MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
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NUCLEAR PRODUCTION DEPARTMENT

August 26, 1981

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
File 0260/0862
Transmittal of Proposed FSAR Changes and Responses to NRC SER Open Items
AECM-81/324

In response to your request for additional information, Mississippi Power & Light Company is submitting the enclosed materials updating information pertaining to the above referenced items.

This information represents proposed changes and additions to the Grand Gulf Nuclear Station Final Safety Analysis Report (FSAR).

These proposed FSAR changes will be incorporated into the next available amendment to the FSAR unless noted otherwise. If you have any questions, please contact this office.

Yours truly,

L. F. Dale
Manager of Nuclear Services

RFP/DWF/JDR:dn

Attachments: (See Next Page)

B001
S.1/1

MISSISSIPPI POWER & LIGHT COMPANY

Attachments:
1. PSB SER Open Item - Monitoring Systems of DC Power Supply
2. PSB SER Open Item - Non-safety Loads on Energy Sources
3. PSB SER Open Item - Power Lockout to Motor Operated Valves
4. PSB SER Open Item - Load Shedding and Sequencing Panel Reliability
5. PSB SER Open Item-Upgrade Diesel Generator Auxiliary System
6. CSB SER Open Item - Subcompartment Pressurization Analysis

cc: Mr. N. L. Stampley
Mr. G. B. Taylor
Mr. R. B. McGehee
Mr. T. B. Conner

Mr. Victor Stello, Jr., Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attachments for Item # 4 - To Sang Rhow, PSB

SER Open Item

Monitoring Systems of DC Power Supply in the Control Room - (PSB)

Response

The following indications and alarms of the Class IE DC power systems are provided in the control room:

DC Bus Voltage (Voltmeter)
DC Bus Undervoltage Alarm
DC Bus Ground Detection Alarm
Open position of the following breakers:
 Main battery breaker
 Charger DC breaker
 Distribution center output breaker to the distribution panel
Battery Low Voltage alarm
Charger DC Undervoltage alarm
Charger AC Overvoltage alarm
Charger AC Power Failure alarm

The following alarms listed in the SER have not been provided for the following reasons:

Battery current (ammeter-charge/discharge)
Normally the floating charge for the battery is very small, thus requiring a very sensitive ammeter. Since currents in this circuit may be in the order of 2000A, the ammeter must also be able to withstand this current. Therefore, shut bypasses must be employed so that the meter movement will not be destroyed by the larger currents.

These shunts are then manually removed when the normal (i.e., small) current readings are desired. Thus, the reading cannot be continuous and no automatic alarms or indications can be given. Since the purpose of a "Battery Current" indication is to determine the battery condition, the method of accomplishing this purpose should not be important. For the Class IE batteries, Grand Gulf utilizes a Battery Monitoring Device which is like an extremely sensitive undervoltage relay. This device compares half of the battery cells to the other half to determine if there is a voltage imbalance greater than $\pm$ 2%. If differences are detected, the general trouble alarm is sounded and an operator is dispatched to ascertain and correct the situation. This response is exactly what would be achieved if an improper ce of battery current (which would cause the voltage imbalance) were indicated by an ammeter.

The Grand Gulf method is faster and more reliable since an automatic alarm is sounded. Additionally, it is Grand Gulf's design philosophy not to burden an operator with information that is not required. In this case, no trouble will result in the dispatch of an operator to the battery where corrective action would be initiated. It would serve no useful purpose to determine the exact cause of the problem in the control room when action must take place in the battery room. Rather, the analysis of the problem in the control room might distract the operator from other and perhaps more vital duties. The Grand Gulf design accomplishes the purpose of a Battery Current alarm in a way better suited to the operation of the plant.

Battery charger output current (ammeter)
This ammeter is located on the front of the charger panel where it provides useful information to maintenance or service personnel. This information is not required in the main control room since any current deviations of significance would result in the sounding of the charger undervoltage or overvoltage alarms which are in the control room. This alarm philosophy is in accord with the general principal of giving the operator only the information that is necessary so that he is not overwhelmed by the inputs.

Battery charger output voltage (voltmeter)
Instead of a voltmeter for the charger output, a voltmeter is provided for the DC bus in addition to overvoltage and undervoltage alarms which are provided for the battery chargers. With the charger output breaker closed, the output voltage of the breaker would be the same as the bus voltage (due to the close proximity of the chargers to the DC bus). Consequently, there would be no additional information conveyed by the added instrument. With the breaker open, the charger is not connected to the bus, so minor voltage fluctuations are unimportant and only alarms are necessary in the control room. A battery charger output voltmeter is provided on the front of the battery charger panel as an aid to service and maintenance personnel.

Battery high discharge rate alarm
This condition can only occur if there is an undervoltage on the DC bus or a ground between the bus and the battery. Since both of these two conditions are alarmed, the addition of this alarm would not add to the operator's information of the situation and could be distracting. This alarm is not in accordance with the Grand Gulf philosophy and has, therefore, been excluded.

Thus, the Grand Gulf design conveys all necessary information to the operator without giving him more than he needs. In general, if the operator can perform some corrective action in the control room in response to a specific input, then he is given that specific piece of information. However, if the operator's only response is to dispatch another operator to a location removed from the control room, then the only information required in the control room is general information with only the level of specificity necessary to provide the proper directions.

SER Open Item

Non-Safety Loads on Emergency Sources - (PSB)

Response

The isolation method between the Class IE power sources and non-safety loads has been defined by the applicant in FSAR subsection 8.3.1.4.2.

SER Open Item

Power Lockout to Motor Operated Valves - (PSB)

Response

No list has been provided since there are no valves in this category at Grand Gulf. All electrically operated valves which are in safety piping are class IE. When valves are used for isolation, two redundant division valves (Division I and Division II) are installed in series. Thus no power lockout is required for any Grand Gulf valves.

SER Open Item

Load Shedding and Sequencing Panel Reliability - (PSB)

Response

The attached package contains the environmental and seismic qualification information necessary to confirm the reliability of the load shedding and sequencing panel. These attachments are listed below.

1. Seismic Qualification Report No. 2699-1, Load Shedding and Sequencing Panel.

2. Load Shedding and Sequencing Panel, Seismic Qualification Test Plan No. 2699, Revision A.

3. Seismic Simulation Test Program on a Grand Gulf Load Shedding and Sequencing Panel.

4. Wyle Laboratories Seismic Simulation Report No. 43497-1.

5. Qualification Report, Load Shedding and Sequencing Panel.

SER Open Item

Upgrade Diesel Generator Auxiliary System - (PSB)

Response

Item: Design of piping and components for piping from the engine block to the engine interfa-- has not been defined.

Response: FSAR Table 3.2-1 "Classification of Systems, Components, and Structures" has been revised to explicitly identify the design code and quality group classification of all emergency diesel engine piping and components.

Item: Fuel oil drip return lines and tank are not designed as seismic Category I, Quality Group C.

Response: The fuel oil drip return portion of the standby diesel generator is non-essential to the proper operation of the diesel generator. The fuel oil drip return system is low capacity, approximately 8 gal/hour. Failure of this portion of the fuel oil system is inconsequential as the quantity of fuel oil "lost" to the fuel oil system would be insignificant compared to that consumed during diesel operation.

Based on the non-essential function of the fuel oil drip return system the existing Quality Group D classification is justified and acceptable for overall emergency diesel generator system operation.

The portion of the fuel oil drip piping which is engine-mounted has been seismically qualified with the engine. Failure of the remaining piping from the engine to the drip return tank or of the piping from the drip return tank to the fuel oil day tank would not present a fire hazard. The fuel oil would possibly drip on the lower portion of the engine or on the floor. Drippage onto the lower portion of the engine would not be ignited by the engine due to the relatively low temperature of the engine and the high ignition point of diesel fuel oil. Oil drippage onto the floor would be collected by the floor drains and routed to oily waste system and appropriately processed.

Item: The Diesel Engine cooling water system, starting system and the lubricating il system are designed as Quality Group D.

Response: Piping and components for the diesel engine cooling water system, the diesel engine starting system and the diesel engine lubricating oil system are designed as Quality Group D with supplemental requirements upgrading the subject items. These supplemental requirements are specified in FSAR Table 3.2-1, and are ASME Section III Class 3 requirements. The piping and components do not adhere to all ASME Section III Class 3 requirements, therefore cannot be listed as Quality Group C. The requirements which are imposed serve to upgrade the system from normal Quality Group D requirements. Justification for Grand Gulf's approach are the guidelines specified in the attached NRC letter to MP&L dated July 11, 1975.

Item: Diesel engine combustion air intake and exhaust system piping and components are designed and classified as Quality Group D.

Response: The diesel engine combustion air intake and exhaust system piping and components are designed as Quality Group D which is justified by the service of this system. Both the intake and the exhaust systems are low pressure systems (10 psig) except for the on-engine portions which are on the engine side of the turbocharger. The on-engine piping is designed to diesel engine manufacturer's in-house standards. The low pressure off-engine piping is designed to ANSI B31.1 as stated in FSAR Table 3.2-1. The pressure vessels, intake and exhaust silencers and intake filter, are designed to manufacturer's standards for the respective components. All piping and components are seismic Category I qualified and supported.

The scope of higher quality group systems, i.e., jacket water, lube oil and starting air, was previously agreed upon by MP&L and the NRC. The diesel engine combustion air intake and exhaust system was not included in the group of systems requiring supplemental quality requirement to upgrade the integrity of the system above the normal Quality Group D requirements.

Unlike these other diesel generator auxiliary systems which benefit from higher quality requirements imposed on the pressure boundary, the combustion air intake and exhaust system would not benefit from higher quality due to the mild service conditions.

The existing Quality Group D and seismic Category I classification is commensurate with the service conditions imposed on the combustion air intake and exhaust system and adequately ensures the integrity of the system.

Item: Design of engine mounted piping and components has not been defined.

Response: On engine hardware is designed to diesel engine manufacturer's in-house standards, not necessarily national standards.

SER Open Item

Subcompartment Pressurization Analysis - (CSB)

1. Provide justification of splitting blowdown mass and energy

   a. RPV - Shield Wall Annulus - Recirculation Inlet Line Break

   b. Drywell Head - Main Steam Line Break

Response:

a. For the Recirculation Inlet (Recirc Return) Line Break analysis, the assumed break location is at the intersection of 4 subcompartments in the annulus; subcompartmens 3,5,13 and 23 (see attached FSAR Fig. 6.2-26a.) While some of blowdown from the break would be expected to flow directly through the penetration in the sacrificial shield wall to the drywell, it is conservatively assumed that all of the blowdown is released in the annulus, divided equally between the four subcompartments.

   For the Recirculation Suction Line and the Feedwater Line Break analyses, the postulated breaks occur in the flow diverters described in FSAR subsection 3.8.3.4.5.4. Calculations have been performed to determine the size of the gap between the flow diverter sleeve and the RPV nozzle, for both the feedwater line and the recirc suction line, such that the flow to the annulus from the break is less than 15% of the total blowdown. It was consevatively assumed in the subcompartment analyses for these breaks that 15% of the total blowdown was released directly in the annulus. The remaining 85% of the blowdown was released to the drywell via the flow diverter.

   As in the case for the Recirculation Inlet line, the assumed break nozzles are at the intersection of two or three subcompartments for the Recirculation Suction and Feedwater lines respectively. Thus, the 15% of the total blowdown released directly to the annulus is further divided. For the Recirculation Suction Line Break, the flow from the break to the annulus is assumed to be split equally between subcompartments 1 and 11 (see attached FSAR Fig. 6.2-26b). So then, as shown in FSAR Table 6.2-15b, 7.5% of the total blowdown is assumed released to subcompartment 1 and 7.5% to subcompartment 11. For the Feedwater Line Break, the flow from the break to the annulus is assumed to be split between subcompartments 14, 16 and 20 (see attached FSAR Fig. 6.2-26c). Therefore, as shown in FSAR Table 6.2-15c, the mass and energy flowing into subcompartments 14, 16 and 20 is 3.75%, 3.75% and 7.5% of the total blowdown respectively.

b. For the Drywell head analysis for a Main Steam Line Break, the assumed break location is at the intersection of two subcompartments; 1 and 2. It was assumed that the mass and energy released from the break was split evenly between the two subcompartments. FSAR Table 6.2-30 incorrectly indicated that the total blowdown from the break was released to subcompartment 1. This table has been revised to show the correct distribution of the blowdown.

2. Provide actual AP across boundaries (Reference Table 6.2-30, Figures 6.2-72a and b).

Response:

See revised Table 6.2-30 attached.

3. Provide the method used for calculating the ℓ/A terms.

Response:

The inertial term in the momentum equation used in the subcompartment analysis is referred to as the "ℓ/a". Theoretically, this term is the solution to the equation

$$\ell/a_{(1-2)} = \int_{r_1}^{r_2} \frac{d\ell}{a(\ell)}$$

where ℓ = Flow path length

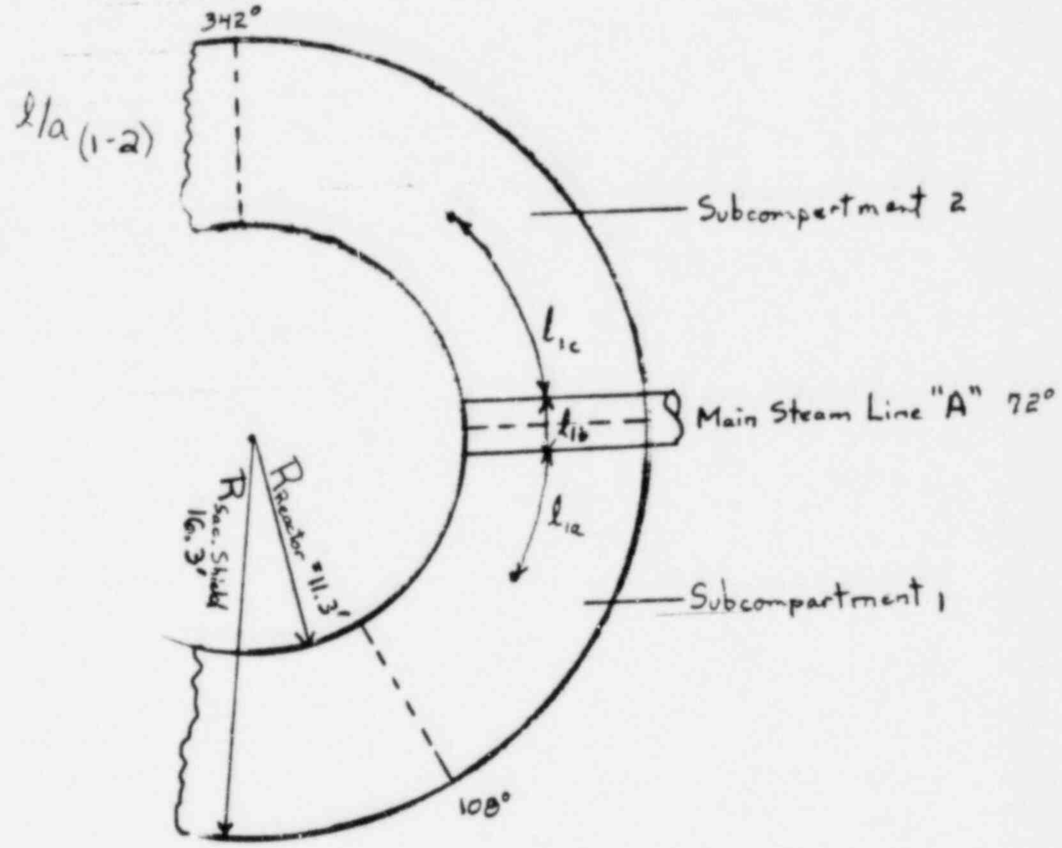
$a(\ell)$ = Flow area (the area perpendicular to the direction of flow at any point)

r_1, r_2 = locations of the subcompartment or node centers

In practice, this integral is approximated by the summation over n segments

$$\ell/a_{(1-2)} = \sum_{i=1}^{n} \frac{\ell_i}{a_i}$$

To illustrate the technique for calculating ℓ/a's, two examples are shown from the subcompartment analysis for the Main Steam Line Break near the Drywell Head. The nodalization scheme for this analysis is shown in FSAR Figure 6.2-72a. The two flow paths for which the ℓ/a calculation will be shown are between subcompartments 1 and 2 and subcompartments 1 and 9.



Height of Subcompartments = 18[illegible]" - 173'3" = 10.58'

Radius to center of Subcompartments = $\frac{11.3' + 16.3'}{2}$ = 13.8'

Diameter of Main Steam Line = 2.33' (Radius) = 1.165')

Cross Sectional Area of Main Steam Line = 2.33' x (16.3'-11.3') = 11.65 ft^2

$\ell_{1a} = \frac{1}{2}(2\pi(13.8)(\frac{36°}{360°}) - 1.165 = 3.17'$ $\quad \ell 1a/a_{1a} = .0599$

$a_{1a} = 5.0' \times 10.58' = 52.9\ ft^2$

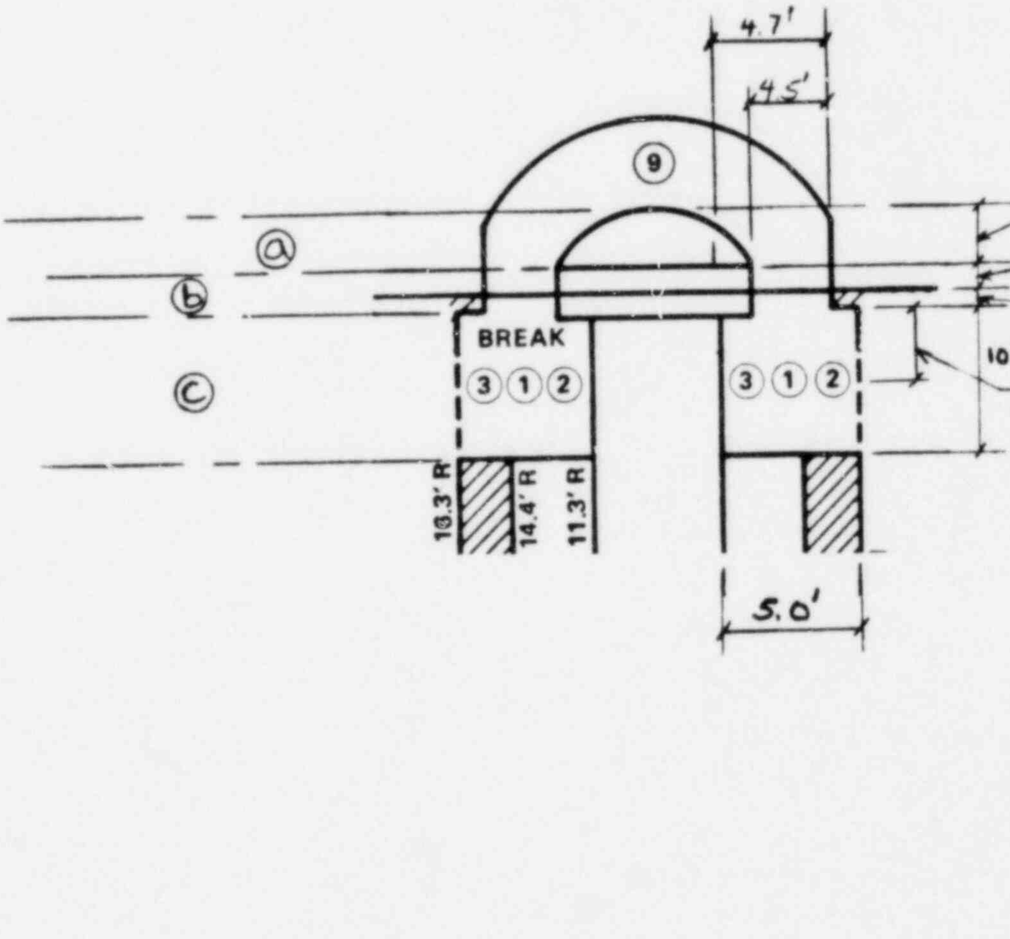
$\ell_{1b} = 2.33'$

$a_{1b} = 52.9 - 11.65 = 41.25 \text{ ft}^2$ $\qquad\qquad$ $\ell_{1b}/a_{1b} = .0565$

$\ell_{1c} = \frac{1}{2}(2\pi(13.8)(\frac{90°}{360°}) - 1.165 = 9.67'$

$\varepsilon_{1c} = 52.9 \text{ ft}^2$ $\qquad\qquad$ $\ell_{1c}/a_{1c} = .1828$

$\ell/a_{1\to2} = \ell_{1a}/a_{1a} + \ell_{1b}/a_{1b} + \ell_{1c}/a_{1c} = .2992$



1. Vent from 1 to 9 is through a manway 20"Ø.

2. $\ell_1 = 9.4'$

a_1 = area of subcompartment 9 into which subcompartment 1 is assumed to flow

$= 4.7' \times \frac{36°}{180°} \times \pi \times 13.65'$ (36° from previous calculation) $\ell/a_{(1-2)}$

$= 40.31 \text{ ft}^2$

$\ell_1/a_1 = 0.2331$

3. $\ell_2 = 1.55'$

a_2 = area through manway

$= \frac{\pi}{4} \times \left(\frac{20"}{12}\right)^2$

$= 2.18 \text{ Ft}^2$

$\ell_2/a_2 = 0.7110$

4. $\ell_3 = 3.2'$

a_3 = area of subcompartment 1 at reactor vessel Flange

$= 4.5' \times \frac{36°}{180°} \times \pi \times 13.8'$

$= 39.02 \text{ Ft}^2$

$\ell_3/a_3 = 0.0820$

5. $\ell_4 = 5.0'$

a_4 = area of subcompartment 1 below reactor vessel flange

$= 5.0' \times \frac{36°}{180°} \times \pi \times 13.8'$

$= 43.35 \text{ Ft}^2$

$\ell_4/a_4 = 0.1153$

6. $\ell/a_{(1-9)} = \ell_1/a_1 + \ell_1/a_2 + \ell_3/a_3 + \ell_4/a_4$

$= 0.2331 + 0.7110 + 0.0820 + 0.1153$

$\ell/a_{(1-9)} = 1.1414$

These values for ℓ/a closely approximate those given in FSAR Table 6.2-31.

4. Miscellaneous Typograhical Errors and/or Inconsistancies

Response:

a) Figures 6.2-33a, b and c for the Recirculation Inlet Line, the Recirculation Suction Line and the Feedwater Line respectively show that the load center elevation for the nodes on the third level is at 168.6'. If the reference elevation for moments is at 121.33', this would indicate that the moment arm for the subcompartments on the third level would be 47.27 ft. Tables 6.2-17 a, b, and c and 6.2-18a, b, and c have been revised according' .

The force coefficients and moment arms given in FSAR Tables 6.2-17a, b and c and 6.2-18a, b and c were used to calculate the moments shown in FSAR Figures 6.2-30aa, ab, ba, bb, ca, and cb and 6.2-31aa, ab, ba, bb, ca and cb. The incorrect moment arm for the third level of subcompartments in the annulus was used in the calculation of the values plotted in the above mentioned Figures. Therefore, these plots have been redrawn using the correct moment arm in the calculations of moments.

The moment arm values given in FSAR Tables 6.2-17a, b, and c and 6.2-18a, b, and c, and the plots shown in FSAR Figures 6.2-30aa, ab, ba, ca, and cb and 6.2-31aa, ab, ba, bb, ca, and cb are presented for the purpose of illustration. The values of the moments given in FSAR Figures 6.2-30aa, et al and 6.2-31aa, et al were not used in any design calculations. Therefore, the above mentioned corrections have no impact on the design of the plant or any equipment.

b) As shown in FSAR Figure 6.2-26a, the annulus between elevations 163.9' and 173.3' is divided equally into six subcompartments; 17, 18, 19, 20, 24 and 25. Table 6.2-15a shows the volumes of these subcompartments to be equal. Figure 1 (attached) illustrates the orientation of these subcompartments with respect to the coordinate axes. The force coefficients for each subcompartment are calculated by projecting the circumferential area subtended by the subcompartment on the axes of the pressure vessel and the sacrificial shield. Tables 6.2-17a, b, and 6.2-18a, b erroneously show the χ component force coefficients for subcompartments 20 and 24 to be reversed for the RPV and Sacrificial Shield for both the Recirculation Inlet and Recirculation Suction Line Break analyses. That is, the coefficient reported for subcompartment 20 should be that of subcompartment 24 and the coefficient reported for subcompartment 24 should be that of subcompartment 20. Tables 6.2-17a, b and 6.2-18a, b have been revised accordingly. The force and moment calculations for both the reactor pressure vessel and the sacrificial shield for the Recirc Inlet and Recirc Suction line breaks have been re-examined. It has been determined that the effect of this error on the total forces and moments is negligible.

c) The plots of force vs. time for the reactor pressure vessel and the sacrificial shield, shown in FSAR Figures 6.2-28aa, et al and 6.2-29aa, et al, respectively, are labelled "FORCE X" or "FORCE Y". The label "FORCE X" is used to describe the force calculated in the X direction and the label "FORCE Y" is used to describe the force calculated in the Y direction. (See Figure 2 attached)

The plots of moment vs. time for the reactor pressure vessel and the sacrificial shield, shown in FSAR Figures 6.2-30aa, et al and 6.2-31aa, et al are labelled either "MOMENT X" or "MOMENT Y". The label "MOMENT X" is used to describe the moment due to the force in the X direction and the label "MOMENT Y" is used to describe the moment due to the force in the Y direction.

d) The model for the Feedwater Line Break analysis, shown in FSAR Figure 6.2-26c, consists of 25 subcompartments. The flow diverter for the feedwater nozzle is modelled with 2 subcompartments; 23 and 25.

The gap between the flow-diverter sleeve and the Feedwater nozzle has been sized so as to allow a maximum of 15% of the total blowdown from a break to flow into the annulus. In the Feedwater Line Break analysis, it was conservatively assumed that 15% of the total blowdown was released directly into the annulus. Because the nozzle of the feedwater line which is postulated to break intersects 3 subcompartments in the annulus, the 15% of the total blowdown released in the annulus is divided between the subcompartments 14, 16 and 20. Referring to revised FSAR Figure 6.2-26c, it may be seen that due to symmetry the pressure in subcompartment 24 at any time should be very nearly the smae as the pressure in subcompartment 18 at that time. FSAR Figures 6.2-27cr and 6.2-27cv show that this is indeed the case. Table 6.2-15c gives the peak differential pressures for each subcompartment (differential between the pressure of the subcompartment in question and the remainder of the drywell, subcompartment 22). The peak differential pressure for subcompartment 24 is shown to be the same as the peak differential pressure for subcompartment 18, as expected.

FSAR Table 6.2-16c and Figure 6.2-25c were both found to be incorrectly showing a flow path #51 between subcompartment 25 (the flow diverter) and subcompartment 24 (in the annulus).

Since there is no direct flow path between these two subcompartments and since none was assumed for the Feedwater Line Break analysis, the above mentioned Table and Figure have been revised without impacting the results of the analysis.

With the postulated break inside the flow diverter, the two subcompartments 23 and 25 are calculated to reach very high pressures, approaching those of the R.C. System. This result is reflected in FSAR Table 6.2-15c. FSAR Figure 6.2-27cw, which is supposedly a plot of the pressure history in subcompartment 25 does not accurately reflect the analysis and was inadvertently entered in the FSAR, and will be deleted.

e) Figure 6.2-87 was provided to illustrate the overturning moment on the reactor pressure vessel due to jet thrust from a main steam line break. It is referenced in the listing accompanying Section 6.2.1.2.3 of the FSAR.

Figure 1

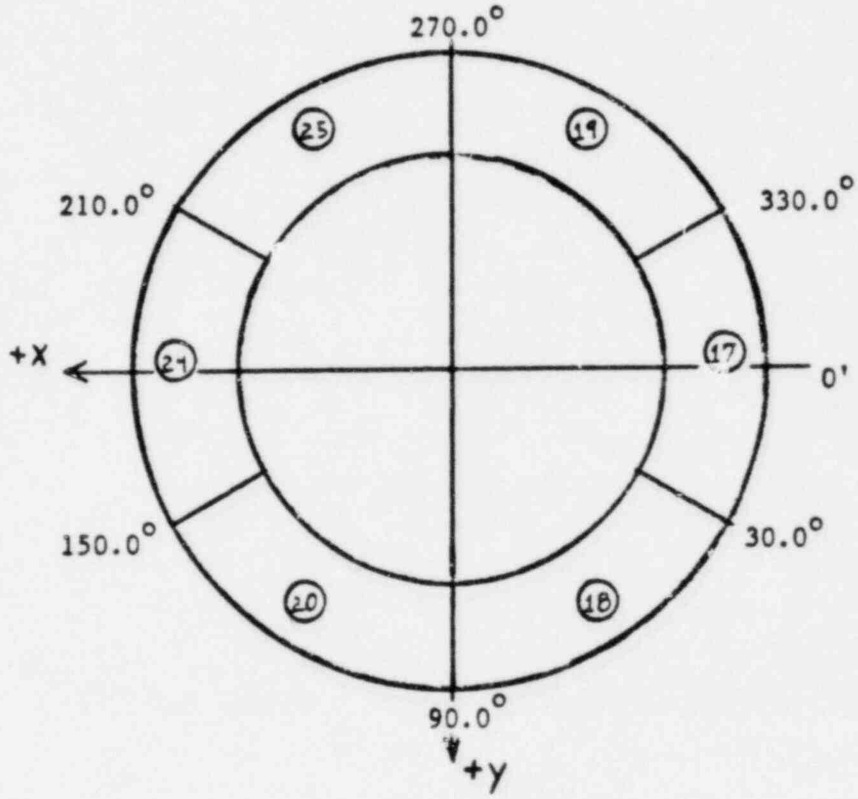


Figure 2
Sign Convention for Force and Moment

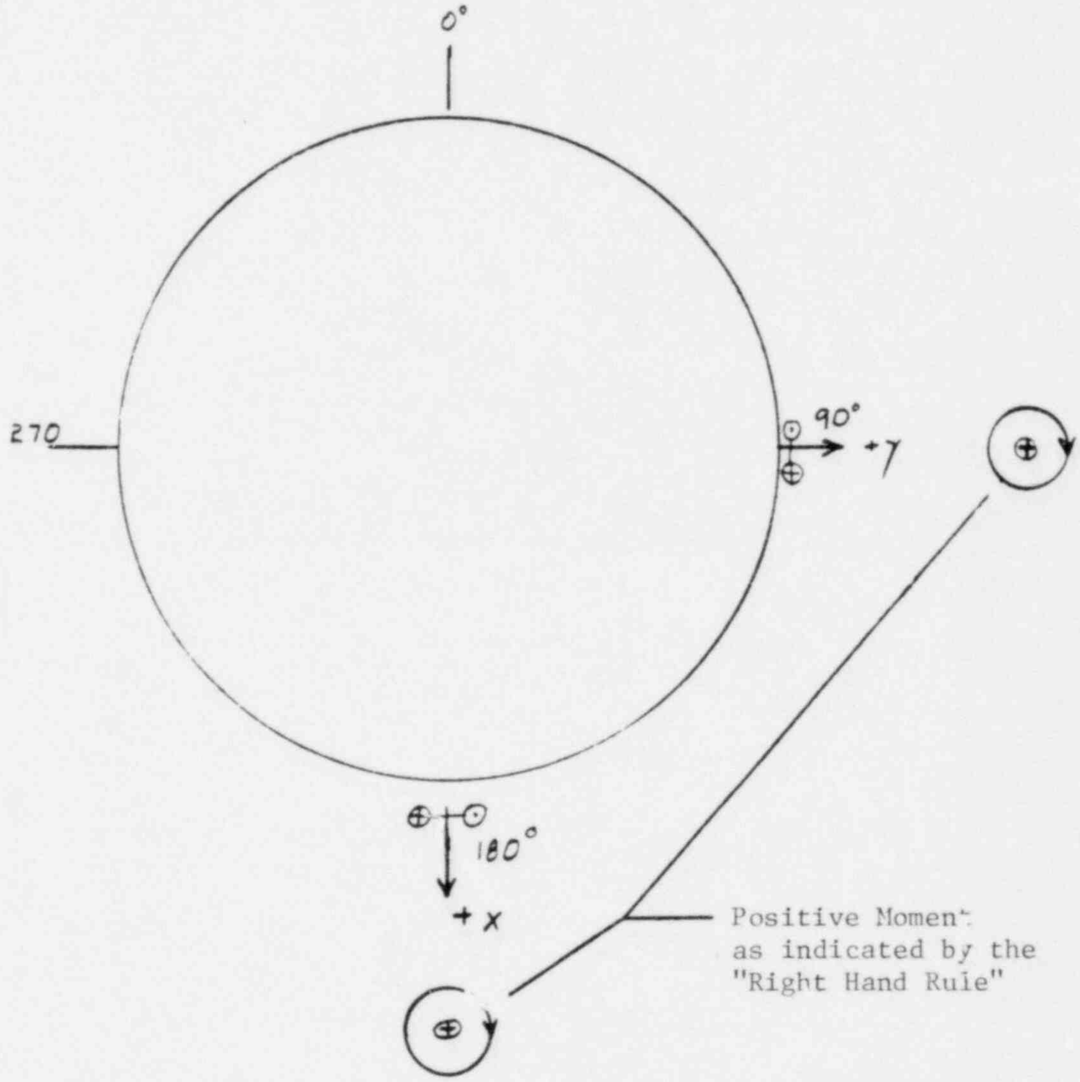


TABLE 6.2-16c

SUBCOMPARTMENT VENT PATH DESCRIPTION
FEEDWATER LINE BREAK
RPV - SHIELD WALL ANNULUS

Vent Path No.	From Vol. Node No.	To Vol. Node No.	Description of flow choked/unchoked	Area (ft^2)	ℓ/a (ft^{-1})	Head Loss, K Friction	Turning loss	Expansion	Contraction	Total
1	1	2	Unchoked	40.87	0.2004	-	0.129	1.0	0.01	1.139
2	1	3	Unchoked	40.87	0.2004	-	0.129	1.0	0.01	1.139
3	1	11	Unchoked	16.84	0.6930	0.078	-	1.0	0.24	1.318
4	2	4	Unchoked	40.87	0.1336	-	0.086	1.0	0.01	1.096
5	2	11	Unchoked	1.18	8.6929	0.078	-	1.0	0.47	1.548
6	2	12	Unchoked	11.26	1.6627	0.078	-	1.0	0.03	1.108
7	3	5	Unchoked	40.87	0.1336	-	0.086	1.0	0.01	1.096
8	3	11	Unchoked	1.18	8.6929	0.078	-	1.0	0.47	1.548
9	3	13	Unchoked	11.26	1.6632	0.078	-	1.0	0.1	1.178
10	4	6	Unchoked	40.87	0.1336	-	0.086	1.0	0.01	1.096
11	4	12	Unchoked	12.44	1.3856	0.078	-	1.0	0.05	1.128
12	5	7	Unchoked	40.87	0.1336	-	0.086	1.0	0.01	1.096
13	5	13	Unchoked	12.44	1.3856	0.078	-	1.0	0.05	1.128
14	6	8	Unchoked	40.87	0.1336	-	0.08	1.0	0.01	1.096
15	6	12	Unchoked	6.22	2.7712	0.078	-	1.0	0.05	1.128
16	6	14	Unchoked	6.22	2.7712	0.078	-	1.0	0.05	1.128
17	7	9	Unchoked	40.87	0.1336	-	0.086	1.0	0.01	1.096
18	7	13	Unchoked	6.22	2.7712	0.078	-	1.0	0.05	1.128
19	7	15	Unchoked	6.22	2.7712	0.078	-	1.0	0.05	1.128
20	8	10	Unchoked	40.87	0.3345	-	0.214	1.0	0.01	1.224
21	8	14	Unchoked	12.44	1.3856	0.078	-	1.0	0.05	1.128
22	9	10	Unchoked	40.87	0.3345	-	0.214	1.0	0.01	1.224
23	9	15	Unchoked	12.44	1.3856	0.078	-	1.0	0.05	1.128
24	10	14	Unchoked	11.26	1.6627	0.078	-	1.0	0.03	1.108
25	10	15	Unchoked	11.26	1.6627	0.078	-	1.0	0.03	1.108
26	10	16	Unchoked	21.86	0.5940	0.078	-	1.0	0.18	1.258
27	11	12	Unchoked	66.06	0.1878	-	0.20	1.0	0.01	1.21
28	11	17	Unchoked	27.24	0.5040	0.078	-	1.0	0.08	1.158
29	12	14	Unchoked	66.06	0.1878	-	0.20	1.0	0.01	1.21
30	12	18	Unchoked	27.24	0.5040	0.078	-	1.0	0.08	1.158
31	13	15	Unchoked	66.06	0.1878	-	0.20	1.0	0.01	1.21
32	13	19	Unchoked	27.74	0.5040	0.078	-	1.0	0.08	1.158
33	11	13	Unchoked	66.06	0.1878	0.078	0.20	1.0	0.01	1.21
34	14	16	Unchoked	66.06	0.1878	-	0.20	1.0	0.01	1.21
35	14	20	Unchoked	24.11	0.5040	0.067	-	1.0	0.13	1.197
36	15	16	Unchoked	66.06	0.1878	-	0.20	1.0	0.01	1.21
37	15	24	Unchoked	24.11	0.5040	0.067	-	1.0	0.13	1.197
38	16	20	Unchoked	27.24	0.5040	0.078	-	1.0	0.08	1.158
39	17	18	Unchoked	21.17	0.5224	-	0.20	1.0	0.06	1.26
40	17	19	Unchoked	21.17	0.5224	-	0.20	1.0	0.06	1.26
41	17	22	Unchoked	35.28	0.1333	0.018	-	1.0	-	1.018
42	18	20	Unchoked	21.17	0.5224	-	0.2	1.0	0.06	1.26
43	18	22	Unchoked	35.28	0.1333	0.018	-	1.0	-	1.018
44	19	22	Unchoked	35.28	0.1333	0.018	-	1.0	-	1.018

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TABLE 6.2-16c (Cont.)

SUBCOMPARTMENT VENT PATH DESCRIPTION
FEEDWATER LINE BREAK
RPV - SHIELD WALL ANNULUS

Vent Path No.	From Vol. Node No.	To Vol. Node No.	Description of flow choked/unchoked	Area (ft^2)	ℓ/a (ft^{-1})	Head Loss, K Friction	Turning loss	Expansion	Contraction	Total
45	19	24	Unchoked	21.17	0.5224	-	0.2	1.0	0.06	1.26
46	20	22	Unchoked	70.56	0.0333	0.018	-	1.0	-	1.018
47	20	24	Unchoked	21.17	0.5224	-	0.2	1.0	0.06	1.26
48	22	25	Unchoked	4.14	0.2414	0.018	-	1.0	-	1.00
49	23	25	Unchoked	4.14	0.3145	-	-	1.0	0.27	1.27
50	24	22	Unchoked	35.28	0.1333	0.018	-	1.0	-	1.018

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TABLE 6.2-17a

RECIRCULATION INLET LINE BREAK
PROJECTED AREAS FOR FORCE CALCULATIONS
ON THE RPV

Force Level	Vol. Node No.	Coefficient (in^2) Fx	Fy	Moment arm (ft) *
1	1	22115.76	0.0	8.55
	2	8867.72	- 7079.42	8.55
	3	8867.72	7079.42	8.55
	4	4921.22	-10153.46	8.55
	5	4921.22	10153.46	8.55
	6	0.0	-11249.30	8.55
	7	0.0	11249.30	8.55
	8	- 4921.22	-10153.46	8.55
	9	- 4921.22	10153.46	8.55
	10	-39851.22	0.0	8.55
2	11	42303.87	0.0	29.50
	12	21151.92	-36636.21	29.50
	13	9081.93	26190.06	29.50
	14	-21151.92	-36636.21	29.50
	15	-21151.92	36636.21	29.50
	16	-42303.87	0.0	29.50
	23	12070.02	10446.15	29.50
3	17	15199.41	0.0	47.27
	18	7600.32	-13164.39	47.27
	19	7600.32	13164.39	47.27
	20	- 7600.32	-13164.39	47.27
	24	-15199.41	0.0	47.27
	25	- 7600.32	13164.39	47.27

*Reference elevation = 121.33 ft

TABLE 6.2-17b

RECIRCULATION SUCTION LINE BREAK
PROJECTED AREAS FOR FORCE CALCULATIONS
ON THE RPV

Force Level	Vol. Node No.	Coefficient (in^2) Fx	Fy	Moment arm (ft) *
1	1	22115.76	0.0	8.55
	2	8867.72	- 7079.42	8.55
	3	8867.72	7079.42	8.55
	4	4921.22	-10153.46	8.55
	5	4921.22	10153.46	8.55
	6	0.0	-11249.30	8.55
	7	0.0	11249.30	8.55
	8	- 4921.22	-10153.46	8.55
	9	- 4921.22	10153.46	8.55
	10	-39851.22	0.0	8.55
2	11	42303.87	0.0	29.50
	12	21151.92	-36636.21	29.50
	13	21151.92	36636.21	29.50
	14	-21151.92	-36636.21	29.50
	15	-21151.92	36636.21	29.50
	16	-42303.87	0.0	29.50
3	17	15199.41	0.0	47.27
	18	7600.32	-13164.39	47.27
	19	7600.32	13164.39	47.27
	20	- 7600.32	-13164.39	47.27
	24	-15199.41	0.0	47.27
	25	- 7600.32	13164.39	47.27

110.29

*Reference elevation = 121.33 ft

TABLE 6.2-17c

FEEDWATER LINE BREAK
PROJECTED AREAS FOR FORCE CALCULATIONS
ON THE RPV

Force Level	Vol. Node No.	Coefficient (in^2) Fx	Fy	Moment arm (ft) *
1	1	22115.76	0.0	8.55
	2	8867.72	- 7079.42	8.55
	3	8867.72	7079.42	8.55
	4	4921.22	-10153.46	8.55
	5	4921.22	10153.46	8.55
	6	0.0	-11249.30	8.55
	7	0.0	11249.30	8.55
	8	- 4921.22	-10153.46	8.55
	9	- 4921.22	10153.46	8.55
	10	-39851.22	0.0	8.55
2	11	42303.87	0.0	29.50
	12	21151.92	-36636.21	29.50
	13	21151.92	36636.21	29.50
	14	-21151.92	-36636.21	29.50
	15	-21151.92	36636.21	29.50
	16	-42303.87	0.0	29.50
3	17	15199.41	0.0	47.27
	18	7600.32	-13164.39	47.27
	19	7600.32	13164.39	47.27
	20	-22801.39	-13164.39	47.27
	24	- 7600.32	13164.39	47.27

110.29

*Reference elevation = 121.33 ft

TABLE 6.2-18a

110.29

RECIRCULATION INLET LINE BREAK PROJECTED AREAS FOR FORCE CALCULATIONS ON THE SHIELD WALL

Force Level	Vol. Node No.	Coefficient (in^2) Fx	Fy	Moment arm (ft) *
	1	27393.61	0.0	8.55
1	2	10983.97	- 8768.90	8.55
	3	10983.97	8768.90	8.55
	4	6095.65	-12576.55	8.55
	5	6095.65	12576.55	8.55
	6	0.0	-13933.91	8.55
	7	0.0	13933.91	8.55
	8	- 6095.65	-12576.55	8.55
	9	- 6095.65	12576.55	8.55
	10	-49361.57	0.0	8.55
	11	52399.54	0.0	29.50
2	12	26199.75	-45379.31	29.50
	13	11249.30	32440.23	29.50
	14	-26199.75	-45379.31	29.50
	15	-26199.75	45379.31	29.50
	16	-52399.54	0.0	29.50
	23	14950.49	12939.09	29.50
	17	18826.70	0.0	47.27
3	18	9414.11	-16306.03	47.27
	19	9414.11	16306.03	47.27
	20	- 9414.11	-16306.03	47.27
	24	-18826.70	0.0	47.27
	25	- 9414.11	16306.03	47.27

*Reference elevation = 121.33 ft

TABLE 6.2-18b

RECIRCULATION SUCTION LINE BREAK
PROJECTED AREAS FOR FORCE CALCULATIONS
ON THE SHIELD WALL

Force Level	Vol. Node No.	Coefficient (in^2) Fx	Fy	Moment arm (ft) *
	1	27393.61	0.0	8.55
1	2	10983.97	- 8768.90	8.55
	3	10983.97	8768.90	8.55
	4	6095.65	-12576.55	8.55
	5	6095.65	12576.55	8.55
	6	0.0	-13933.91	8.55
	7	0.0	13933.91	8.55
	8	- 6095.65	-12576.55	8.55
	9	- 6095.65	12576.55	8.55
	10	-49361.57	0.0	8.55
	11	52399.54	0.0	29.50
2	12	26199.75	-45379.31	29.50
	13	26199.75	45379.31	29.50
	14	-26199.75	-45379.31	29.50
	15	-26199.75	45379.31	29.50
	16	-52399.54	0.0	29.50
	17	18826.70	0.0	47.27
3	18	9414.11	-16306.03	47.27
	19	9414.11	16306.03	47.27
	20	- 9414.11	-16306.03	47.27
	24	-18826.70	0.0	47.27
	25	- 9414.11	16306.03	47.27

*Reference elevation = 121.33 ft

110.29

TABLE 6.2-18c

FEEDWATER LINE BREAK
PROJECTED AREAS FOR FORCE CALCULATIONS
ON THE SHIELD WALL

Force Level	Vol. Node No.	Coefficient (in²) Fx	Fy	Moment arm (ft) *
	1	27393.61	0.0	8.55
1	2	10983.97	- 8768.90	8.55
	3	10983.97	8768.90	8.55
	4	6095.65	-12576.55	8.55
	5	6095.65	12576.55	8.55
	6	0.0	-13933.91	8.55
	7	0.0	13933.91	8.55
	8	- 6095.65	-12576.55	8.55
	9	- 6095.65	12576.55	8.55
	10	-49361.57	0.0	8.55
	11	52399.54	0.0	29.50
2	12	26199.75	-45379.31	29.50
	13	26199.75	45379.31	29.50
	14	-26199.75	-45379.31	29.50
	15	-26199.75	45379.31	29.50
	16	-52399.54	0.0	29.50
	17	18826.70	0.0	47.27
3	18	9414.11	-16306.03	47.27
	19	9414.11	16306.03	47.27
	20	-28240.81	-16306.03	47.27
	24	- 9414.11	16306.03	47.27

*Reference elevation = 121.33 ft

Table 6.2-30

SUBCOMPARTMENT NODAL DESCRIPTION

Drywell Head 2) Main Steam Line Break

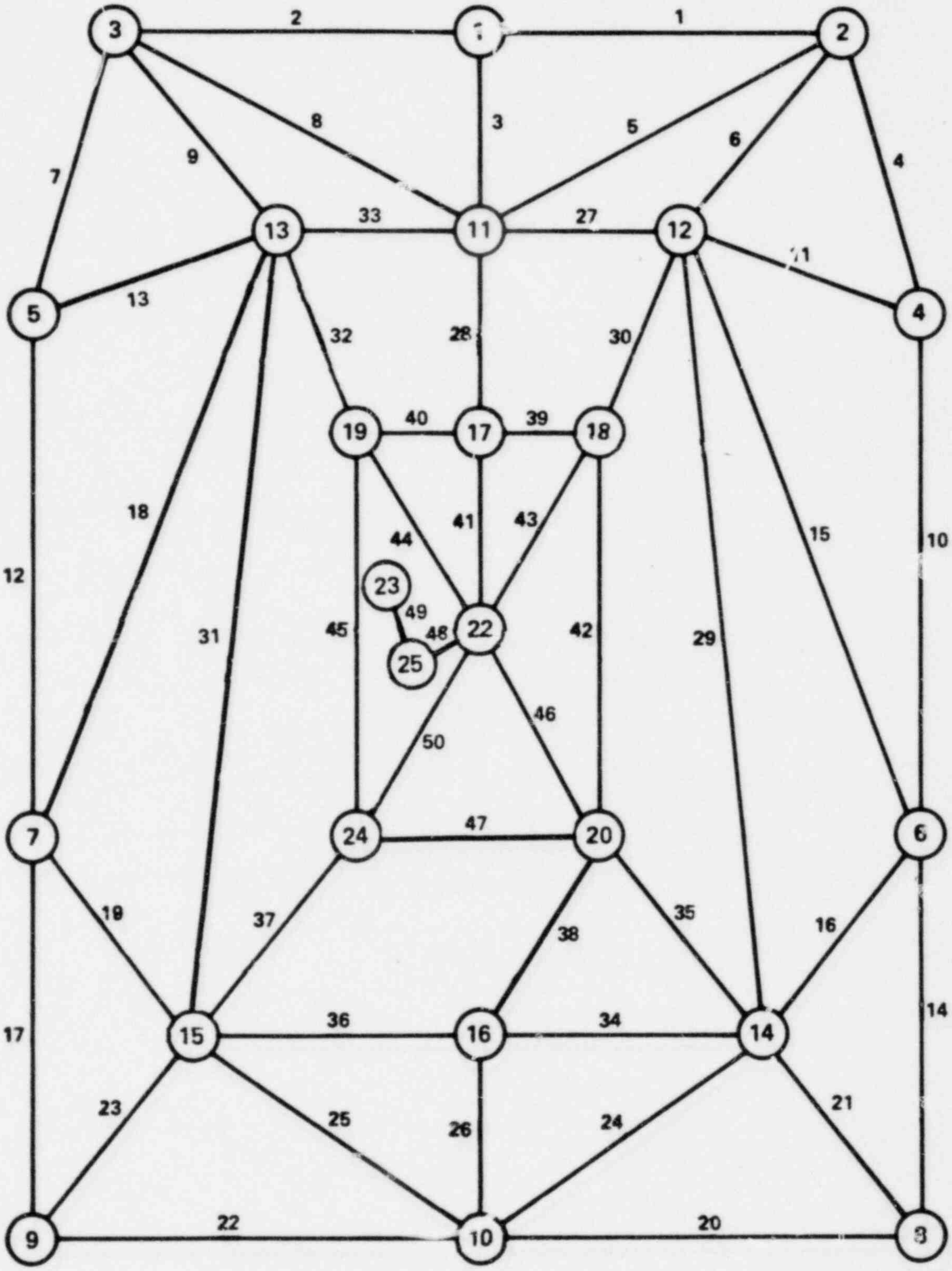
Volume #	Volume (ft³) *	Initial Conditions Temp F	Press Psia	Humid %	DBA Break Conditions % Break in Volume	Break Line	Break Area (ft²)	Break Type	Calc. Peak Psia	Design Peak Press Psid
1	382.41	135	14.7	50	50	MSLB	3.45	Double ended	See Figures 6.2-73 a, b and 6.2-74 a, b, c.	See Note 1,2 and 3
2	1030.24	↓	↓	↓	50					
3	2652.66									
4	61705.02									
5	10253									
6	41043.24									
7	102997.07									
8	28286.65									
9	7331.80									
10,11	1.4×10^6	80	14.7	60						

*See subsection 6.2.1.2.2 for subcompartment physical description

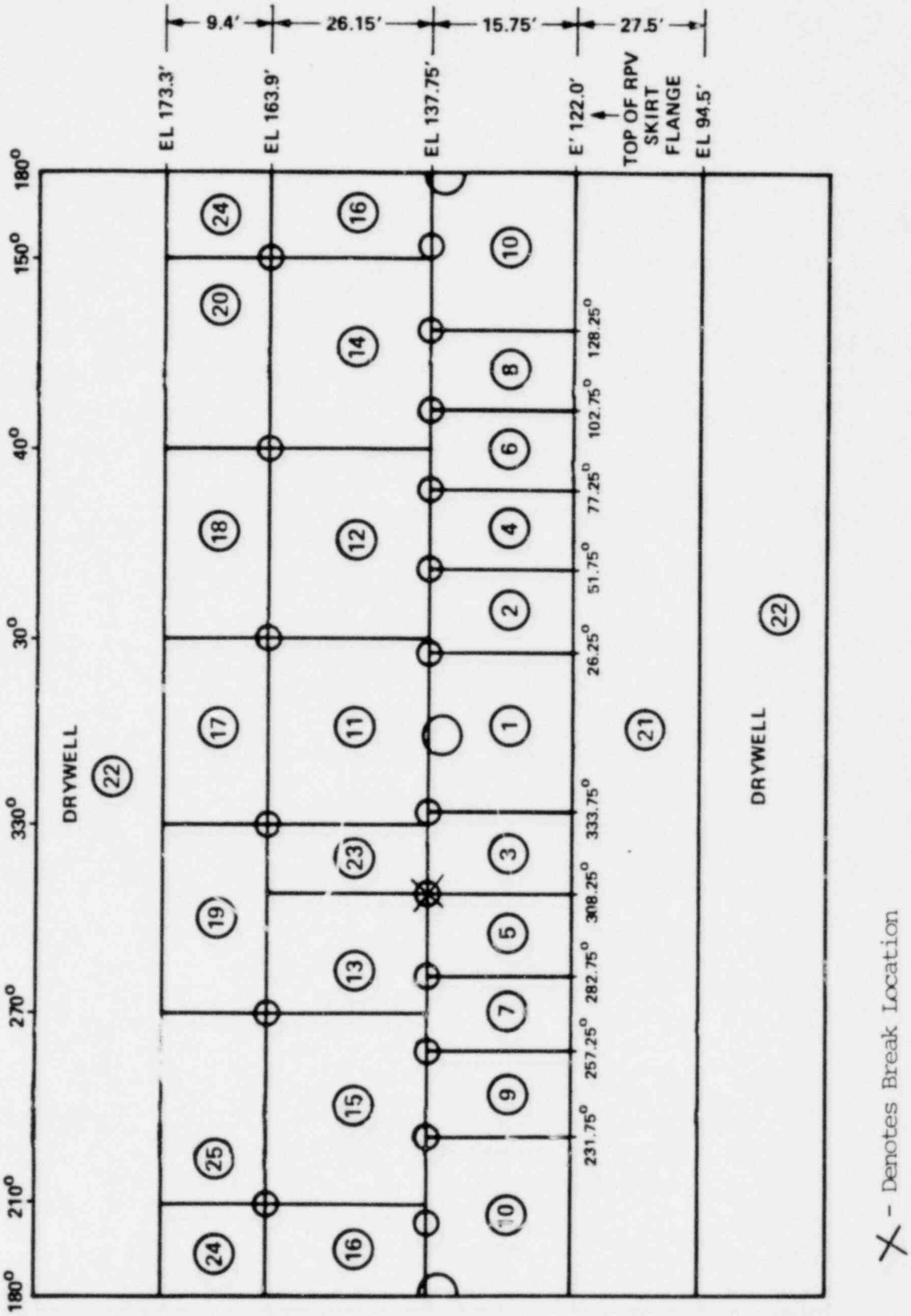
Note: 1) This table summarizes the pressure response, ie, the drywell bulk head cavity, due to a main steam line break directly below the bulkhead. The design parameters for the pressure suppression containment are shown in Tables 6.2-1, 6.2-2, and 6.2-13. The pressure responses and evaluation and evaluations in other subcompartments are tabulated in Subsection 6.2.1.2.3.

2) The nodalization scheme was chosen so as to accurately model the upper portion of the drywell and the Drywell Head region.

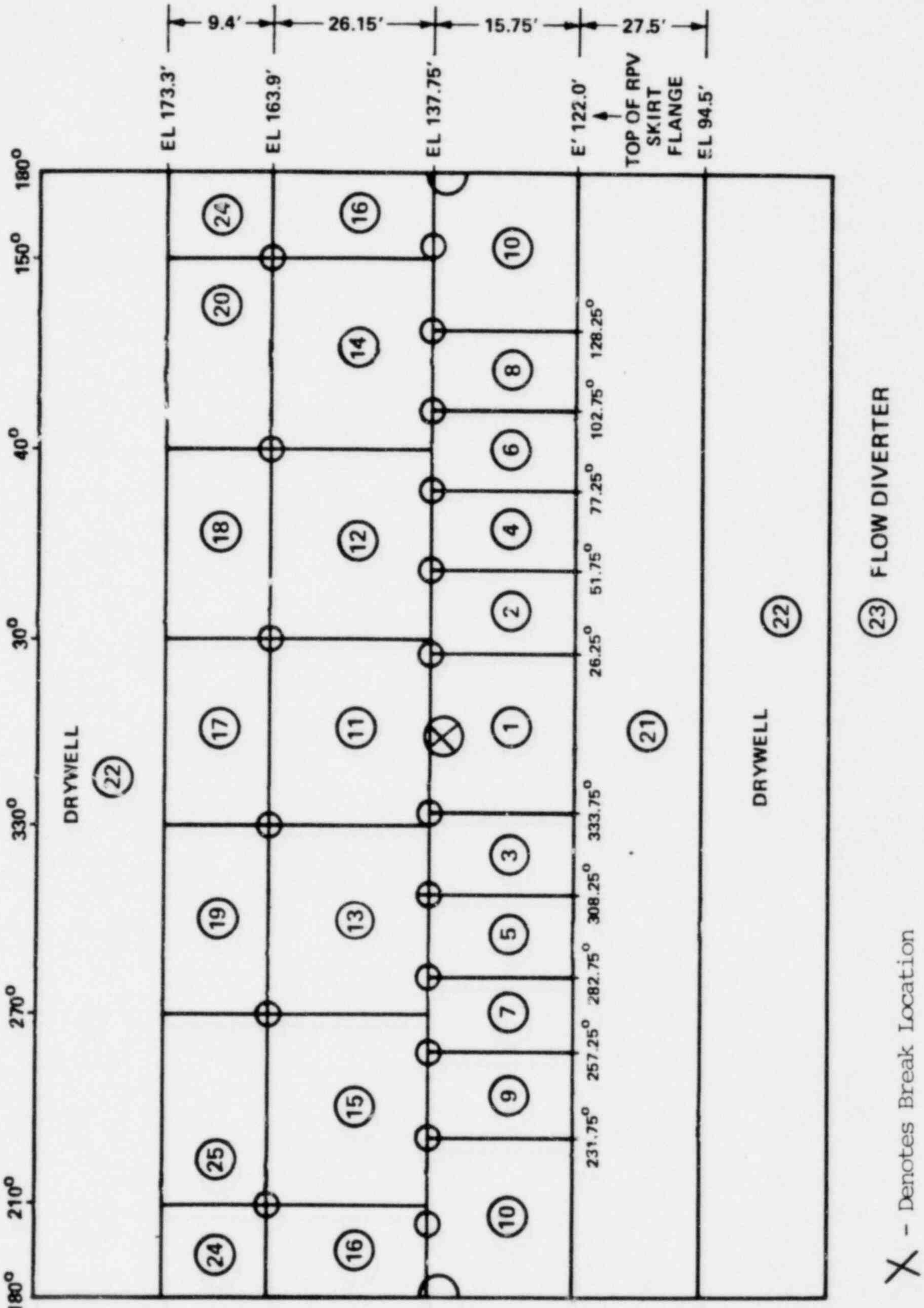
3) The bulkhead and the reactor cavity, (9-1.2.3), has a peak design load spike of 34.03 psid at).065 second and continuous at 12 psid.



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FEEDWATER LINE BREAK SCHEMATIC FLOW DIAGRAM FIGURE 6.2 – 25c



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	NODAL MODEL FOR RECIRCULATION INLET LINE BREAK FIGURE 6.2 – 26a



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	NODAL MODEL FOR RECIRCULATION SUCTION LINE BREAK FIGURE 6.2 – 26b

MISSISSIPPI POWER & LIGHT COMPANY
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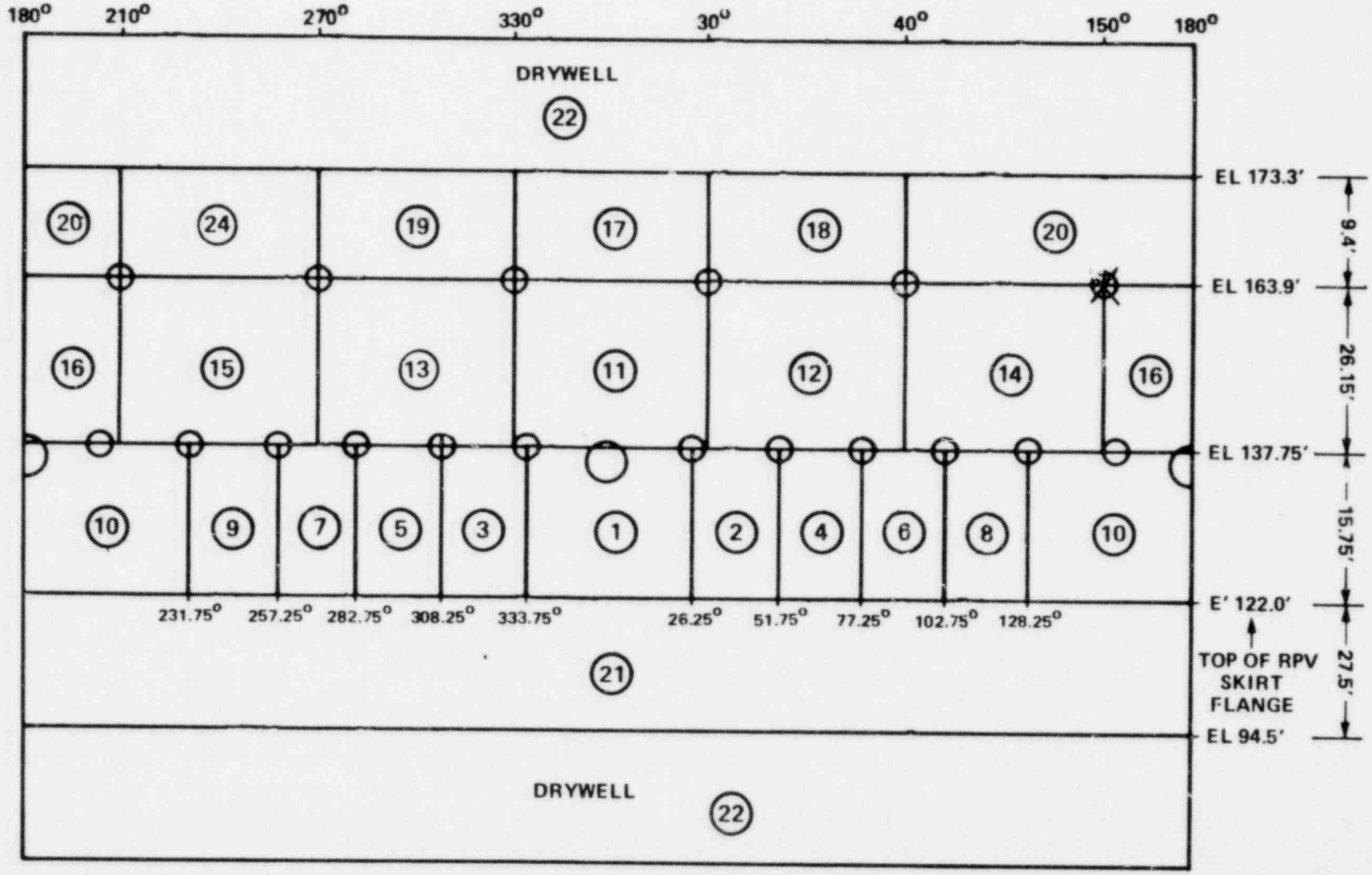
UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

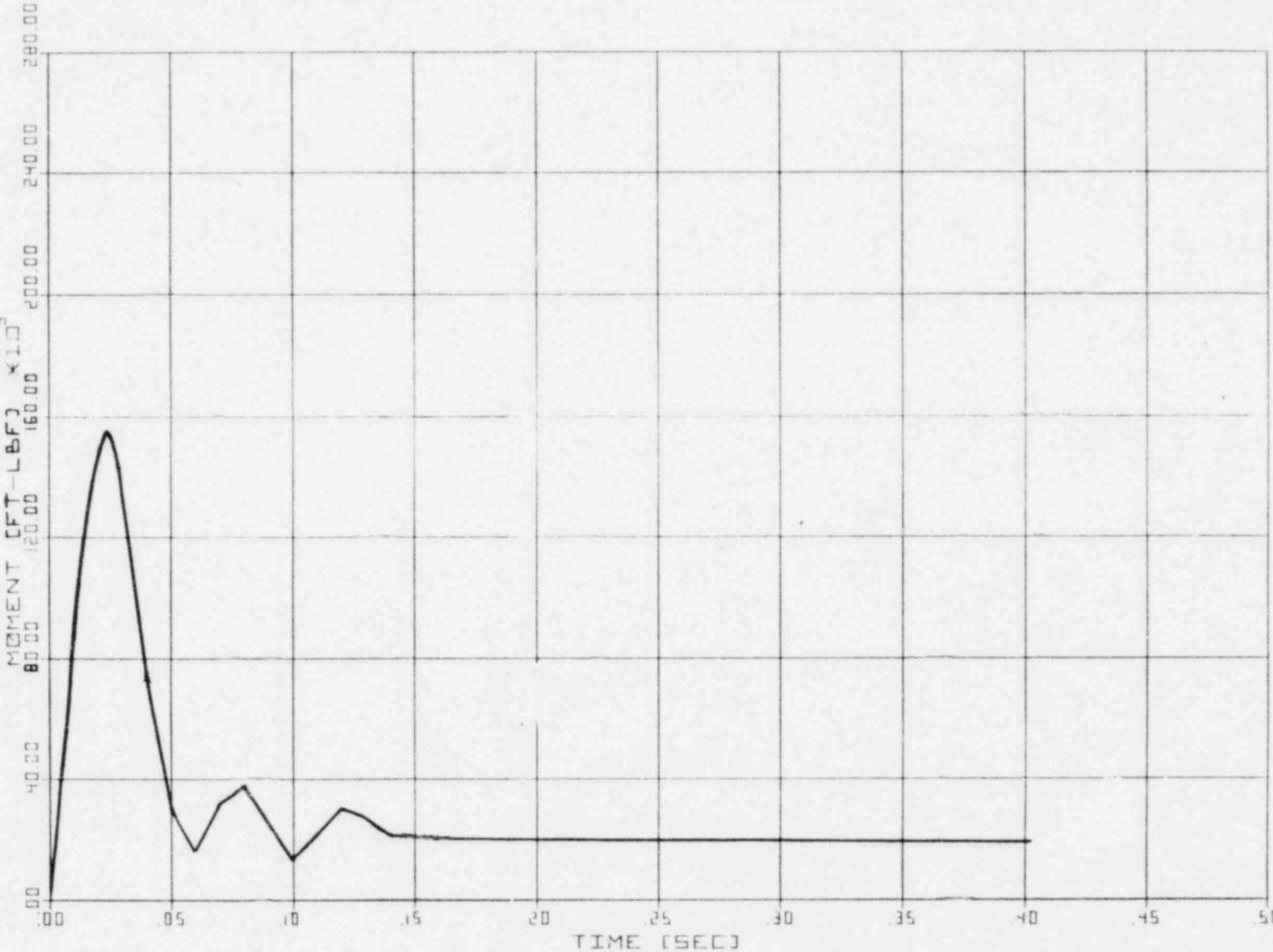


23 25 FLOW DIVERTER

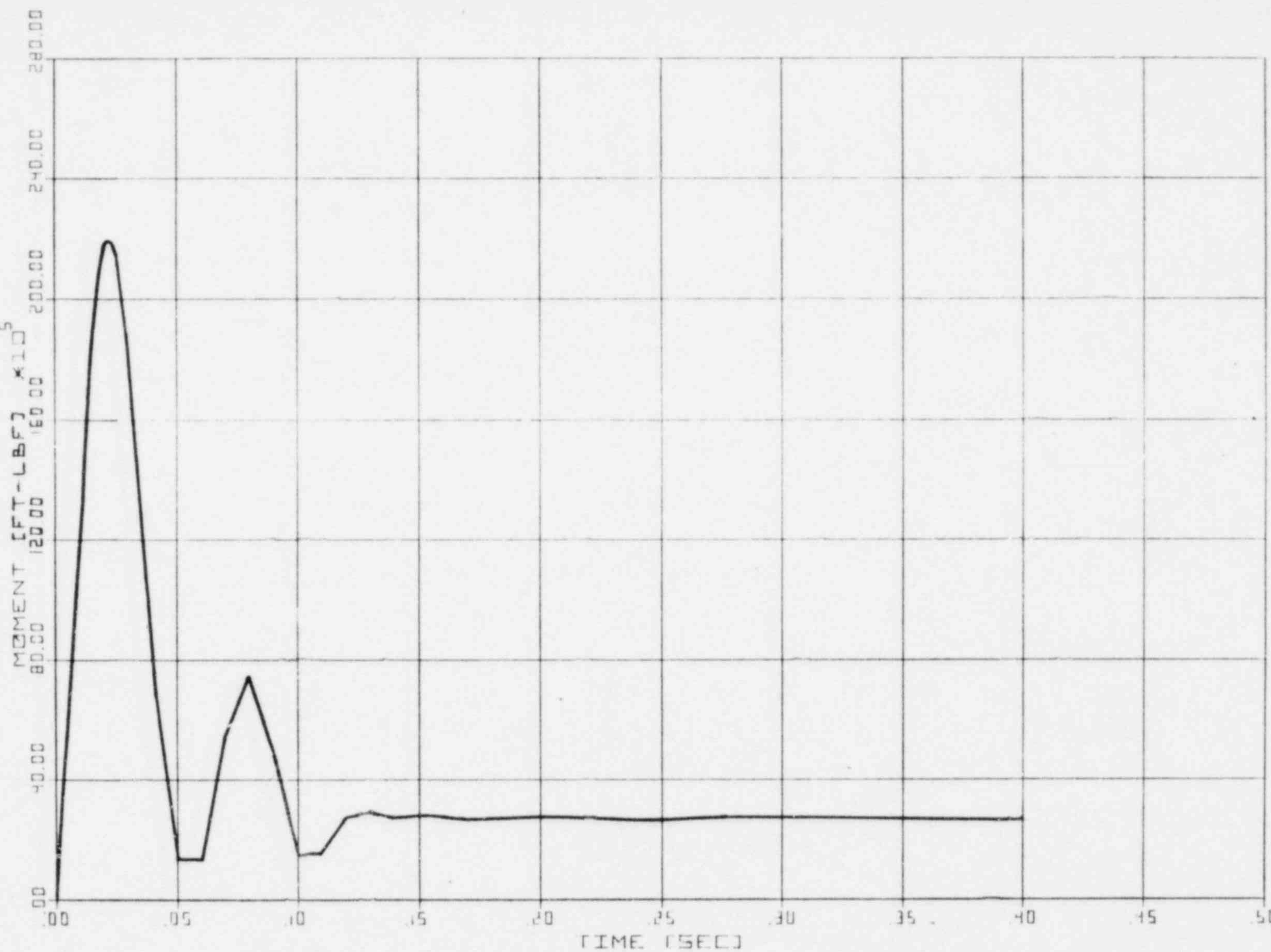
X - Denotes Break Location

NODAL MODEL FOR
FEEDWATER LINE BREAK

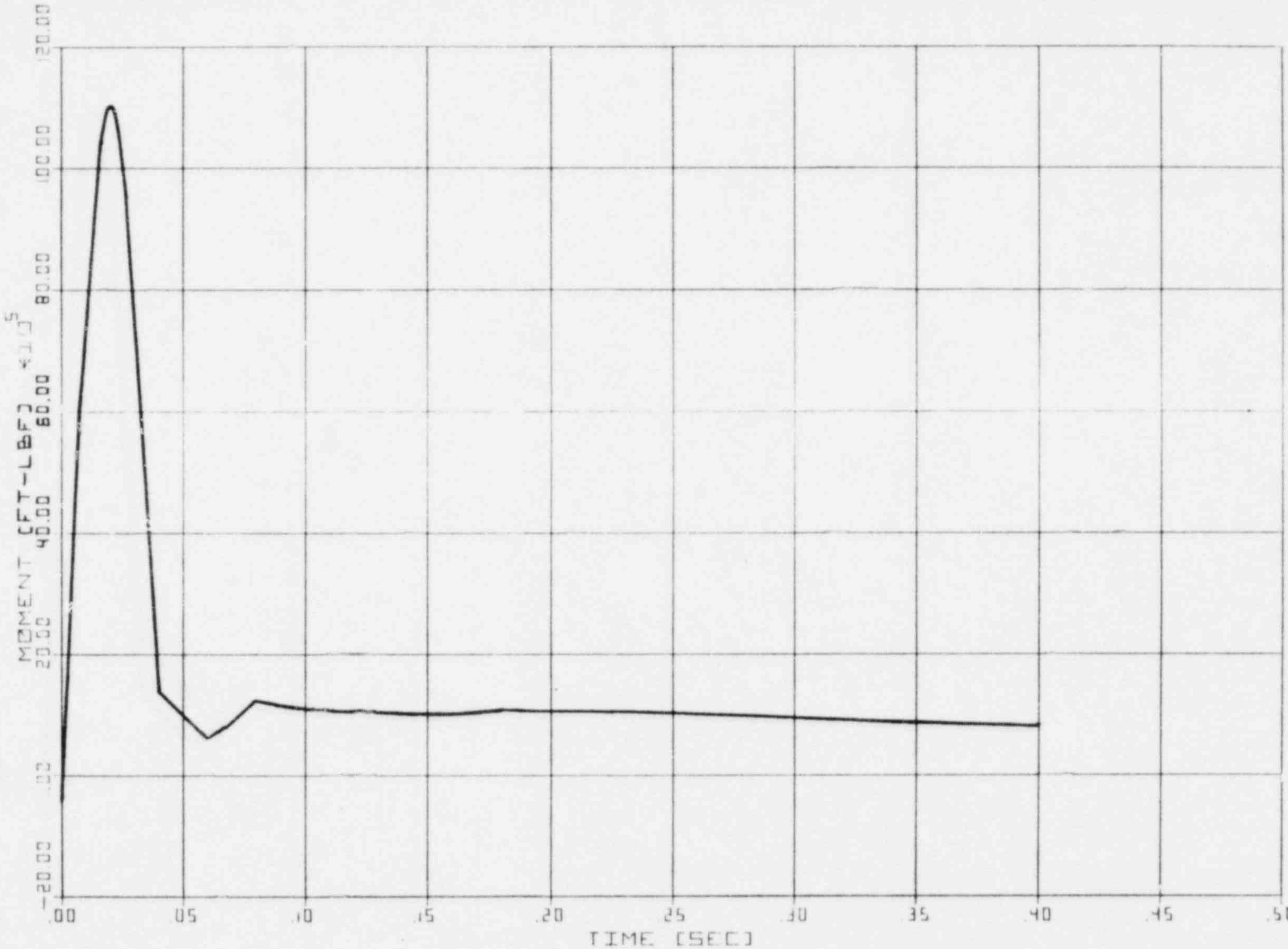
FIGURE 6.2 – 26c



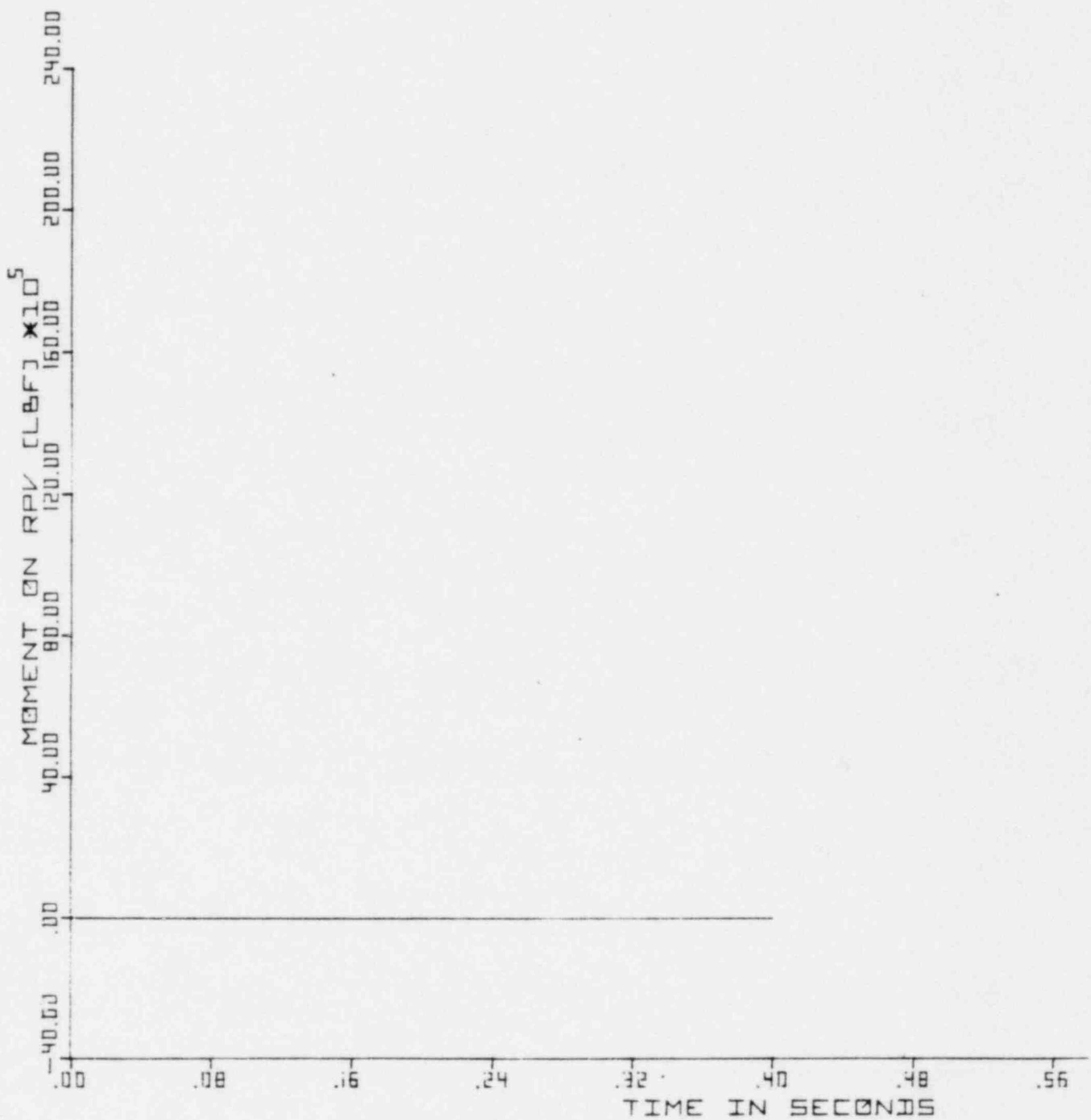
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC RETURN LINE BREAK MOMENT X ON THE RPV FIGURE 6.2 – 30aa



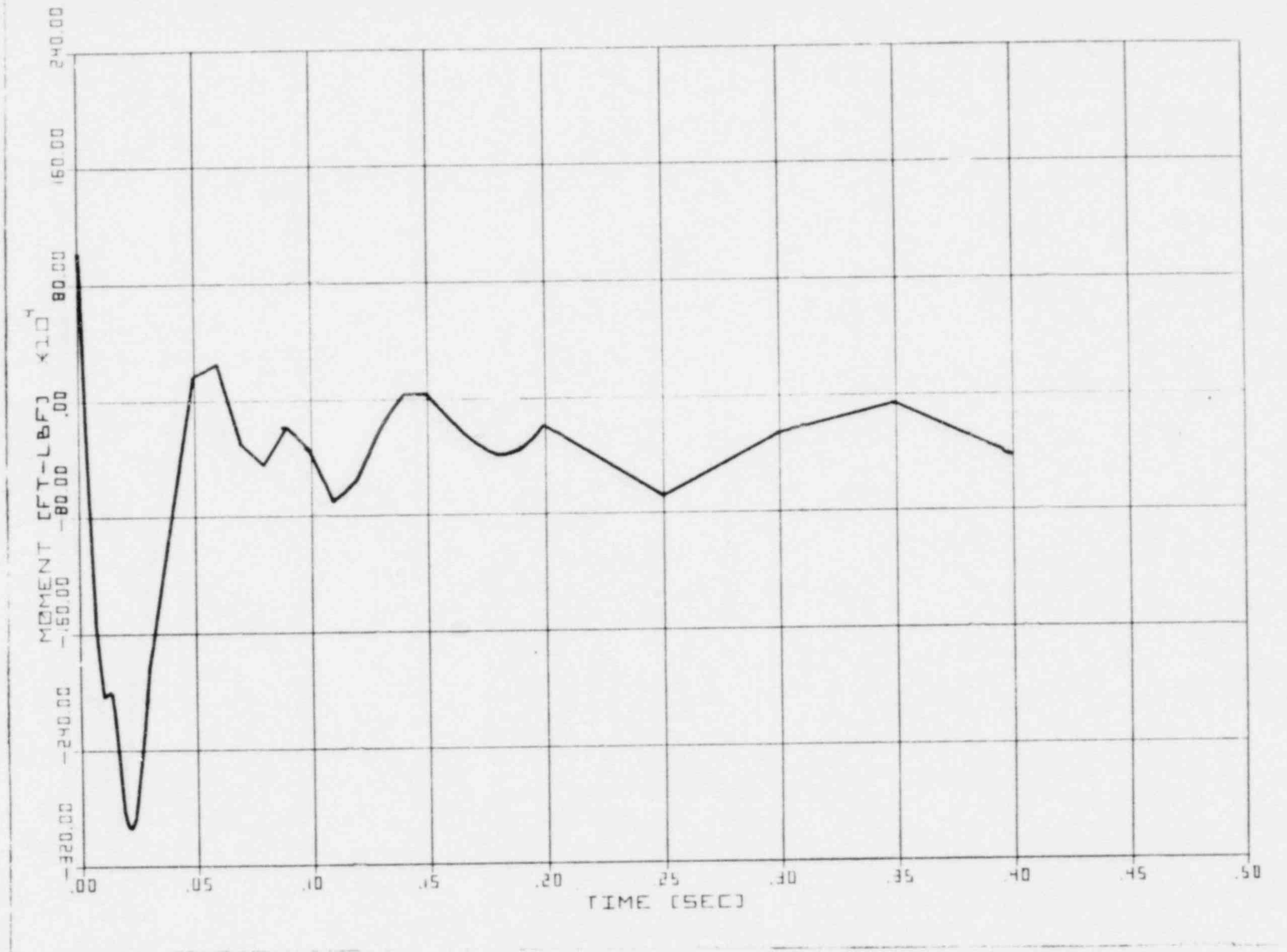
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC RETURN LINE BREAK MOMENT Y ON THE RPV FIGURE 6.2 – 30ab



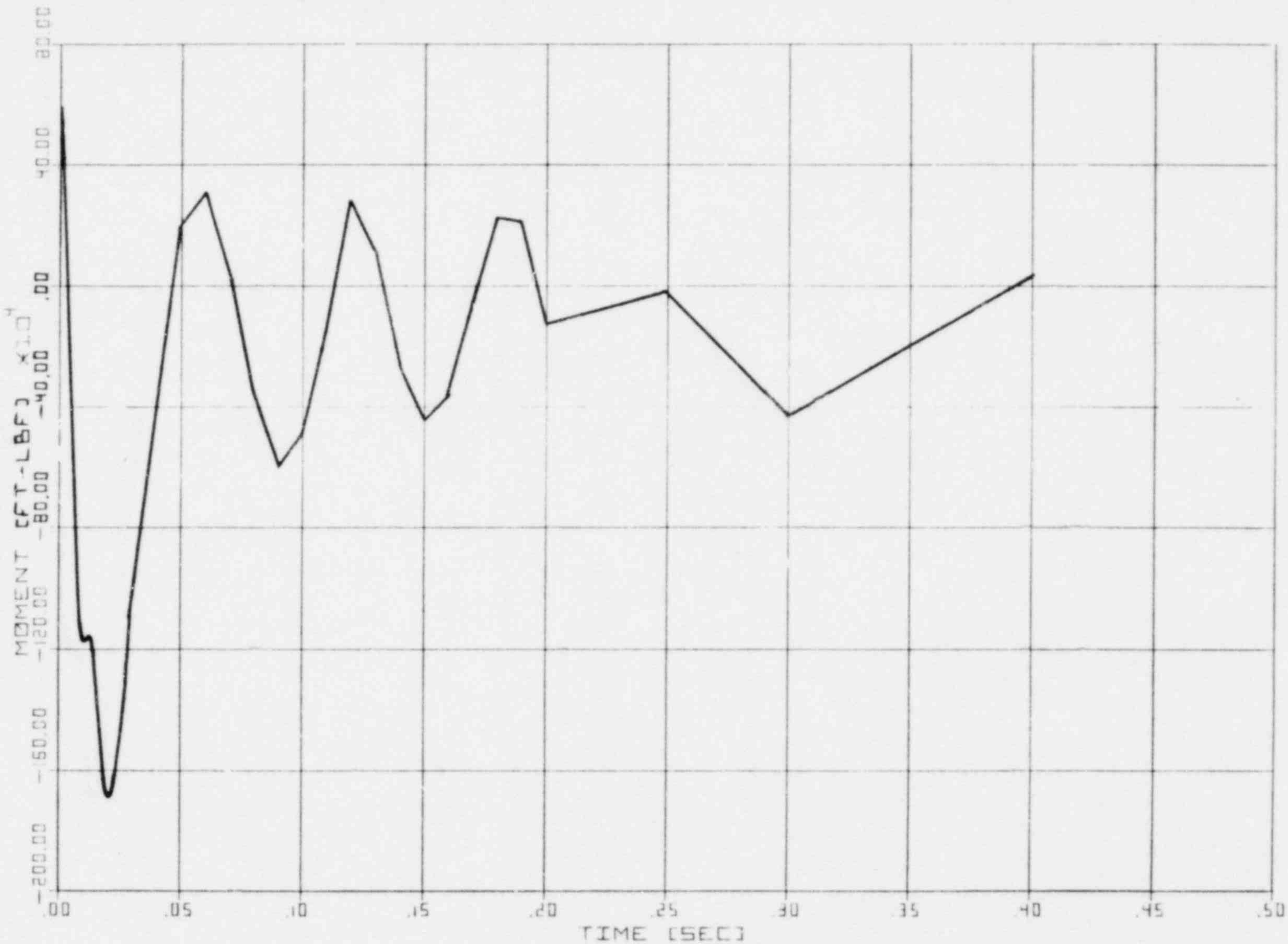
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC SUCTION LINE BREAK MOMENT X ON THE RPV FIGURE 6.2 – 30ba



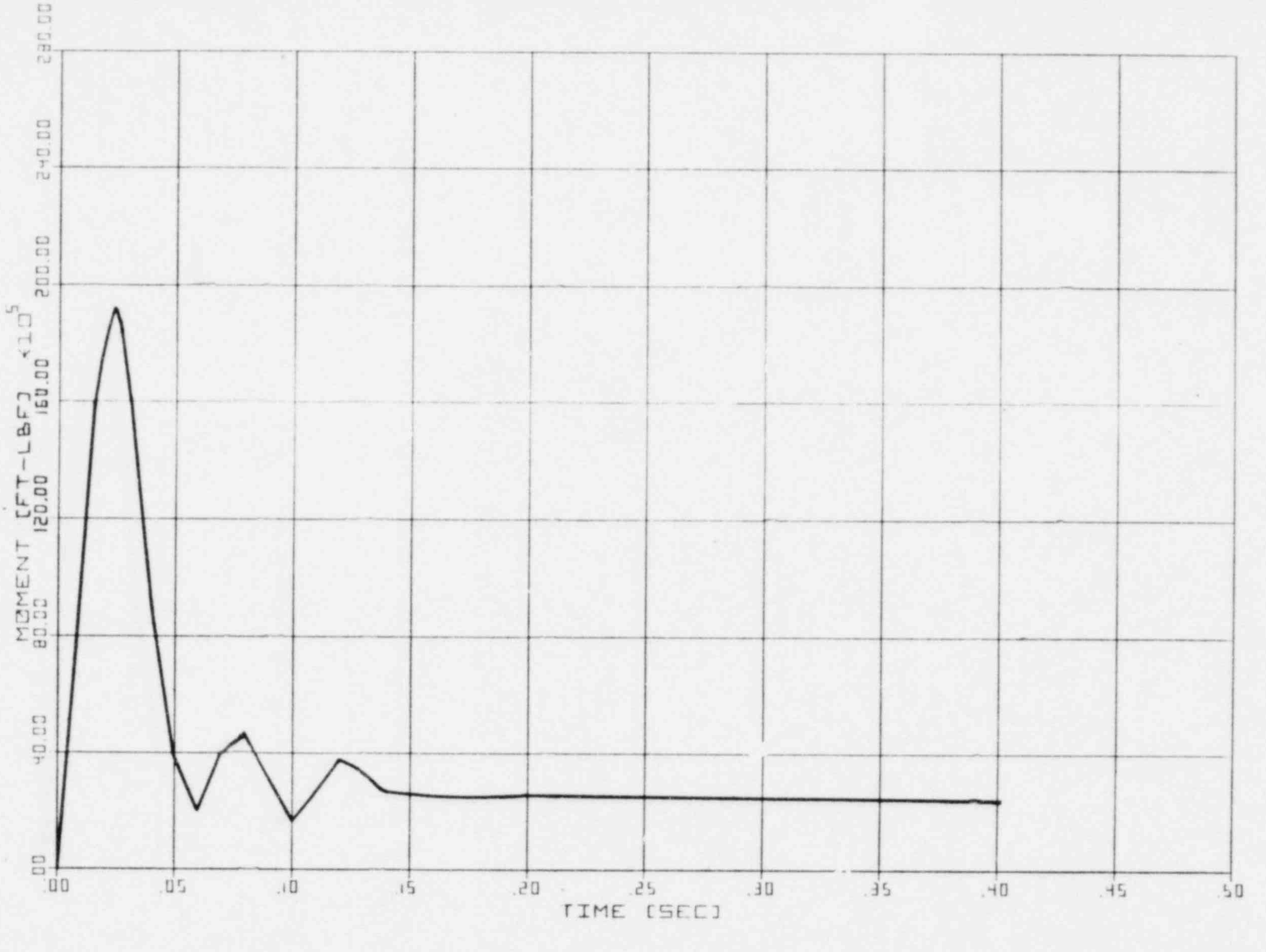
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC SUCTION LINE BREAK MOMENT Y ON THE RPV FIGURE 6.2 – 30bb



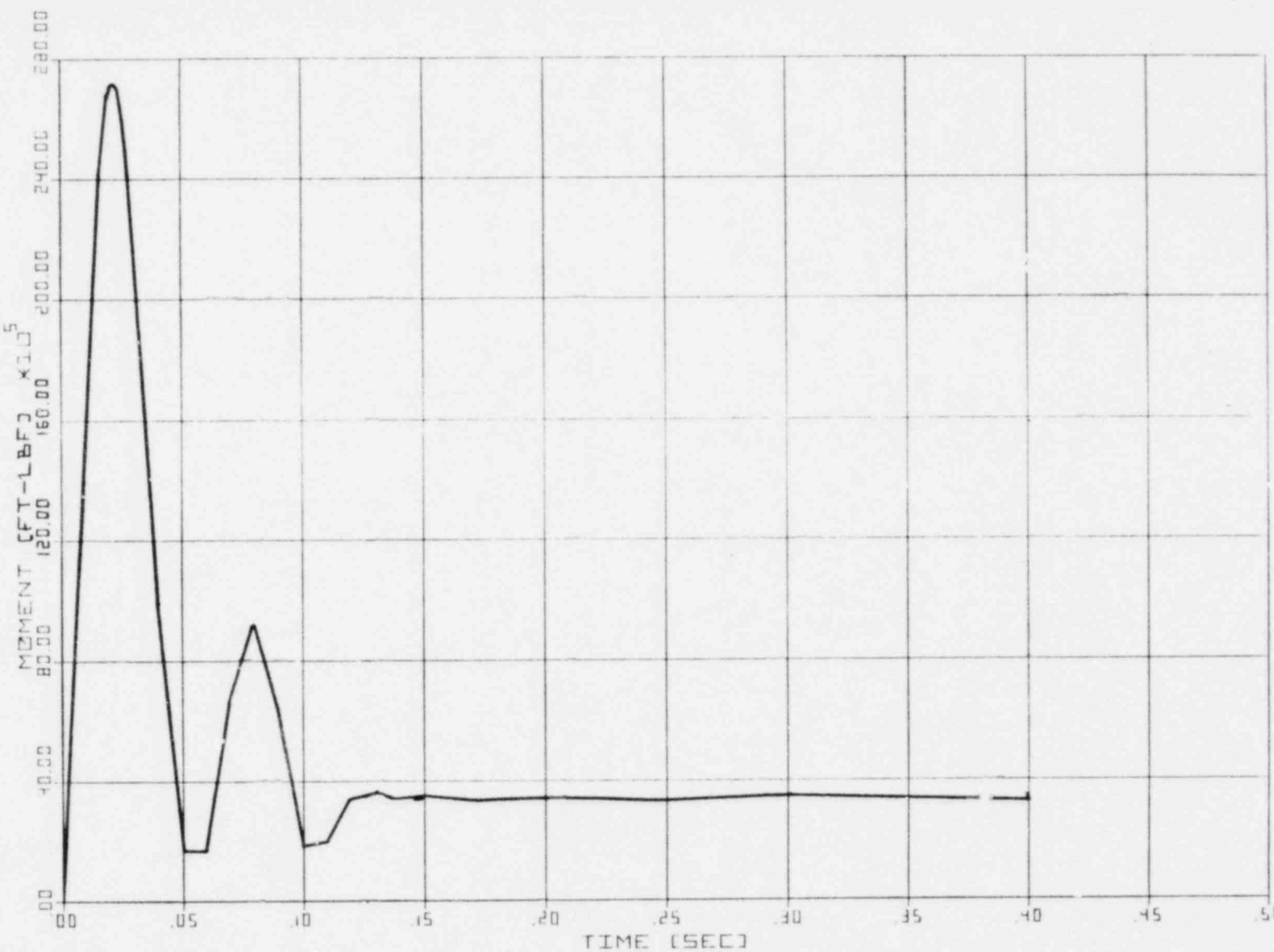
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FEEDWATER LINE BREAK MOMENT X ON THE RPV FIGURE 6.2 – 30ca



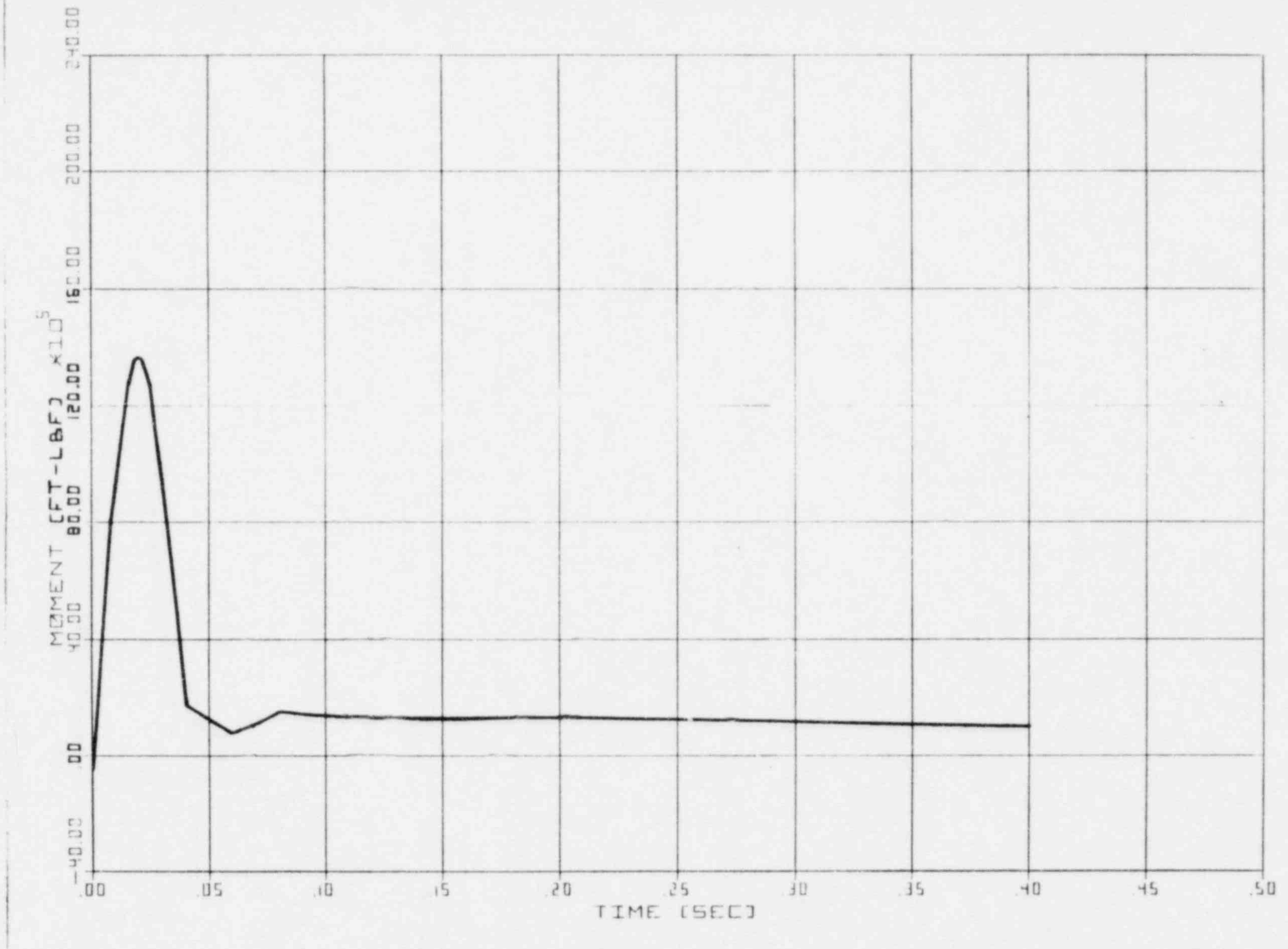
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FEEDWATER LINE BREAK MOMENT Y ON THE RPV FIGURE 6.2 – 30cb



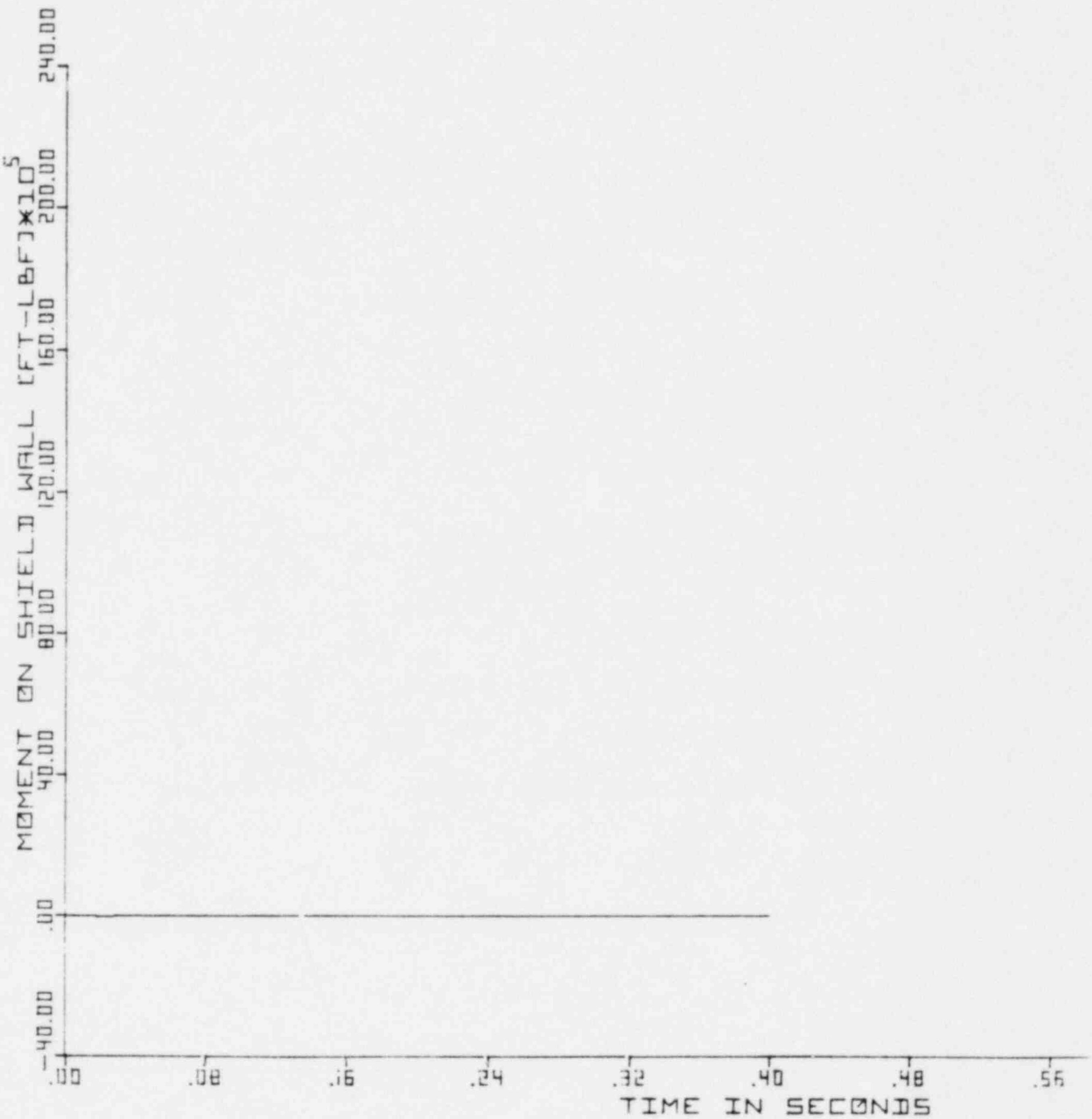
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC RETURN LINE BREAK MOMENT X ON SHIELD WALL FIGURE 6.2 – 31aa



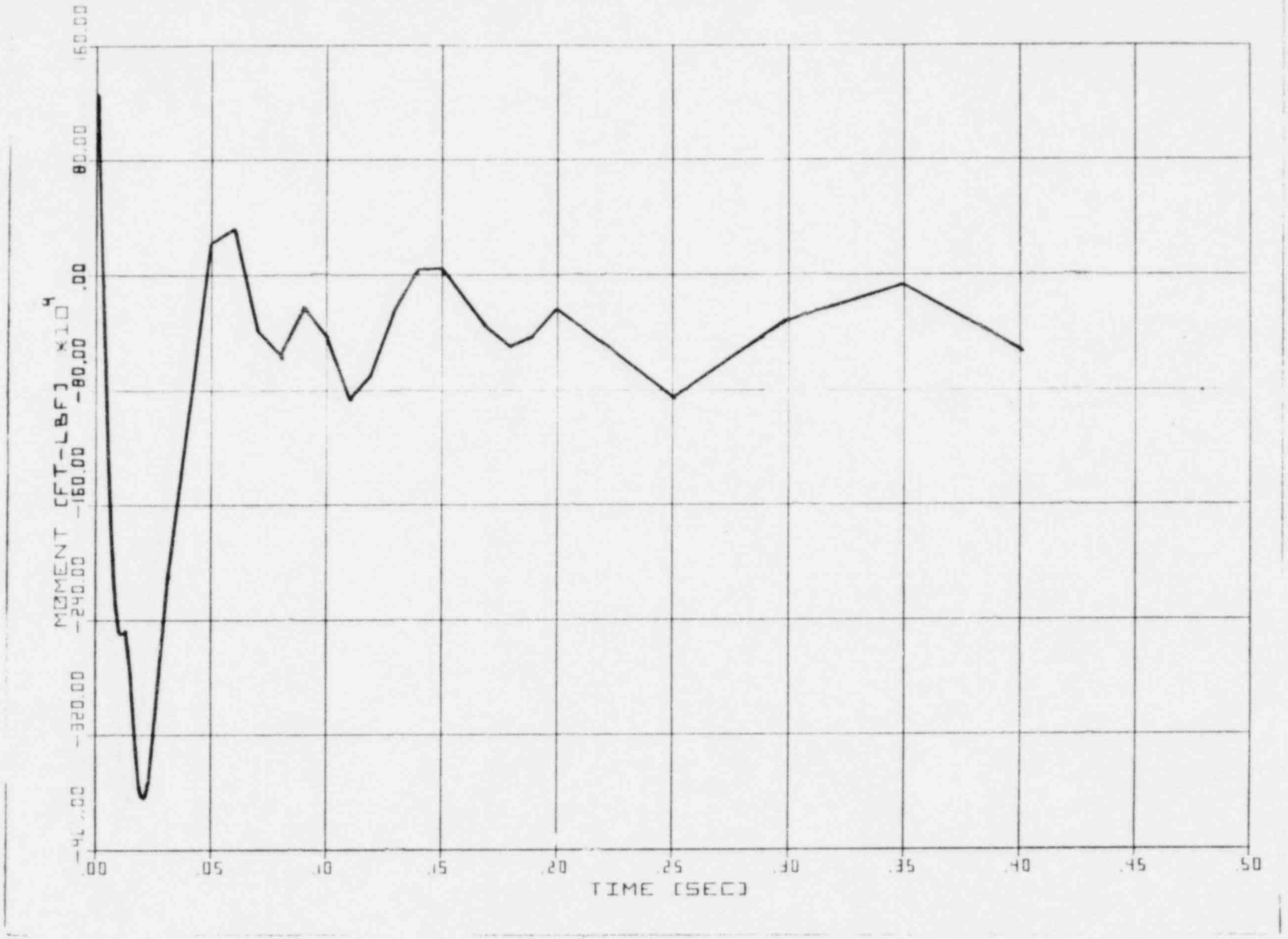
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC RETURN LINE BREAK MOMENT Y ON SHIELD WALL FIGURE 6.2 – 31ab



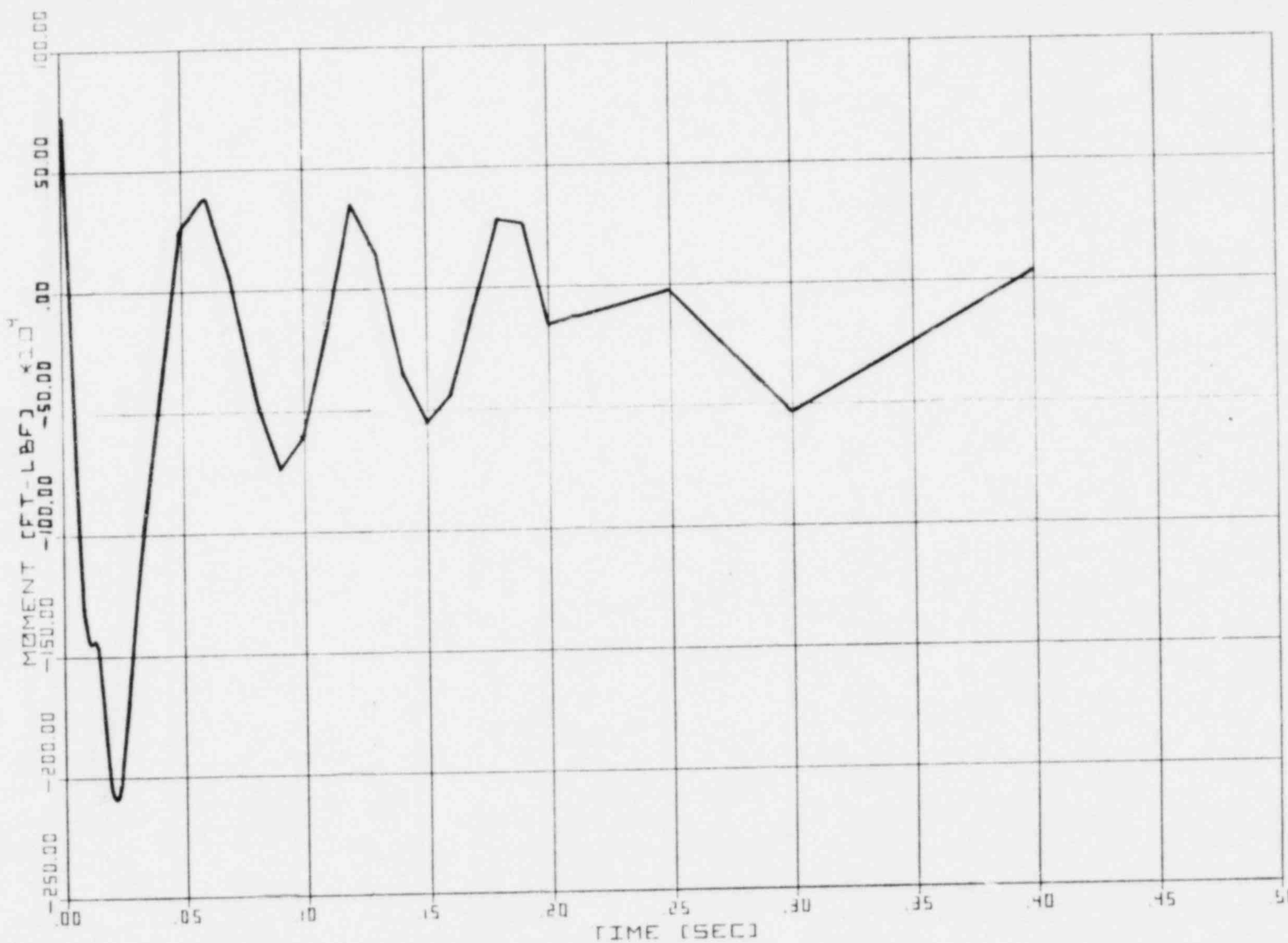
MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC SUCTION LINE BREAK MOMENT X ON SHIELD WALL FIGURE 6.2 – 31ba



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	RECIRC SUCTION LINE BREAK MOMENT Y ON SHIELD WALL FIGURE 6.2 – 31bb



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FEEDWATER LINE BREAK MOMENT X ON SHIELD WALL FIGURE 6.2 – 31ca



MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FEEDWATER LINE BREAK MOMENT Y ON SHIELD WALL FIGURE 6.2 – 31cb

Figure 6.2-27cw has been deleted.