Westinghouse Electric Corporation
Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

AW-93-409

February 8, 1993

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: MR. R. W. BORCHARDT

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

SUBJECT: SLIDES FROM THE FEBRUARY 10, 1993 NRC MEETING ON AP600 MODULARIZATION

Dear Mr. Borchardt:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10CFR Section 2.790, Affidavit AW-92-409 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-93-409 and should be addressed to the undersigned.

Very truly yours,

P. J. Morris /for

N. J. Liparulo, Manager
Nuclear Safety And Regulatory Activities

/nja

cc: M. P. Siemien Office of the General Counsel, NRC
L. Barnett NRC (12H5)

0785A

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PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant specific review and approval.

In order to conform to the requirements of 10CFR 2.790 of the commission's regulation concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets and where the proprietary information has been deleted in the non-proprietary versions on the brackets remain, the information that was contained within brackets and where the proprietary information has been deleted in the non-proprietary versions only the brackets remain, the information that was contained within the brackets in the proprietary versions having been deleted. The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) contained within parentheses located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Section (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10CFR2.790(b)(1).

AW-93-409

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Peter J. Morris, who, being by me dul·· 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:

Peter J. Morris

Peter J. Morris, Manager
Strategic Safety and Regulatory Issues

Sworn to and subscribed
before me this 9th day
of February, 1993

Lorraine M. Pzelica

Notary Public

Notarial Seal
Lorraine M. Pipitca, Notary Public
Monroeville Boro, Allegheny Co. 1
My Commission Expires Dec. 14, 1995
Member, Pennsylvania Association of Notaries

0786A

(1) I am Manager, Strategic Safety and Regulatory Issues, in the Nuclear and Advanced Technology Division, of the 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 and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.

(2) I am making this Affidavit in conformance with the provisions of 10CFR 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 the Westinghouse Energy Systems Business Unit 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.

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 of 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 10CFR Section 2.790, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) Enclosed is Letter ET-NRC-93-3817, February 1993, being transmitted by Westinghouse Electric Corporation (W) letter and Application for Withholding Proprietary Information from Public Disclosure, N. J. Liparulo (W), to Mr. R. W. Borchardt, Office of NRR. The proprietary information as submitted for use by Westinghouse Electric Corporation is in response to questions concerning the AP600 plant and the associated design certification application and is expected to be applicable in other licensee submittals in response to certain NRC requirements for justification of licensing advanced nuclear power plant designs.

This information is part of that which will enable Westinghouse to:

(a) Demonstrate the design and safety of the AP600 Passive Safety Systems.

(b) Establish applicable verification testing methods.

(c) Design Advanced Nuclear Power Plants that meet NRC requirements.

(d) Establish technical and licensing approaches for the AP600 that will ultimately result in a certified design.

(e) Assist customers in obtaining NRC approval for future plants.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for advanced plant licenses.

(b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar advanced nuclear power designs and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information 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 the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing analytical methods and receiving NRC approval for those methods.

Further the deponent sayeth not.

NRC/WESTINGHOUSE MEETING AGENDA 2-10-93
AP600 STRUCTURAL MODULES
CONTAINMENT INTERNAL STRUCTURES

1.	General Description of Structural Modules	(R.Orr)
2.	Structural Module Behavior	(R.Orr)
3.	CIS Design Loads	(R.Orr)
4.	Procedures for Design and Fabrication	(K.Gross)
5.	Design Examples	(K.Gross)
6.	Seismic Margin Assessment	(R.Orr)
7.	Summary	(R.Orr)

STRUCTURAL MODULES

STEEL FABRICATION IN SHOP AND SITE SUB-ASSEMBLY AREA PERMITS PARALLEL CONSTRUCTION ACTIVITIES AND REDUCES OVERALL SCHEDULE.

SHOP AND SUBASSEMBLY AREA WORK MORE PRODUCTIVE, BETTER SUPERVISED, HIGH QUALITY THAN SAME WORK IN CONTAINMENT

STEEL PLATE FORM MODULES (L-MODULES) USED TO FORM VOID SPACES IN MASS CONCRETE BASEMAT

STEEL PLATE STRUCTURAL MODULES (M-MODULES) USED FOR WALLS AND FLOORS ABOVE THE BASEMAT

STRUCTURAL M-MODULES ARE FILLED WITH CONCRETE WHERE RADIATION SHIELDING IS REQUIRED

STRUCTURE IS DESIGNED AS A STEEL STRUCTURE WITH SEISMIC ANALYSIS USING COMPOSITE STIFFNESS

a,c

a,c

[Westinghouse Proprietary]
[Provided under separate cover]

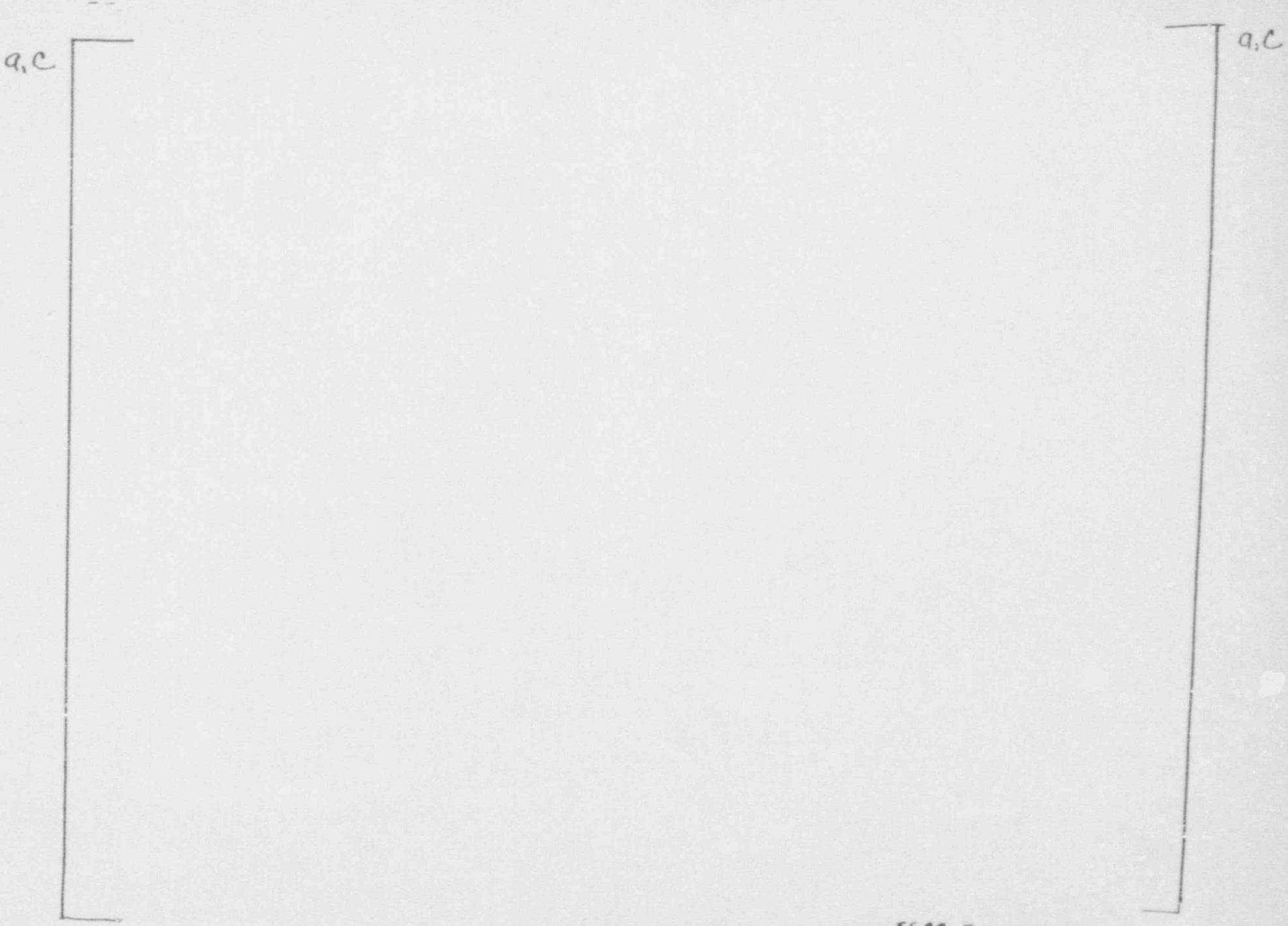
Figure 1.2-13

Nuclear Island General Arrangement
Section B-B

a,c

a,c

Figure 1.2-7



SSAR Fig. 3A-1, sheet 4

SSAR FIG 3A 6 SHEET 1

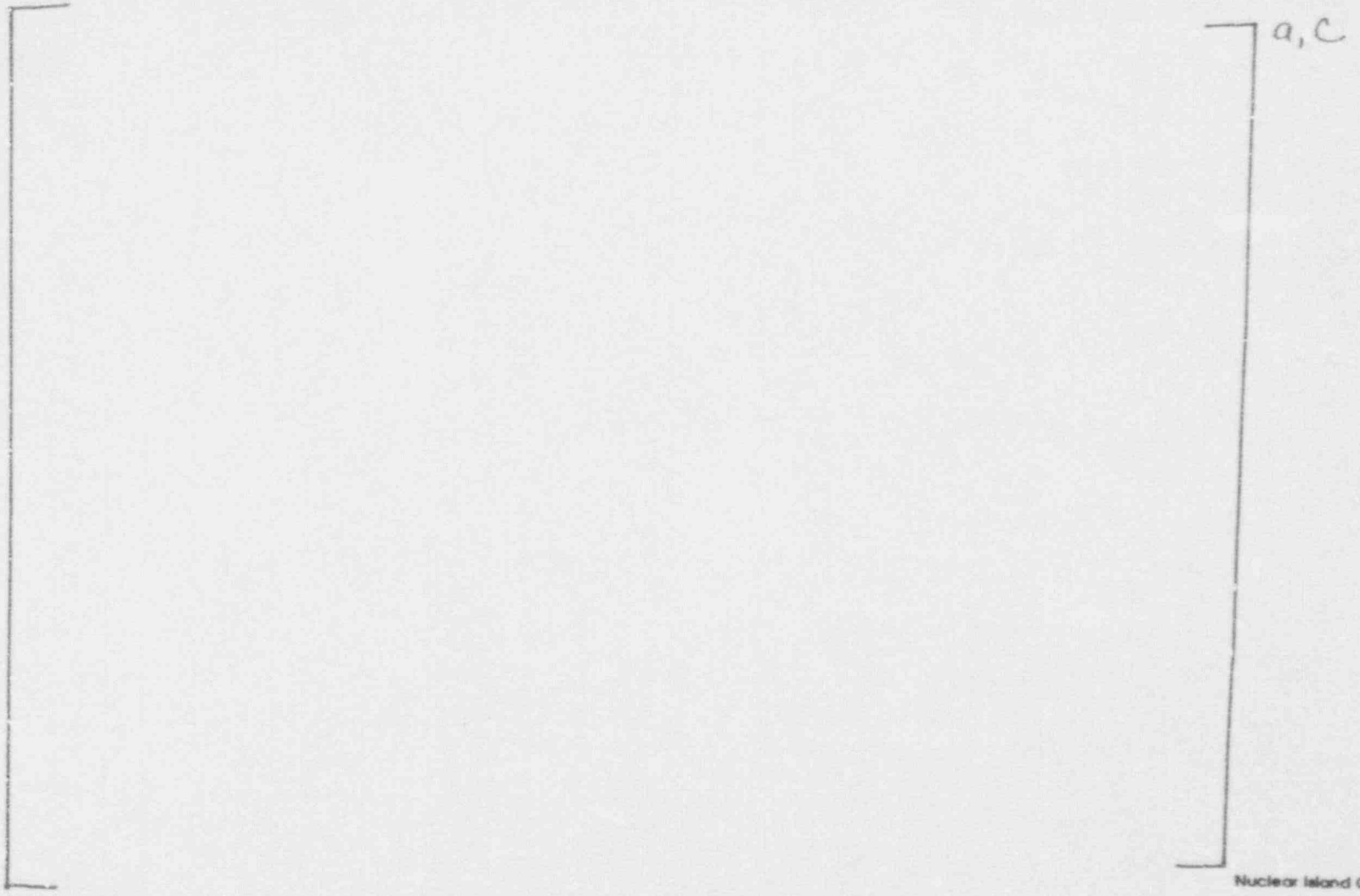
DESIGN OF CONTAINMENT INTERIOR STRUCTURES

- CONCRETE UP TO ELEVATION 83'0" (BOTTOM OF STEAM GENERATOR COMPARTMENTS) IS REINFORCED CONCRETE AND ACTS AS INTERIOR BASEMAT

- LOADS FROM INTERIOR STRUCTURES ARE TRANSFERRED THROUGH CONTAINMENT VESSEL BOTTOM HEAD TO EXTERIOR CONCRETE THAT EMBEDS THE HEAD UP TO ELEVATION 82'

- STRUCTURES INSIDE CONTAINMENT ABOVE ELEVATION 83' ARE STEEL MODULES WHICH ARE EMBEDDED IN REINFORCED CONCRETE EXTENDING ABOVE ELEVATION 83'. THIS EMBEDMENT (BETWEEN ELEVATIONS 83' TO 107'2") TRANSFERS LOADS FROM THE MODULES TO THE INTERIOR BASEMAT

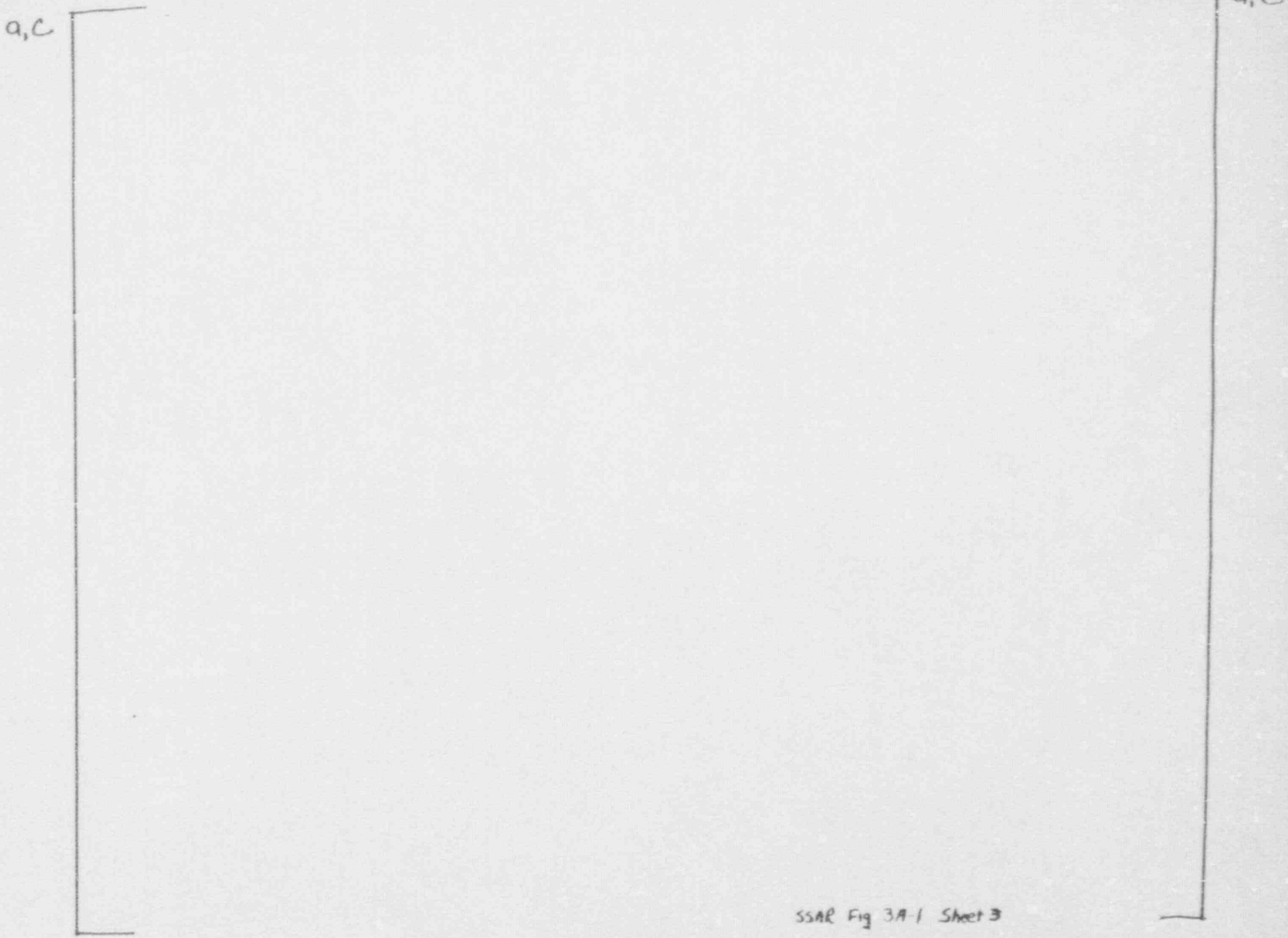
a,c



a,c

Figure 1.2-6

Nuclear Island General Arrangement
Plan at El. 96'-6"



SSAR Fig 3A-1 Sheet 3

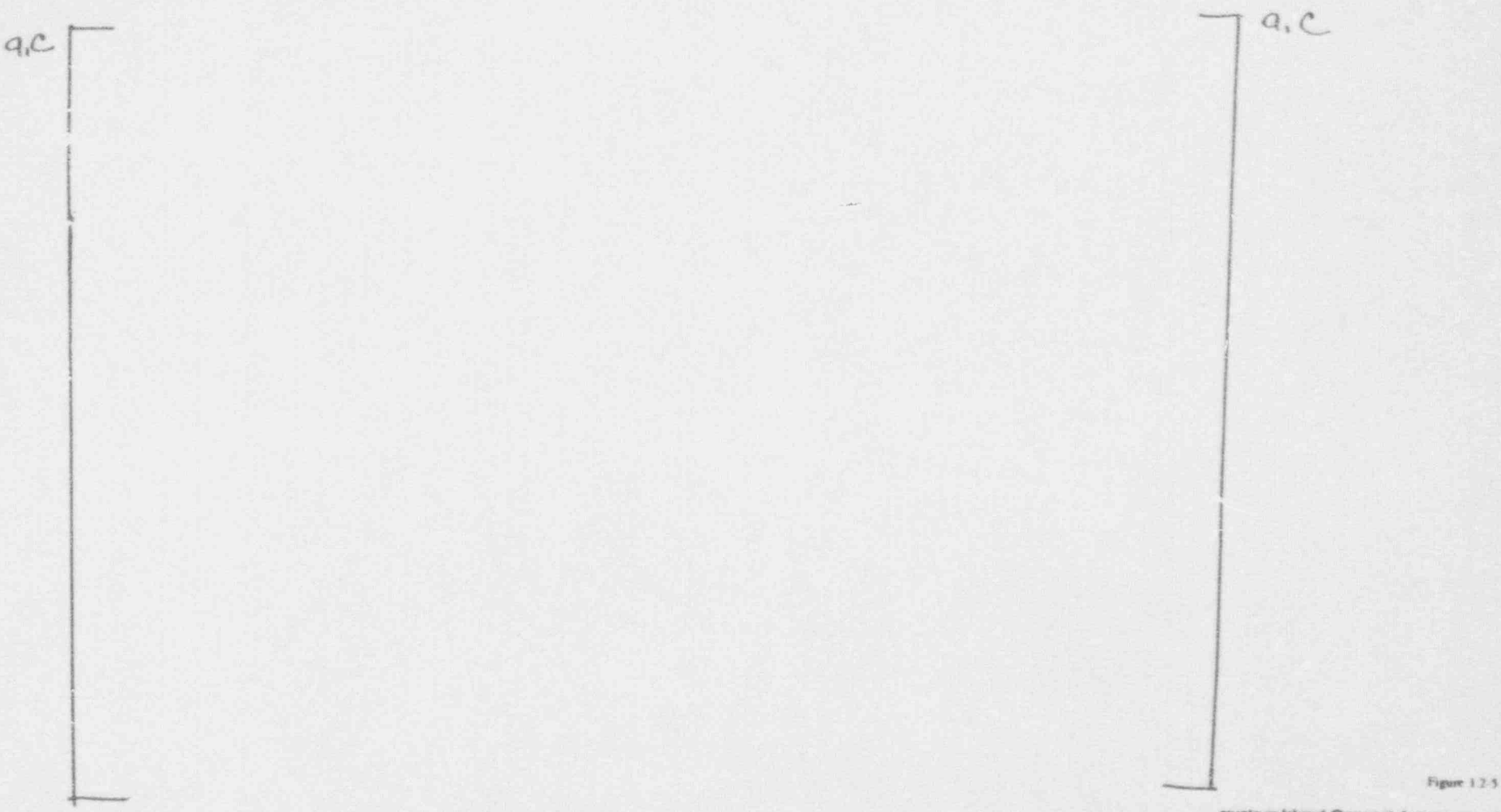


Figure 1.2-5

Nuclear Island General Arrangement
Plan at El. 82'-6"

a,c

a,c

SSAR Fig 3A-1 Sheet 2

a,c

a,c

[Westinghouse Proprietary]
[Provided under separate cover]

Figure 1.2-1.

Nuclear Island General Arrangement
Section A-A

a,c

a,c

SSAR
Figure 3A.1-
Sheet 7
Structural Modul

a,c

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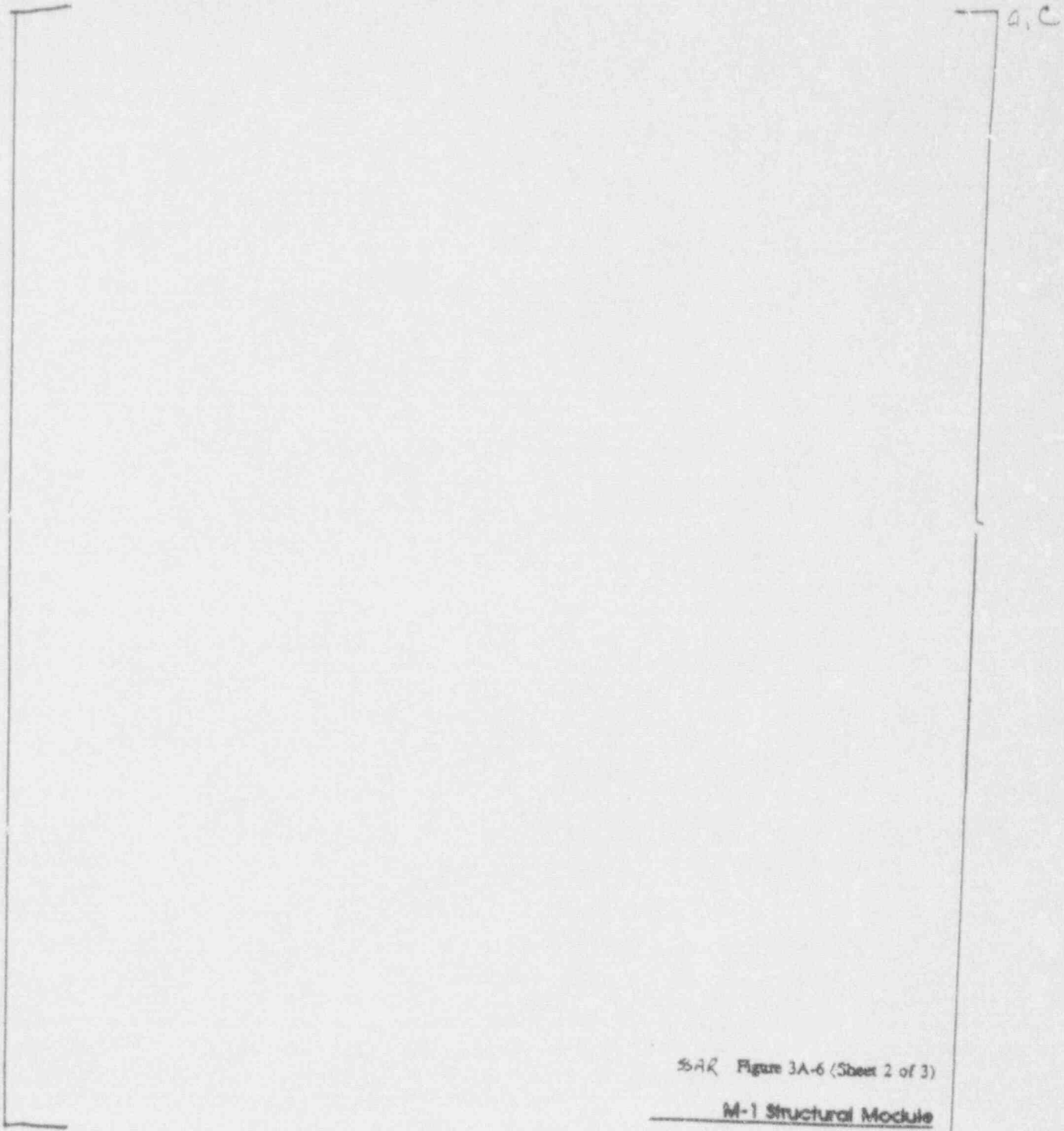
SVIR
Figure 3A
Sheet 8
Structural Mod

a,c



a,c

SSAR Figure 3A-6 (Sheet 2 of 3)

M-1 Structural Module

a,c

a,c

SSAR Figure 3A-5 (Sheet 1 of 2)

M-1 Typical Subunit

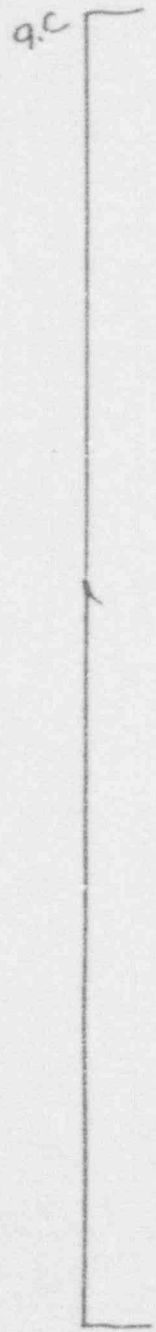


Figure 3A-3 (Sheet 2 of 2)
M-1 Typical

Figure 4 M-1 MODULE CONCRETE POUR SEQUENCE

REFERENCES FOR STRUCTURAL MODULES

REFERENCE	SCOPE
ASCE, Composite and Mixed Construction, Proceedings of the U.S./Japan Joint Seminar, July 18-20, 1984	Multiple pepers on composite construction
ASCE, Composite Construction in Steel and Concrete, Proceedings of an Engineering Foundation Conference, New Hampshire, June 7-12, 1987.	Multiple papers on composite construction
H.Takeuchi, H.Okamura, "Composite Structure of Concrete and Steel Plate", IABSE Symposium, Paris-Versailles, 1987.	Concrete slab with stiffened steel bottom plate - design of shear connectors
T. Fukumoto, B. Kato, et al, "Concrete Filled Steel Bearing Walls," IABSE Symposium, Paris-Versailles, 1987.	Shear and compression tests of various configurations of plates and shear connectors
R.Narayan, H.D.Wright, H.R.Evans, R.W.Francis, " Load Tests on Double Skin Composite Girders", Proceedings - Composite Construction in Steel and Concrete, 1987, Published by ASCE.	Bending tests on curved beams with stud shear connectors
A.Kaneuji, Y.Okuda, K.Hara, H.Masumoto, "Feasibility Study of Concrete Filled Steel (SC) Structure for Reactor Building", 10th International Conference on Structural Mechanics in Reactor Technology, 1989.	Overview of steel plate construction approach
H. Akiyama, H. Sekimoto, M. Tanaka, K. Inoue, M. Fukihara, Y. Okuda, "1/10th Scale Model Test of Inner Concrete Structure Composed of Concrete Filled Steel Bearing Wall", 10th International Conference on Structural Mechanics in Reactor Technology, 1989.	Tests of a concrete filled steel plate model of typical PWR internal structures for cyclic loads and comparison with similar tests for a reinforced concrete model.
H.Akiyama, H.Sekimoto, M.Fukihara, K.Nakanashi, K.Hara, "A Compression and Shear Loading Test of Concrete Filled Steel Bearing Wall", 11th International Conference on Structural Mechanics in Reactor Technology, 1991.	Cyclic compression and shear tests of concrete filled steel plate wall models.

LOAD TESTS ON DOUBLE SKIN COMPOSITE GRIDERS

R. Narayanan, H.D. Wright, H. R. Evans and R. W. Francis

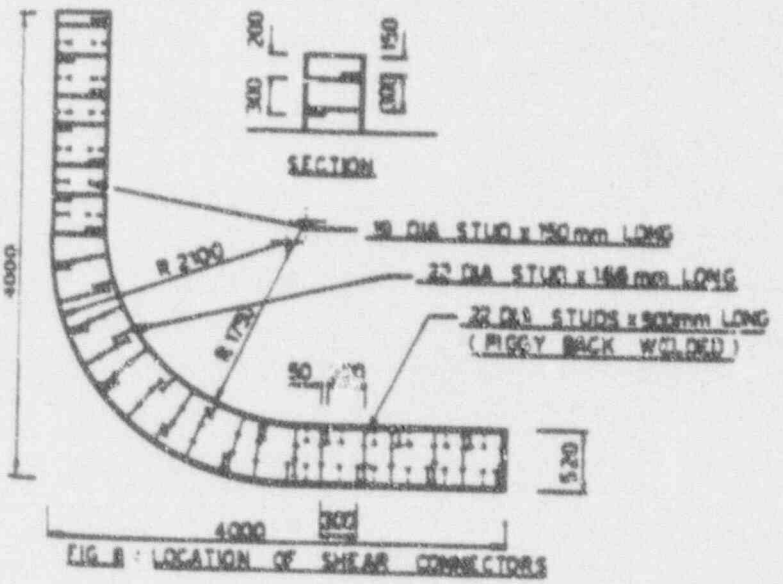
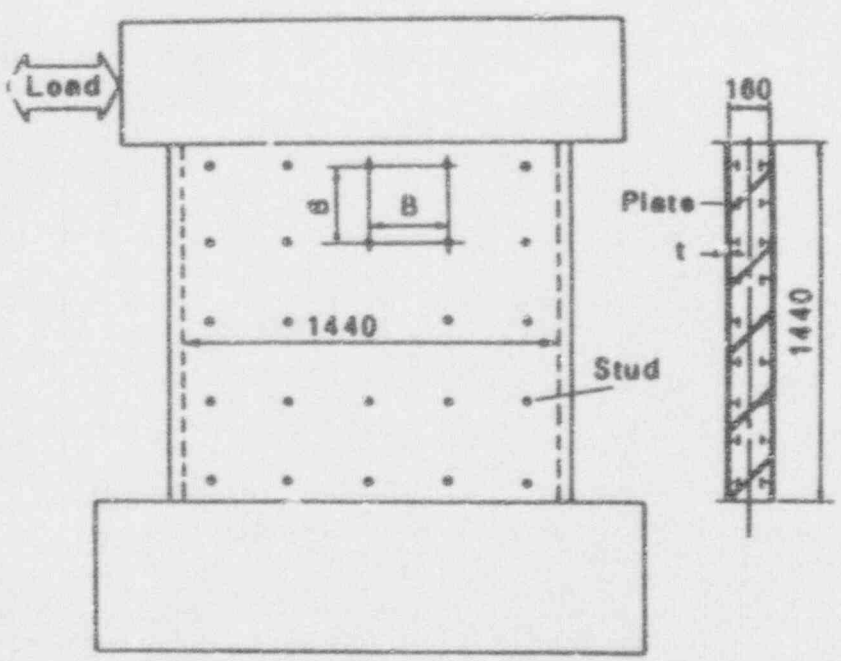
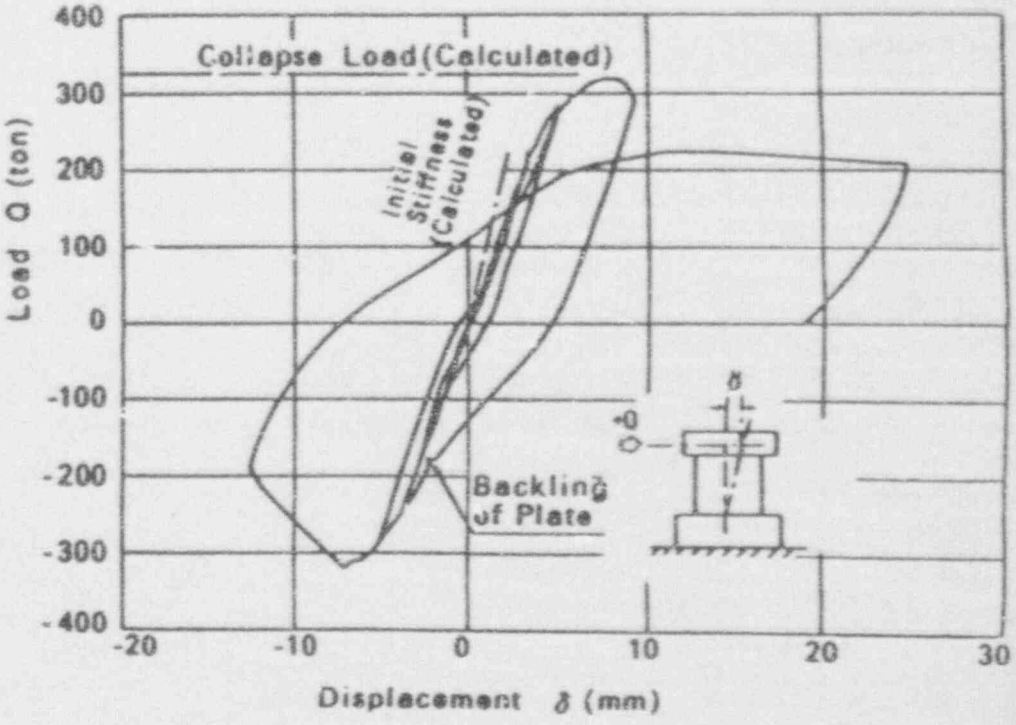


FIG 8 : LOCATION OF SHEAR CONNECTORS



Thickness of Plate	(t)	3.2 mm
Stud Pich	(B)	320 mm
	(B/t)	100

Dimension of Specimen



Relationship of Shearing Load and Displacement

Type	Cross Section	Structure	Width Thickness Ratio	Stiffening Method
Non Stiffening 200K		SC	200	Non Stiffening
One Insert Plate 100k		SC	100	Insert Plate (1-PL-3.2)
Two Insert Plates 67K		SC	67	Inser Plate (2-PL-3.2)
Angle 67A		SC	67	Angle (4-L50X 50X4)
Stud 35S		SC	35	Headed Stud (ϕ6, ℓ=40, @80)
Steel 100S		Steel	100	Insert Plate (1-PL-3.2)
Concrete OC(Com.) 1C(Shear)	OC / 1C	Concrete	—	—

※Concrete : Fc240 Surface Plate : PL-3.2
Side Plate : PL-22(Com.),PL-19(Shear)

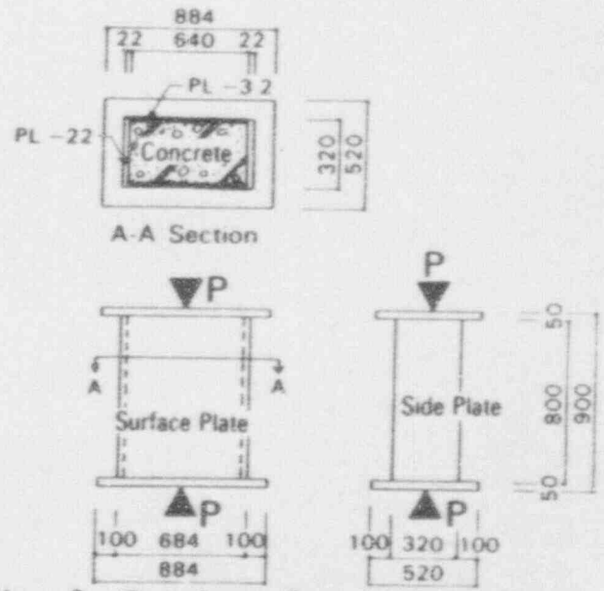


Fig. 3 Specimen for Compression Test

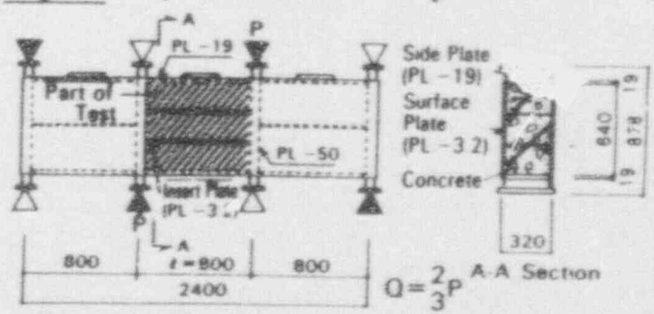
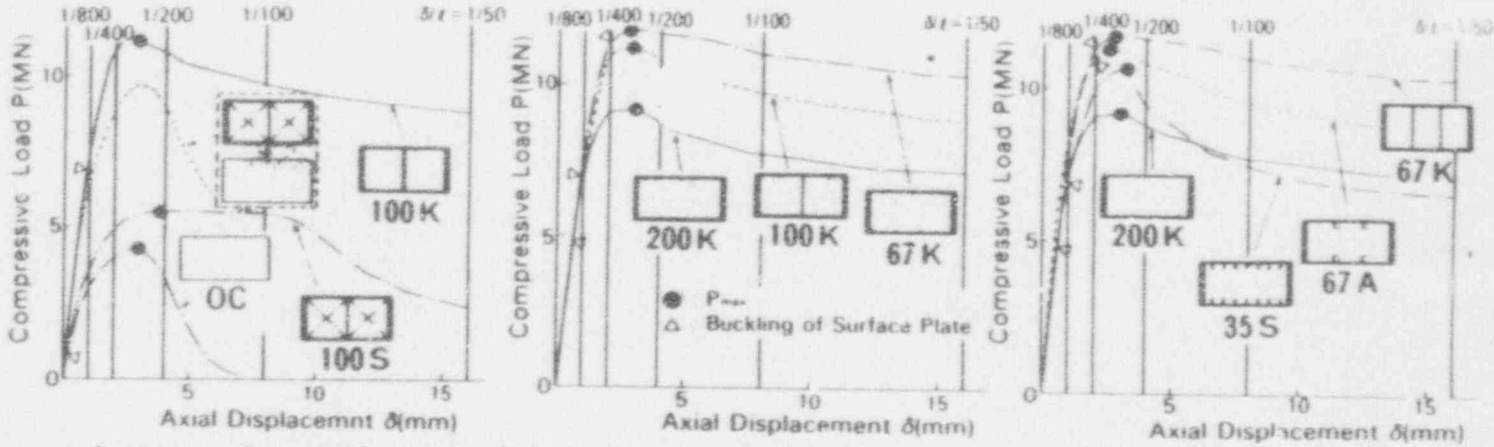
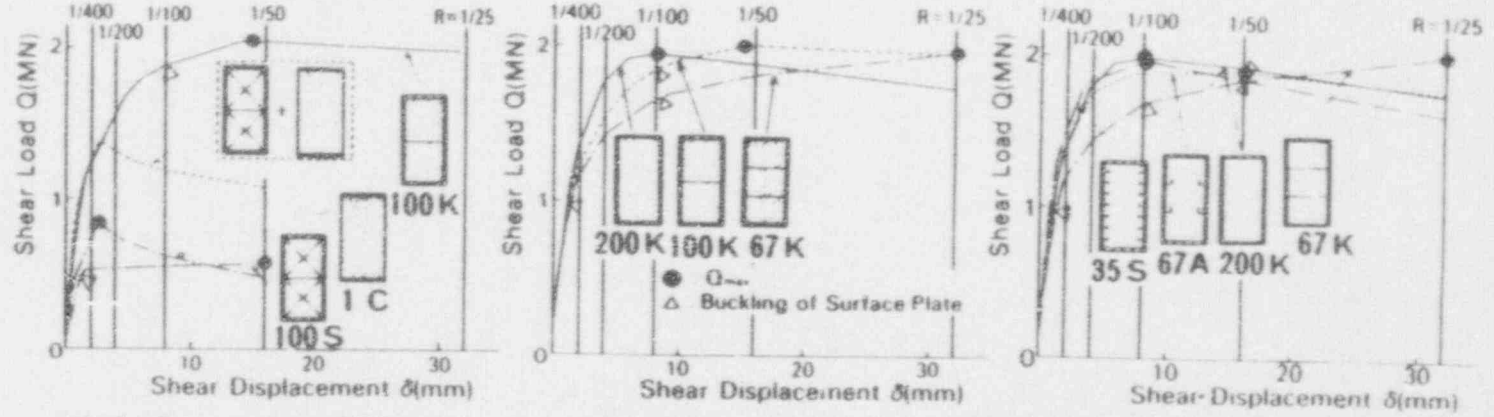


Fig. 4 Specimen for Shear Test



(a) Composite Effects (b) Effects of Insert Plate (c) Stiffening Methods

Fig. 5 Load-Displacement Relationship for Each Parameter in Compression Tests



(a) Composite Effects (b) Efrects of Insert Plate (c) Stiffening Methods

Fig. 6 Load-Displacement Relationship for Each Parameter in Shear Tests

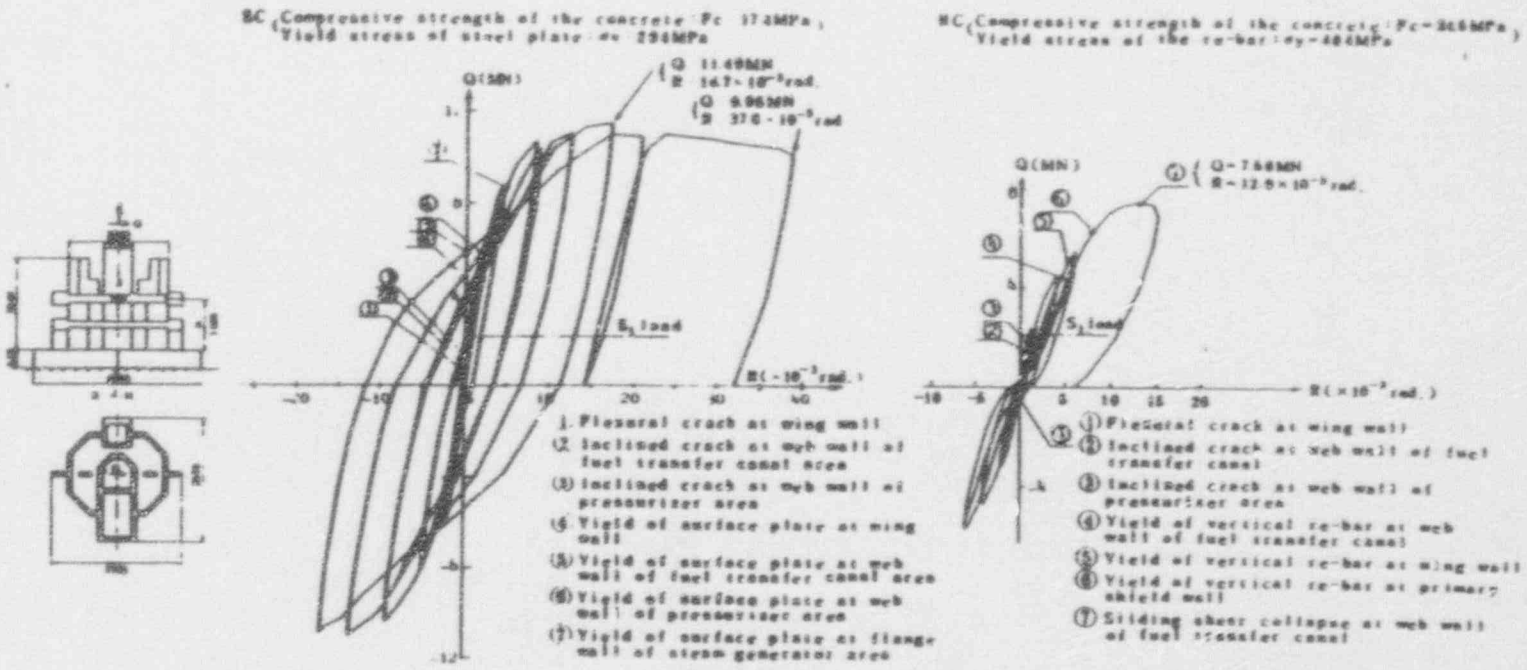


Fig.3 Load Relative Rotation Angle Relationship

Table 3.8.4-1

Load Combinations And Load Factors For Seismic Category I Steel Structures

Combination No.		Load Combination and Factors								
		1	2	3	4	5	6	7	8	9
Load description										
Dead	D	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Liquid	F	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Live	L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Earth pressure	H	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Normal reaction	R_o	1.0	1.0	1.0	1.0				1.0	1.0
Normal thermal	T_o			1.0	1.0				1.0	1.0
Wind	W		1.0							1.0
SSE	E_s			1.0				1.0(3)		
Tornado	W_t				1.0					
Accident pressure	P_a					1.0	1.0	1.0		
Accident thermal	T_a					1.0	1.0	1.0		
Accident thermal reactions	R_a					1.0	1.0	1.0		
Accident pipe reactions	Y_r						1.0	1.0		
Jet impingement	Y_j						1.0	1.0		
Pipe impact	Y_m						1.0	1.0		
Stress Limit(1),(4) Coefficient		1.0	1.0	1.6	1.6	1.6	1.6	1.7	1.5	1.5

Notes:

1. Allowable stress limits coefficients are per AISC - N690.
2. Where any load combines the effects of other loads, the coefficient for that load shall be taken as zero unless it can be demonstrated that the load is always present or occurs simultaneously with the other loads.
3. Seismic loads will only be combined with ruptures of pipes that are not seismically supported.
4. In no instance shall the allowable stress exceed $0.7F_u$ in axial tension nor $0.7F_u$ times the ratio of the plastic to elastic section modulus for tension plus bending.

Table 3.8.4-2

Load Combinations And Load Factors For Seismic Category I Concrete Structures

Combination No.		Load Combination and Factors								
		1	2	3	4	5	6	7	8	9
Load description										
Dead	D	1.4	1.4	1.0	1.0	1.0	1.0	1.0	1.05	1.05
Liquid	F	1.4	1.4	1.0	1.0	1.0	1.0	1.0	1.05	1.0
Live	L	1.7	1.7	1.0	1.0	1.0	1.0	1.0	1.3	1.3
Earth	H	1.7	1.7	1.0	1.0	1.0	1.0	1.0	1.3	1.3
Normal reaction	R_o	1.7	1.7	1.0	1.0				1.3	1.3
Normal thermal	T_o			1.0	1.0				1.3	1.3
Wind[1]	W		1.7						1.3	1.3
SSE	E_s			1.0						1.3
Tornado	W_t				1.0			1.0(3)		
Accident pressure	P_a					1.5	1.25	1.0		
Accident thermal	T_a					1.0	1.0	1.0		
Accident thermal reactions	R_a					1.0	1.0	1.0		
Accident pipe reactions	Y_r						1.0	1.0		
Jet impingement	Y_j						1.0	1.0		
Pipe impact	Y_m						1.0	1.0		

Notes:

1. Design is in accordance with ACI-349 Strength Design Method for all load combinations.
2. Where any load reduces the effects of other loads, the corresponding coefficient for that load shall be taken as 0.9 if it can be demonstrated that the load is always present or occurs simultaneously with the other loads. Otherwise the coefficient for the load shall be taken as zero.
3. Seismic loads will only be combined with ruptures of pipes that are not seismically supported.

AP600 STRUCTURES - PRELIMINARY FRAGILITY ESTIMATE

- HARD ROCK SITE
- SSE IS CRITICAL LOAD IN DESIGN OF STRUCTURES
- MEAN CAPACITY ESTIMATED BY APPLYING MARGIN FACTORS TO SSE
- MARGIN FACTORS LEADING TO INCREASED CAPACITY OF STRUCTURE
  - INTERACTION FACTOR (ACTUAL LOAD < CODE ALLOWABLE)
  - CODE FACTOR (CODE ALLOWABLE IS LOWER BOUND)
  - MATERIAL FACTOR (ACTUAL VS SPECIFIED, DYNAMIC)
- MARGIN FACTORS LEADING TO REDUCED SEISMIC DEMAND
  - DAMPING FACTOR
  - ANALYSIS FACTOR
  - SPECTRAL SHAPE FACTOR
  - INELASTIC RESPONSE FACTOR
- ENGINEERING JUDGEMENT FACTOR

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

STRUCTURAL MODULE DESIGN DEVELOPMENT

- O DESIGN CRITERIA ESTABLISHED AND DOCUMENTED IN SSAR
- O PRELIMINARY DESIGN DESCRIBED IN SSAR; DETAILED DESIGN IS PART OF FIRST-OF-A-KIND ENGINEERING
- O CONSERVATIVE DESIGN APPROACH IS SUPPORTED BY EXISTING CODES AND TEST DATA
- O SEISMIC MARGIN IS SUCH THAT THE CONTAINMENT INTERIOR STRUCTURE HCLPF EXCEEDS THOSE OF MANY COMPONENTS AND DOES NOT CONTRIBUTE TO SEISMIC RISK
- O ADDITIONAL TESTING COULD QUANTIFY MARGIN AND PERMIT RELAXATION OF DESIGN CRITERIA

STRUCTURAL MODULES

DESIGN EXAMPLE

REFUELING CAVITY - WEST WALL

Presentation Material Includes 13 Pages of Proprietary Information.

STRUCTURE MODULES

PROCEDURES FOR DESIGN

Presentation Material Includes 21 Pages of Proprietary Information.