Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Technology Division
Box 355
Pittsburgh Pennsylvania 15230

January 7, 1983

CAW-83-1

Ref: Duke Power Company Letter, Tucker to Denton, January 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

REACTOR CAVITY ASYMMETRIC LOADS

Dear Mr. Denton:

The proprietary material for which withholding is being requested by Duke Power Company is proprietary to Westinghouse and withholding is requested pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. Withholding from public disclosure is requested with respect to the subject information which is further identified in the affidavit accompanying this application.

Accordingly, withholding the subject information from public disclosure us requested in accordance with the previously submitted affidavit, AW-76-11, a copy of which is attached.

Accordingly, this letter authorizes the use of the proprietary information and affidavit AW-76-11 by Duke Power Company for Catawba Units 1 and 2.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference CAW-83-1 and be addressed to the undersigned.

Very truly yours,

Robert A. Wiesemann

Robert A. Wiesemann, Manager
Regulatory & Legislative Affairs

/bek
Enclosure

cc: E. C. Shomaker, Esq.
Office of the Executive Legal Director, NRC

AW-76-11

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Robert A. Wiesemann, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Robert A. Wiesemann, Manager
Licensing Programs

Sworn to and subscribed
before me this 14th day
of May 1976.

Notary Public

(1) I am Manager, Licensing Programs, in the Pressurized Water Reactor Systems Division, of Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing or rule-making proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Water Reactor Divisions.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse Nuclear Energy Systems in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(g) It is not the property of Westinghouse, but must be treated as proprietary by Westinghouse according to agreements with the owner.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition in those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.790, it is to be received in confidence by the Commission.

(iv) The information is not available in public sources to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is bracketed in WCAP-7593, Rev. 2 and WCAP-8708 transmitted by Westinghouse letter NS-CE-1075, Eicheldinger to Vassallo, dated May 13, 976. The letter and attachment are being submitted in partial response to the April 1976 NRC questions arising out of the review of the Westinghouse reports WCAP-7593, Rev. 2, "Description of Blowdown-2 Computer Program" and WCAP-8708, MULTIFLEX, A Fortran-IV Computer Program for Analyzing Thermal-Hydraulic Structure System Dynamics."

This information enables Westinghouse to:

(a) Justify the design basis for hydraulic forcing functions following postulated loss of coolant accidents.

(b) Assist its customers to obtain licenses.

(c) Justify the model and conservative assumptions used in hydraulic forcing functions during the subcooled de-compression.

(d) Verify applicability of design model.

Further, this information has substantial commercial value as follows:

(a) Westinghouse sells the use of the information to its customers for purposes of meeting NRC requirements for licensing documentation.

(b) Westinghouse uses the information to perform and justify analyses which are sold to customers.

Public disclosure of this information is likely to cause substantial harm to the competitive position of Westinghouse because it would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of this information is the result of many years of Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for analyses verification and code development.

Further the deponent sayeth not.

REACTOR CAVITY ASYMMETRIC LOADS

Response to CSB Draft SER Item on Page 30 relative to Reactor Cavity Analysis

"Specifically, the applicant should show conformance with the provisions of Section 3.2.2.4 of NUREG-0609, Asymmetric Blowdown Loads on PWR Primary Systems," dated January, 1981.

Section 3.2.2.4 of NUREG-0609, Force-moment Calculations, requires the following to be applied to the translation of calculated pressure gradients into forces and moments.

1. The subcompartment nodal model used for the calculation of forces and moments should be the same model as that found acceptable for the calculation of pressure gradients.

Response: Both models are the same.

2. Projected areas onto a curved surface shall be based on projected planar areas. Then multiplication of the projected area by the calculated nodal pressure gives the force acting normal to the surface through the area centroid.

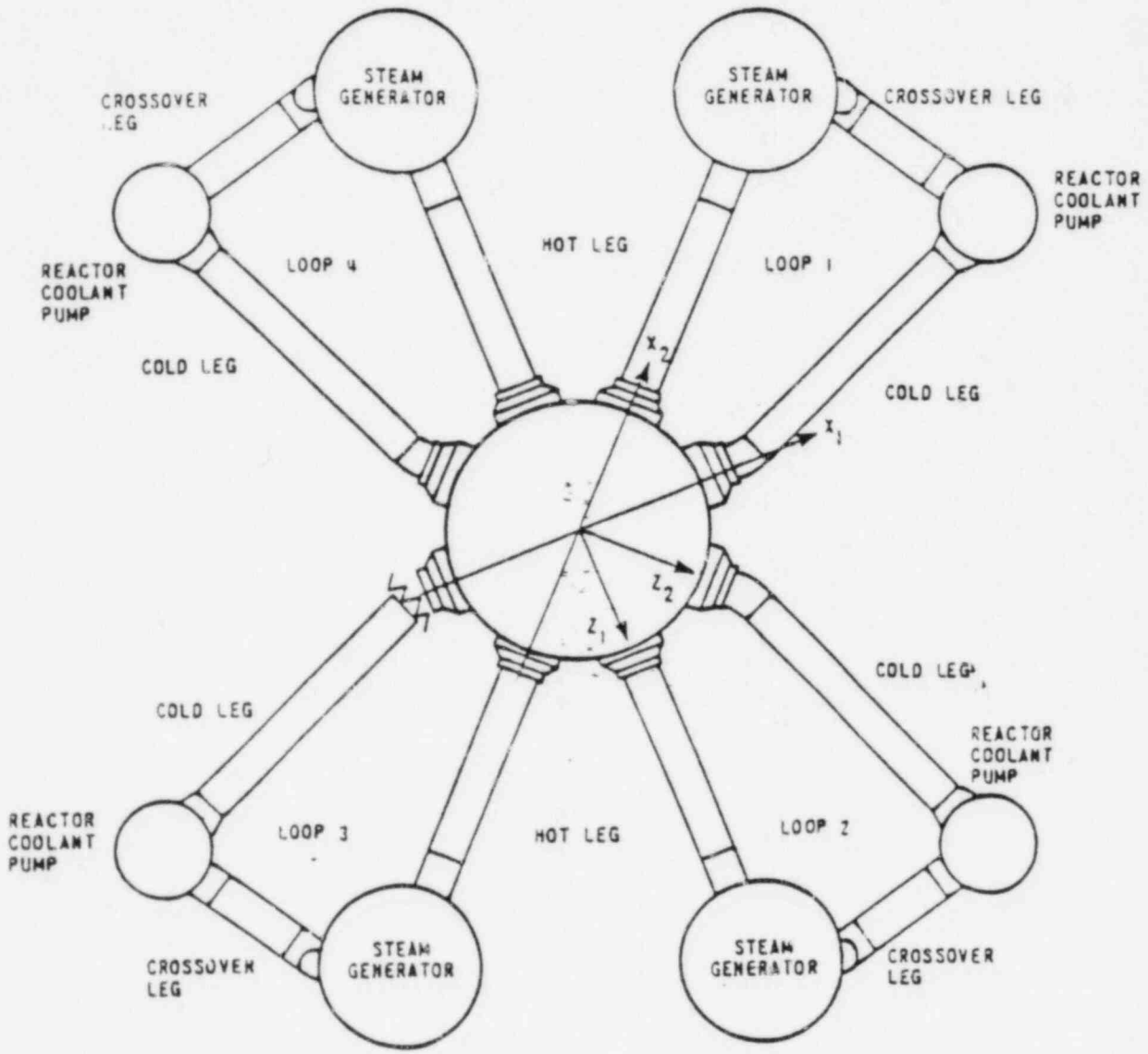
Response: This assumption was factored into the analysis.

3. Force calculations for components such as the reactor pressure vessel shall include loads resulting from differential pressure acting across the vessel piping and nozzles.

Response: Differential pressures acting across the vessel piping and nozzles were considered in the analysis.

The following documents the pressurization nodal and force development for Catawba and shows that the methodology is consistent with previously reviewed cases for dynamic analysis of the reactor pressure vessel for postulated LOCA. For Catawba Units 1 and 2, the primary shield wall stiffness was supplied by Duke Power Company. All other analysis input was obtained from Westinghouse Nuclear Energy Systems (WNES) organizations. Model formulation and analyses were performed by the Systems Structural Analysis group of WNES.

The final results of the WNES analysis are the displacements of the reactor pressure vessel and internals and the loads on the reactor vessel supports.



X_1, Z_1 - COORDINATE SYSTEM FOR BREAK POSTULATED TO OCCUR IN COLD LEG

X_2, Z_2 - COORDINATE SYSTEM FOR BREAK POSTULATED TO OCCUR IN HOT LEG

Coordinate Systems for Postulated Pipe Ruptures

REACTOR COOLANT LOOP MECHANICAL LOADS

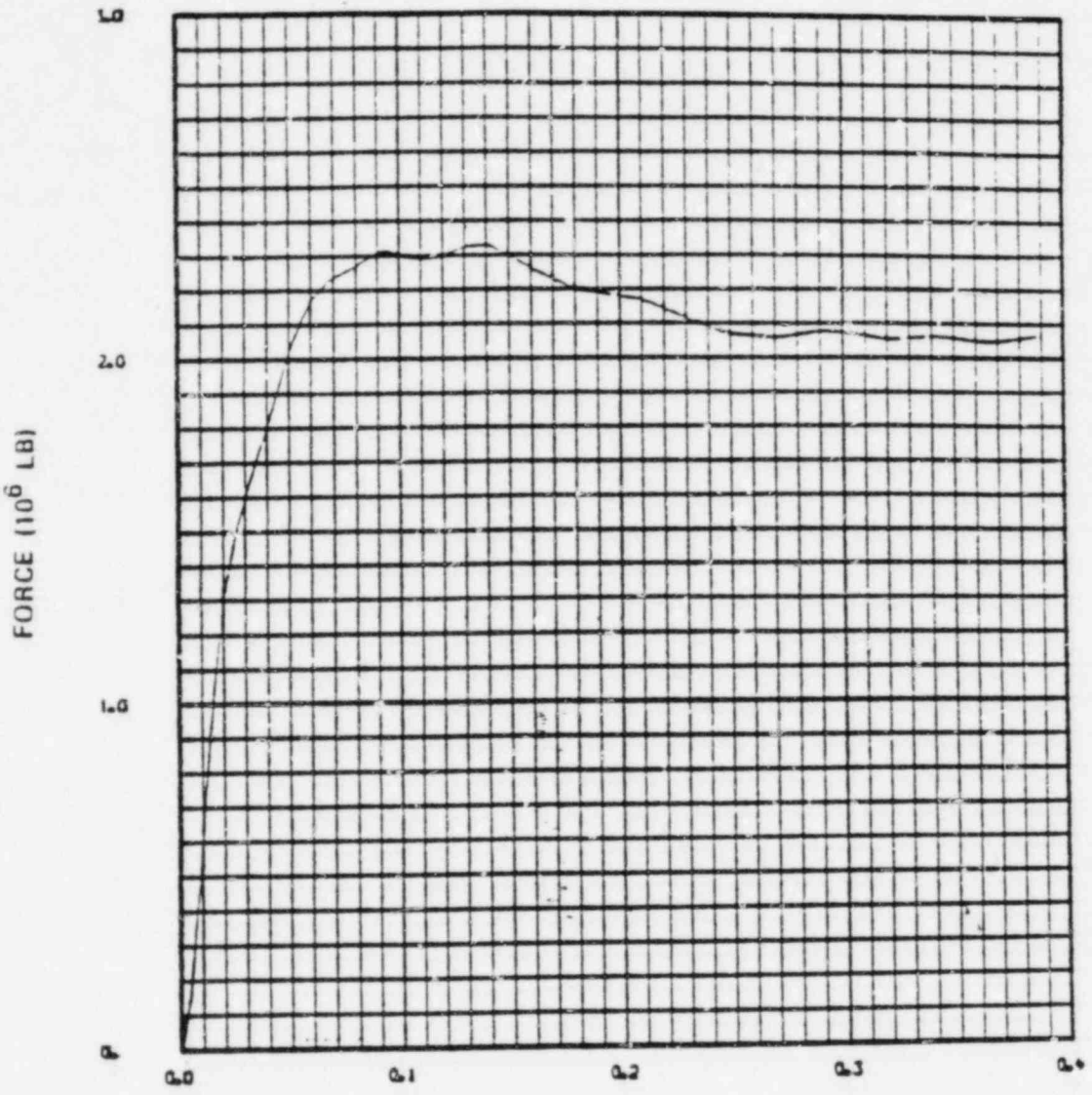
Load Component	Load at Indicated Break Location		
	RPV Inlet Nozzle	RPV Outlet Nozzle	RCP Outlet Nozzle
Axial load (Fx) (kips) Vertical load (Fy) (kips) Moment (Mz) (in.-kips)	[ ]a,c	[ ]a,c	[ ]a,c

REACTOR CAVITY PRESSURIZATION LOADS

Reactor cavity forces arise from the steam and water which are released into the reactor cavity through the annulus around the broken pipe. These forces occur only for postulated breaks at the RPV nozzle safe end locations. The reactor cavity is pressurized asymmetrically, with high pressure on the side adjacent to the break. The horizontal differences in pressure across the reactor cavity result in horizontal forces on the reactor vessel. Vertical forces on the reactor vessel arise from similar variations in pressure on the upper and lower head and the tapered parts of the reactor vessel.

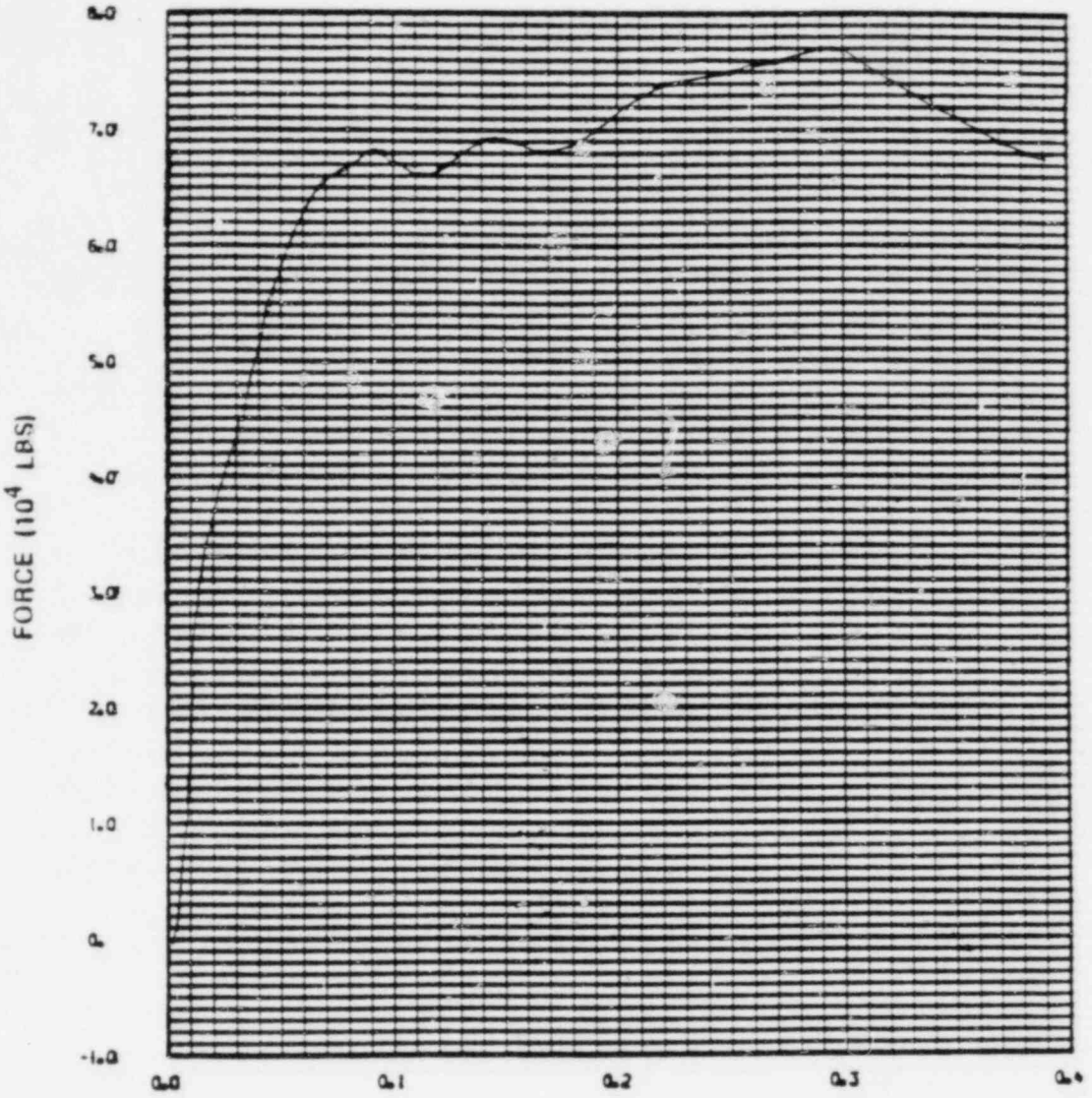
Reactor cavity loads were calculated for an 85-square-inch guillotine break opening at the cold leg nozzle safe end. This break has been verified to be larger than the maximum possible open area, because of the placement of pipe restraints in the primary shield wall.

The reactor cavity loads applied to the DARI-WOSTAS model are shown in figures 1, 2 and 3. Vertical, horizontal and moment loads applied at the intersection of the vessel vertical and broken cold leg nozzle centerlines. The peak horizontal side force is approximately 2300 kips.



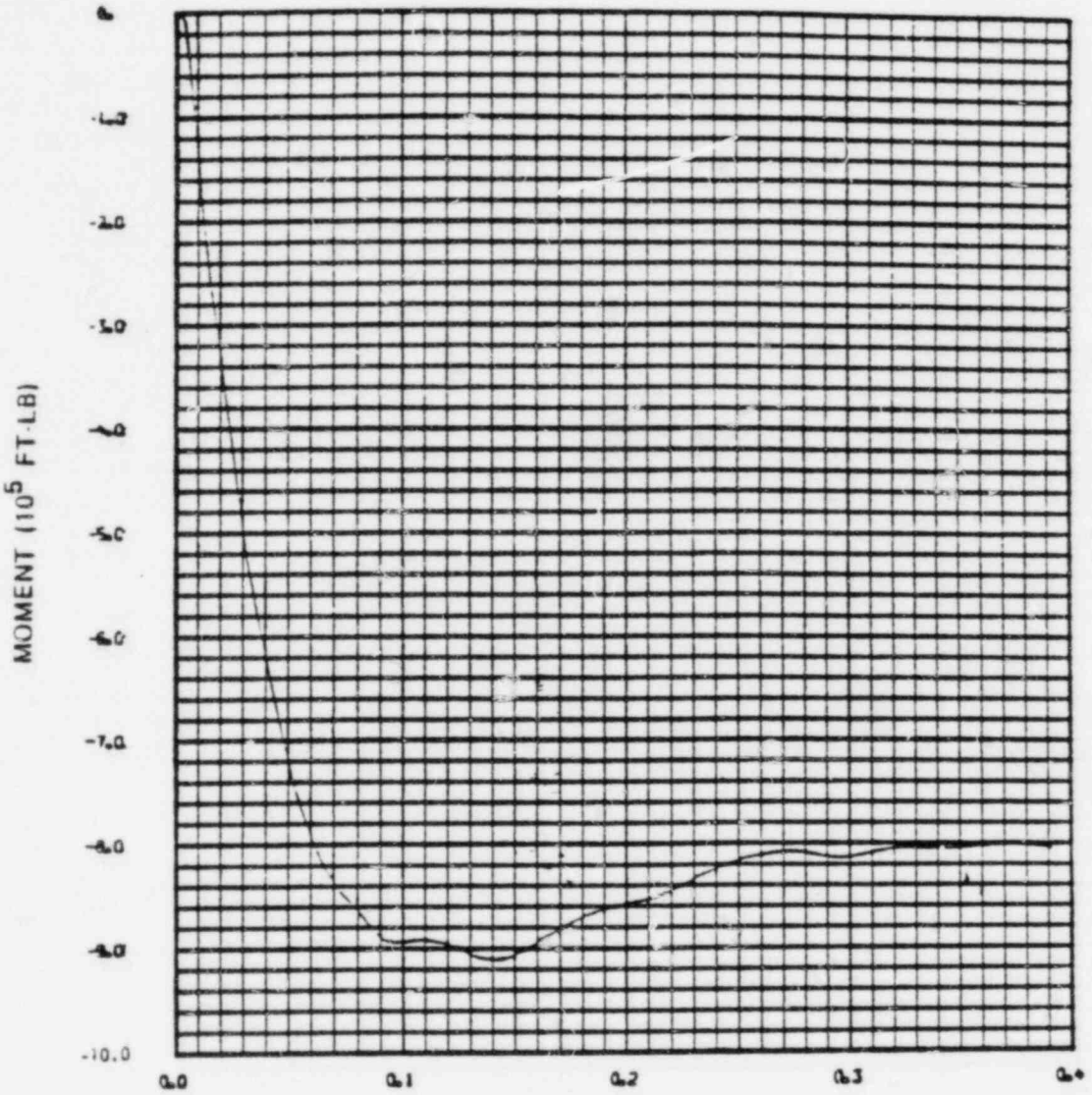
CAVITY PRESSURE TOTAL HORIZONTAL LOAD

FIGURE 1



CAVITY PRESSURE VERTICAL LOAD

FIGURE 2



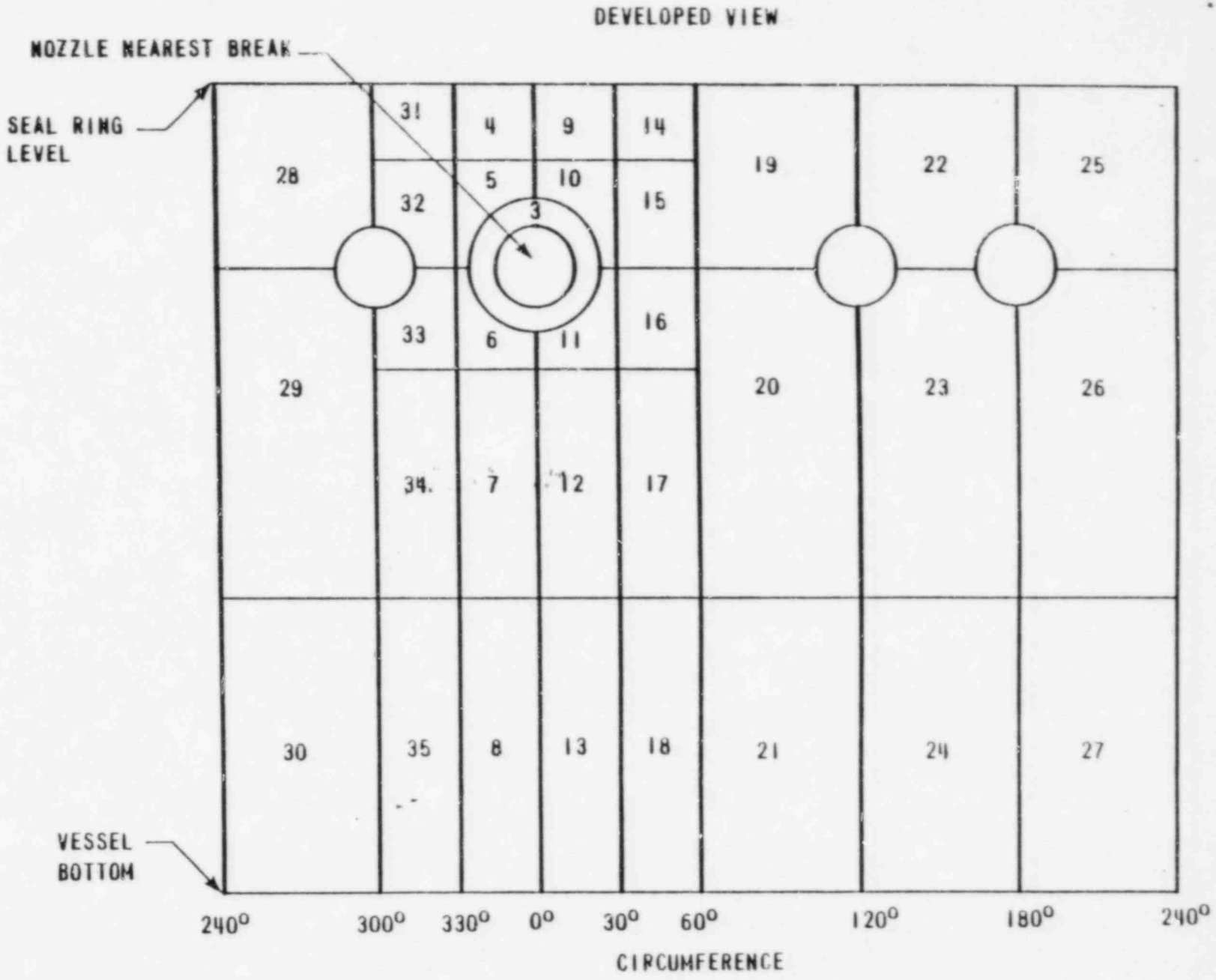
CAVITY PRESSURE MOMENT LOAD

FIGURE 3

The TMD computer code was used to calculate the pressure transients in the reactor cavity region. This program utilized the unaugmented homogeneous critical flow and the compressible subsonic flow correlations.

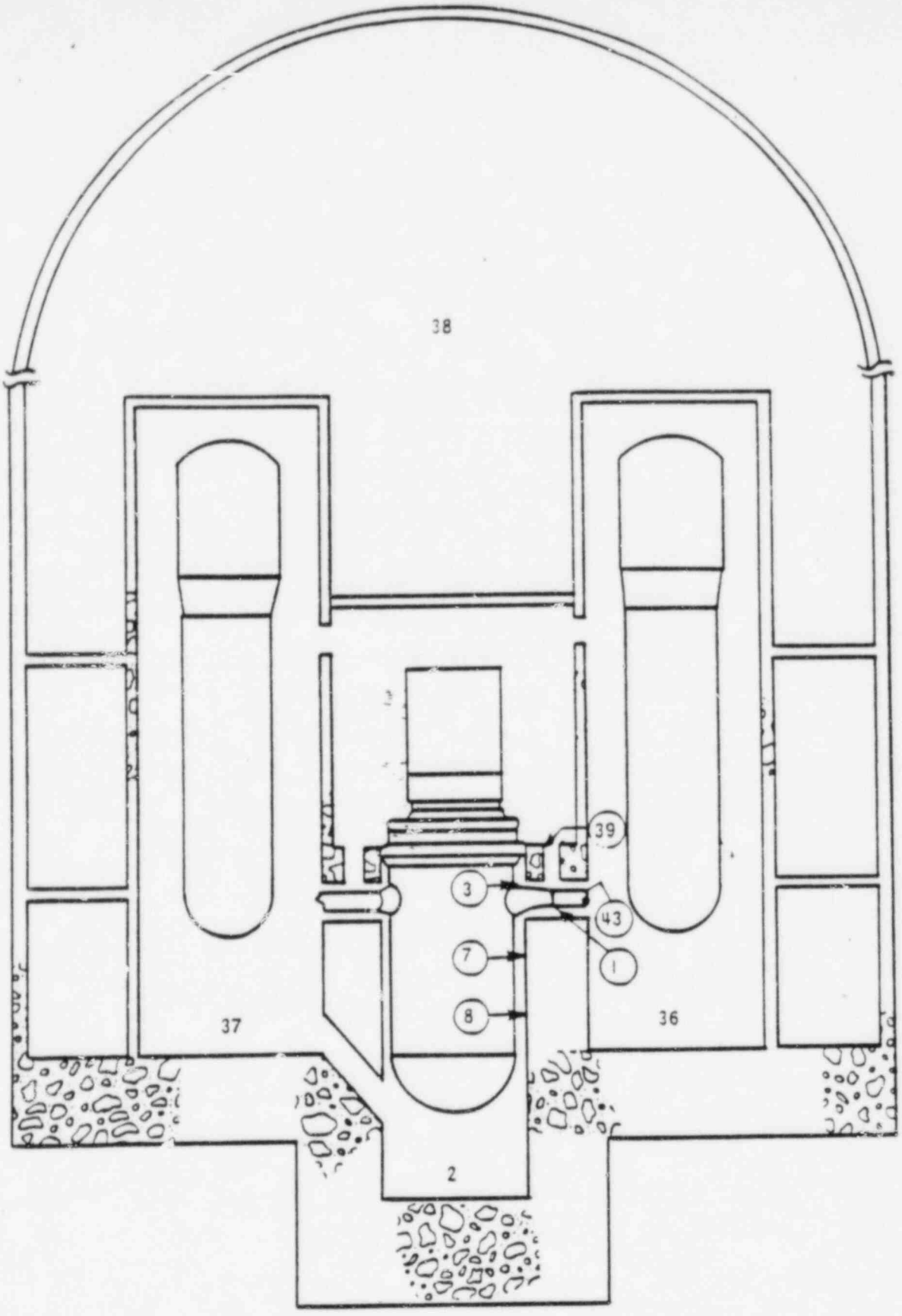
A generic nodalization sensitivity study formed the basis for the mathematical model used to analyze the reactor cavity pressurization transients in the Catawba plant. The nodalization sensitivity study involved sequential increases in modeling detail of the narrow annulus around the reactor vessel and of the pipe annulus containing the postulated break. Two criteria were applied to verify the validity of the model: element detail was increased until no significant changes in integrated force resulted from further changes, and care was taken to make model flow boundaries conform to actual plant geometry without introducing spurious flow losses.

Figure 4 shows the general configuration of the reactor vessel annulus nodalization. Figure 5 illustrates the positions of some of the compartments. In the model, the lower containment is divided into four loop compartments (21-24). The upper containment is represented by compartment 32. The ice condenser is modeled as five elements neglecting any flow distribution effects. The break occurs in compartment 1, immediately around a nozzle. The corresponding pipe annulus and the upper reactor cavity are also compartments. The lower reactor cavity is compartment 2, and the remainder of the elements, as shown in figure 4, are in the reactor vessel annulus. Compartment 13 is on the opposite side of the vessel from the assumed break.



GENERAL CONFIGURATION OF RPV ANNULUS NODALIZATION

FIGURE 4



COMPARTMENTALIZED VIEW OF CONTAINMENT MODEL

FIGURE 5