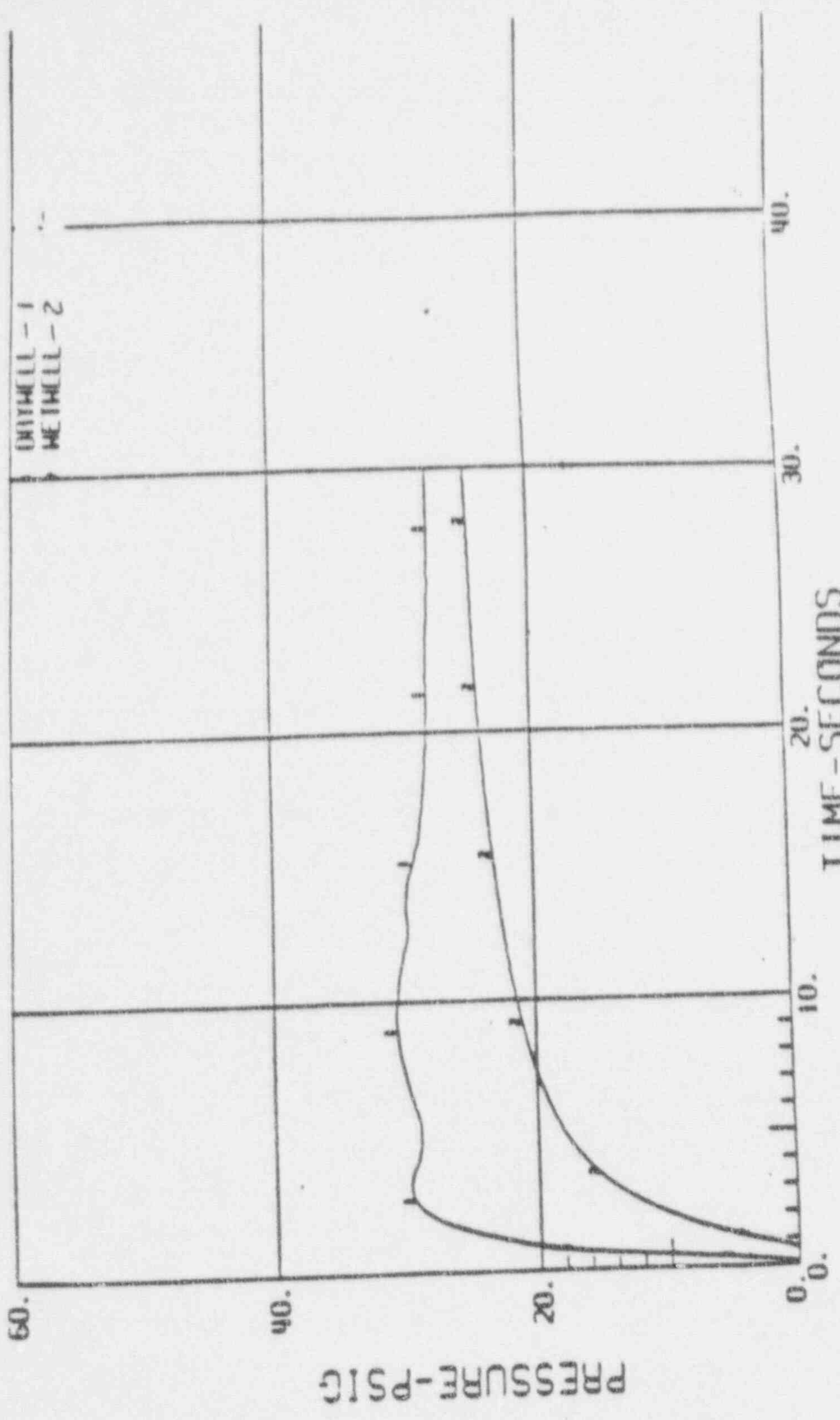

FIGURE 5

OYSTER CREEK PRESSURE RESPONSE

CASE 1 - M3CPT / TRACG

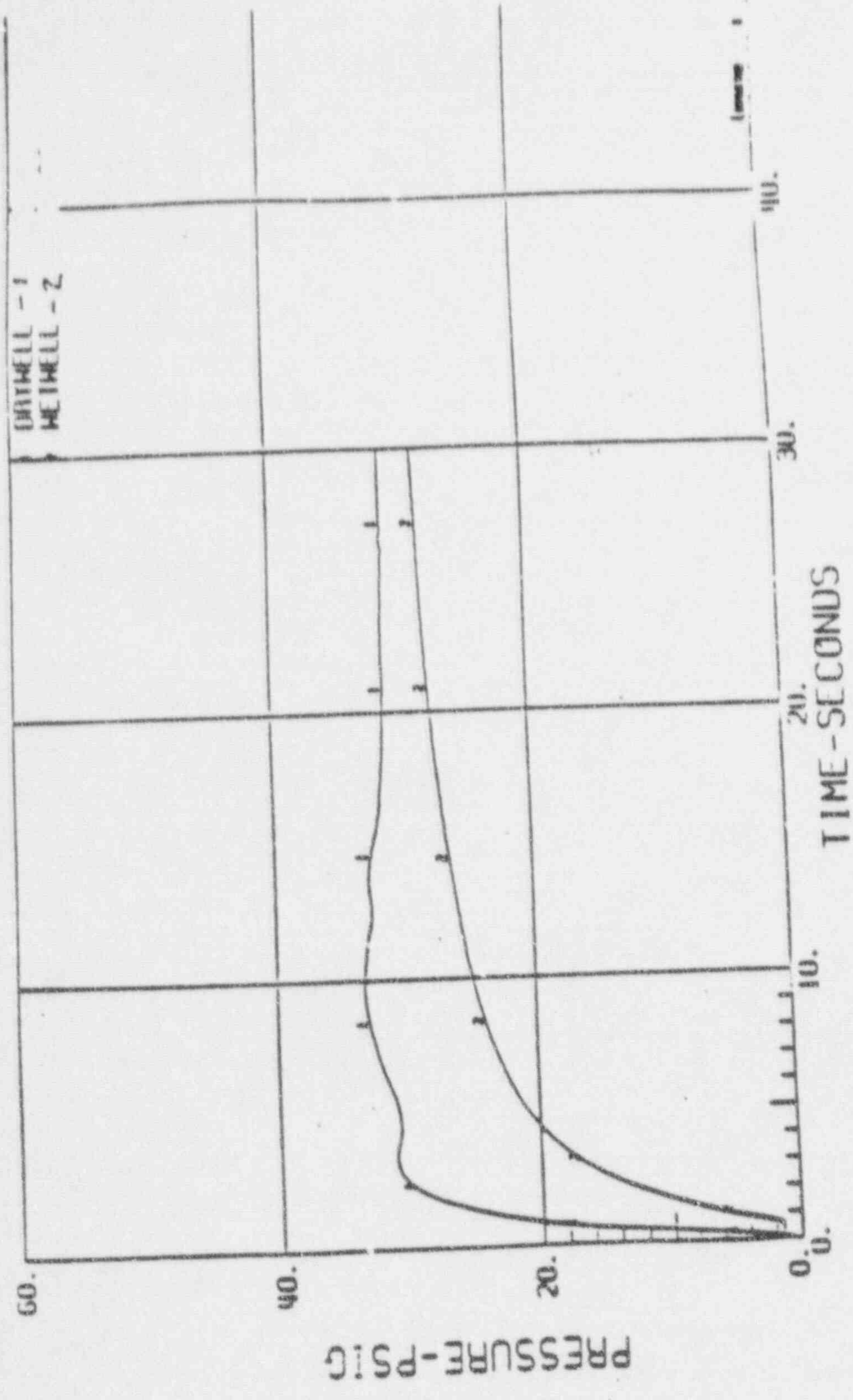

FIGURE 6

OYSTER CREEK PRESSURE RESPONSE

CASE 2 - M3CPT / TRACG

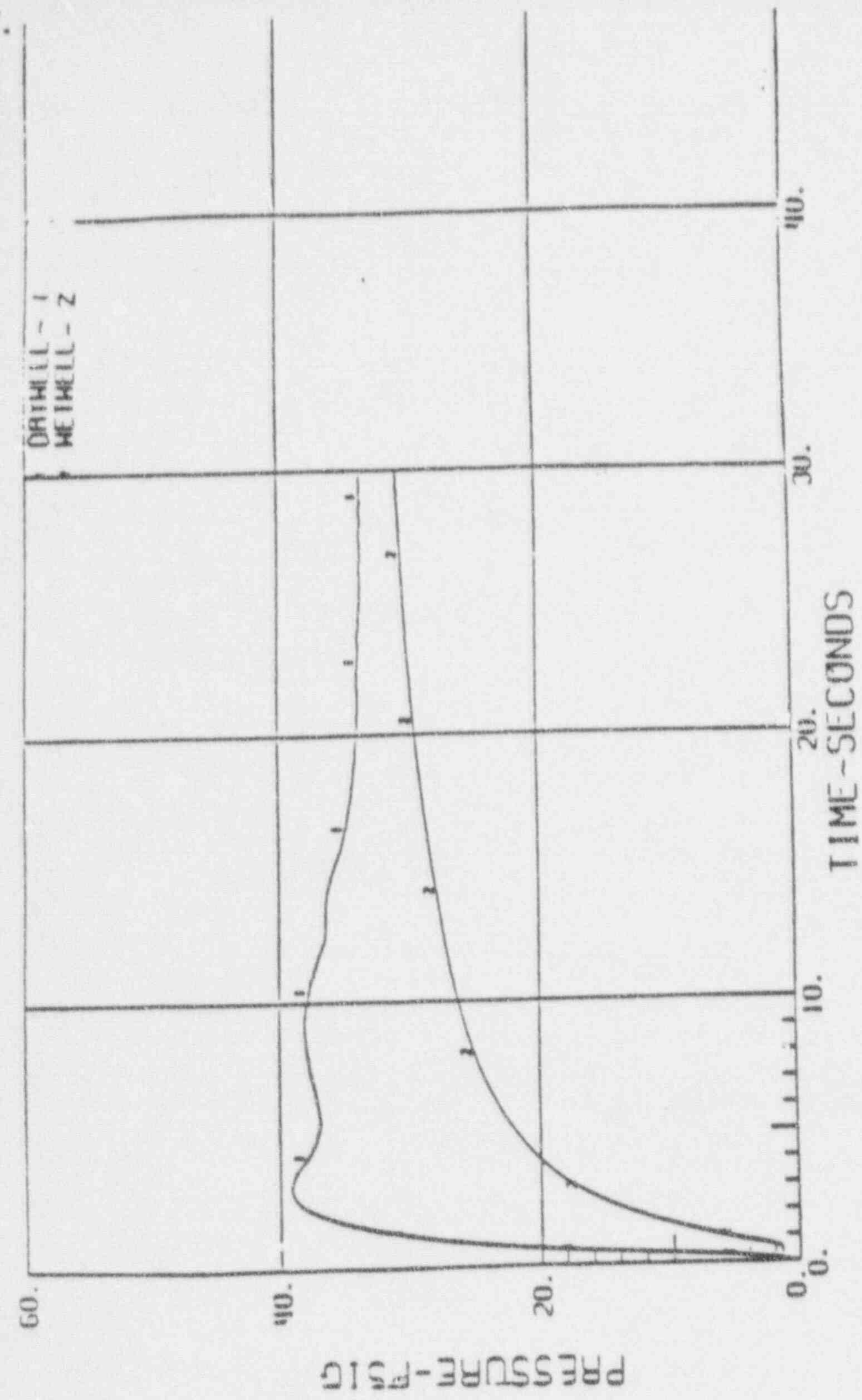

FIGURE 7

OYSTER CREEK PRESSURE RESPONSE

CASE 3 - M3CPT / TRACG

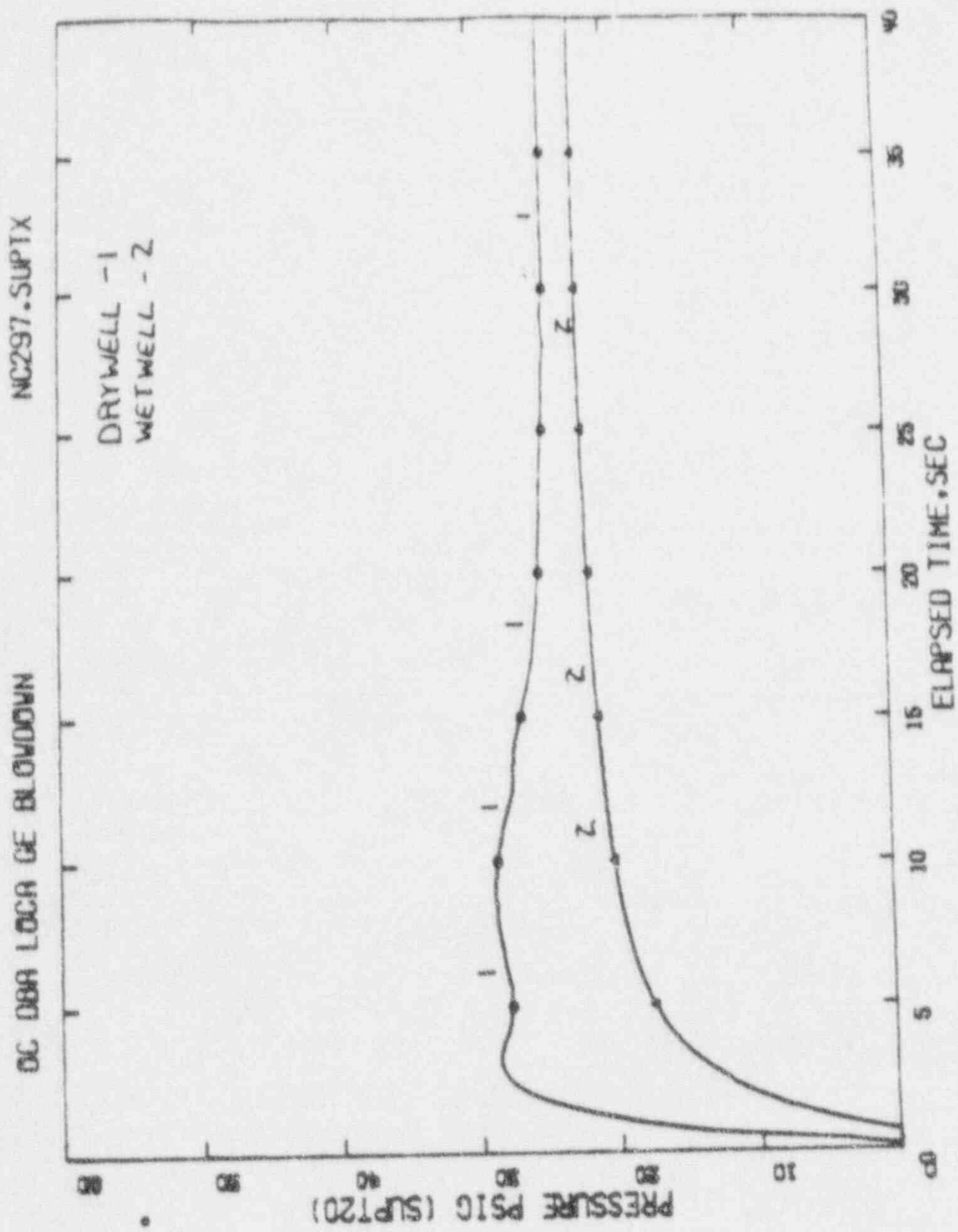

FIGURE 8

OYSTER CREEK PRESSURE RESPONSE

CASE 1 - CONTEMPT / TRACG

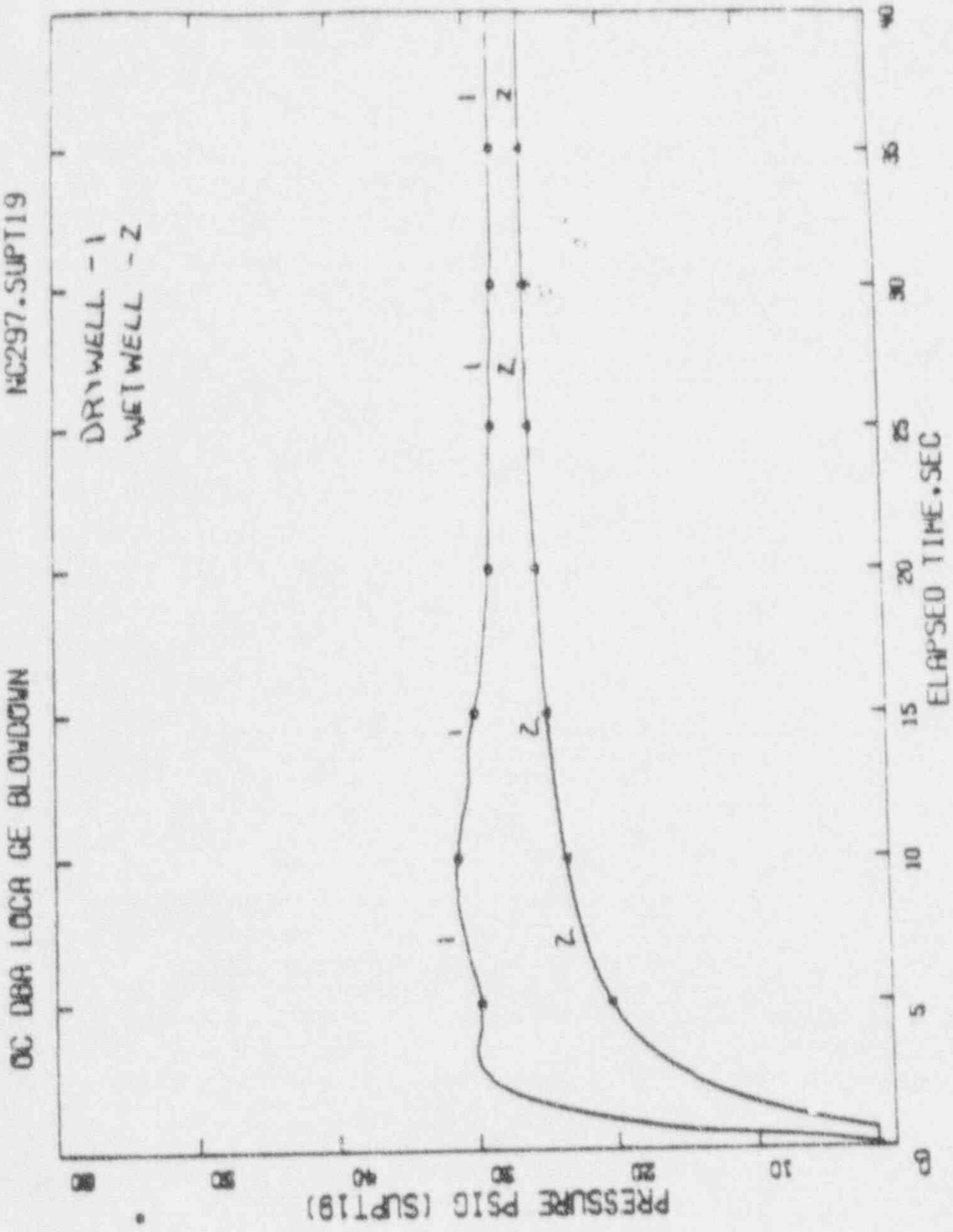

FIGURE 9

OYSTER CREEK PRESSURE RESPONSE

CASE 2 - CONTEMPT / TRACG

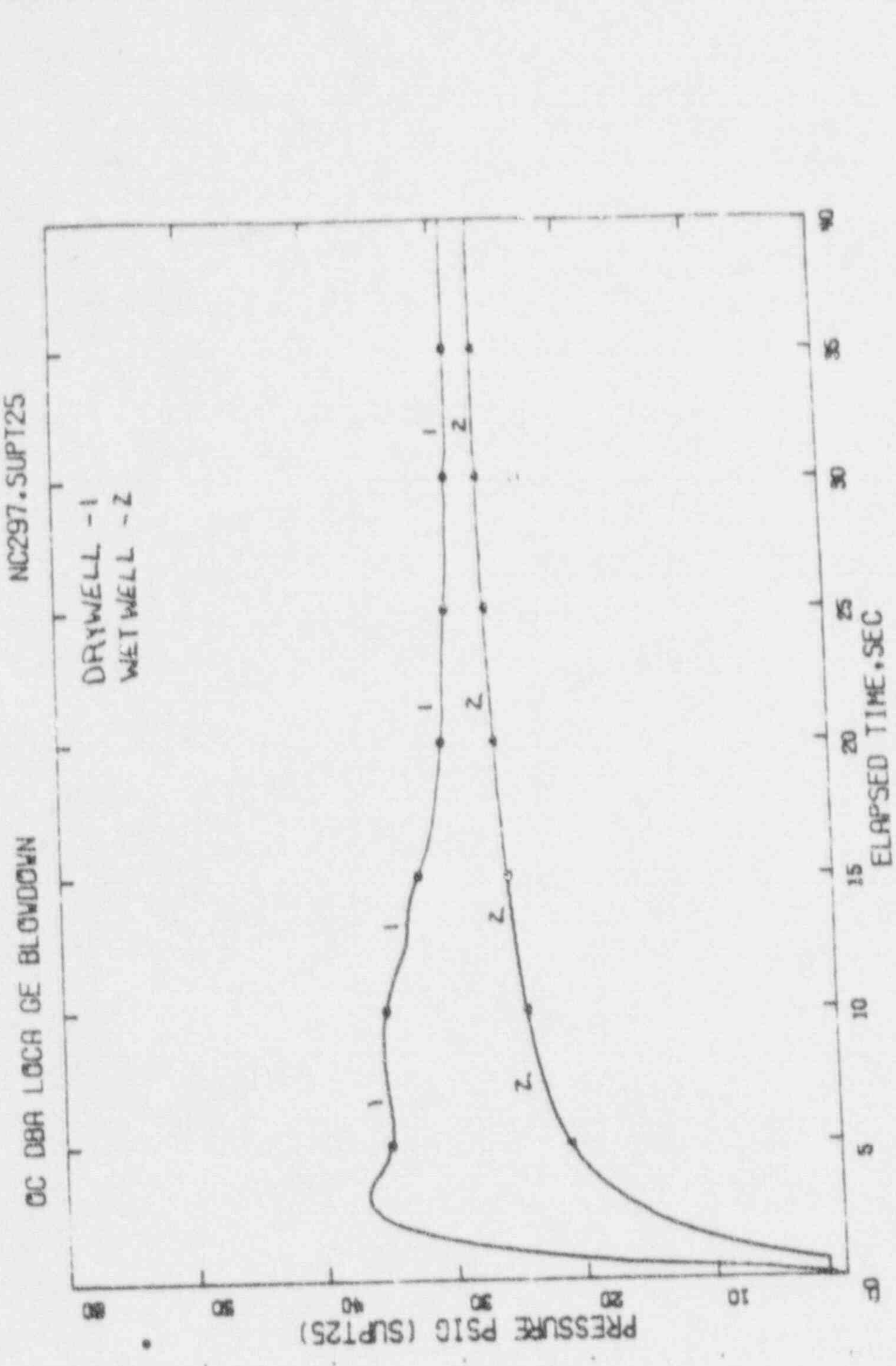

FIGURE 10

OYSTER CREEK PRESSURE RESPONSE

CASE 3 - CONTEMPT / TRACG

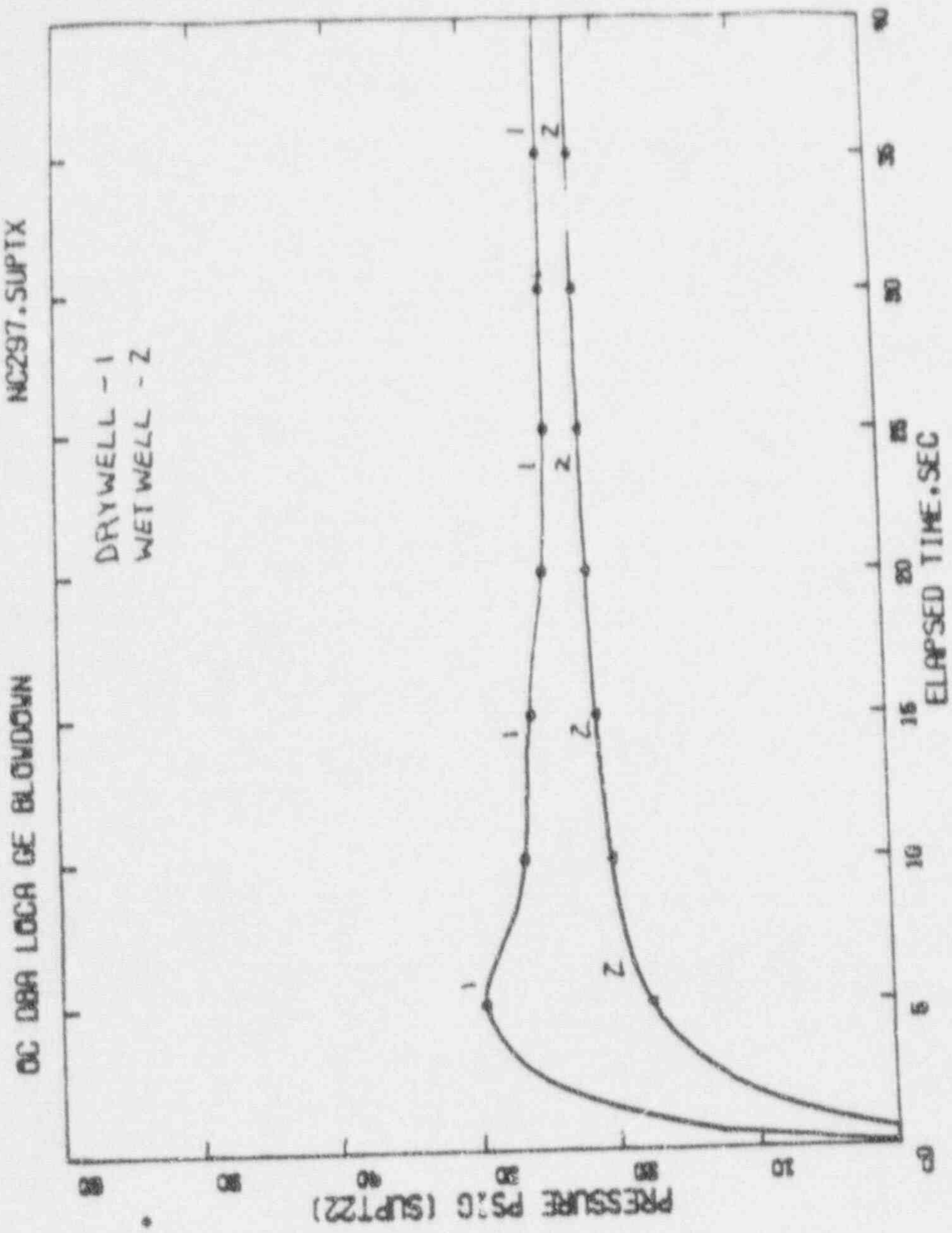

FIGURE 11

OYSTER CREEK PRESSURE RESPONSE

CASE 1 - CONTEMPT / RELAP5

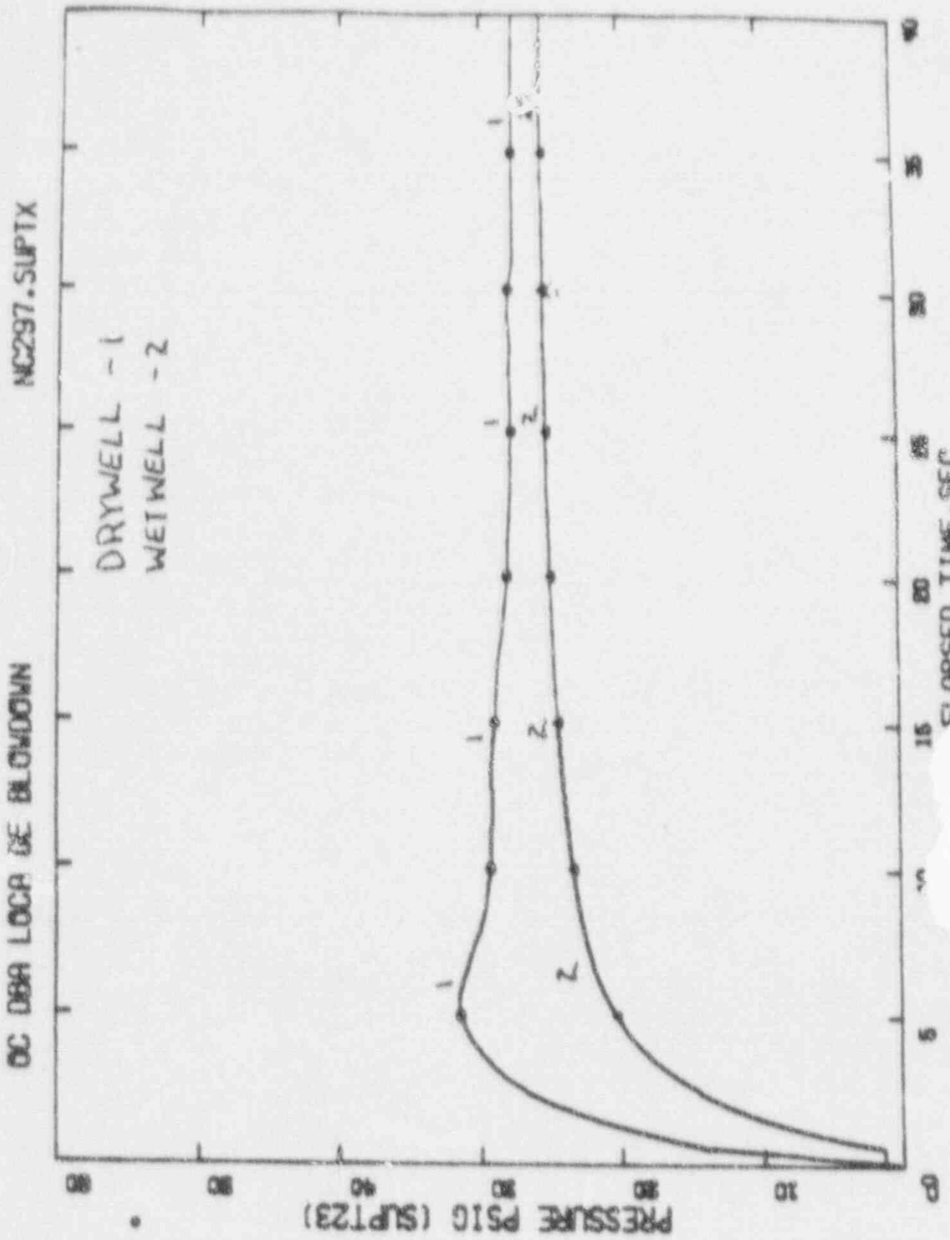

FIGURE 12

OYSTER CREEK PRESSURE RESPONSE

CASE 2 - CONTEMPT / RELAP5

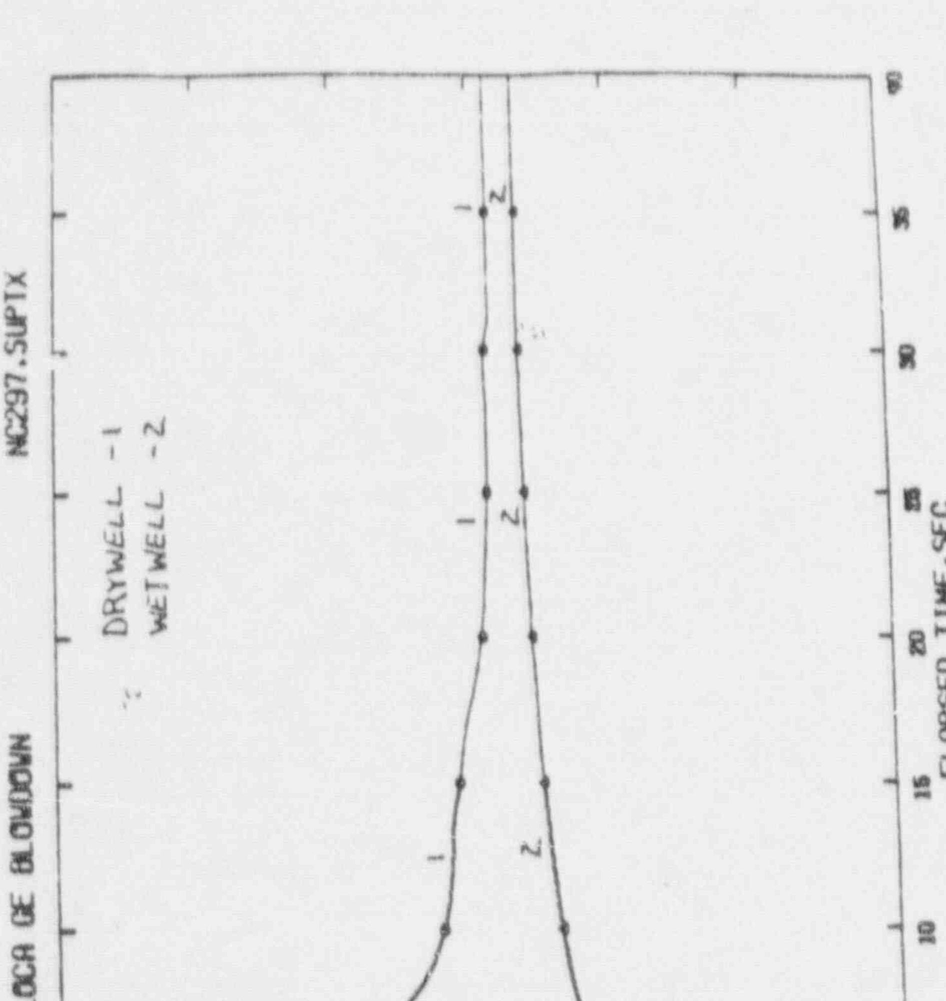

FIGURE 13

OYSTER CREEK PRESSURE RESPONSE

CASE 3 - CONTEMPT / RELAP5