CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT

PREDICTED BEHAVIOR OF CONTAINMENT BUILDING DURING STRUCTURAL INTEGRITY TEST

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11/04/85	3	J Manchak J.M.	M Weber M.W.

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1. PURPOSE OF THE ANALYTICAL PREDICTION

The purpose of the analytical prediction of the behavior of the Containment Building (CB) to structural integrity test (SIT) conditions is to demonstrate through correlation of predicted with actual responses that Containment Building (CB) design for internal pressure loads is satisfactory, and that construction and quality of materials of construction are adequate. Commitment to the SIT is stated in Section 3.8.1.7.1 of the Plant Safety Analysis Report (SAR). 2

2. CONTAINMENT BUILDING DESCRIPTION, MATERIALS OF CONSTRUCTION, GOVERNING CODE

2.1 Physical Description

The CB is a reinforced concrete structure with steel plate liner on the interior side. The building shape is a vertical right cylinder with hemispherical dome and circular flat base which has a recess below the reactor vessel. The radius to the inside face of the cylinder wall and dome is 65 ft. The cylinder wall is keyed into the foundation mat and is 160 ft high to its liner intersection with the dome liner. Wall thickness, concrete with liner plate is 2 ft 6 in. for the dome and 4 ft 6 in. for the cylinder except at major penetration areas where thickness is increased to 6 ft 6 in. extending outwards. The radius of the circular foundation mat is 74 ft, and the mat is concentric with the CB. Mat thickness below the base liner is 12 ft except at the perimeter of the mat where the thickness is increased by a 2 ft 6in. deep by 6 ft wide shear key below the mat and centered on the cylinder wall.

Liner plate thickness is 1/2 in. for the dome, 1/4 in. for the base, and 3/8 in. for the cylinder wall except for the region of the polar crane runway support brackets where the thickness is increased to one inch, extending outwards into the wall concrete to retain the flush face interior. The base liner is overlain with concrete, the top of which forms the floor inside the Containment. Liner plate is anchored to the CB wall, dome, and mat concrete by headed studs welded to the plate except in regions where larger loadings require the use of larger bent-end rod anchors. Anchors are omitted from wall and base liner in the region of juncture of the two liners, and compressible material is provided between base liner and interior side floor concrete, and wall liner and wall concrete to allow building responses to loadings to take place in that region with minimum straining of the liner.

All equipment systems penetrations into the CB are through the cylinder wall except for four pipe penetrations through the foundation mat, one each into four 8 ft 10 in. inside diameter valve chambers which are below the CB wall and embedded in the mat except for the chamber side away from the CB where embedment is only partial. Access into the CB is through an equipment hatch, personnel air lock, and emergency air lock whose sleeve inside diameters are 24 ft, 9 ft, and 4 ft 11 in. respectively. Penetration sleeves are anchored to concrete by headed or bent-end rods welded to the sleeve, and are not directly connected to wall concrete reinforcing steel except for the main steam (MS) and feedwater (FW) sleeves (3 each). The close proximity to each other of those sleeves requires retention in continuity of reinforcement in that region to be obtained by means of reinforcing steel anchorages to the sleeves.

2.1 Physical Description (Cont'd)

The major structural features of the CB are presented in Appendix A figures.

2.2. Materials of Construction

CB superstructure and mat are of reinforced concrete, specified compressive strength 4000 psi for the mat, 5000 psi for the wall from its base (El.216 ft) to its intersection with the dome (El. 376 ft), and 4000 psi for the dome. Reinforcing steel is ASTM A-615 Grade 60, liner plate ASTM A-516 Grade 70, and valve chambers, penetration sleeves, and wall reinforcement anchorages to the MS and FW penetration sleeves are ASTM SA-516 Grade 70.

2.3 Principal Governing Code

The principal governing code for the CB is the ASME Boiler and Pressure Vessel Code Section III Nuclear Power Plant Components, Division 2 Concrete Reactor Vessels and Containments (ACI Standard 359-74), 1975 Edition and Winter 1975 Addenda.

3. PREDICTED RESPONSES OF BUILDING TO STRUCTURAL INTEGRITY TEST (SIT)

3.1 Analytical Models

Finite element models and computer program analysis were used to calculate the predicted responses of the CB to SIT pressurizations and concurrent temperatures. An overall (global) and three local area models were analyzed. The properties of the elements considered tension cracking of concrete due to pressurization. Liner plate is included as reinforcing steel.

3.1.1 Overall Model

A finite element model for the cylinder and dome configuration was simulated by inputting the properties of a segment of CB superstructure and mat with the relevant boundary conditions. The model used is an 8 degree wide radial segment of half the superstructure. The shell was modeled by quadrilateral finite elements. The polar crane runway structure is represented in the segment by reactions at the crane runway brackets. Foundation mat and supporting media properties were represented by a series of springs located at node points. The model is shown in Appendix E.

3.1.2 Local Areas Models

Three local area models were used for analysis of the major penetration regions where cylinder wall concrete thickness is increased. The local area models were developed for the areas identified below. Quadrilateral finite elements were also employed for the models. The models were extended sufficiently to place their boundaries into regions where there is compatibility with CB structure overall response to the loadings.

a) Area with penetration sleeves of equipment hatch, personnel lock and containment purge makeup

2

3.1.2 Local Areas Models (Cont'd)

b) Area with penetration sleeves of main steam and feedwater pipes

c) Area with containment purge exhaust and HVAC duct

The models are shown in Appendix E.

3.2 Effects of As-Built Changes and Simplifications in Analysis

3.2.1 As-Built Changes

3.2.1.1 Field Change Requests and Permanent Waivers

Field change requests (FCRs) and permanent waivers (PWs) identify and describe differences in "as-built" structure from that shown on drawings or required by specifications and standards. Those for the CB superstructure and mat were tabulated (Appendix C). Review of the tabulation indicates that there are only two categories of FCR and PW changes that might affect structure responses to SIT loadings. These categories are: 2

1) Change in structure dimensions

   a) diameter

   b) Wall thickness

2) Change in wall reinforcement

   a) arrangement

   b) amounts in local areas

The two categories of change were evaluated for possible effects on CB responses to SIT conditions. It was concluded that the effects are probably below the threshold of measurability because of the smallness and randomness of the changes, except possibly for deviations of the CB from a true circle. For those deviations, if liner tolerance deviations identified in the PWs are conservatively assumed to also be deviations in the location of the wall, displacing the wall from a true circle, CB deformation responses in those regions may be changed to a detectable level. During pressurization, CB concrete cracking patterns will be checked for patterns indicative of change of shape in shell in local areas from noncircular to circular.

3.2.1.2 Materials of Construction Mechanical Properties

3.2.1.2.1 Concrete

The concrete test reports for the CB superstructure and foundation mat were reviewed. Weighted average values of concrete as-built compressive strengths were calculated for each 10 ft height increment of the CB cylinder wall, and each approximately 9 degree segment of the dome (except for the two-stage topmost placement). As-built concrete strengths are considerably higher than the concrete strengths specified, varying from (values are rounded off) 2

3.2.1.2.1 Concrete (Cont'd)

5230 psi (El. 256 to 266 ft) to 6470 psi (El. 216 to 226 ft) for the cylinder wall (5000 psi specified), from 4560 psi (El. 428.6 to 433.9 ft) to 5990 psi (topmost placements) for the dome (4000 psi specified), and 6620 psi for the mat (4000 psi specified). Appendix D furnishes the weighted average values of as-built concrete strengths obtained from the concrete test reports for the CB. 2

Calculations indicate that under full SIT pressurization, CB superstructure concrete will be fully cracked except where bending moments generated by pressurization reduce compression in concrete and close the cracks. The principal region of occurrence of this is at the base of the cylinder wall, for a height of about the lowest 5 feet. The reinforcement anchoring the CB to the foundation mat prevents the CB from moving out radically and induces bending moments in the wall and compressive stresses in the concrete on the outer side of the wall. However, the effects on the responses of the CB to pressurization by the higher as-built strengths of the concrete of the cylinder wall and mat are considered to be minor and have not been taken into account in the responses prediction. 2

3.2.1.2.2 Liner Plate

The certified mill test reports for the CB liner plate and welding electrodes show strengths considerably higher than minimum required yield strengths for those materials. Since under SIT pressures and temperatures liner plate stresses remain within elastic limits, the higher values will have no effects on either predicted or actual responses.

3.2.2 Construction Opening

The construction opening from elevation 234 to 336 feet and azimuth 17-41-30 to 315-05-06 and which encompasses the equipment hatch was the last part of the CB superstructure to be constructed. During the time of open area, the cylinder wall on either side of the opening supported CB structure above that spanned across the opening as well as CB structure directly above itself. In addition part of the load of the polar crane and runway girder supported by brackets above the elevation of the top of the opening also was supported by the cylinder wall on either side of the opening. As a result, locked-in stresses and strains are present in the CB structure around the opening. In addition, placement of concrete in the construction opening last in the sequence of placement of concrete further induced locked-in stresses and strains and in addition enhanced the formation of cracks around the perimeter of the opening due to the setting shrinkage of the concrete in the opening. The condition described is expected to affect the formation of cracks in the region when SIT pressurization is applied, and the region will be monitored for crack formation during the test.

3.2.3 Simplifications in Analysis 2

Certain simplifying assumptions were made in the computerized analyses performed for CB responses to SIT loadings. It is not expected that the analysis results are significantly affected by the assumptions. The assumptions are:

3.2.3 Simplifications in Analysis (Cont'd)

a) Concrete tensile stress to induce cracking is assumed to be the same for all the various "as-built" concrete compressive strengths.

b) Design basis values, not as-built values of concrete compressive strengths were used to calculate concrete modulus of elasticity.

c) Stresses present in concrete and reinforcement due to temperature difference between time of construction and time of test are neglected, and average exterior and interior air temperatures are assumed to remain constant during the SIT. The temperatures assumed for the SIT are 40F for the part of the CB higher than the elevation of roof line of the adjacent RAB, and 60F for the part of the CB that is lower than the roof line. The CB response predictions analysis was based on exterior air temperatures which were derived from meteorological records for the site and other nearby locations for December, January, and February. Interior air temperature value was estimated from the conditions expected to exist indoors at the time of the test, for the month of the test.

The region of the CB wall where stresses are most affected by temperature changes is the cylinder wall at its base, where it is fully restrained by the mat. Wall stresses due to temperature are neglible when wall and mat temperatures are at construction temperatures (considered to be 60F). Divergence of mat and wall temperatures more highly stress the wall, and are additive to wall stresses due to SIT pressurization when wall temperature is higher than mat temperature. The effects of wall-mat temperature differences diminish with distance away from the mat.

Since at SIT pressurization superstructure concrete will be fully cracked except as noted above, temperature difference between time of construction and time of test will affect response only at pressurizations below maximum. Locked-in stresses due to temperature and accumulated load from structure above will change pressure levels at which cracking of concrete is initiated at various elevations. The impact is relevant only to intermediate pressurizations, and have not been taken into account in the predictions.

3.3 Computer Programs Used

Three variations of the National Aeronautics and Space Administration (NASA) finite element computer program NASTRAN were used in the computer programs analyses for the predicted responses of the CB to SIT pressures and temperatures.

2

3.3 Computer Programs Used (Cont'd)

EBS/NASTRAN developed by Ebasco Services Incorporated was used for the response analysis of the overall model. The program is suitable for determination of responses because of capability to calculate propagation of cracks in concrete sections under various loadings. In the program the cracked section is represented by a series of flat shell layers with coupled in-plane and out-of-plane stiffnesses, enabling the monitoring of crack propagation from one layer to the next at each stage of loading, and the calculation of section properties at various extents of cracking.

2

MSC/NASTRAN by MacNeal-Schwendler Corporation was used for the local area models analyses. Input of concrete cracking in this program is manual. EBS/NASTRAN program concrete cracking results were used for input.

2

3.4 Predictions Analysis Loadings for Overall Model

The loadings considered for the overall model were pressure, dead load of polar crane in its parked location, and accumulated dead load of CB structure above the elevation of interest. Effects on radial movement due to the dead load of the crane (resistance to movement caused by friction between the wheels and the crane runway rail, with crane in its parked location) were evaluated, found to be minor, and have not been considered in the predictions. Effects on vertical movement due to the dead load of the crane were evaluated, found likely to have measurable effect, and were considered in the loadings for prediction of CB vertical movements. Since temperature was assumed to remain constant for the period of the test, effects of temperature change were not considered.

3.5 Predicted Responses

The predicted responses calculated from the computerized analyses are presented in Appendix E tables and figures. Table E1 lists the deformations predicted for the CB. Table E2 lists the strains predicted for the liner, and Table E3 lists the strains predicted for the reinforcing steel. Figures E1 through E5-8 define and detail the overall model and the various local area models. Figures E6-1 through E6-4 furnish plots of the deformed structure at azimuths of particular interest. The radial and meridional deformations of the CB listed at the elevations given in the figures are used to develop the profiles of the deformed structure.

2

4. -Displacement Measurements Locations

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Displacement measurement locations are shown on the figures of Appendix B. The figures are from Specification CAR-SH-CH-22 "Figures for Displacement Measurement Locations".

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APPENDIX A

CONCRETE CONTAINMENT STRUCTURE FSAR FIGURES

APPENDIX A

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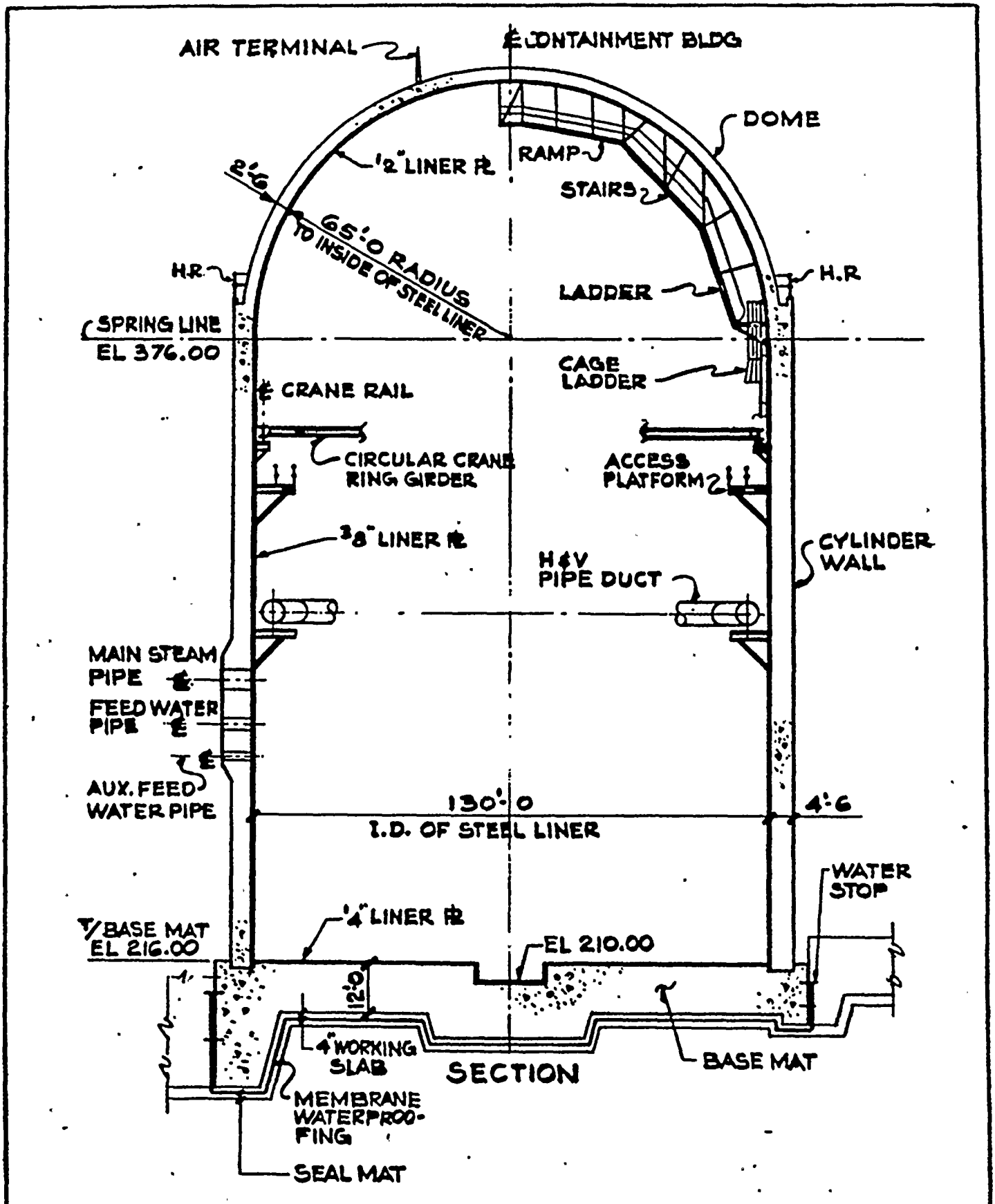
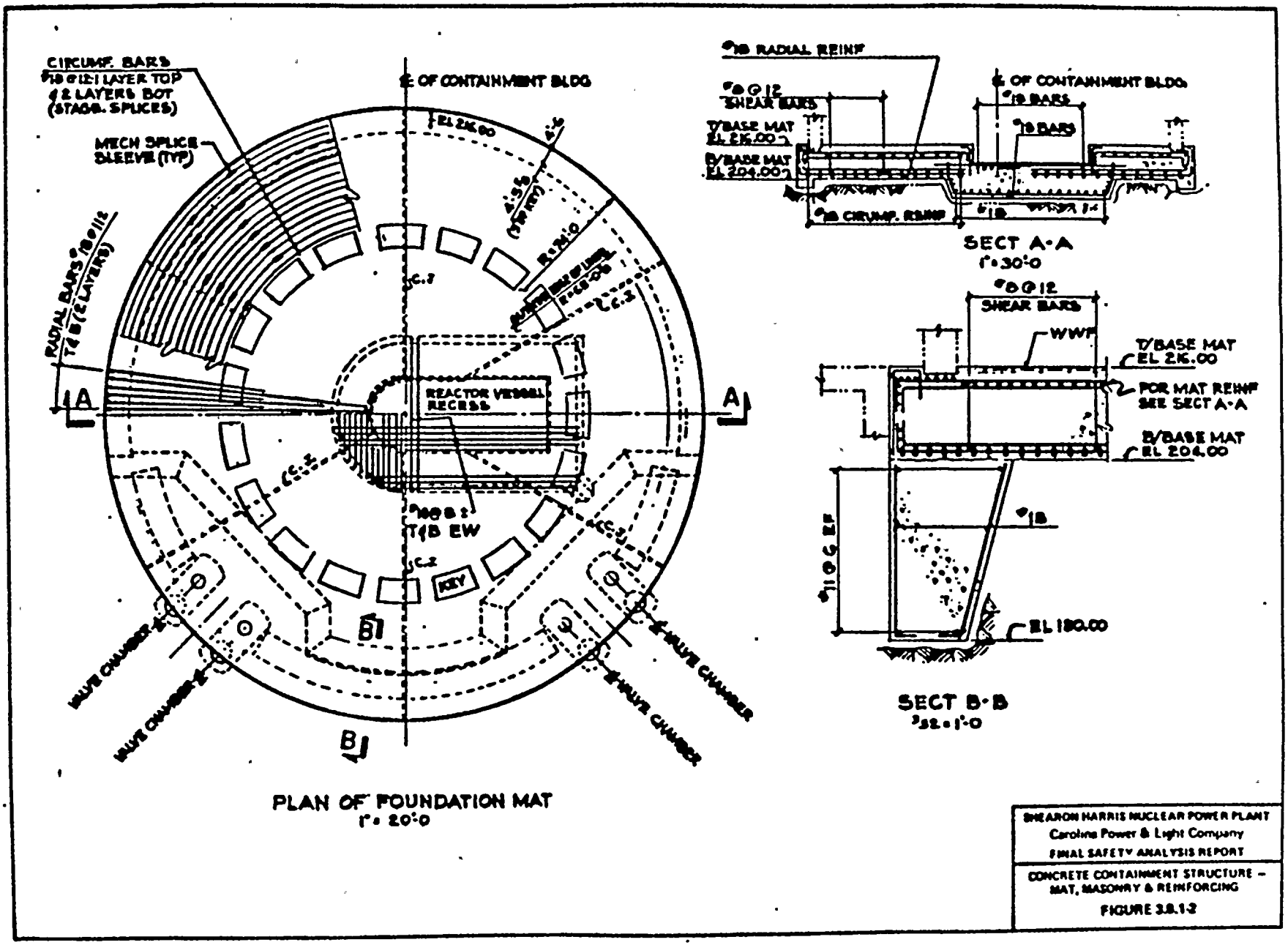


SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	CONCRETE CONTAINMENT STRUCTURE – GENERAL ARRANGEMENT	FIGURE 3.8.1-1



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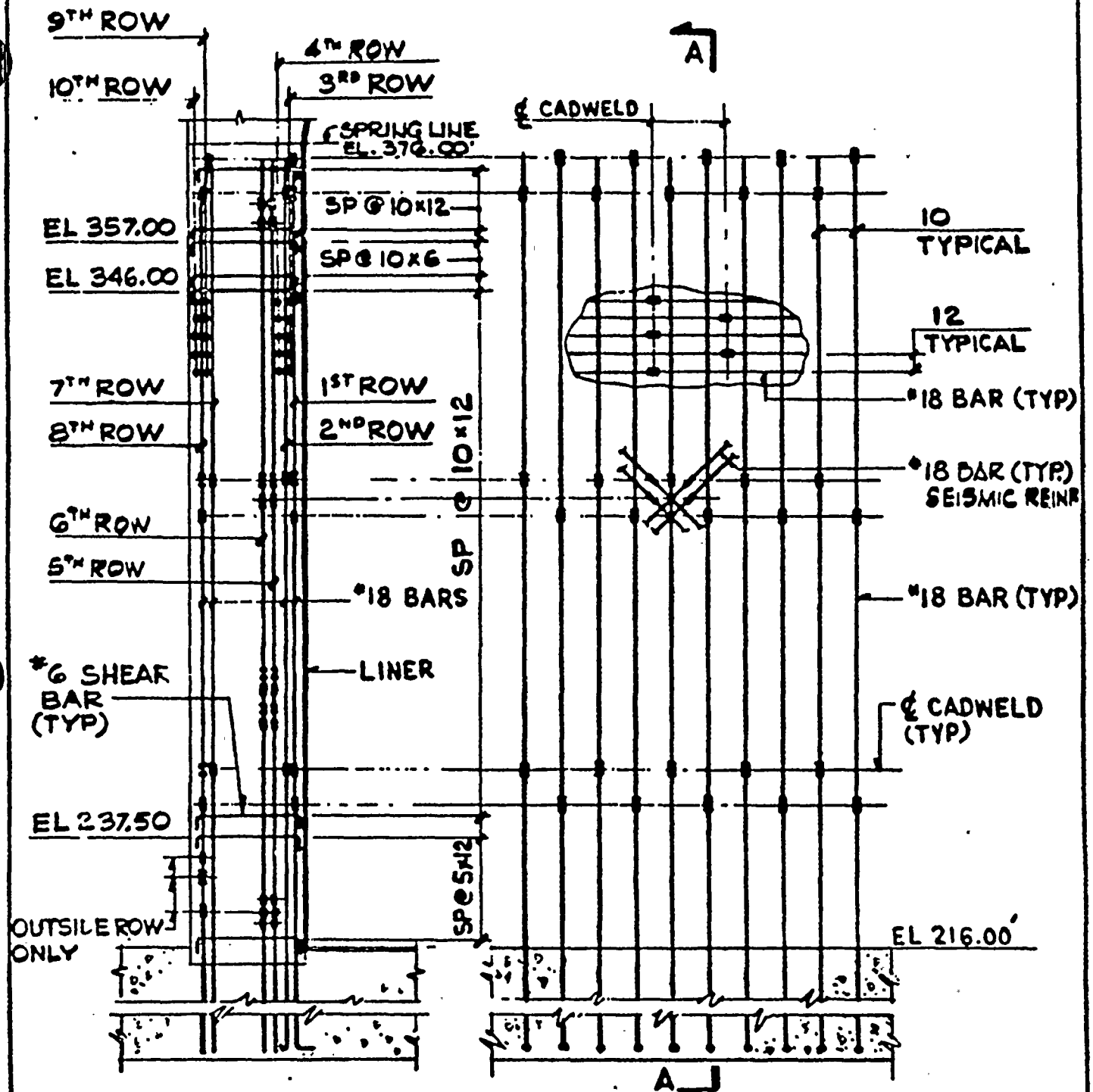
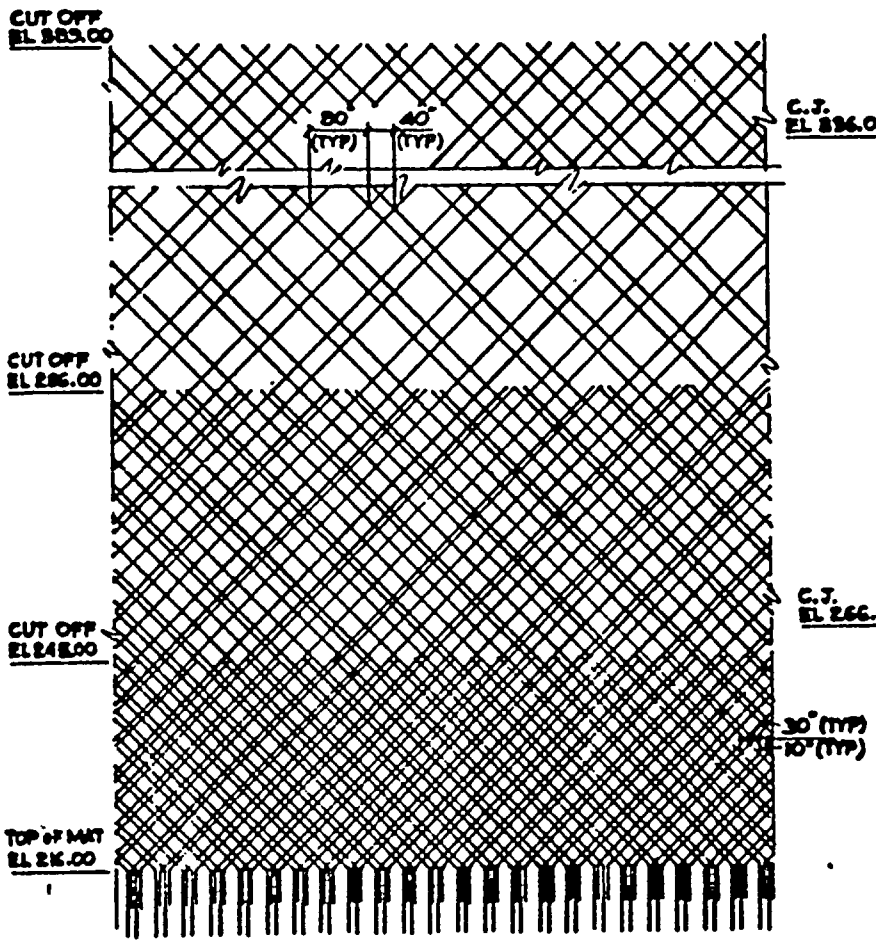
CONCRETE CONTAINMENT STRUCTURE – MAT, MASONRY & REINFORCING

FIGURE 3.8.1-2

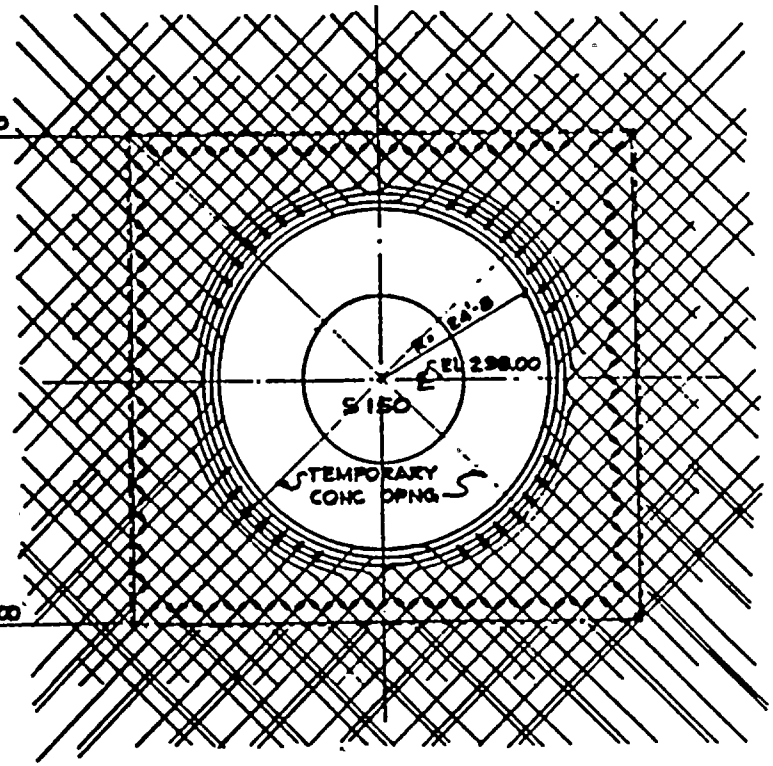
NOTE: CADWELD STAGGER SPACING VARIES.



SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	CONCRETE CONTAINMENT STRUCTURE CYLINDER WALL REINFORCEMENT	FIGURE 3.8.1-3



DEVELOPED ELEVATION - TYPICAL AREA
(LOOKING FROM OUTSIDE)



EQUIPMENT HATCH

NOTE: ALL REINFORCING BARS ARE #18

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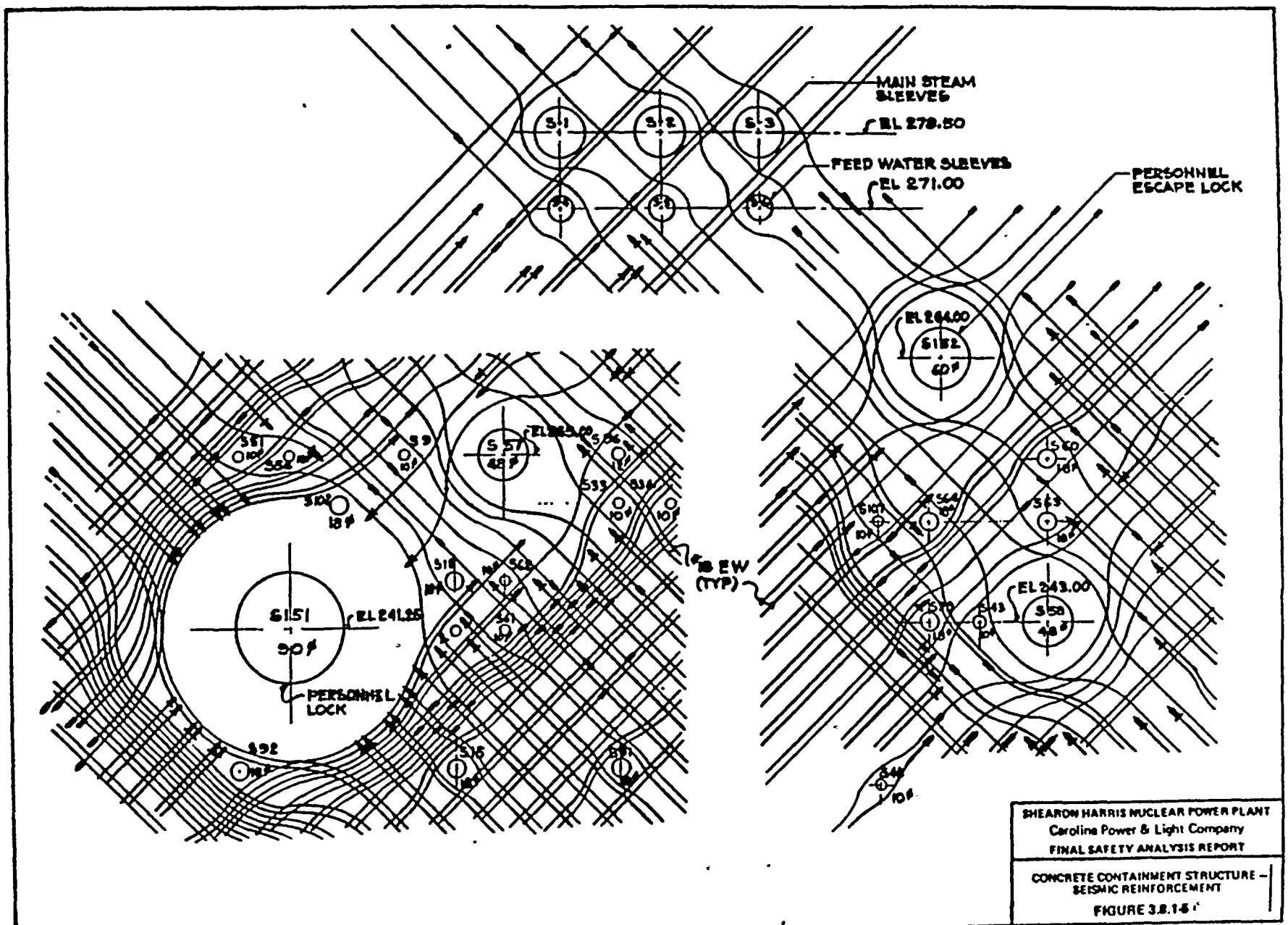
CONCRETE CONTAINMENT STRUCTURE – I
SEISMIC REINFORCEMENT

FIGURE 3.8.1-4



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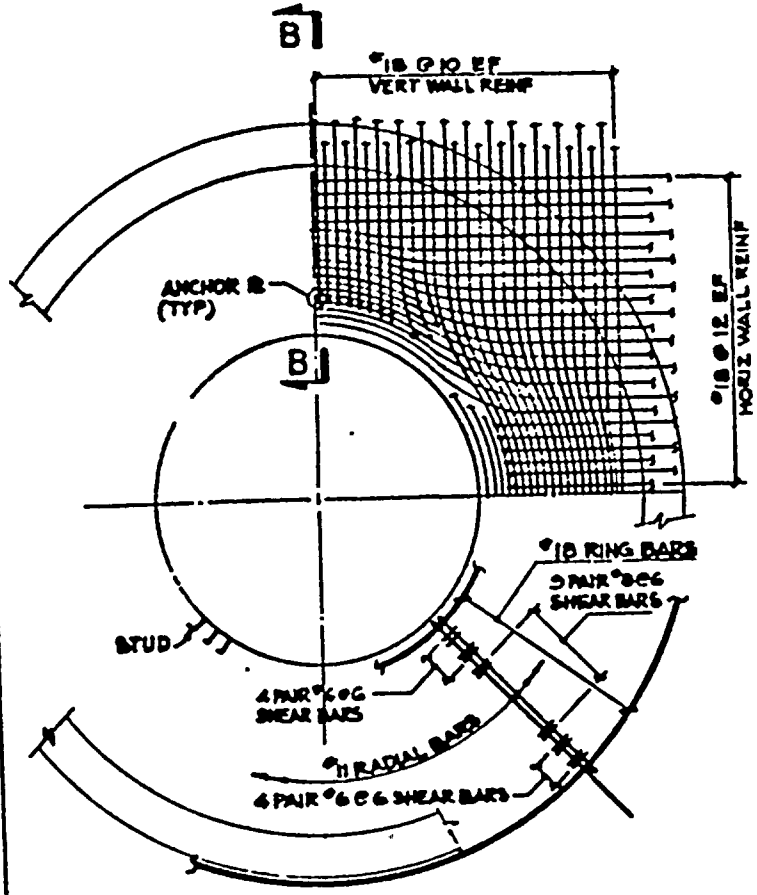
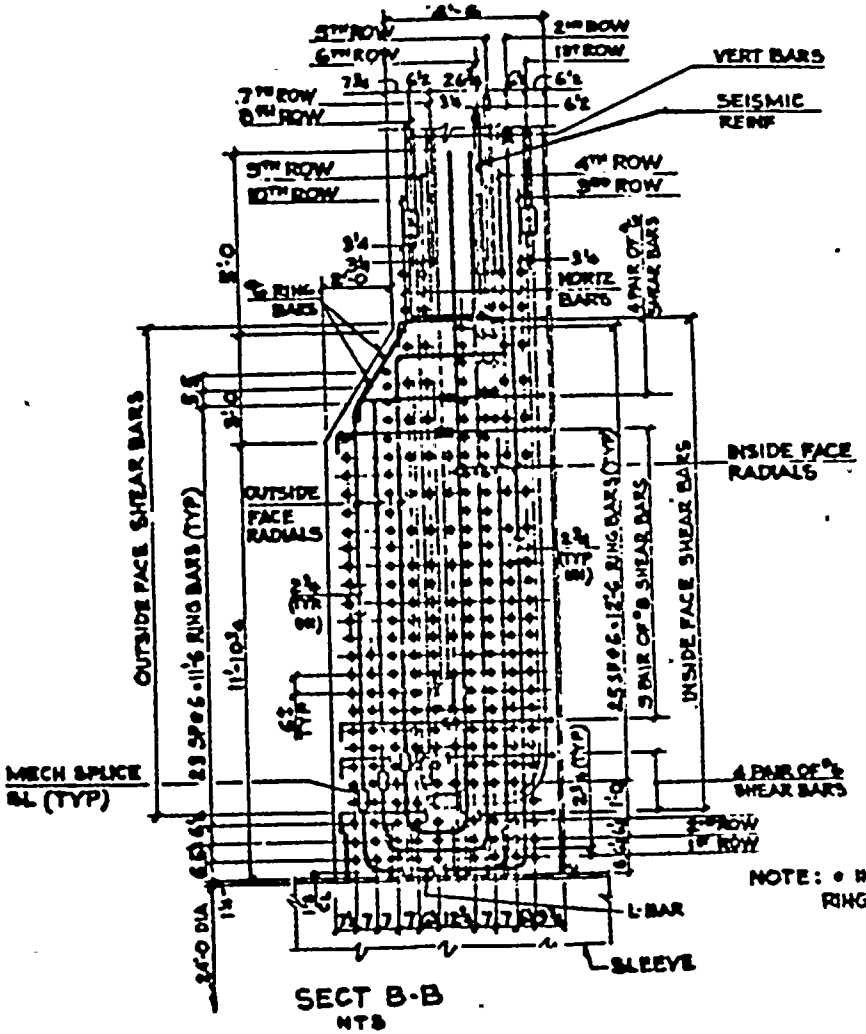
CONCRETE CONTAINMENT STRUCTURE – SEISMIC REINFORCEMENT

FIGURE 3.8.1-6



DEVELOPED ELEVATION
NTS



SECT B-B
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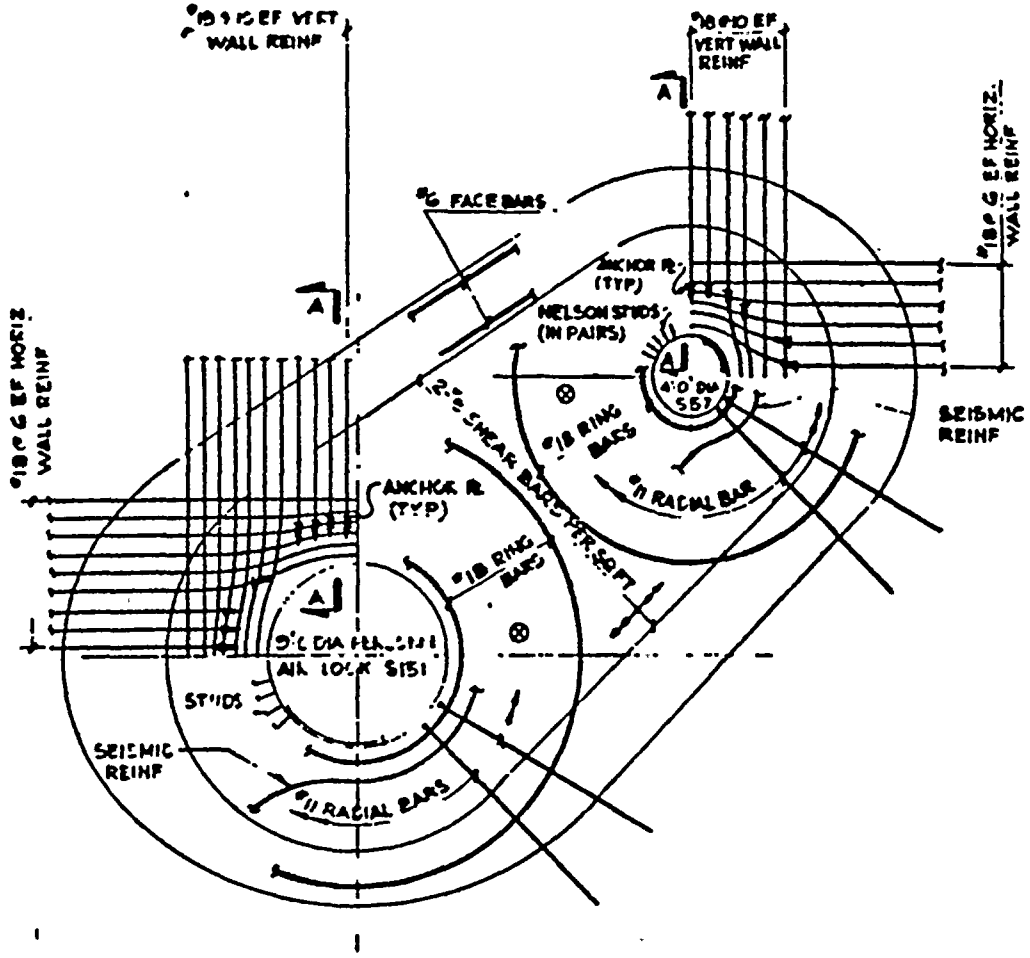
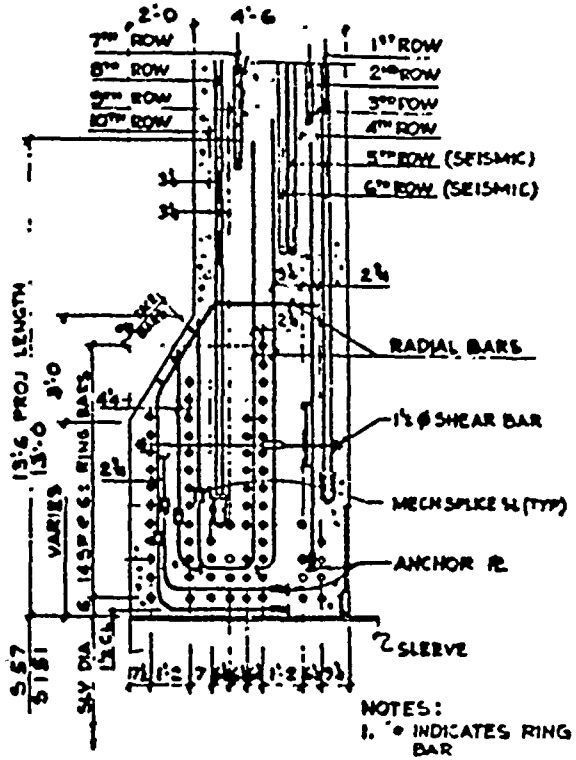
CONCRETE CONTAINMENT STRUCTURE – EQUIPMENT HATCH REINFORCING

FIGURE 3.8.1-6



DEVELOPED ELEVATION (OUTSIDE FACE)
NTS



SECT A-A
NTS

NOTES:
1. • INDICATES RING BAR
2. ○ INDICATES HORIZ BAR
3. STUDS OMITTED FOR CLARITY
4. ⊗ INDICATES 1½ ø SHEAR BAR

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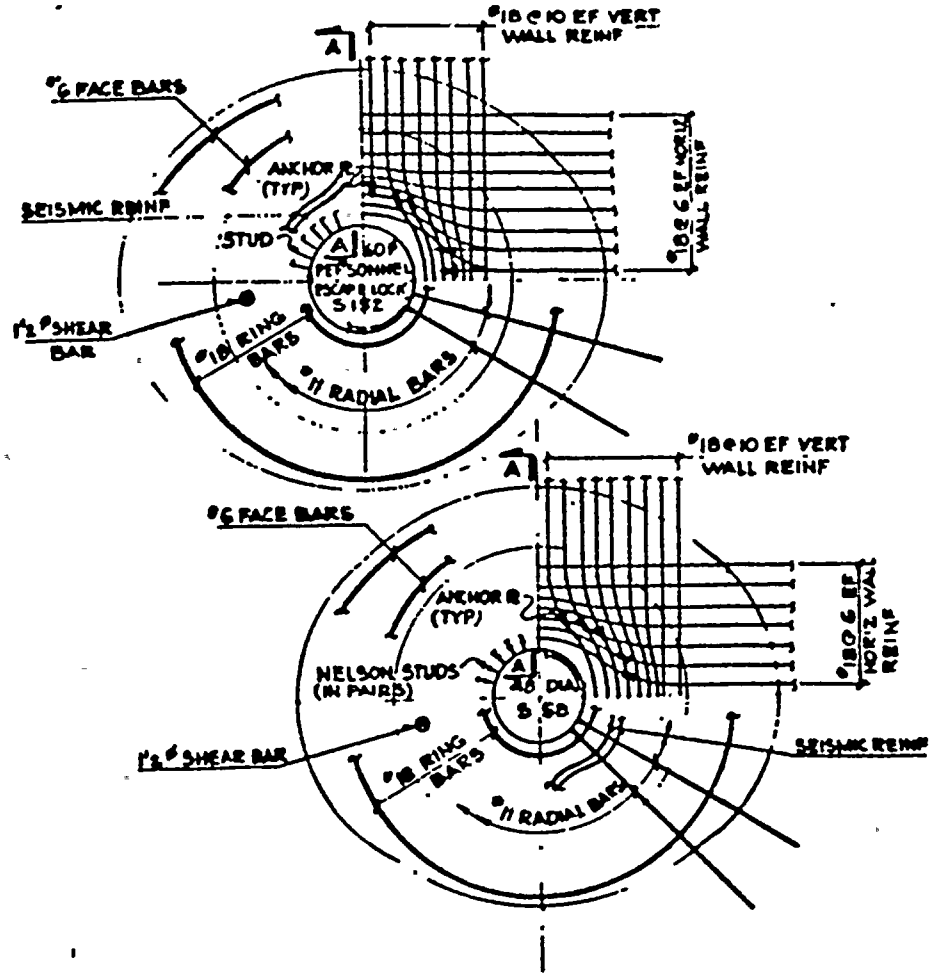
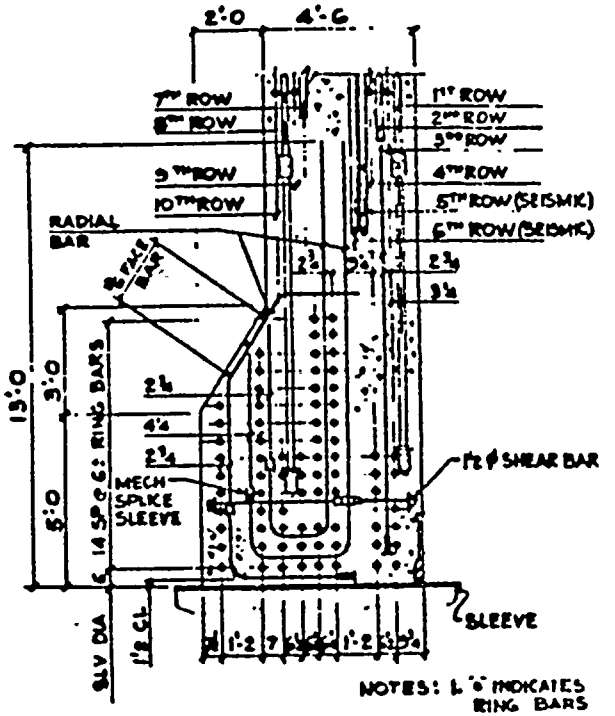
CONCRETE CONTAINMENT STRUCTURE PERSONNEL AIR LOCK AND PEN S57 - REINFORCING

FIGURE 3.8.1-7



DEVELOPED ELEVATION (OUTSIDE FACE)
NTS



SECT A-A
NTS

NOTES:
1. '6' INDICATES RING BARS
2. 'o' INDICATES HORIZ BARS
3. STUDS OMITTED FOR CLARITY
4. ⊕ INDICATES 1½ ϕ SHEAR BAR

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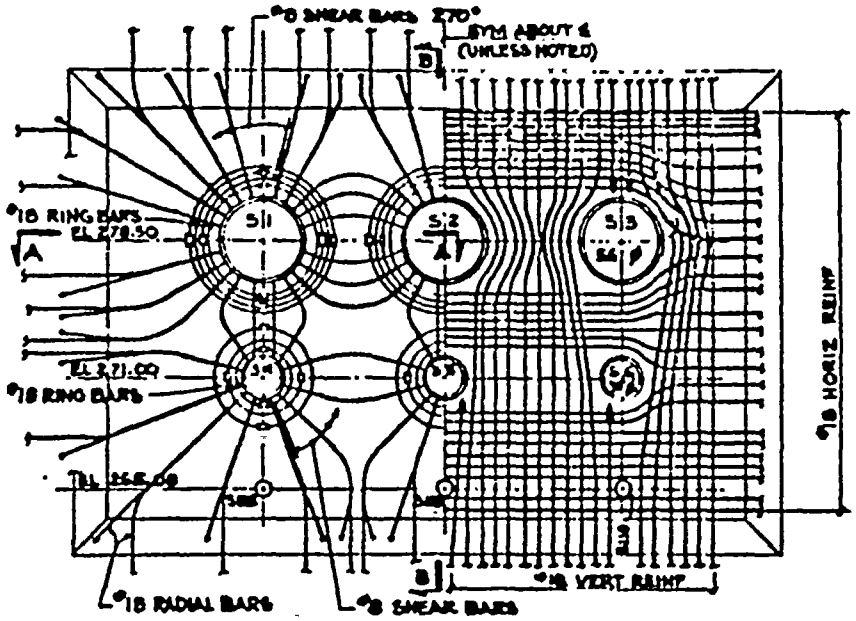
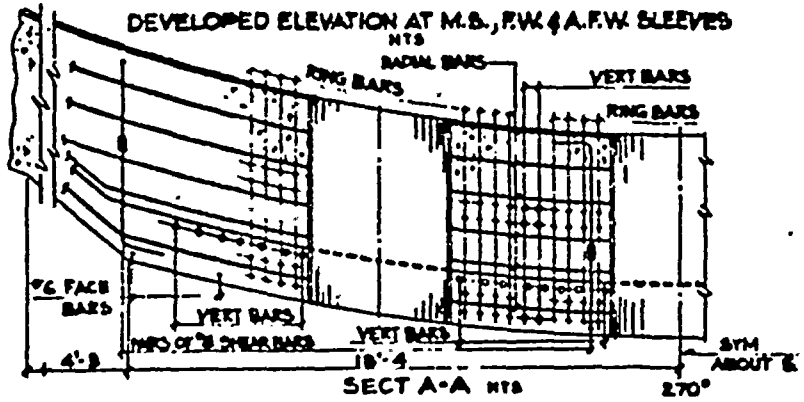
CONCRETE CONTAINMENT STRUCTURE PERSONNEL ESCAPE LOCK AND PEN. S&A REINFORCING

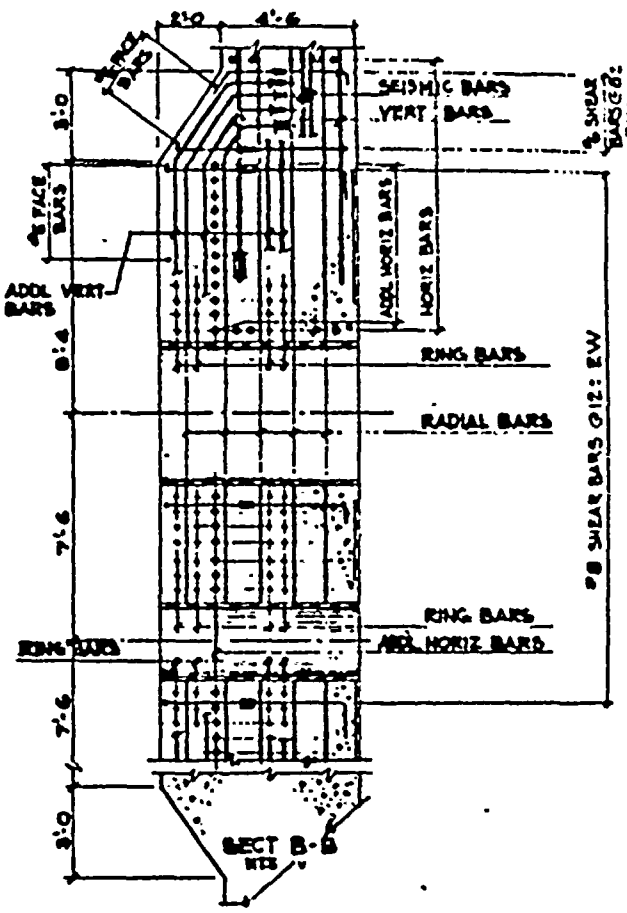
FIGURE 3.8.1-8



DEVELOPED ELEVATION AT M.S., F.W. & A.F.W. SLEEVES



SECT A-A NTS



SECT B-B NTS

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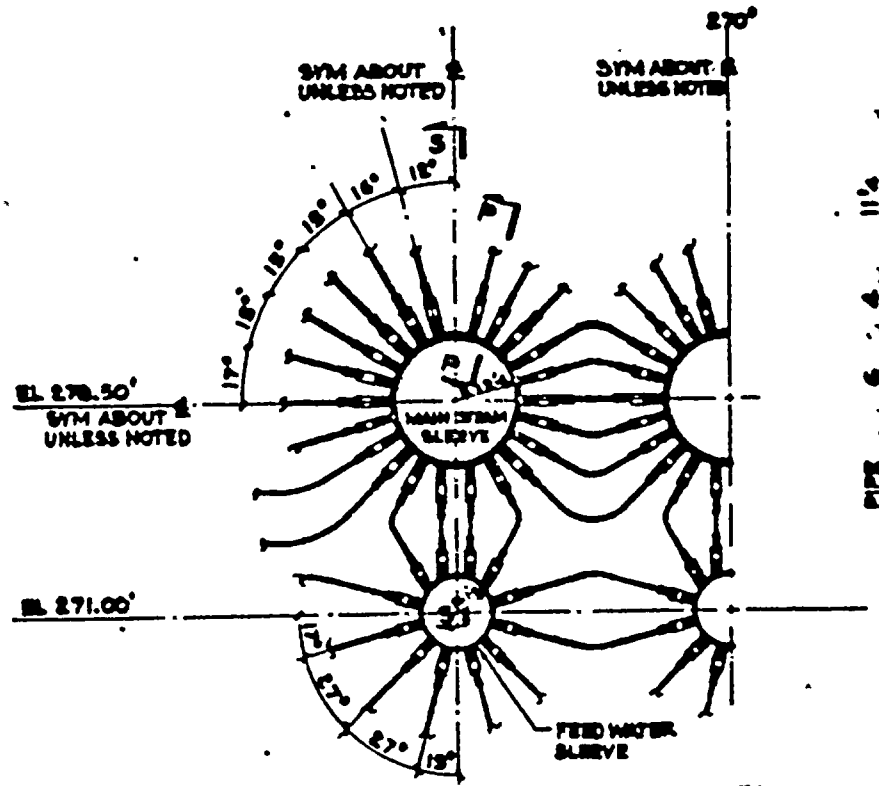
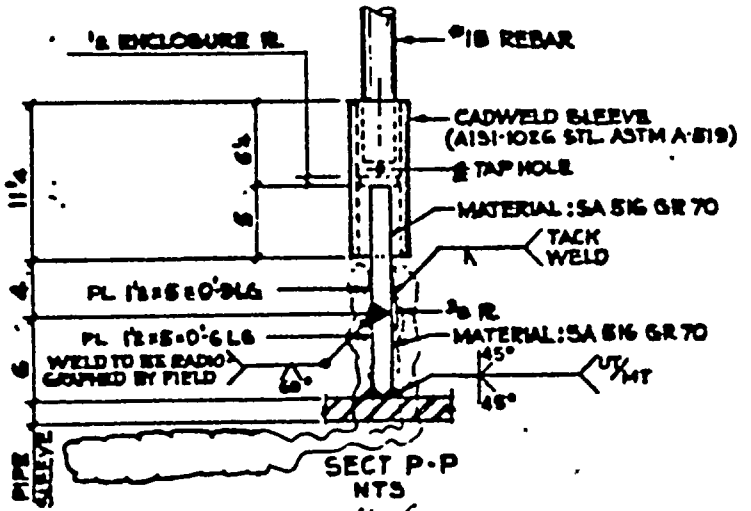
CONCRETE CONTAINMENT STRUCTURE - MS & FW PENETRATION REINFORCING

FIGURE 3.8.1-8



DEVELOPED ELEVATION AT M.S. & F.W. SLEEVES
NTS



SECT P-P
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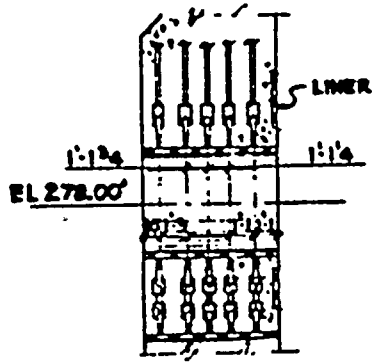

SECT S-S
NTS

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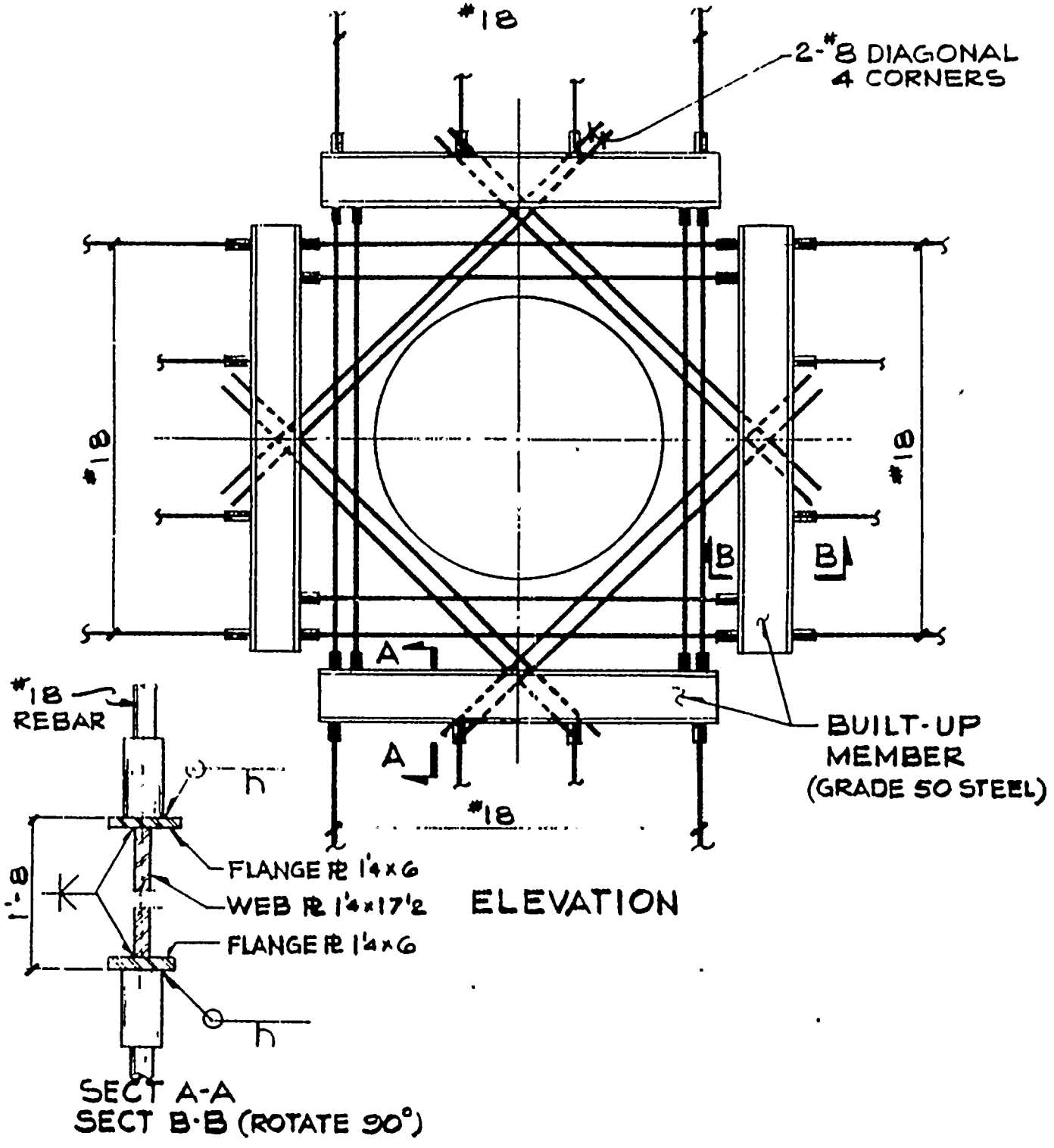
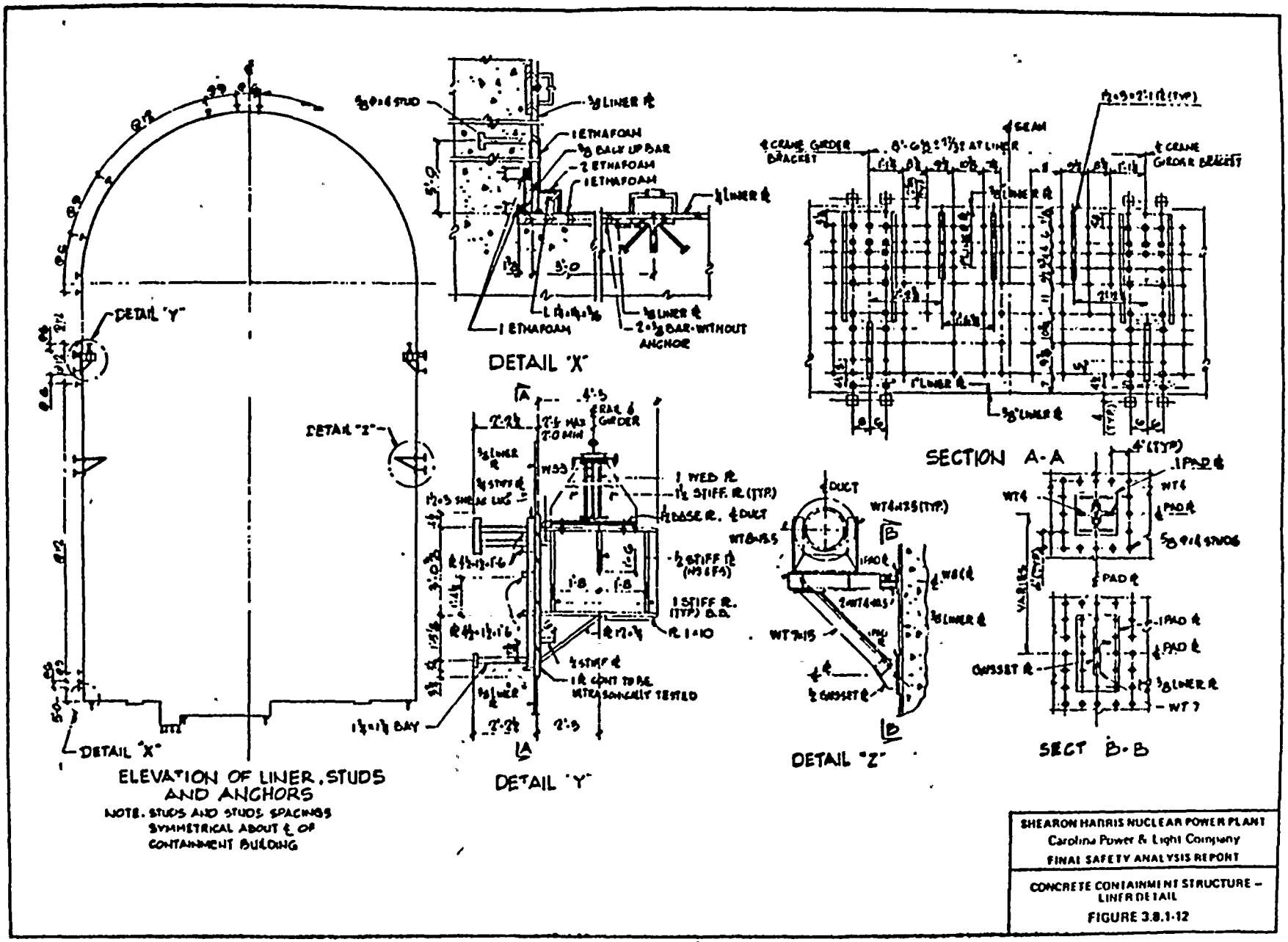
CONCRETE CONTAINMENT STRUCTURE
MS & FW PENETRATION ATTACHMENT
FIGURE 3.8.1-10



SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	CONCRETE CONTAINMENT STRUCTURES – SMALL PENETRATION REINFORCING	FIGURE 3.8.1-11



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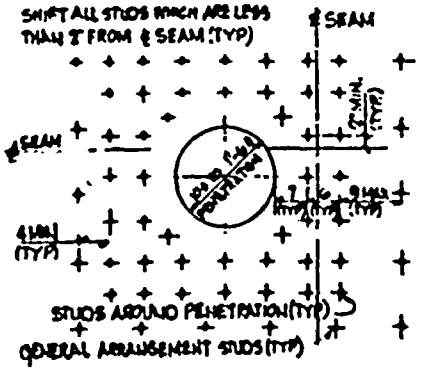
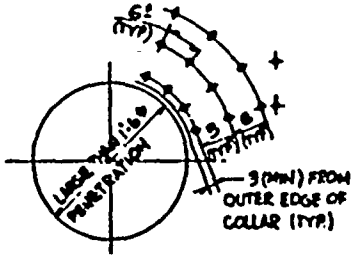
CONCRETE CONTAINMENT STRUCTURE – LINER DETAIL

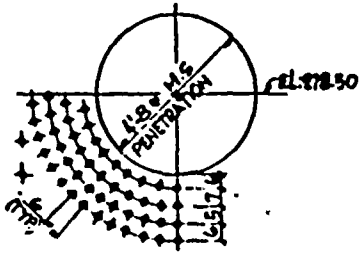
FIGURE 3.8.1-12



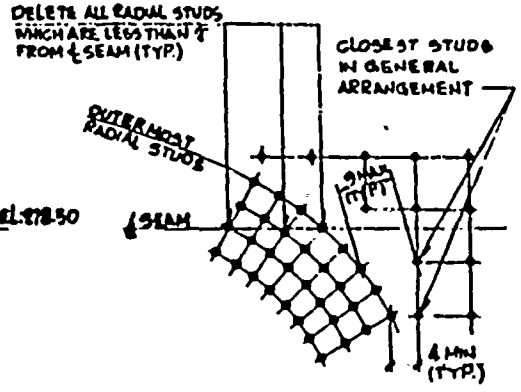
TYPICAL SPACING DET FOR 10"ϕ TO 1'-6"ϕ PENETRATIONS



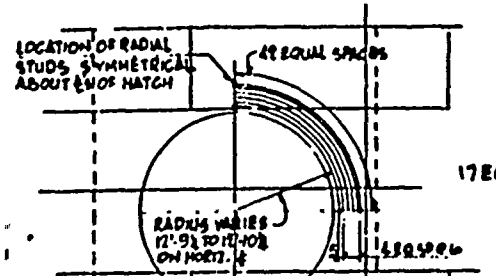
TYPICAL SPACING DETAILS FOR LARGER THAN 1'-6"ϕ PENETRATIONS (UNLESS NOTED)



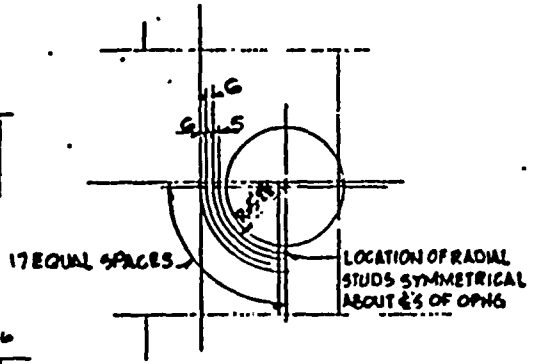
TYPICAL SPACING DETAIL FOR 4'-8"ϕ M.S. PENETRATION



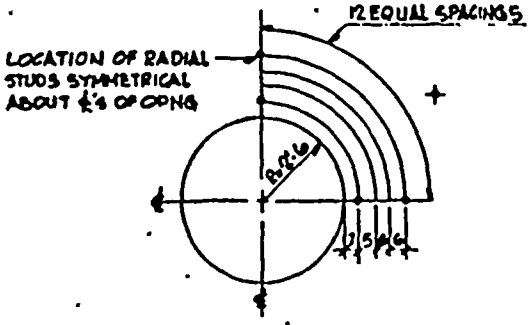
TYPICAL SPACING DETAIL AT TRANSITION BETWEEN RADIAL AND GENERAL ARRANGEMENT STUDS



EQUIPMENT HATCH PENETRATION

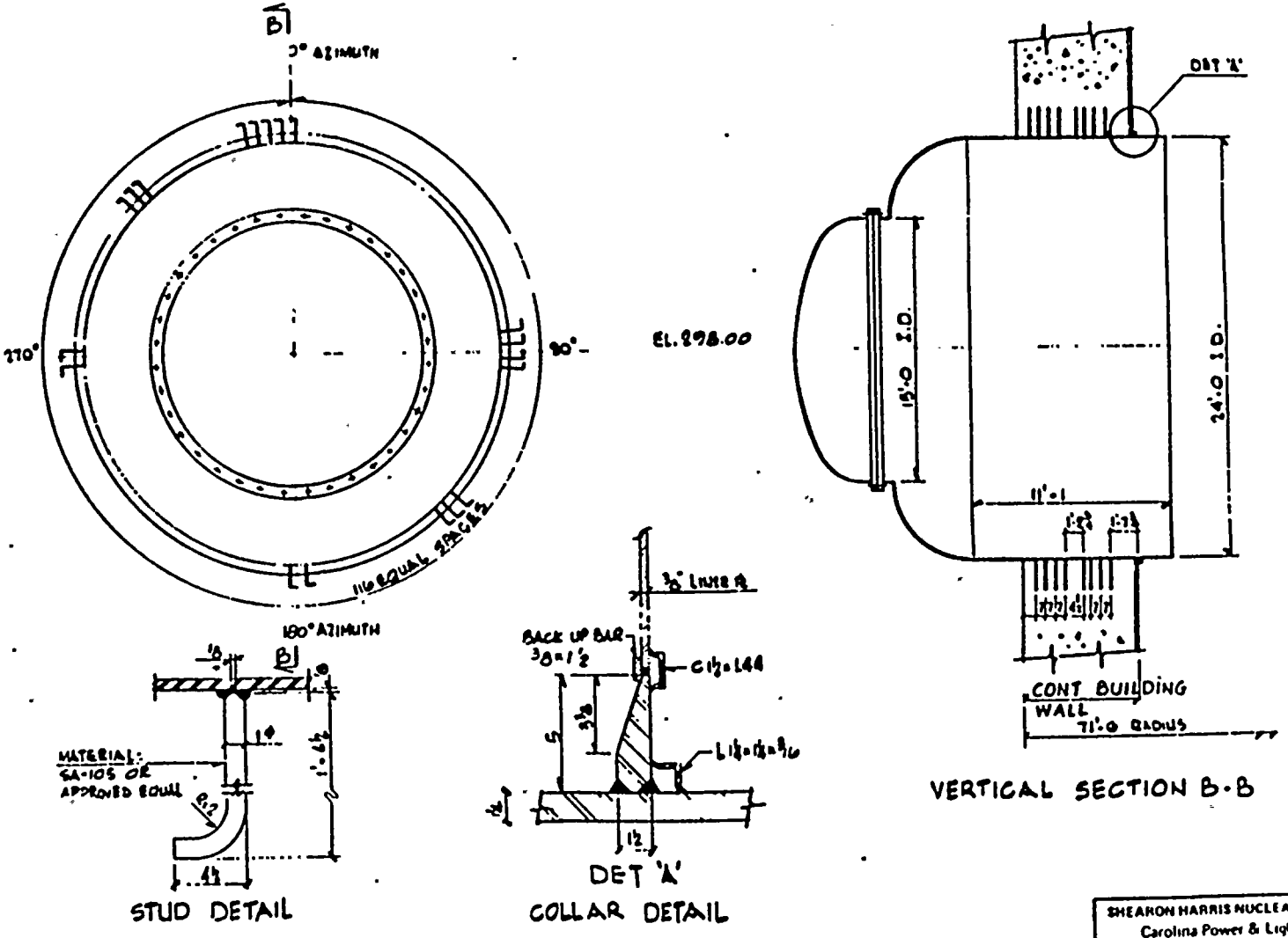


PERSONNEL LOCK PENETRATION



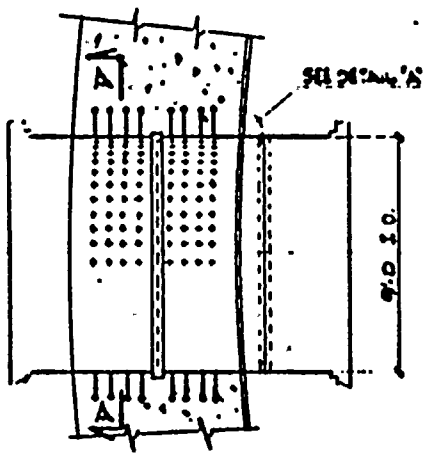
PERSONNEL ESCAPE LOCK PENETRATION

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT
CONCRETE CONTAINMENT STRUCTURE – LINER DETAILS FIGURE 3.8.1-13

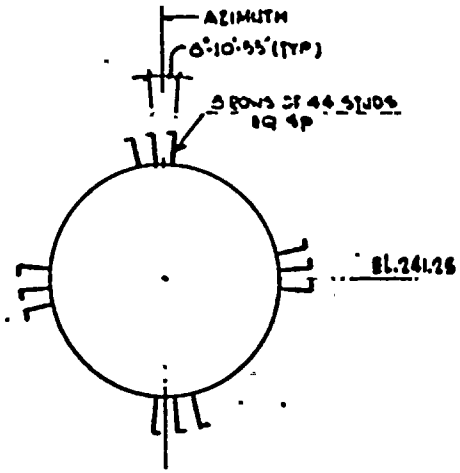


SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

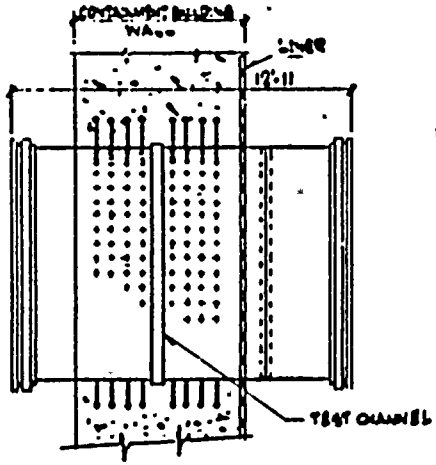
CONCRETE CONTAINMENT STRUCTURE
EQUIPMENT HATCH PENETRATION
FIGURE 3.8.1-14



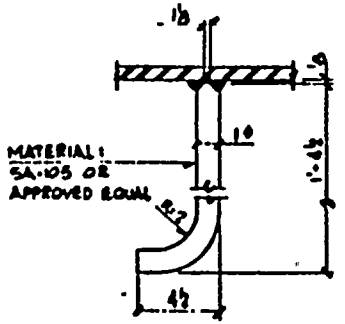
HORIZONTAL SECTION



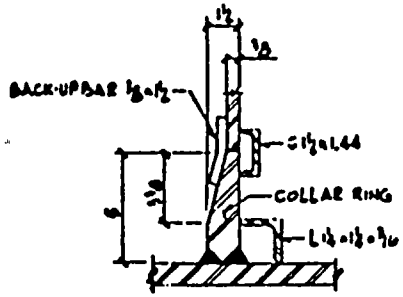
SECT A



VERTICAL SECTION



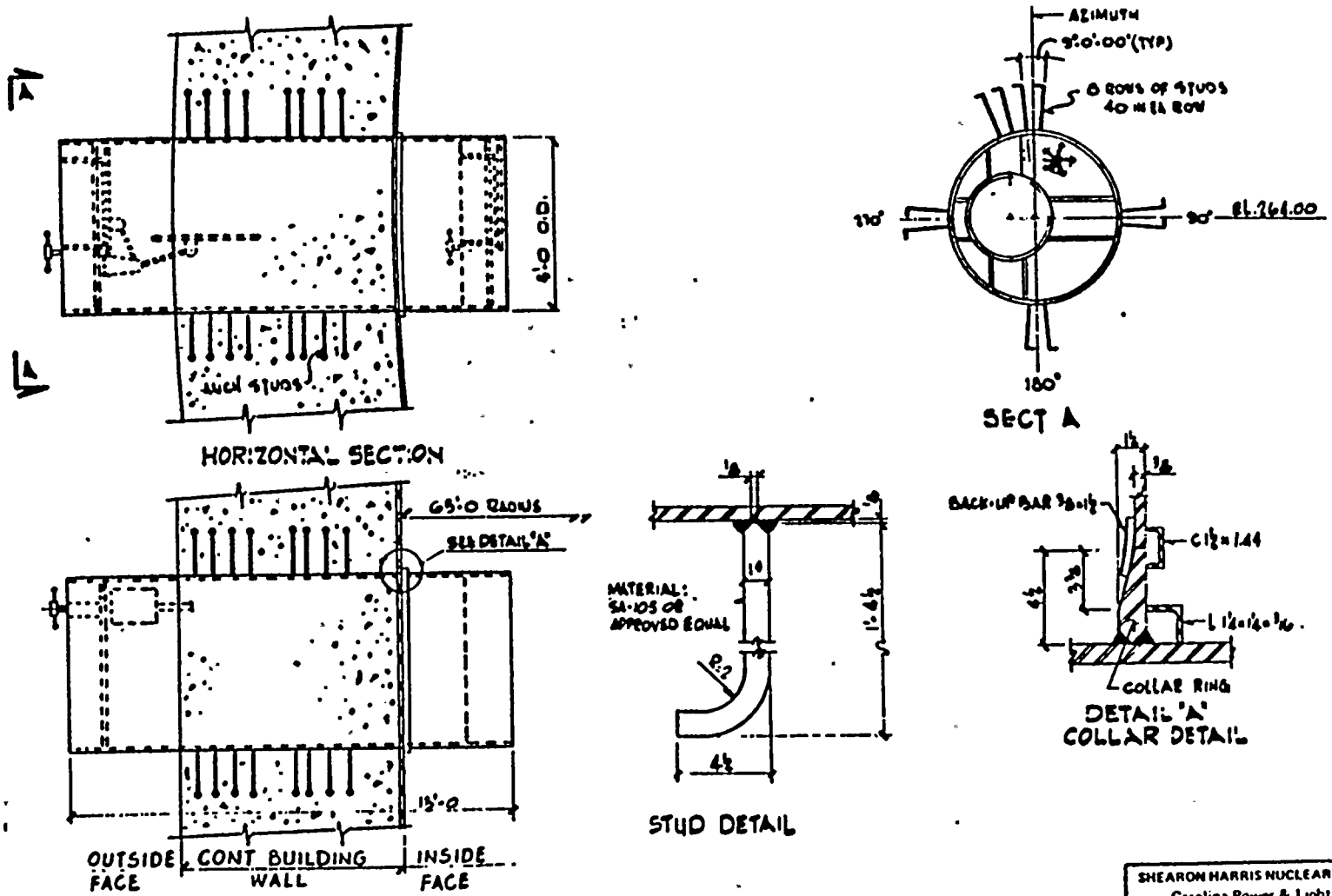
STUD DETAIL



DETAIL 'A'
COLLAR DETAIL

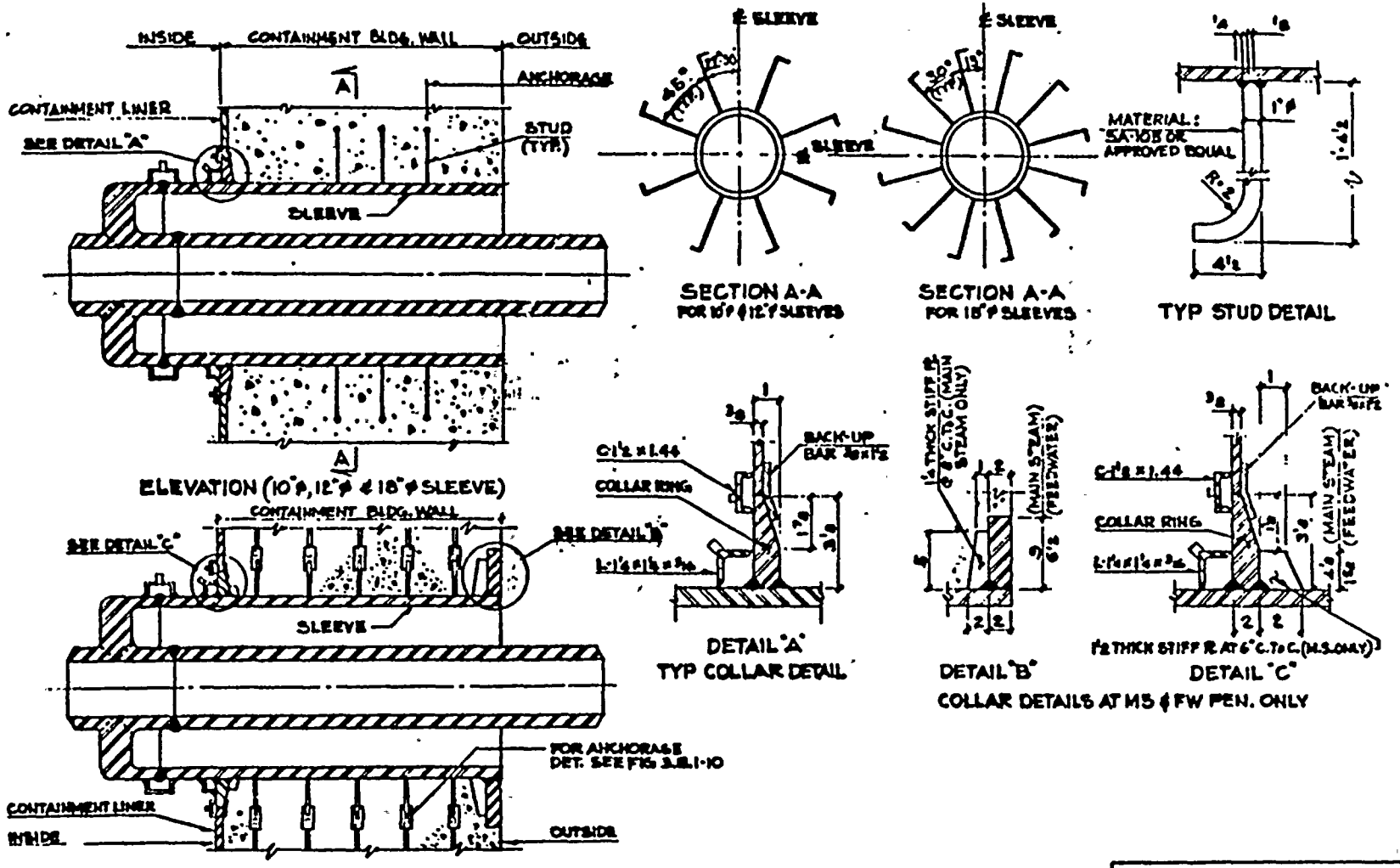
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT STRUCTURE
PERSONNEL LOCK PENETRATION
FIGURE 3.8.1-15



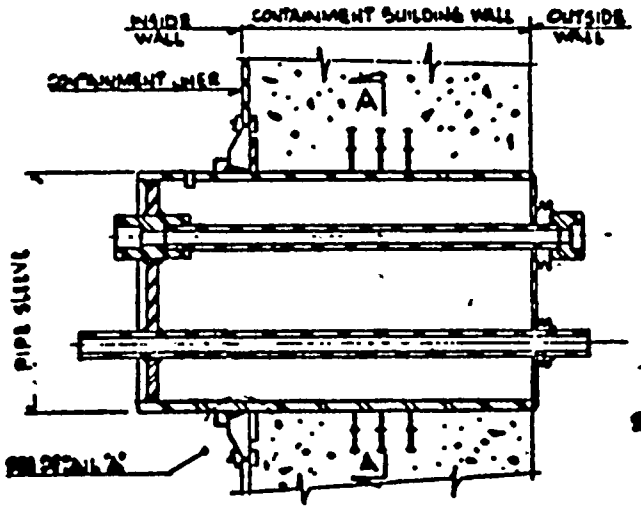
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT STRUCTURE
ESCAPE LOCK PENETRATION
FIGURE 3.8.1-16



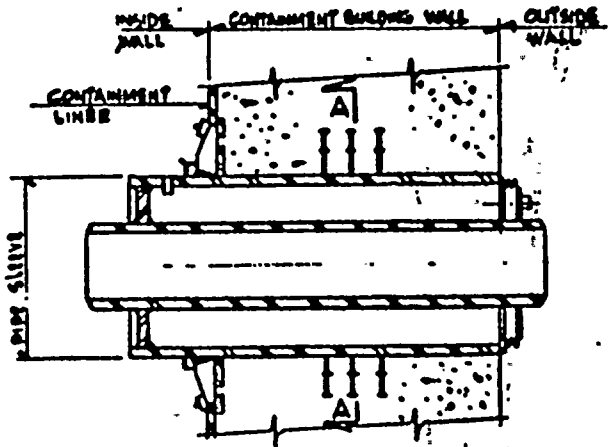
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT BUILDING
MECHANICAL TYPE I PENETRATION
FIGURE 3.8.1-17



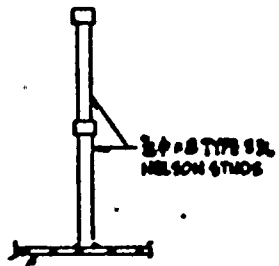
TYPE II A

FOR SINGLE TUBING OR MULTIPLE PIPES &/OR TUBING

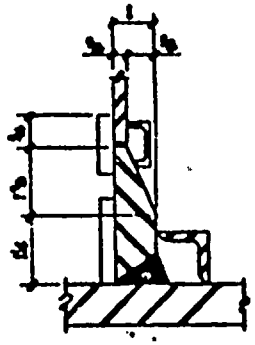


TYPE II B

(FOR SINGLE PIPES)

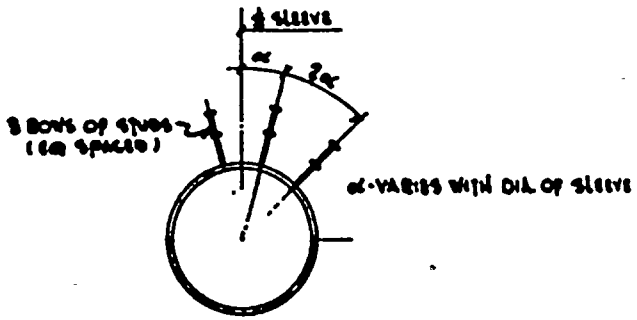


STUD DETAIL



DETAIL 'A'

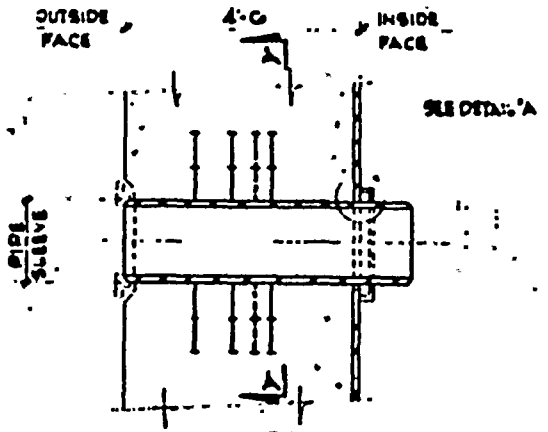
COLLAR DETAIL



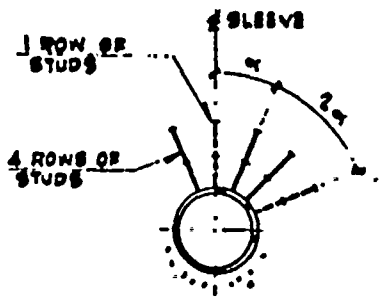
SECT A

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

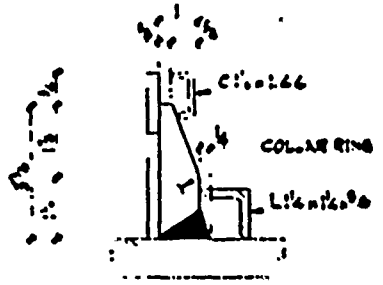
CONCRETE CONTAINMENT BUILDING
MECHANICAL TYPE II PENETRATION
FIGURE 3.8.1-18



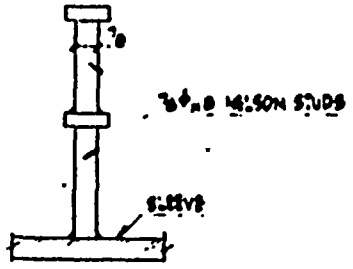
TYPE III
(BASIC SLEEVE)



SECT A



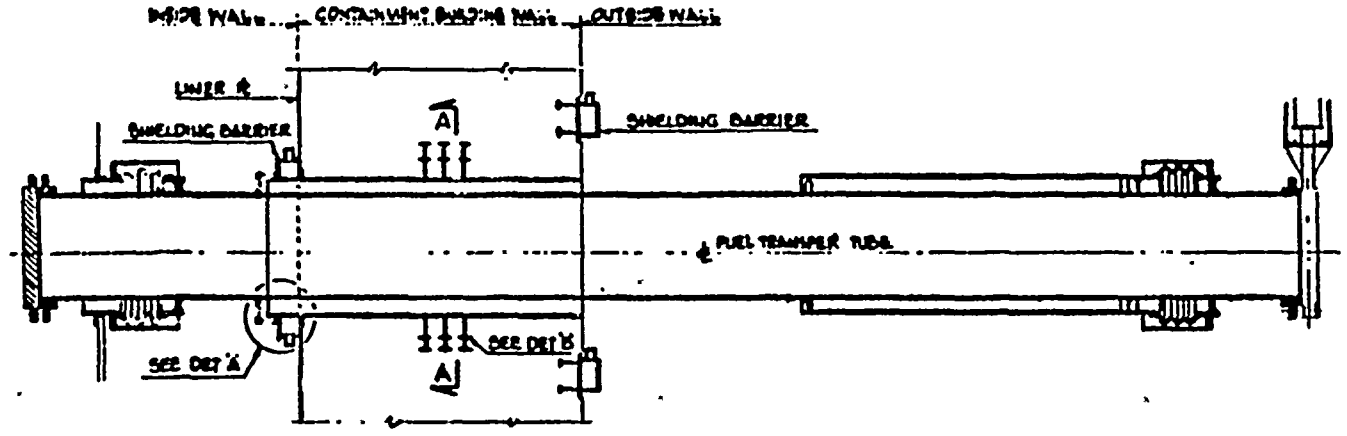
DETAIL A
COLLAR DETAIL

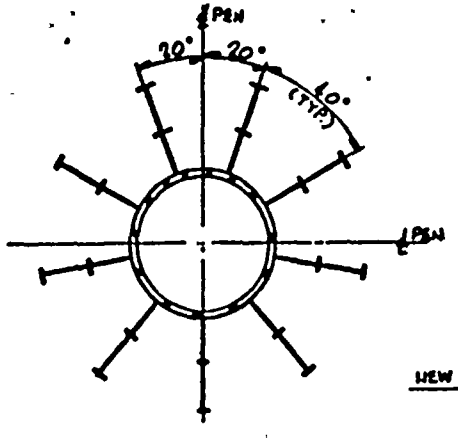


STUD DETAIL

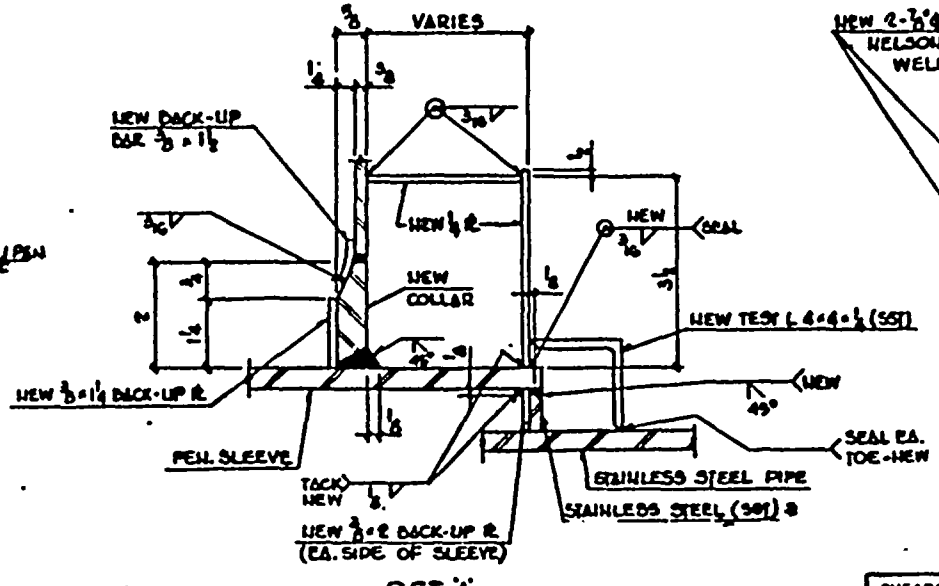
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT BUILDING
ELECTRICAL TYPE III PENETRATION
FIGURE 3.8.1-19

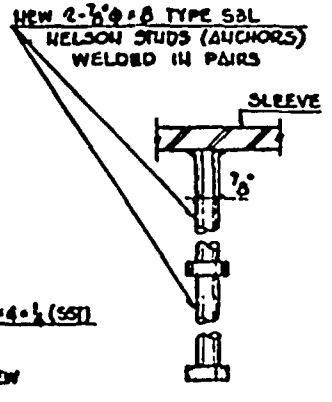




SECT A-A



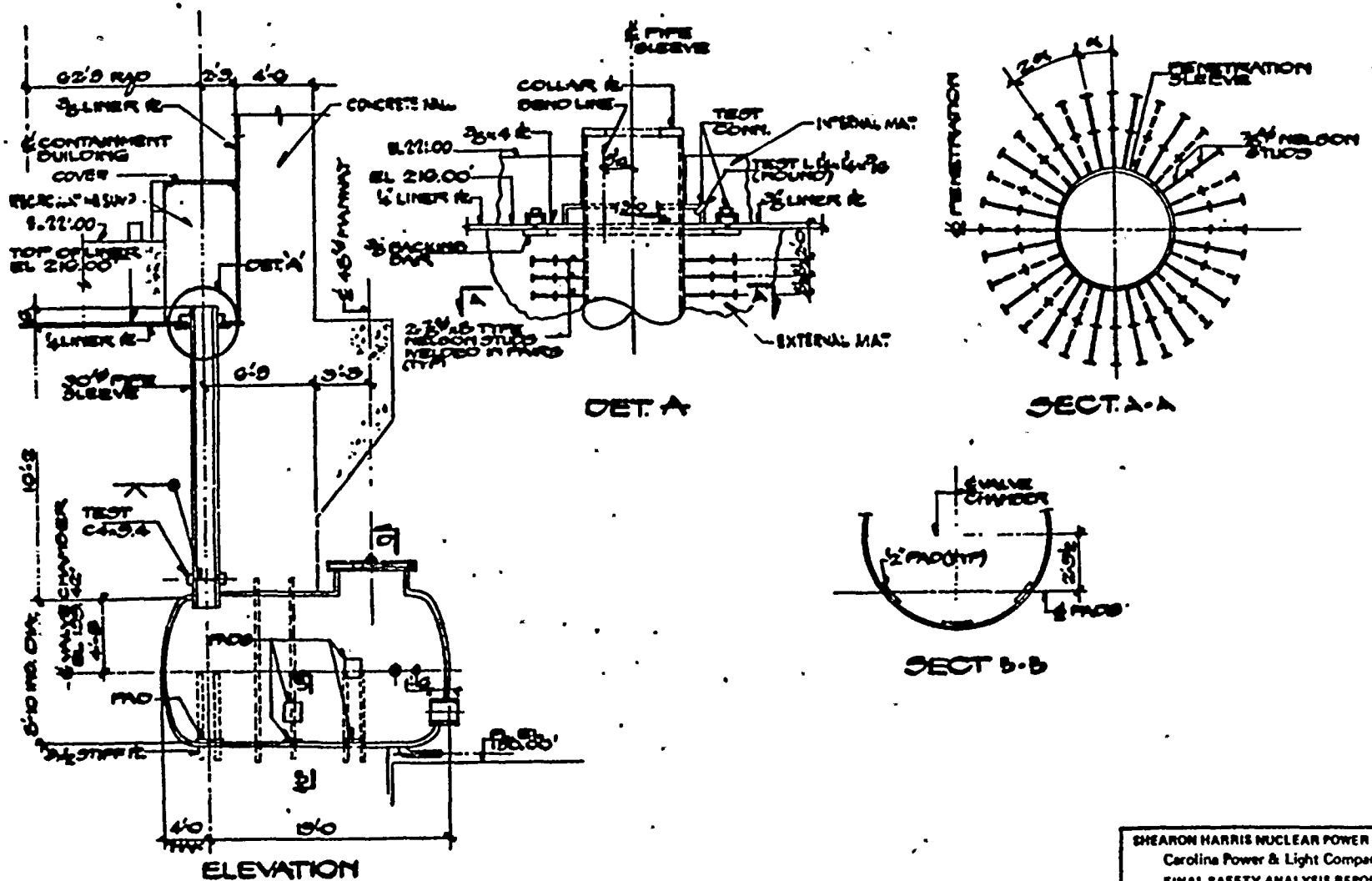
DET 'A'



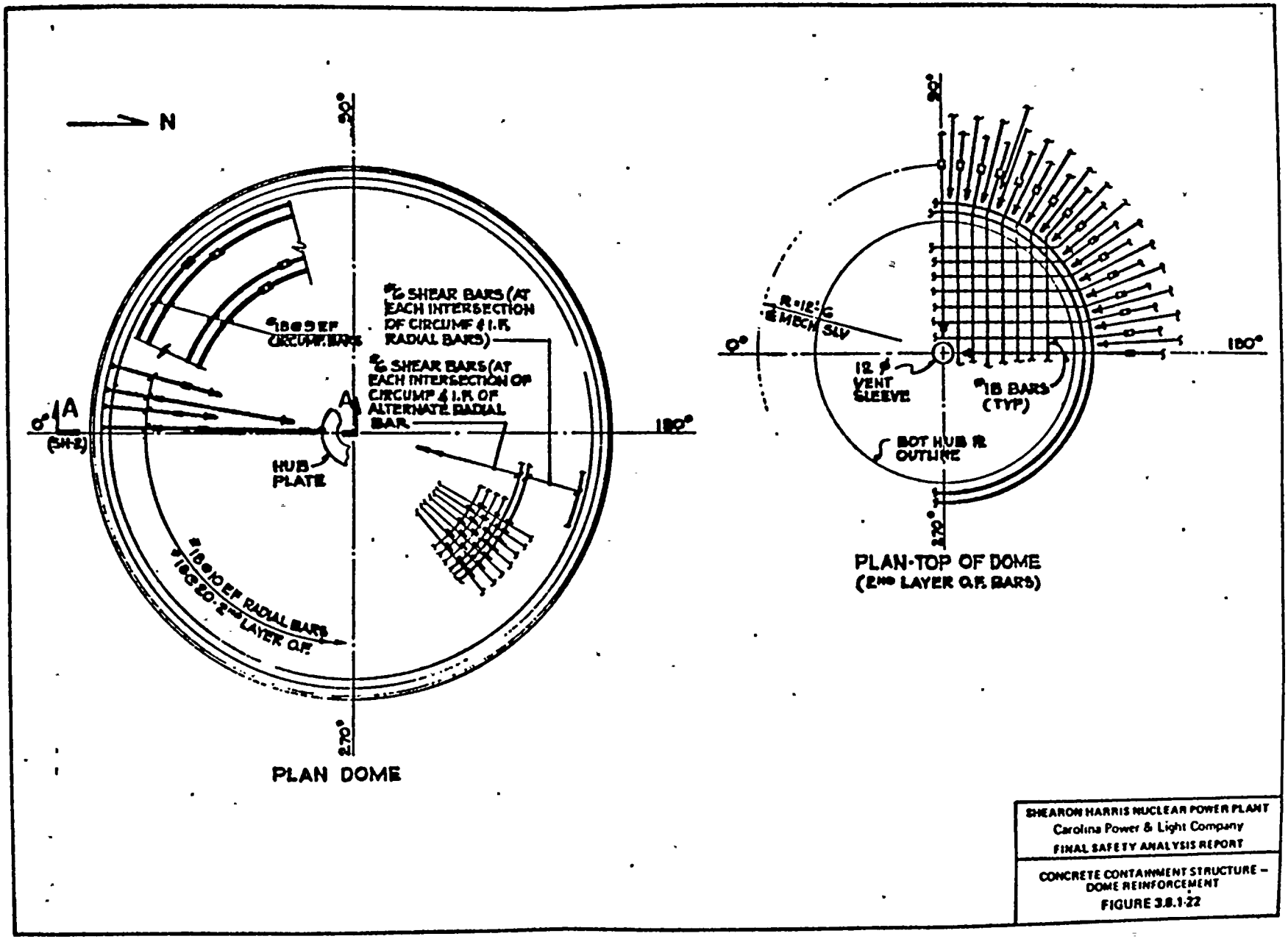
DET. 'B'

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT BUILDING
FUEL TRANSFER TUBE PENETRATION
FIGURE 3.8.1-20



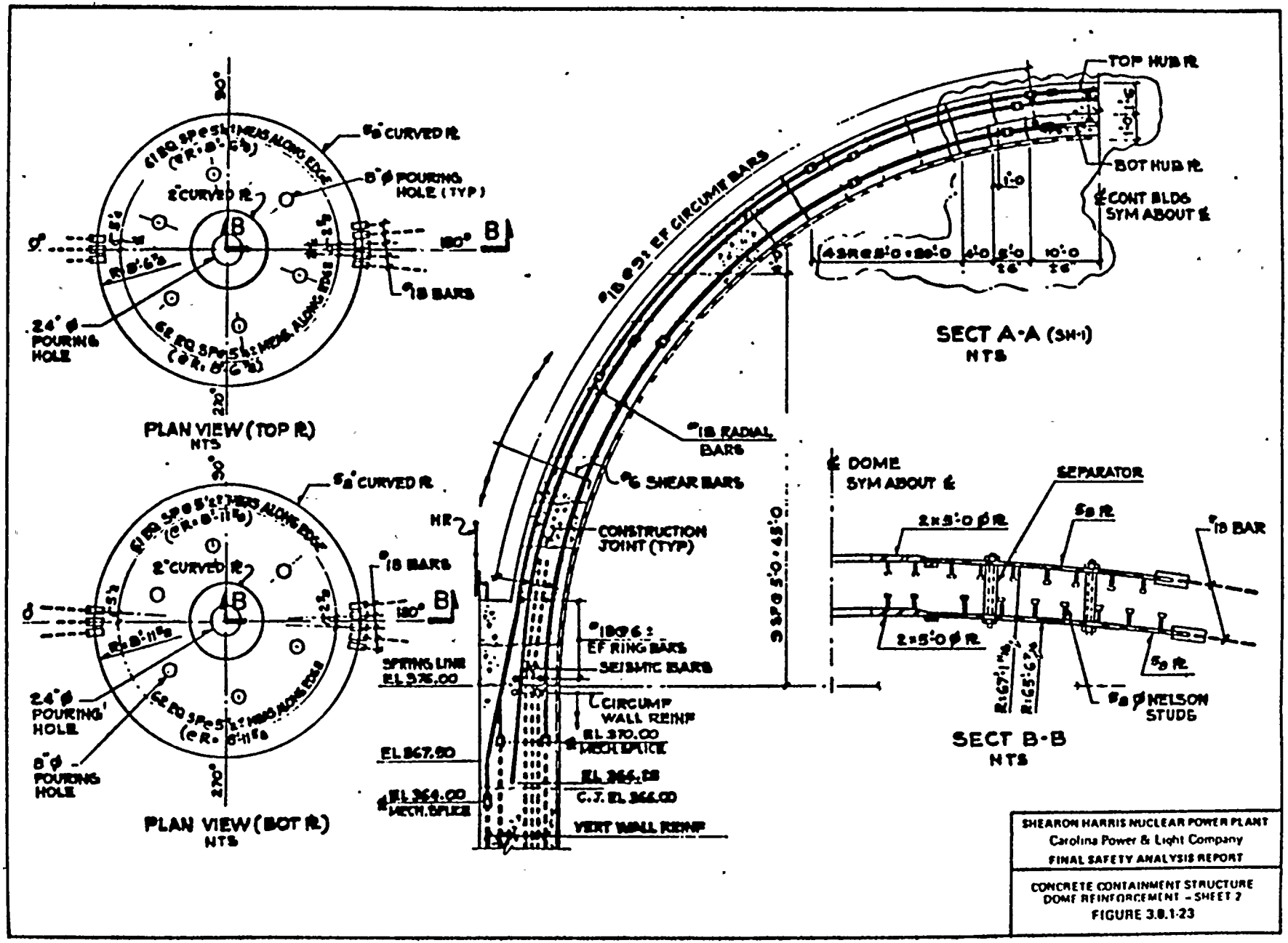
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT
CONCRETE CONTAINMENT STRUCTURE VALVE CHAMBER
FIGURE 3.8.1-21



SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT STRUCTURE – DOME REINFORCEMENT

FIGURE 3.8.1-22



SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

CONCRETE CONTAINMENT STRUCTURE
DOME REINFORCEMENT - SHEET 2
FIGURE 3.8.1-23

CAROLINA POWER & LIGHT COMPANY

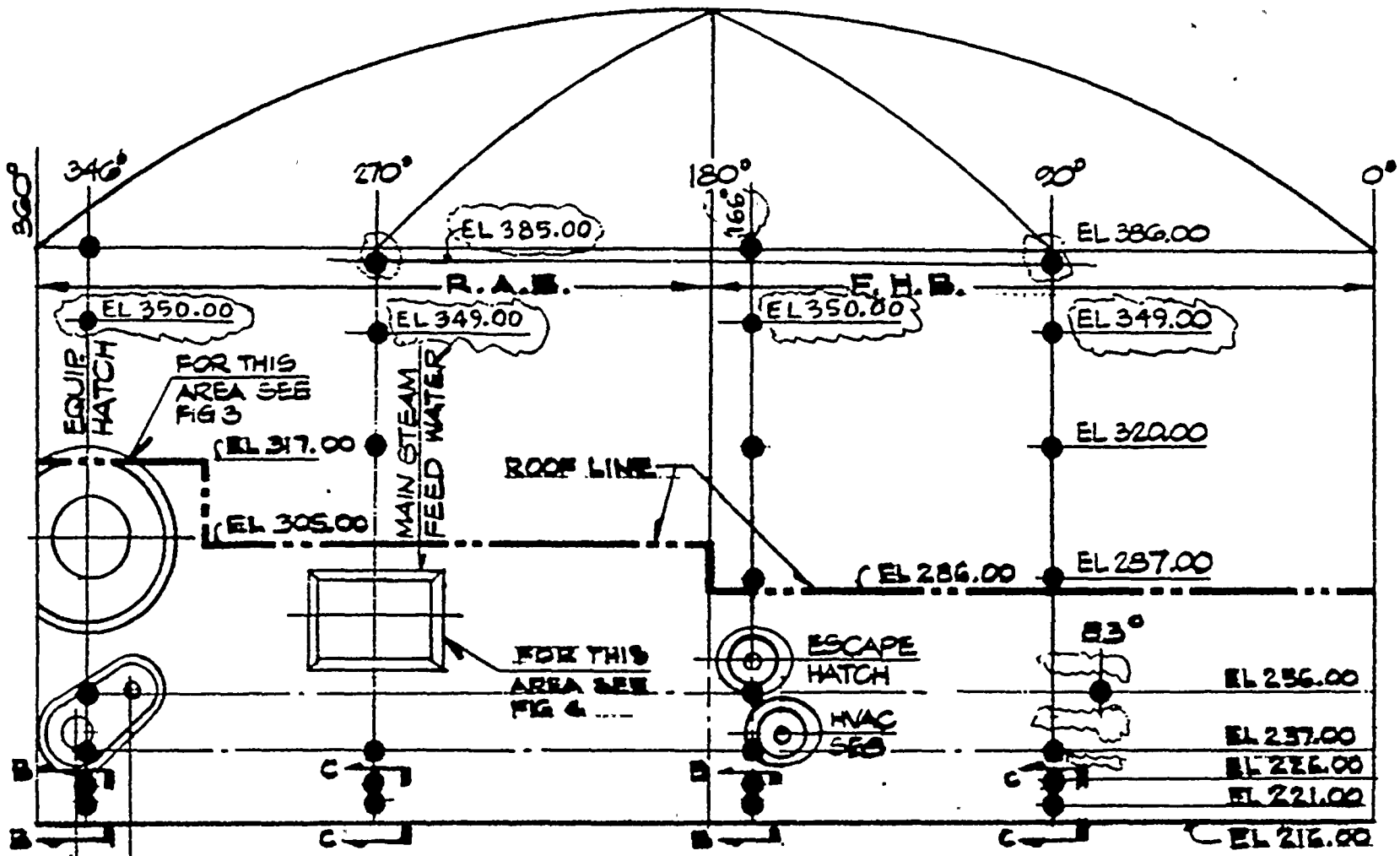
SHEARON HARRIS NUCLEAR POWER PLANT

PREDICTED BEHAVIOR OF CONTAINMENT BUILDING

DURING STRUCTURAL INTEGRITY TEST

APPENDIX B

CAR-SH-CH-22 FIGURES FOR DISPLACEMENT MEASUREMENT LOCATIONS



DEVELOPED ELEVATION - OUTSIDE FACE OF WALL

NOTES FOR PREDICTIONS REPORT:

1. SECTIONS B-B & C-C DO NOT SHOW MEASUREMENTS LOCATIONS & ARE NOT SHOWN
2. NOTE ON FIGURE 3 APPLIES TO THIS FIGURE

SPEC. REV. NO	DATE	BY	CH	APPROVED
5	10-28-85	JM	MW	
4	1-26-83	HW	JFS	

EBASCO SERVICES INCORPORATED

DIV. CIVIL (CH.) DR. JANES

DATE 12-7-82 CH. MW

SCALE NONE

APPROVED

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT

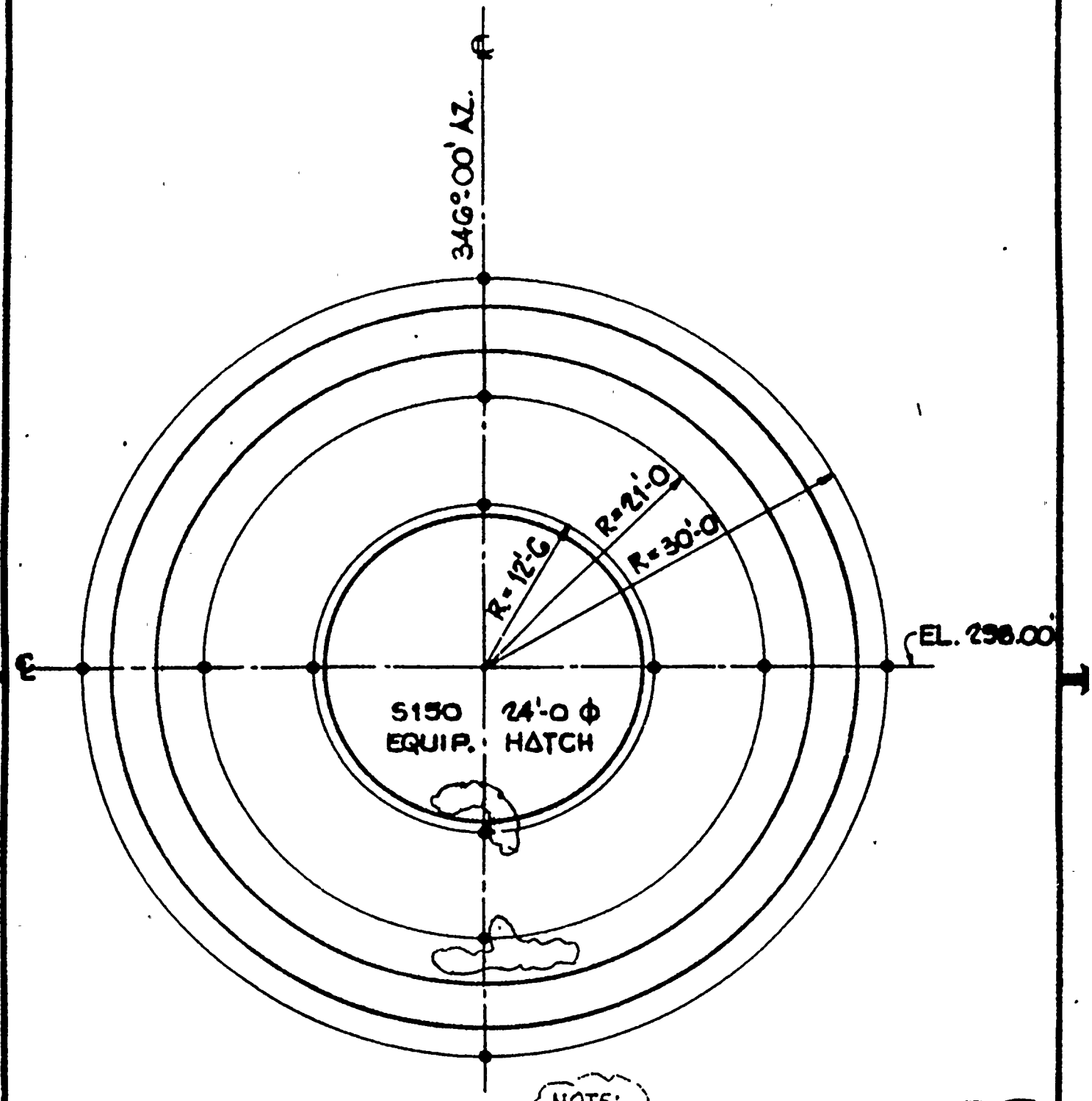
900.000 KW UNIT 1

CYLINDER WALL RADIAL DISPLACEMENT MEASUREMENT LOCATIONS

FIGURE 2

SPECIFICATION CAR-SH-CH-22

SPECIFICATION CAR-SH-CH-22



NOTE:
DISPLACEMENTS MAY BE MEASURED FROM EITHER THE INTERIOR OR EXTERIOR OF THE WALL.

5	10-28-85	JM	MW
SPEC. REV. NO.	DATE	BY	CH.

EBASCO SERVICES INCORPORATED

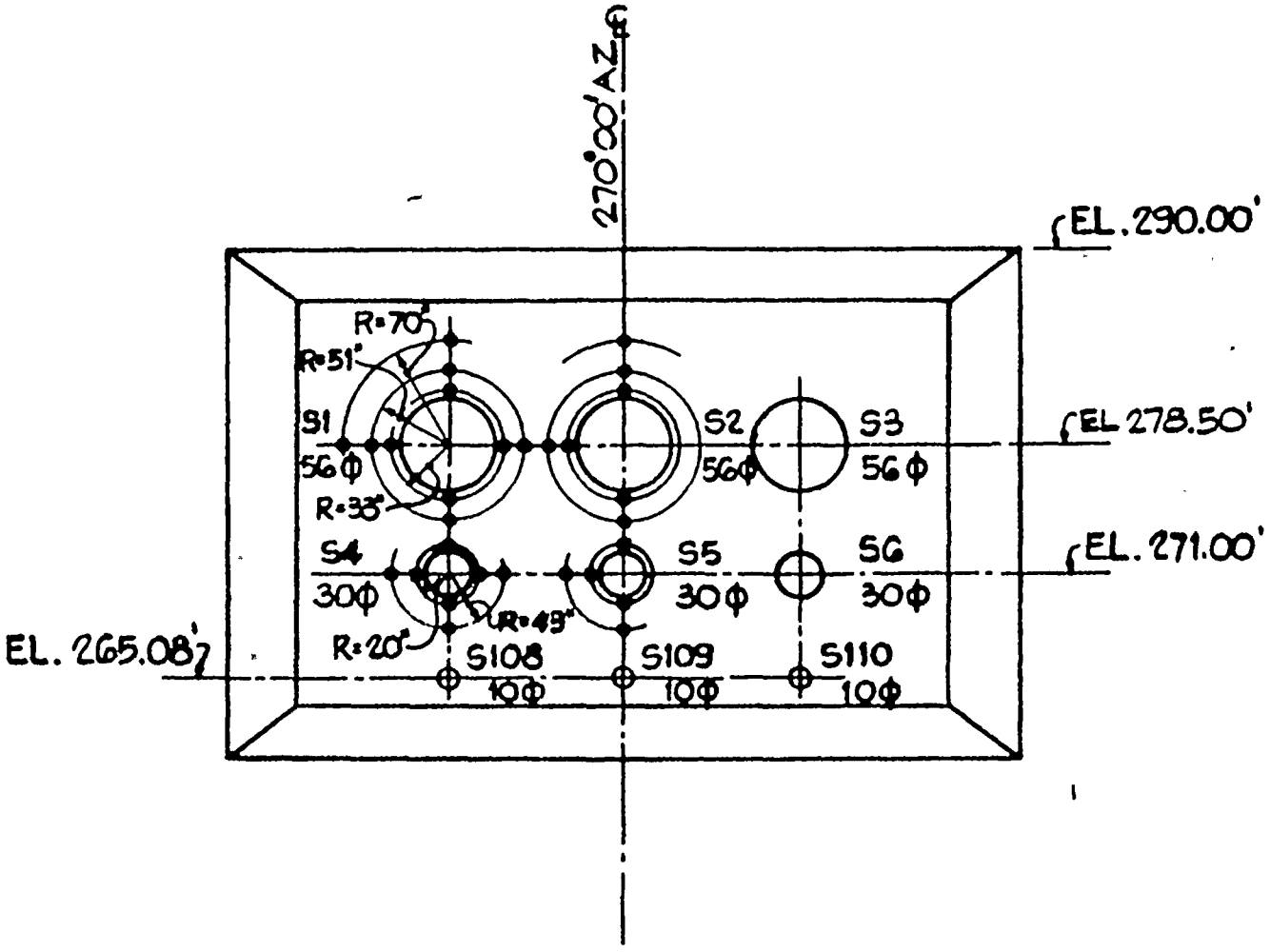
DIV. CIVIL (C.H.) DR. [illegible]
DATE 10-7-83 CH. J. MANSHAN
SCALE NOT TO SCALE

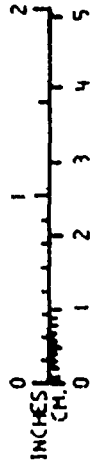
APPROVED

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NOS. 1 AND 2

CONT. BLDG. EQUIP. HATCH RADIAL DISPLACEMENT MEASUREMENT LOCATIONS

FIGURE 3

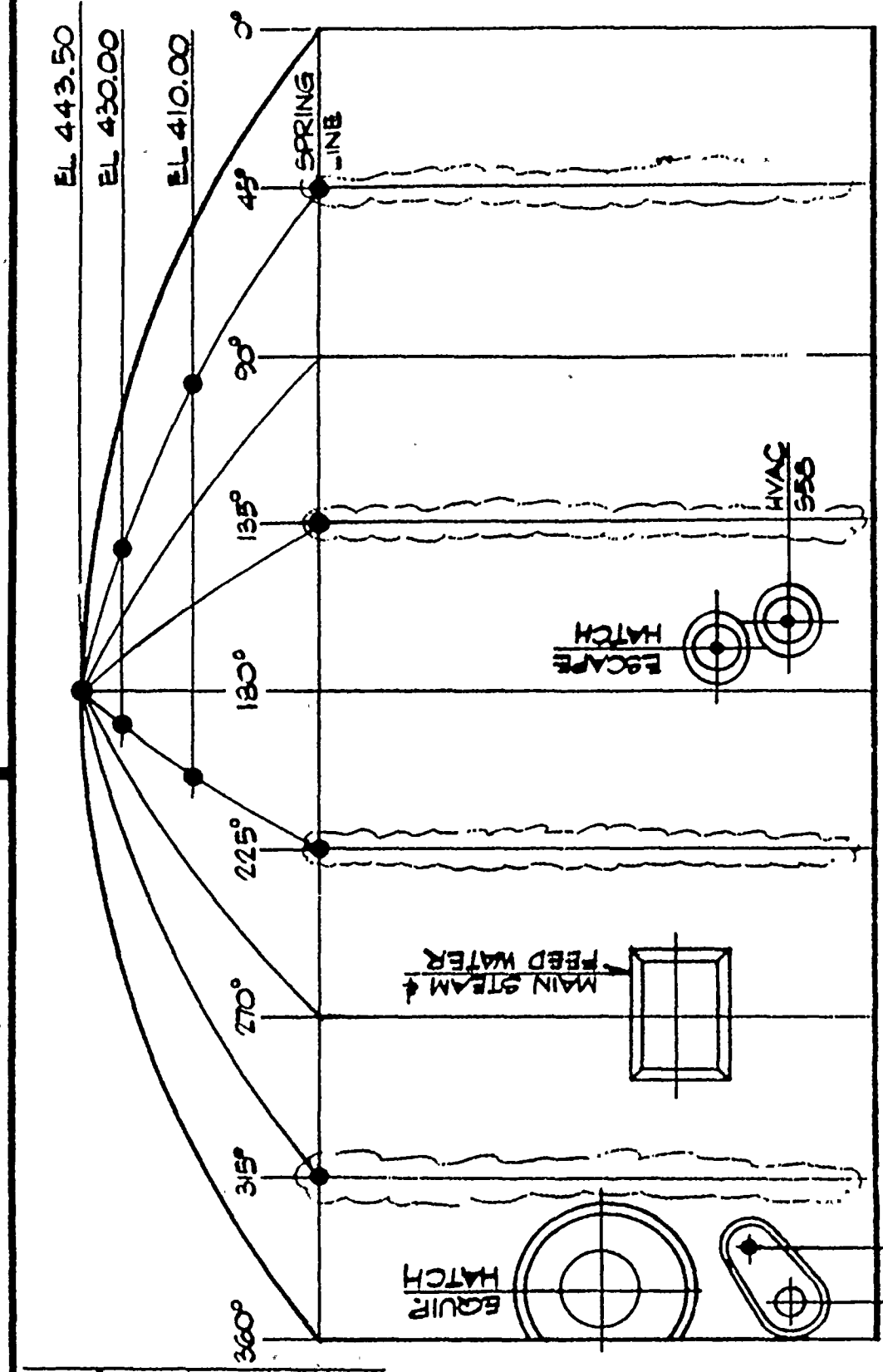




NOTE FOR PREDICTION REPORT:
NOTE ON FIGURE 3 APPLIES TO THIS FIGURE

3

EBASCO SERVICES INCORPORATED	CAROLINA [illegible] COMPANY SHEARON [illegible] PLANT UNIT 1	FIGURE 4
DIV. CIVIL (C.H.) DR. WAGNER J. MANCHAK DATE 12-7-93 CH. SCALE NOT TO SCALE	APPROVED	
	CONT. BLDG. MAIN STEAM & FEEDWATER PENETRATIONS RADIAL DISPLACEMENT MEASUREMENT LOCATIONS	



NOTE FOR PREDICTION REPORT:
NOTE ON FIGURE 3 APPLIES TO THIS FIGURE

INCHES 0 1 2 3 4 5
CM. 0 1 2

5	10-28-85	JM	LEW
SPEC. REV. NO.	DATE	BY	CH.

EBASCO SERVICES INCORPORATED

DIV. CIVIL (C.H.) DR. JANES J. MAN...
DATE 12-7-83 CH. CHAK
SCALE NONE

APPROVED

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
900,000 KW UNIT 1

CYLINDER WALL & DOME VERTICAL DISPLACEMENT MEASUREMENT LOCATIONS

FIGURE 5

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT

PREDICTED BEHAVIOR OF CONTAINMENT BUILDING
DURING STRUCTURAL INTEGRITY TEST

APPENDIX C

FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR CONTAINMENT BUILDING

TABULATION OF FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-049R1	12/19/77	2167-G-2213, G-611: Bevelled keyways, relocated keyway waterstops.
FCR-C-065	02/18/78	2167-G-612 R4: Relocated welded wire mesh to lower elev. (216)
FCR-C-097	04/14/78	No ref. doc.: Replaced work slab by asbestos cement board
PW-C-100	04/18/78	2167-G-550, G-560: Seal mat section below strength concrete accepted
FCR-C-116	05/03/78	2167-G-615 R3, G-616 R3: Rearrangement of mechanical splice locations in mat, El. 180 to 204
FCR-C-117	05/03/78	2167-G-614 R5, G-617 R5, B-9005-1 R6: Reactor sump rebar adjustments made to maintain correct spacing
FCR-C-120	05/04/78	2167-G-550 R7, G-617 R5,: Seal mat, Azimuth 180-204, rebars relocated to clear areas of excessive preceding concrete pour
FCR-C-125	05/09/78	2167-G-612 R4, G-613 R4, 614 R4, G-616 R2: Mat construction joints rearranged
FCR-C-137	05/24/78	2167-G-612, 3, 4, 5: Deleted mat construction joints at Azimuths 90 and 30; added joint at Azimuth 11
FCR-C-142	05/23/78	2167-G-611 R5: Deleted mat construction joint at El. 195.42
PW-C-164	06/07/78	2167-G-614 R5: Relocated reactor sump rebars to obtain tolerances
FCR-C-179	06/28/78	2167-G-611: Reduced time interval between mat concrete placements
FCR-C-186	07/05/78	2167-G-618 R5: Relocated CB exterior wall dowels
FCR-C-189	07/11/78	2167-G-617 R5: Corrected rebar concrete cover insufficiency at El. 207
FW-C-191	07/11/78	2167-G-613 R5: Accepted omission of five (5) horizontal rebars in keyway (near El. 216)

TABULATION OF FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-192	07/11/78	2167-G612 R5: Corrected reactor cavity incorrect rebar bends
FCR-C-193	07/11/78	2167-G-612 R5: Accelerated construction by introduction of additional staggered rebar mechanical splices
FCR-C-199	7/14/78	2167-G-613 R5: Relocated row of shear bars in keyway to allow surface preparation for next pour
PW-C-202	07/19/78	2167-G-610 R6: Mat waterproof membrane damaged and repaired (six (6) places)
PW-C-208	07/24/78	2167-G-616 R2: Mechanical splice repaired
FCR-C-210	07/26/78	2167-G-610 R6: Deleted mat construction joints at Azimuths 208, 270, 330
FCR-C-213A	02/16/79	2167-G-619: Removed or bent rebars interfering with valve chamber portion to be embedded in the mat
PW-C-235	08/19/78	2167-G-615 R4: Accepted local spacing violation of two (2) mat circumferential bars at El. 216
FCR-C-236	08/16/78	No document: Increased concrete at top of mat to obtain top rebar cover
PW-C-255	08/31/78	2168-G-228 R8: Accepted change in sump liner elevation due to grouting
FCR-C-259	09/01/78	2167-G-611 R5: Revised topping concrete finish
FCR-C-291	09/27/78	2167-G-631 R4: Deleted lean concrete at construction opening and protected exposed rebars

TABLULATION OF FIELD CHANGED AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-303A	02/17/79	Corrected 8th row dowel incorrect projections by extending projections using mechanical sleeve connections; deleted excess dowels
PW-C-312A	02/17/79	2167-G-1630 R3: Containment base slab drainage-corrected mislocated drainage pipe
FCR-C-362	11/06/78	2168-G-289 R3: Penetrations sleeves shortened to fit into forms
FCR-C-369	11/06/78	2167-G-631 R4, G-901 R0: Increased thickness (1 in. max) around major penetrations to suit forms
FCR-C-363	11/07/78	2168-G-231 R11, 2167-G-631: Increased length of penetration sleeves
FCR-C-388	11/15/78	2167-G-683 R2, B-9005-20 Sh. 4 of 4: Cut rebars and added splices at shear key
FCR-C-411	12/13/78	2167-G-683 R2: Lengthened several too short bars at Azimuth 180 by mechanical sleeves splicing
FCR-C-412	12/13/78	2167-G-761 R2: Added temporary opening below air lock to accommodate later insertion of rebars (due to late delivery of lock)
FCR-C-425	12/21/78	2167-G-631 R4, G-630 R3: Extended equipment hatch blockout to include air lock S-151 region
FCR-C-459	01/16/79	2167-G-680 R4: Deleted construction joints at Azimuths 190 and 340, El. 221
FCR-C-499	02/06/79	Same as FCR-C-459
FCR-C-520	02/21/79	2167-G-685 R3: Bent mat dowels at El. 221 per ACI-359

TABULATION OF FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-522	02/21/79	2167-G-683 R3: Relocated (in elevation) 1st layer radial bars in mat from bottom of internal mat El. 216
FCR-C-533	02/26/79	None: Used 3/4 in. expanded metal mesh for vertical construction joints
FCR-C-538 R1	03/02/79	2167-G-618 R6, 619 R6, R31 R5: Adapted cylinder wall vertical rebars to accommodate mislocated dowels in wall key
FCR-C-594	03/29/79	2167-G-619 R6: Row 1 dowels interference with Penetrations S-25, 27, 31, 88 (dowels bent, some cut to clear interferences)
FCR-C-508	03/01/80	2167-G-864: Added No. 8 rebars in mat to makeup rebars displaced by conduit
FCR-C-612	04/09/79	2167-G-632 R2, 633 R2, 634 R2, 635 R2, 636 R3, 637 R3: Replaced cylinder wall rebar terminations in steel beams by bent rebars
FCR-C-660	05/07/79	2167-G-763 R3: Blockout of MS-FW penetration area: Provided detail for alternative with no rebars
PW-C-682	05/15/79	2167-G-618 R6, 619 R6: Cylinder wall dowels at El. 218, rows 1, 28 mislocated and rebars above restored to specified location by gradual displacements
PW-C-727	06/06/79	2167-G-641 R3: El. 226, variations in concrete cover for 10th row bars between 3-1/2 to 6 in.
FCR-C-731	06/07/79	None: Cleanout troughs added to cylinder wall at construction joints about 20 ft. spacing
FCR-C-732	06/08/79	2167-G-631 R4: Cylinder wall relocation of construction joint at El. 226 pour to clear mechanical sleeve splices
FCR-C-841	08/15/79	2167-G-766 R3: Revision to weld on mechanical connection sleeves

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-850	08/17/79	2167-G-766 R2: Revision to weld on mechanical connection sleeves
FCR-C-883	08/29/79	2167-G-762: Added vertical construction joints 17 ft. on either side Penet. S-58 between El. 226 and 236
FCR-C-953	09/27/79	2167-G-630: Replaced four (4) vertical construction joints in cylinder wall with five (5) joints for pour at El. 236
PW-C-984 R1	11/02/79	2167-G-618 R6, 619 R6, 641 R3, 650 R3: Revised vertical reinforcement of Rows 8, 7 to accommodate too-short, missing and mislocated rebars between El. 236 and 246 and Azimuths 16 to 160
PW-C-1033	11/09/79	2167-G-762 R3: Repair of unsatisfactory weld of mechanical splice sleeve at Penet. S-58
FCR-C-1085	12/02/79	2167-G-618 R2, 2167-G-561 R2: Added No. 8 or No. 10 rebars horizontally and vertically at interior face in region of excessive concrete cover of outermost rebars
FCR-C-1115	12/10/79	2167-G-631 R6: Relocated horizontal construction joints from El. 258 to 256 to accommodate forms
FCR-C-1129	12/18/79	2167-G-632 R2, 633 R2, 634 R2, 635 R2, 636 R3, 637 R3: Replaced rebar splice structural beams with bent bars on rebar rows 9, 10
FCR-C-1143	01/04/80	Bethlehem dwg 8099-43: Added rebar mechanical splice sleeve to radial rows 2 and 3
FCR-C-1197 R1	09/02/80	2167-G-631 R6: Added horizontal construction joints around S-58 at El. 242 and S-152 at El. 263

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-1205	02/04/80	2167-G-761 R3: Row 1 vertical rebars under Penet. S-151 deficient welds in two (2) mechanical sleeve connections accepted
FCR-C-1234	02/15/80	2167-G-631 R6: Added a horizontal construction joint at El. 231, from Azimuth 199 to 148
FCR-C-1243	02/22/80	None: Request made that for exterior surfaces with excess concrete cover rebars, if less than 6 in. cover, leave alone, if 6-9 in. cover, add No. 8 or 10 at 12 in. (Request not approved)
PW-C-1272	03/04/80	2167-G-638 R5: El. 277, Azimuth 45 6th row repaired damaged rebar with mechanical splice sleeve
PW-C-1302	03/18/80	2167-G-630 R5: Add vertical construction joints between El. 236 and 286
FCR-C-1353 R2	07/07/80	2167-G-631 R6: Add horizontal construction joint at El. 311 from Azimuth 240 to 300 and relocated joint at 318 to 316 all around
FCR-C-1355	04/09/80	2167-G-619 R6, 650 R3, Bethlehem 8099-13 R2: Adjustments in Row 8 vertical rebars between penetrations S-92 and S15
PW-C-1361	04/10/80	2167-G-651 R3: Makeup of 7th row vertical and horizontal rebars between Azimuths 16 and 46,. El. 266 to 286 (thirteen (13) verticals, twelve (12) horizontals)
PW-C-1370	04/15/80	2167-G-650 R3: Makeup of 2-8th row vertical bars originating at El. 216
PW-C-1416	04/29/80	2167-G-637 R3, 764 R2, 619 R6: Extension of 7 Row 8 vertical rebars near S-151 to obtain specified rebar arrangement

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-1423	05/05/80	Specification Ch-6-R6: Details provided for vibration procedure to consolidate concrete placement between El. 231 and 236 below equipment hatch
FCR-C-1427	05/05/80	2167-G-651 R3, DCN-550-302 R0: Provisions for addition of exterior surface rebars to minimize surface cracking due to thermal expansion
PW-C-1433	05/09/80	PW-C-984 R1, 2167-G-618 R6: Accepted omission of three (3) vertical rebars between Azimuths 180 to 162 at El. 231, Rows 7, 8
FCR-C-1525	06/18/80	2167-G-631 R6: Replacement of 4000 psi concrete between El. 326 and 376 by 5000 psi concrete
FCR-C-1596	06/27/80	2167-G-631 R6, 640 R4: Added a horizontal construction joint at El. 362 and a 10 ft lap splice (El. 362-372) on CD-10 rebars
FCR-C-1601	07/02/80	2167-G-640 R4: Displacement of CD-2 rebars into 8th row vertical rebar plane to obtain sufficent concrete cover
FCR-C-1645	07/18/80	2167-G-631 R6: Temporary support of MS and FW penetration sleeves with flued heads by concrete anchors above El. 311
FCR-C-1678	08/05/80	2167-G-651 R3, FCR-C-1475: Radial shear bars modification at El. 336 (top of construction opening above equipment hatch)
PW-C-1686	08/07/80	2167-G-651 R3: Retention of five (5) QC-rejected mechanical splice sleeve connections at top of equipment hatch construction opening El. 336 (total number of splices is 228)
PW-C-1689	08/08/80	2167-G-641 R4, 618 R6: Retained incorrectly spaced row eight (8) rebars between El. 337 and 362 at Azimuth 16

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-1700	08/12/80	FCR-C-1475, SK-1364-CH-2519 Sh. 3: Accelerated placement of two (2) concrete lifts above construction opening in wall
FCR-C-1715	08/19/80	2167-G-651 R3, 2167-G-637 R4: Cut and repair of four (4) rebars to obtain access into wall for cleanup
PW-C-1725	08/20/80	2167-G-651 R3, PW-C-1686, FCR-C-1425: Retained five (5) mechanical sleeves rejected by QA (168 total sleeves) above the equipment hatch opening
PW-C-1726	08/20/80	2167-G-651 R3: Omission of one rebar lap splice (rebar CC-901) at Azimuth 16
FCR-C-1727	08/20/80	2167-G-651 R3: Relocated three (3) radial shear bars near El. 356 above the equipment hatch
FCR-C-1728	08/20/80	2167-G-640 R4: Row 8 verticals, reduced concrete cover to 1 inch for mechanical splice sleeves at El. 356
FCR-C-1744	08/28/80	2167-G-632 R2: Retained discontinuous Row 3 horizontal rebar at Azimuth 16, El. 358 ft 9 in., one side plain end, other side with anchor plate
PW-C-1783	09/11/80	2167-G-631 R6 Sect. E-E, Penet. S-152: Thickened area dimensional variations accepted. Additional rebars (No. 6 at 9 in. each way) requested for areas where concrete cover exceeds 6 in.
PW-C-1814	09/23/80	2167-G-631 R6 Sect. H-H, Penet. S-58: Retained out-of-tolerance forms, causing 1 in. additional concrete cover in thickened concrete area
FCR-C-1845	10/09/80	2167-G-631 R4: Added horizontal construction joints in the thickened area region of S-151 and S-57 at El. 226, 234, 240, 245, 251, 256, 260.75

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-1846	10/09/80	21670-G-631 R4: Added horizontal construction joints in the thickened area region of the MS-FW penetrations at El. 256, 263.5, 271, 278, 286.83, 289.83
FCR-C-1864	10/14/80	2167-G-631 R6 Sect. H-H: Increased thickened area concrete by one in. at S-S8
FCR-C-1865	10/14/80	2167-G-631 R6: Added horizontal construction joint at S-58, El. 252 between Azimuth 120 and 180
FCR-C-1932	10/31/80	2167-G-650 R4: Revision to MS and FW penetration sleeves temporary supports (used Row 8 rebars)
PW-C-1956	11/07/80	2167-G-641 R4, 618 R6, Bethlehem 8099-11 R1: Omitted vertical rebar anchor on one bar and terminated one continuous rebar with an anchor (penetration S-152)
PW-C-1958	11/07/80	2167-G-762 R4: Exterior wall-welding of rebar anchors per vendor procedure accepted
PW-C-1962	11/11/80	2167-G-766 R3: Repair of rebar mechanical sleeve connection (for rebar between MS and FW penetrations)
PW-C-2051 R1	12/23/80	2167-G-632 R3: Corrected incorrect arrangement of rebars Rows 3 and 4 above S-152 and S-58 between Azimuth approximately 200 and 320 by mechanical sleeve spliced rebars
PW-C-2078	01/07/81	CAR-SH-CH-6 R7 Para. 11.4: Exterior wall placement ICBXW263001 unit weight is 136.6 pcf due to entrained air
PW-C-2089	01/21/81	2167-G-619 R6, 631 R6, 764 R3, Bethlehem 8099-13 R2: Rebars rearranged above S-92 and S-15
PW-C-2105	01/20/81	2167-G-619 R6, 561 R2, FCR-C-1243: Added temperature reinforcement No. 8 rebars at 12 in. ea. way Azimuth 120 to 130, El. 271 to 276 because of excessive concrete cover on exterior face rebars

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-2146	02/10/81	2167-G-619 R6, 561 R2: Added temperature reinforcement No. 8 rebars at 12 in. ea. way Azimuth 120 to 145, El. 276 to 286 because of excessive concrete cover on exterior face rebars
PW-C-2160	02/18/81	2167-G-641: Row 7 - four (4) verticals mislocated between El. 286 and 294, Azimuth 176, 154, 138, 121.5
PW-C-2165	02/20/81	2167-G-632 R3: El. 286-294, Azimuth 120-130: Mat of No. 6 or No. 8 rebars (at 12. in. ea. way) added to region due to excessive concrete cover on 10th row horizontal rebars
PW-C-2167	02/23/81	None (relevant to final condition): Variations in radius of steel liner between Azimuths 170-180 and El. 286.54-290.54
PW-C-2170	02/24/81	2167-G-651 R3: Eliminated one No. 6 CC904 shear bar 42 in. away from Azimuth 120 (towards 180) at El. 292 for access into wall
PW-C-2218	03/12/81	2167-G-767 R2: No. 18 Row 2 rebar CB13 connected to No. 11 radial rebar
PW-C-2227	03/17/81	2167-G-766 R3: Pent. S-1 Azimuth 278 row C position 10, QA-rejected mechanical sleeve connection: Rejection approved
FCR-C-2247	03/25/81	2167-G-762 R4, 763 R4, 766 R3: Rearrangement of radial shear bars around MS and FW sleeves
FCR-C-2259	03/27/81	2167-G-651 R3: Revision to CC904 No. 6 shear rebars
PW-C-2282 R1	04/15/81	2167-G-770 R1: Modifications to exterior face vertical rebars below S-151

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-2333	05/05/81	FCR-C-1423, CAR-SH-CH-6 R7 Section II: Use of form attached vibrators and probe vibrators in areas of rebar congestion in the exterior wall (thickened areas of the peronnel air lock, MS-FW penetrations, equipment hatch) accepted
FCR-C-2324	04/29/81	2167-G-761 R4, Bethlehem 1364-13217 R1, thickened area at S-151, S-57: Added No. 6 at 9 or No. 8 at 12 in. in region of excess concrete cover over outermost rebars.
FCR-C-2366	05/20/81	None (for the Containment): Reduction of exterior wall thickness by 0.5 in. between Azimuth 325-333 and El. 234-236
PW-C-2432	06/17/81	2167-G-631 R6: 8 in. dia. by 1 ft. long plastic tremie buried in concrete at Azimuth 343 El. 240
PW-C-2433	06/17/81	2167-G-637 R4, Bethlehem 1364-9672 R1: Mislocated Row 3, 4 horizontal rebars at El.241.7 retained
PW-C-2459	06/22/81	2167-G-617 R5, B-9005-1 R4: Modification of CA-49 No. 11 rebars at valve chambers to fit within concrete
FCR-C-2483	07/07/81	2167-G-636 R4, 637 R4, 641 R4, 650 R4: Adjustments to row 1, 7, 8 dowels above El. 362 to obtain correct rebar arrangement
PW-C-2495	07/10/81	2167-G-761 R4, Bethlehem 1364-13217, 8099-33 R3, 1364-13220, 8099-33C R1, S-57 region: Rebars 29 and 30 modified to obtain 2 in. concrete cover
FCR-C-2557	08/03/81	2167-G-631 R7, 764 R3, Bethlehem 8099 R2: Increase in wall thickness from 4 ft. 6 in. to 4 ft. 8 in. to obtain rebar concrete cover

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-2558	08/04/81	2167-G-631 R7: Placement of concrete at El. 256, Azimuth 315-05-06 to fill in previous pour overhang
FCR-C-2577	08/13/81	2167-G-638 R5, 639 R5, Bethlehem 8099-57 R2, 8099-54 R2: Correction of infringement of 6th row diagonal rebar in 5th row space, Azimuth 300-33-33, El. 362-389
FCR-C-2581	08/17/81	2167-G-631 R7: Relocation of horizontal construction joint Azimuth 315-06-06 and 16-35-43 to El. 261.80
PW-C-2597	08/29/81	2167-G-641 R4, 650 R4, 651 R4: Deviations in projection of 40 bars (Azimuth 0 to 360) to specified elevation above El. 368; bars left as-is.
FCR-C-2600	08/26/81	2167-G-631 R7, MS-FW areea, Azimuth 230-300, El. 246.25-260.50: No. 8 rebars at 12 in. ea. way added due to excessive concrete cover over outermost rebars
FCR-C-2632	09/03/81	2167-G-763 R4, 651 R4: Replacement of outside face continuous bars with lapped bars
PW-C-2650	09/15/81	2167-G-766 R3: Deletion of compressible material around rebar plate attachments to MS and FW penetrations
PW-C-2660	09/16/81	CAR-SH-CH-6 R8, ASME B&PV Code Section III CC-4240: Cold-weather curing of containment concrete details added
PW-C-2689	09/30/81	CAR-SH-CH-6 R8, CP&L NCR-C-454 & DDR-655: CB exterior wall and base mat concrete placements were not kept above 50F and moist cured for first 7 days after placement

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-2690	09/30/81	2167-G-651 R4: Relocation of shear bars CC-900 from Row 1 to 2 at El. 376 above the equipment hatch
FCR-C-2755 R1	11/20/81	2167-G-760 R3, Bethlehem 8099-62 R2, 63 R1: Revision to radial shear bars in radial layers 1, 3, and 4 below S-150 (90 degree ends replaced by anchor plates)
FCR-C-2825	12/02/81	2167-G-618 R6, 641 R4: Edge of construction opening Azimuth 16-35-43, El. 265 to 341: Shifted one Row 8 vertical rebar 6 in. to clear mechanical sleeve splices of horizontal rebars, adjacent bars exceeds 18 in.
FCR-C-2832 R1	07/18/83	2167-G-631 R7: Added No. 6 rebars at 9 in. ea. way Azimuth 323-347 from El. 269 to 286, and Azimuth 315-319 from El. 270.5 to 284 due to excessive concrete cover on face rebars
PW-C-2840 R1	12/16/81	2167-G-634 R3, 640 R5: One CD-2 No. 11 parapet dowel at Azimuth 170, El. 363.92 was bent to clear a mechanical splice sleeve, and one bent CC-401 No. 18 at Azimuth 15, El. 295 was straightened out
FCR-C-2843	12/08/81	2167-G-641 R4, 666 R3: El. 362 Azimuth 0 to 180, vertical rebars Rows 7, 8: Correction of incorrectly space concreted rebars by the addition of two rebars, with displacement of the upper ends to obtain correct rebar spacing
FCR-C-2864 R1	03/05/82	2167-G-640 R5: Deleted construction joint at El. 381, provided temporary supports for liner, and placed 10 ft. left of parapet concrete from El. 376 to 386
FCR-C-2873	12/08/81	CAR-SH-CH-6 R8: Modification to lubrication of concrete pump pipeline and subsequent concrete placement (for application to placement of dome concrete)

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-2887	01/08/82	2167-G-631 R7: Added vertical construction joints at Azimuth 16 and 238 between El. 366 and 376
PW-C-2891 R1	02/01/82	CAR-SH-CH-6 R9: Deviation from CH-6 form cleaning requirements consistent with form vendor's recommendations for cleaning of form surfaces after each use
PW-C-2900	01/11/82	SK/A-G-177 R0 (by CP&L): As-built tolerances excesses of the containment liner between El. 264-296 and Azimuth 240-300
FCR-C-2901	01/11/82	2167-G-631 R7: Added No. 6 rebars at 10 in. ea. way El. 366 to 376, Azimuth 180-200 because exterior face rebars have excessive concrete cover
FCR-C-2902	01/11/82	2167-G-631 R7: Relocated horizontal construction joint from El. 376 to 376.42
FCR-C-2913	01/20/82	2167-G-640 R5, DCN-550-906 R0: Installation of additional CC-578 rebars with field-located 42 in. minimum lap splices at 15 degree minimum offsets.
FCR-C-2937	02/02/82	2167-G-651 R4, 661 R4, FCR-C-2259 R0, 2632 R0 (Dome): Replacement of non-lapped CC-904, CJ290, CJ291 by lapped (33 in.) bars where continuous bars cannot be installed
FCR-C-2974	02/02/82	2167-G-640 R5: Addition of vertical construction joints at Azimuths 4-07-22, 94-07-22, 184-07-22, 274-07-22
FCR-C-3019	03/05/82	2167-G-640 R5: Added No. 6 rebars at 9 in. ea. way Azimuth 263-275 El. 380-386, Azimuth 193-199 El. 379-386, Azimuth 193-199 El. 379-386, Azimuth 80-88 El. 380-386 because face rebars these areas have excessive concrete cover

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-3036	03/11/82	2167-G-640 R5: Horizontal construction joint lowered 3 in. to El. 385.75 Azimuth 94-07-22 to 184-07-22, Azimuth 274-07-22 to 4-07-22
PW-C-3038	03/11/82	2167-G-640 R5: Added No. 6 rebars at 9 in. ea. way between El. 381 and 386 at Azimuth 95 to 98, 115 to 126, 275 to 278
FCR-C-3059	03/22/82	2167-G-640 R5: Location of dome concrete construction joints at Azimuth 0, 90, 180, 270 between El. 385.75 and 425
FCR-C-3061	03/23/82	2167-G-640 R5, 661 R4: Use of 12 ga. expanded WWM 1/2 x 1/2 for dome exterior side form, 4.5 in. maximum concrete thickness between dome outermost rebars and the WWM, unknown minimum thickness grout cover on the WWM
FCR-C-3067	03/24/82	2167-G-640 R5, dome El. 391 and above: Construction joint preparation for next pour by wire brushing and blow-off of loose material with air and/or water to obtain surface stipulated in CAR-SH-CH-6
PW-C-3166	04/06/82	2167-G-763 R5, Bethlehem 1364-15001 R1, 8099-61: Correction of incorrect vertical rebar installation at El. 265.08 in thickened wall section of MS-FW penetrations area by the addition of rebars per 2167-G-651 with B class lap splices in spaces of 18 in. or more which have no outside face rebars (see attachment to the PW)
FCR-C-3129	04/08/82	2167-G-631 R7: Addition of No. 6 at 9 in. ea. way or No. 8 at 12 in. ea. way in sloped sides of MS and FW penetration area thickened section due to excessive concrete cover on outermost rebars
PW-C-3171	04/20/82	2167-G-633 R3: One Row 3 CC93 horizontal rebar which should be continuous was terminated somewhere between Azimuth 300 and 315
FCR-C-3193	04/29/82	2167-G-631 R37 Same as FCR-C-3129

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-3198	04/30/82	2167-G-618 R6, 637 R4, 633 R3: El. 272, 285, Azimuth 253 to 263 excess concrete cover on Row 1 dowels (is 9-1/2 in., should be 6 in.); Row 3 dowels are directly behind, and out of location; per PW-C-2900, liner plate is at shorter than specified radius
PW-C-3218	05/07/82	2167-G-640 R5: Revision to the dome concrete placements sequence in the 38 ft. diameter region at the top of the dome
PW-C-3388	07/11/82	FCR-C-716, SK/A-G-177 R2: Containment liner plate allowable tolerances exceeded between El. 292-314 Azimuth 240-300
PW-C-3389	07/11/82	2167-G-639 R5: Bethlehem 8099-38 R5, 1364-14880 R2: One rebar in 5th row diagonals terminating at about El. 282 and Azimuth 241 is 2 ft. too short
FCR-C-3399	07/14/82	2167-G-631 R7: Added No. 6 at 9 in. or No. 8 at 12 in. rebars ea. way due to excessive concrete cover on rebars in transition area of wall opposing RAB column line 25 and 29
FCR-C-3460	08/19/82	2167-G-631 R7, 635 R3: Wall thickness increased from 4.5 to 4.62 ft, El. 290 to 296 in MS-FW region near Azimuth 300 and area above and between S-1 and S-2 to obtain 2 in. concrete cover on mechanical sleeve horizontal rebar splices
FCR-C-3661	10/07/82	2167-G-631 R7: Added construction joints at El. 277, 283, 290, 296, 302, 308, 314, 320, 325, 330 between Azimuth 315-05-06 and No. 35-43 (equipment hatch area)
FCR-C-3706	11/02/82	2167-G-660 R4, 661 R4: Misarrangement of terminations of 9 widely separated (over 30 degrees apart) Row 2 meridional rebars

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FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-3707	11/02/82	2167-G-661 R4: Reduced concrete cover to 1 in. (was 2 in.) for 5.5 by 5.5 anchor plates of dome outermost meridional rebars
PW-C-3728	11/10/82	2167-G-660 R4, 661 R5: One ft. reduction in length of dome 1st layer meridional rebars at 9 widely separated locations
FCR-C-3744	11/17/82	2167-G-640 R5, 661 R4: Increase in dome concrete thickness by up to one inch above El. 430 to obtian 2 in. minimum concrete cover for outermost rebars
FCR-C-3770	12/01/82	2167-G-662 R4: Added 12 at 4 in. diameter holes in dome bottom hub plate for concrete vibration
FCR-C-3793	12/13/82	2167-G-640 R5: Addition of a dome construction joint at dome radius 9.97 ft., and revision to placement of concrete in the area
FCR-C-3794	12/13/82	2167-G-662 R5: Use of form vibrator, concrete design mix M-97, and lubrication grout for dome concrete placement below dome top hub plate
FCR-C-3816	12/23/82	2167-G-662 R5, FCR-C-3794: Use of form vibrator, concrete design mix M-97, M-07
FCR-C-3819	12/29/82	2167-G-640 R5: Addition of a dome construction joint at radius 9.57 ft.
PW-C-3820	12/29/82	2167-G-660 R4, 661 R4: 17 CJ-289 No. 6 rebars bent back into shape, and one CJ-289 replaced
PW-C-3832	01/06/83	CAR-SH-CH-6 R10: Reduction from 72 hrs. to 68 hrs. in between dome concrete placements for placement ICBXW442-0044

TABULATION OF FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
PW-C-3835	01/10/83	2167-G-640 R5: Cleanup of about 8 oz. of tapwater fluid No. 2 (oil) from concrete surface below the upper dome hub plate
PW-C-3886	01/31/83	2167-G-640 R5, FCR-C-3219 R1: Concrete placement of dome concrete on ICBXW438001 in 51 hours (instead of 72)
PW-C-4004	03/16/83	2167-G-638 R6, 639 R6: Mislocated Row 5, 6 diagonals at the equipment hatch corrected by additional rebars
PW-C-4040	03/29/83	2167-G-632 R4, 633 R4, 636 R5, 637 R5, 651 R5, 764 R3, Bethlehem 1364-14903 R1, 15004 R1: Spacing violations of horizontal dowels at the equipment hatch, Rows 1, 2, 3, 4 (see as-built)
FCR-C-4078	04/12/83	CAR-SH-CH-19 R6: Tensile testing of rebars damaged by concrete masonry drill bits
PW-C-4095	08/16/81	2167-G-619 R6, 650 R4, 651 R4, DCN-550-799, 770 R1: One incorrect vertical rebar CB-8 termination (should terminate at El. 256.05)
FCR-C-4189	05/19/83	2167-G-651 R5, 2168-G-231 R15: Rearrangement of 5-CC907 and 909 Row 7 rebars at MS-FW penetrations
PW-C-4207	05/26/83	2167-G-634 R4, 635 R4, 650 R5, 641 R5, 651 R5, 764 R3: Spacing violations Rows 7-10 and the additional horizontal row, equipment hatch area dowels (see as-built drawing)
FCR-C-4228	06/10/83	2167-G-760 R4: Shear rebar bolts angled through rebars in equipment hatch area
PW-C-4264	06/22/83	FCR-C-716 R0: Liner tolerance deviations greater than specified in FCR-C-716 R0. The region is between El. 274 and 342, Azimuth 16 to 317

TABULATION OF FIELD CHANGE REQUESTS AND PERMANENT WAIVERS FOR THE CONTAINMENT BUILDING

FCR/PW	CP&L ISSUE DATE	DATA ON FCR/PW FOR EXTERIOR WALL AND FOUNDATION MAT REFERENCED DOCUMENT: DESCRIPTION OF CONDITION & RESOLUTION
FCR-C-4298	07/06/83	2167-G-631 R8: Located construction joints in equipment hatch area, Azimuth 315-05-06 to 16-35-43, from El. 270.50 to 341.25 at El. 275.25, 279.25, 283.25, 288.25, 293.25, 298.25, 303.25, 308.25, 313.25, 318.25, 323.25, 330.25
FCR-C-4395	08/12/83	CAR-SH-CH-6 R11: Equipment hatch area Azimuth 315-05-06 to 16-35-45, from El. 288.25 to 293.25. Pour 1CBXW293001 placed on previous pour 1CBXW293000 after 66 hours
FCR-C-4426	08/23/83	2167-G-631 R7: Added surface rebars No. 6 at 9 in. ea. way in equipment hatch area between Azimuth 16.5 and 12, El. 303.25 to 336 due to 6 in. concrete cover on outermost rebars
FCR-C-278	09/17/78	CAR-SH-CH-06: Repair of honeycomb area in mat at El. 204 above northernmost valve chamber
FCR-C-292	09/27/78	CAR-SH-CH-06: Revision to repair method for FCR-C-278

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
PREDICTED BEHAVIOR OF CONTAINMENT BUILDING 2
DURING STRUCTURAL INTEGRITY TEST

APPENDIX D

CONTAINMENT BUILDING
SUPERSTRUCTURE AND FOUNDATION MAT CONCRETE AS-BUILT STRENGTHS

SUBJECT CONT. BLDG: DOME, CYLINDER, & MAT AVERAGE f'_c FROM CONCRETE TEST REPORTS

LOCATION	NODE (ELEV.)	TO NODE (ELEV.)	AVG f'_c (PSI)	DESIGN MIX NO.
DOME	53 (441.00)	51 (440.20)	5986	M-81
	51 (440.20)	49 (437.82)	5165	
	49 (437.82)	47 (433.92)	5236	
	47 (433.92)	45 (428.59)	4562	
	45 (428.59)	43 (421.96)	4867	
	43 (421.96)	41 (414.21)	5562	
	41 (414.21)	39 (405.51)	5171	
	39 (405.51)	37 (396.09)	5102	
	37 (396.09)	35 (386.17)	5044	
	35 (386.17)	33 (376.00)	5355	M-81
CYLIN-DER	33 (376.00)	31 (366.00)	5338	M-72, M-80
	31 (366.00)	29 (356.00)	5931	
	29 (356.00)	27 (346.00)	6028	
	27 (346.00)	25 (336.00)	5680	
	25 (336.00)	23 (326.00)	5704	
	23 (326.00)	21 (316.00)	5920	
	21 (316.00)	19 (306.00)	5770	
	19 (306.00)	17 (296.00)	5270	
	17 (296.00)	15 (286.00)	5897	
	15 (286.00)	13 (276.00)	5737	
	13 (276.00)	11 (266.00)	5860	
	11 (266.00)	9 (256.00)	5232	
	9 (256.00)	7 (246.00)	5363	
	7 (246.00)	5 (236.00)	6205	
	5 (236.00)	3 (226.00)	5997	
	3 (226.00)	1 (216.00)	6468	M-72, M-80
MAT			6622	

NOTE: FOR NODE LOCATIONS, SEE APPENDIX E FIGURE E2-1

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT

PREDICTED BEHAVIOR OF CONTAINMENT BUILDING DURING STRUCTURAL INTEGRITY TEST

APPENDIX E

CALCULATION RESULTS FOR PREDICTED RESPONSES OF CONTAINMENT BUILDING TO STRUCTURAL INTEGRITY TEST

APPENDIX E

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APPENDIX E (Cont'd)

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TABLE E1

SUBJECT PREDICTED DEFORMATIONS OF CONT. BLDG AT TEST PRESSURE & TEMPERATURE

LOCATION OF MEASUREMENT		PREDICTED DEFORMATION		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	RADIAL (IN.)	MERIDIONAL (IN.)		
90-00-00	386.00	0.534	0.504	DOME PARAPET	2
170-00-00	386.00	0.538	0.514	↕	
270-00-00	386.00	0.523	0.527	↕	
346-00-00	386.00	0.449	0.475	DOME PARAPET	
90-00-00	350.00	0.558	0.423	CYLINDER-GENERAL	
170-00-00	350.00	0.596	0.435	↕	
270-00-00	350.00	0.573	0.443	↕	
90-00-00	320.00	0.642	0.297	↕	
170-00-00	320.00	0.697	0.299	↕	
270-00-00	320.00	0.626	0.305	↕	
90-00-00	287.00	0.665	0.173	↕	
83-00-00	256.00	0.629	0.077	↕	
90-00-00	237.00	0.396	0.023	↕	
90-00-00	226.00	0.147	0.009	↕	
90-00-00	221.00	0.056	0.004	CYLINDER-GENERAL	
170-00-00	287.00	0.542	0.179	ABOVE ESCAPE AIR LOCK	
↕	256.00	0.391	0.106	BELOW ESCAPE AIR LOCK	
↕	237.00	0.539	0.029	BELOW HVAC S58	
↕	226.00	0.260	0.007	BELOW HVAC S58	
170-00-00	221.00	0.130	0.004	BELOW HVAC S58	
270-00-00	237.00	0.382	0.024	BELOW MS & FW	
270-00-00	226.00	0.143	0.010	BELOW MS & FW	
270-00-00	221.00	0.055	0.004	BELOW MS & FW	
346-00-00	256.00	0.393	0.118	ABOVE PERSONNEL AIR LOCK	
346-00-00	237.00	0.342	0.044	BELOW PERSONNEL AIR LOCK	
346-00-00	226.00	0.227	0.015	BELOW PERSONNEL AIR LOCK	

NOTES:

TABLE E1 (CONT'D)

SUBJECT PREDICTED DEFORMATIONS OF CONT. BLDG AT TEST PRESSURE & TEMPERATURE

LOCATION OF MEASUREMENT		PREDICTED DEFORMATION		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	RADIAL (IN.)	MERIDIONAL (IN.)		
346-00-00	321.00	0.114	0.008	BELOW PERSONNEL AIR LOCK	2
↑	328.00	0.154	0.264	ABOVE EQUIP. HATCH ℄	
	319.00	-0.076	0.183	ABOVE EQUIP. HATCH ℄	
	310.50	0.180	0.135	ABOVE EQUIP. HATCH ℄	
	285.50	0.211	0.301	BELOW EQUIP. HATCH ℄	
↓	277.00	-0.032	0.253	BELOW EQUIP. HATCH ℄	
346-00-00	268.00	0.261	0.177	BELOW EQUIP. HATCH ℄	
12-29-36.7	298.00	1.043	0.211	HORIZ. ℄ EQUIP. HATCH	
4-11-45.4	↑	0.487	0.214	↑	
356-42-43.5		0.345	0.216		
335-17-16.5		0.306	0.220		
327-48-14.6	↓	0.392	0.219	↓	
319-30-23.3	298.00	0.812	0.212	HORIZ. ℄ EQUIP. HATCH	
45-00-00	410.00	0.683	0.405	DOME - GENERAL	
45-00-00	430.00	0.701	0.224	↑	
225-00-00	410.00	0.645	0.430	↓	
225-00-00	430.00	0.696	0.242	DOME - GENERAL	
—	441.61	0.686	—	TOP OF DOME	1.
278-00-00	284.33	0.346	0.097	VERT. ℄ MS & FW PENET.	
↑	282.75	0.353	0.091	↑	
	281.25	0.362	0.087		
	275.75	0.355	0.092		
	274.25	0.353	0.087		
	272.67	0.352	0.082		
↓	269.33	0.344	0.082	↓	
278-00-00	266.92	0.334	0.077	VERT. ℄ MS & FW PENET.	

NOTES:

1. BASED ON VALUE 8 DEGREES FROM TOP OF DOME

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TABLE E1 (CONT'D)

SUBJECT PREDICTED DEFORMATIONS OF CONT. BLDG AT TEST PRESSURE & TEMPERATURE

LOCATION OF MEASUREMENT		PREDICTED DEFORMATION		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	RADIAL (IN.)	MERIDIONAL (IN.)		
282-58-34.1	278.50	0.448	0.090	HORIZ. & MS PENET.	2
281-37-24	↑	0.389	0.090	↑	
280-00-37		0.378	0.090		
275-39-54.3		0.347	0.089		
274-22-36		0.343	0.090		
273-37-24	↓	0.341	0.090	↓	
272-20-37	278.50	0.339	0.091	HORIZ. & MS PENET.	
270-00-00	284.33	0.316	0.100	VERT. & MS & FW PENET.	
↑	282.75	0.329	0.094	↑	
	281.25	0.339	0.089		
	275.75	0.334	0.092		
	274.25	0.331	0.087		
	272.67	0.329	0.081		
↓	269.33	0.320	0.082	↓	
270-00-00	266.92	0.304	0.076	VERT. & MS & FW PENET.	
281-28-51.8	271.00	0.369	0.081	HORIZ. & FW PENET.	
279-25-12.4	↑	0.369	0.082	↑	
276-34-47.6		0.339	0.081		
274-31-08.2		0.328	0.081		
273-28-51.8	↓	0.328	0.081	↓	
271-25-12.4	271.00	0.325	0.082	HORIZ. & FW PENET.	

NOTES:

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TABLE E2

SUBJECT PREDICTED STRAINS IN CONT. BLDG LINER AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE		PREDICTED STRAIN (NUMBER x 10^{-6})		DESCRIPTION OF LOCATION	RADIAL DISTANCE OF LINER FROM CENTER OF BUILDING (FT)	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	CIRCUMFERENTIAL	MERIDIONAL			
346-00-00	311.00	684		EQUIP. HATCH AREA	65.00	2
↑	319.00	551		↑	↑	
↓	285.00	683		↓	↓	
346-00-00	277.00	568				
3-55-12.8	298.00		84			
356-58-58.1	↑		14			
335-01-09.9	↓		40			
328-04-47	298.00		100			
338-08-38.4	307.19	324				1
333-14-38.4	312.85	367				1
338-08-58.4	288.81	332				1
333-14-38.4	283.15	393				1
353-51-21.6	288.81	306		↓		1
353-5-21.6	307.19	305		EQUIP. HATCH AREA		1
278-00-00	283.75	497		MS & FW AREA		
↑	281.25	297		↑		
	275.75	286				
	274.25	508				
↓	272.25	230				
278-00-00	269.25	214				
270-00-00	283.75	496				
↑	281.25	281				
	275.75	279				
	274.25	498				
↓	272.75	239				
270-00-00	269.25	229				
283-32-47	278.50		68	↓	↓	
280-24-42.6	278.50		48	MS & FW AREA	65.00	

NOTES:

1. STRAIN MEASUREMENT DIRECTION IS CIRCUMFERENTIAL ABOUT THE CENTER OF THE PENETRATION.

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TABLE E2 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG LINER AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE		PREDICTED STRAIN (NUMBER x 10^{-6})		DESCRIPTION OF LOCATION	RADIAL DISTANCE OF LINER FROM CENTER OF BUILDING (FT)	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	CIRCUM-FERENTIAL	MERID-IONAL			
275-35-16.8	278.50		56	MS & FW AREA	65.00	2
274-09-46.8	278.50		77			
272-24-43.6	278.50		64			
270-29-28	271.00		74			
276-39-32	↑		94			
274-09-46.8	↓		86			
271-29-28	271.80		8	MS & FW AREA		
271-03-54	377.00	575		DOME-CYL. INTERSECTION		
269-21-39.6	377.00	573		DOME-CYL. INTERSECTION		
271-24-00	216.33		41	CYL-MAT INTERSECTION		
↑	216.83		41	↑		
	217.33		88		↓	
	218.33		96		65.00	
	216.00	176			64.67	1
↓	216.00	331			64.17	1
271-24-00	216.00	26			63.67	1
269-00-00	216.33		41		65.00	
↑	216.83		41		↑	
	217.33		88			
	218.33		96		65.00	
	216.00	176			64.67	1
↓	216.00	331		↓	64.17	1
269-00-00	216.00	26		CYL-MAT INTERSECTION	63.67	1

NOTES:

1. PREDICTED STRAIN IS FOR THE FLOOR LINER AND IS IN THE RADIAL DIRECTION.

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EBASCO SERVICES INCORPORATED

TABLE E3

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED STRAIN (NUMBER × 10^{-6})		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)	CIRCUM-FERENTIAL	MERID-IONAL		
346-00-00	319.00	9.75	504		EQUIP. HATCH AREA	2
↑	319.00	49.50	323		↑	
	319.00	70.50	226			
	311.00	9.75	642			
	311.00	49.50	467			
	311.00	70.50	375			
	285.00	9.75	641			
	285.00	49.50	466			
	285.00	70.50	374			
	277.00	9.75	521			
↓	277.00	49.50	327			
346-00-00	277.00	70.50	225			
3-55-13	298.00	6.50		93		
3-55-13	↑	56.50		165		
3-55-13		70.50		185		
356-58-50		6.50		30		
356-58-50		56.50		157		
356-58-50		70.50		193		
335-01-10		6.50		55		
335-01-10		56.50		174		
335-01-10		70.50		207		
328-04-47		6.50		109		
328-04-47	↓	56.50		177	↓	
328-04-47	298.00	70.50		196	EQUIP. HATCH AREA	
278-00-00	283.75	9.75	454		MS PENET. AREA	
278-00-00	283.75	49.50	278		MS PENET. AREA	
278-00-00	281.25	9.75	275		MS PENET. AREA	

NOTES:

TABLE E3 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED STRAIN (NUMBER × 10^{-6})		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)	CIRCUM-FERENTIAL	MERID-IONAL		
278-00-00	281.25	49.50	181		MS PENET. AREA	2
	281.25	72.00	128			
	275.75	9.75	264			
	275.75	49.50	173			
	275.75	72.00	122			
	274.25	9.75	468			
	274.25	49.50	302			
	274.25	72.00	208		MS PENET. AREA	
	272.75	9.75	214		FW PENET. AREA	
	272.75	49.50	149			
	272.75	72.00	111			
	269.25	9.75	200			
	269.25	49.50	138			
278-00-00	269.25	72.00	104		FW PENET. AREA	
270-00-00	283.75	9.75	455		MS PENET. AREA	
	283.75	49.50	282			
	281.25	9.75	260			
	281.25	49.50	173			
	281.25	72.00	123			
	275.75	9.75	259			
	275.75	49.50	173			
	275.75	72.00	124			
	274.25	9.75	460			
	274.25	49.50	303			
	274.25	72.00	213		MS PENET. AREA	
	272.75	9.75	222		FW PENET. AREA	
270-00-00	272.75	49.50	153		FW PENET. AREA	

NOTES:

TABLE E3 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED STRAIN (NUMBER × 10^{-6})		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)	CIRCUM-FERENTIAL	MERID-IONAL		
270-00-00	272.75	72.00	114		FW PENET. AREA	2
↑	269.25	9.75	213		↑	
↓	269.25	49.50	146		↓	
270-00-00	269.25	72.00	108		FW PENET. AREA	
283-32-47	278.50	6.50		76	MS PENET. AREA	
283-32-47	↑	46.25		129	↑	
280-24-42.6		6.50		49		
280-24-42.6		46.25		60		
280-24-42.6		70.50		67		
275-35-16.8		6.50		57		
275-35-16.8		46.25		60		
275-35-16.8		70.50		62		
274-09-46.8		6.50		77		
274-09-46.8		46.25		73		
274-09-46.8		70.50		71		
272-24-42.6		6.50		65		
272-24-42.6	↓	46.25		66	↓	
272-24-42.6	278.50	70.50		67	MS PENET. AREA	
279-29-28	271.00	6.50		73	FW PENET. AREA	
279-29-28	↑	46.25		62	↑	
279-29-28		70.50		56		
276-30-32		6.50		92		
276-30-32		46.25		79		
276-30-32		70.50		70		
274-09-46.8		6.50		86		
274-09-46.8	↓	46.25		92	↓	
274-09-46.8	271.00	70.50		95	FW PENET. AREA	

NOTES:

TABLE E3 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED STRAIN (NUMBER × 10^{-6})		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)	CIRCUM-FERENTIAL	MERID-IONAL		
271-29-28	271.00	6.50		79	FW PENET. AREA	2
271-29-28	271.00	46.25		67	FW PENET. AREA	
271-29-28	271.00	70.50		60	FW PENET. AREA	
276-58-40.8	284.14	13.00		114	MS PENET. AREA	
276-58-40.8	284.14	39.25		94		
276-58-40.8	284.14	68.00		72		
277-37-06.2	274.04	13.00		114		
277-37-06.2	274.04	39.25		132		
277-37-06.2	274.04	68.00		153		
282-54-59.9	278.50	13.00		298		
282-54-59.9		39.25		216		
282-54-59.9		68.00		114		
274-00-00		13.00		315		
274-00-00		39.25		220		
274-00-00	278.50	68.00		102	MS PENET. AREA	
270-51-07.2	377.25	6.75		403	DOME-CYL. INTERSECTION	
270-51-07.2	377.25	38.00		353		
271-03-54	377.00	9.25	574			
271-03-54	377.00	34.00	574			
269-34-26.4	377.25	6.75		399		
269-34-26.4	377.25	38.00		349		
269-21-39.6	377.00	9.25	573			
269-21-39.6	377.00	34.00	573		DOME-CYL. INTERSECTION	
338-08-38.4	307.19	6.50	321		EQUIP. HATCH AREA	1
338-08-38.4	307.19	56.50	295			1
338-08-38.4	307.19	70.50	287			1
333-14-38.4	312.85	6.50	358		EQUIP. HATCH AREA	1

NOTES:

1. STRAIN MEASUREMENT DIRECTION IS CIRCUMFERENTIAL ABOUT THE CENTER OF THE PENETRATION.

TABLE E3 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE & TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED STRAIN (NUMBER × 10^{-6})		DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)	CIRCUM-FERENTIAL	MERID-IONAL		
338-14-38.4	312.85	56.50	285		EQUIP. HATCH AREA	1
333-14-38.4	312.85	70.50	264			
338-08-38.4	288.81	6.50	330			
338-08-38.4	288.81	56.50	310			
338-08-38.4	288.81	70.50	305			
333-14-38.4	283.15	6.50	384			
333-14-38.4	283.15	56.50	315			
333-14-38.4	283.15	70.50	296			
353-51-21.6	288.81	6.50	305			
↑	288.81	56.50	293			
	288.81	70.50	290			
	307.19	6.50	303			
↓	307.19	56.50	292		↓	↓
353-51-21.6	307.19	70.50	289		EQUIP. HATCH AREA	1
271-24-00	216.00	6.50		673	CYL. WALL NEAR MAT	
↑	221.00	6.50		468	↑	
	225.00	6.50		293		
	216.00	44.25		-299		
↓	221.00	44.25		-180		
271-24-00	225.00	44.25		-60		
269-00-00	216.00	6.50		504		
↑	221.00	6.50		351		
	225.00	6.50		220		
	216.00	44.25		-299		
↓	221.00	44.25		-180	↓	
269-00-00	225.00	44.25		-60	CYL. WALL NEAR MAT	

NOTES:

1. STRAIN MEASUREMENT DIRECTION IS CIRCUMFERENTIAL ABOUT THE CENTER OF THE PENETRATION.

2

TABLE E 3 (CONT'D)

SUBJECT PREDICTED STRAINS IN CONT. BLDG REINF. STEEL AT TEST PRESSURE AND TEMPERATURE

LOCATION OF STRAIN GAGE			PREDICTED RADIAL STRAIN OF SHEAR REINFORCEMENT (NUMBER x10^{-6})	DESCRIPTION OF LOCATION	NOTES
AZIMUTH (DEG-MIN-SEC)	ELEVATION (FT)	DISTANCE FROM INSIDE FACE OF LINER (IN.)			
271-24-00	216.00	27	1070	NEAR BASE OF WALL	1
271-24-00	221.00	↑	898	↑	↑
271-24-00	225.00	|	306	|	|
269-00-00	216.00	|	775	|	|
269-00-00	221.00	|	650	|	|
269-00-00	225.00	27 ↓	221	NEAR BASE OF WALL ↓	1 ↓

2

NOTES:

1. LOCATION DISTANCE IS APPROXIMATE.

581/8-81

LOCAL MODELS LOCATIONS & BOUNDARIES

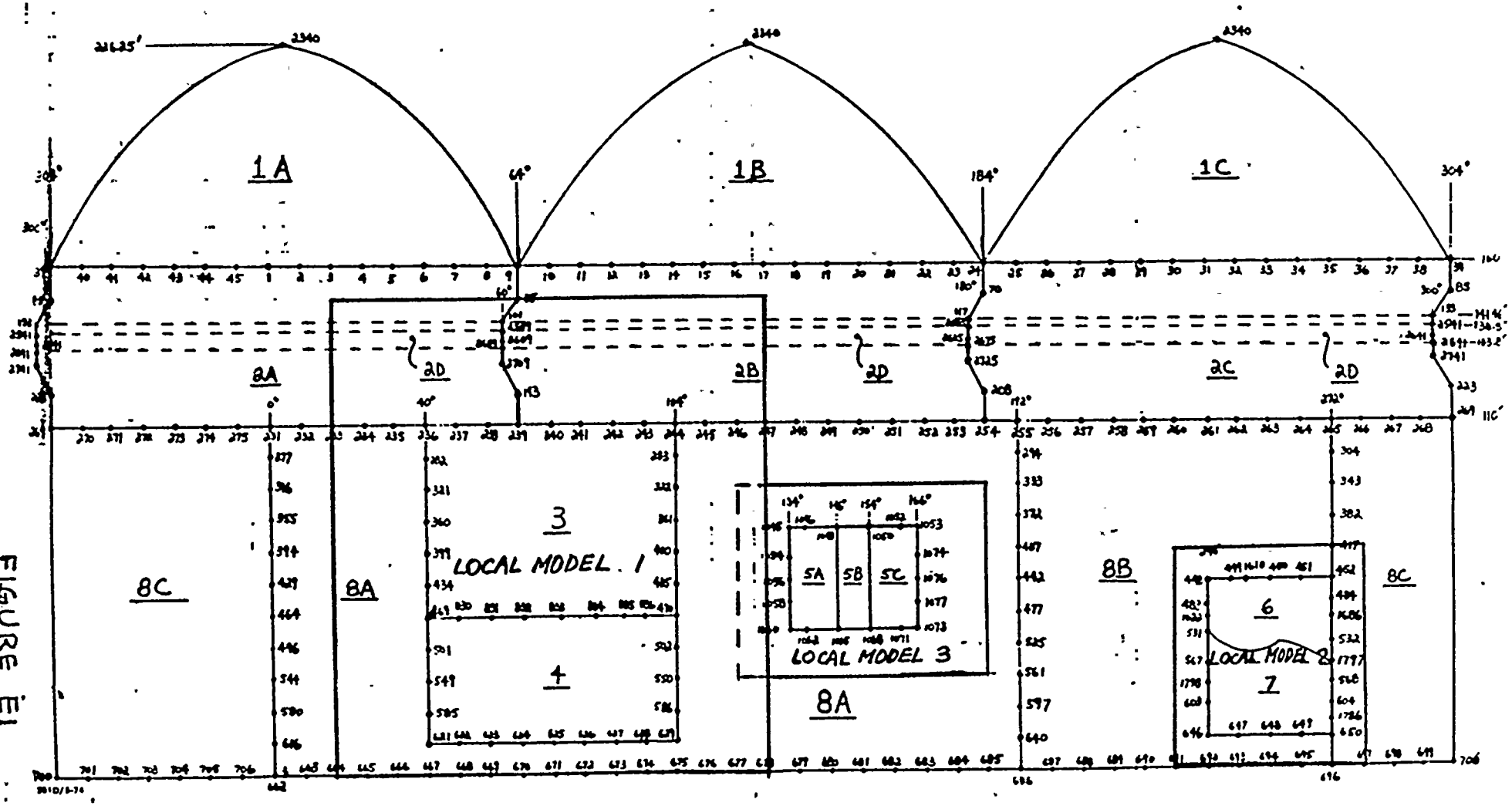


FIGURE E1

EBASCO SERVICES INCORPORATED

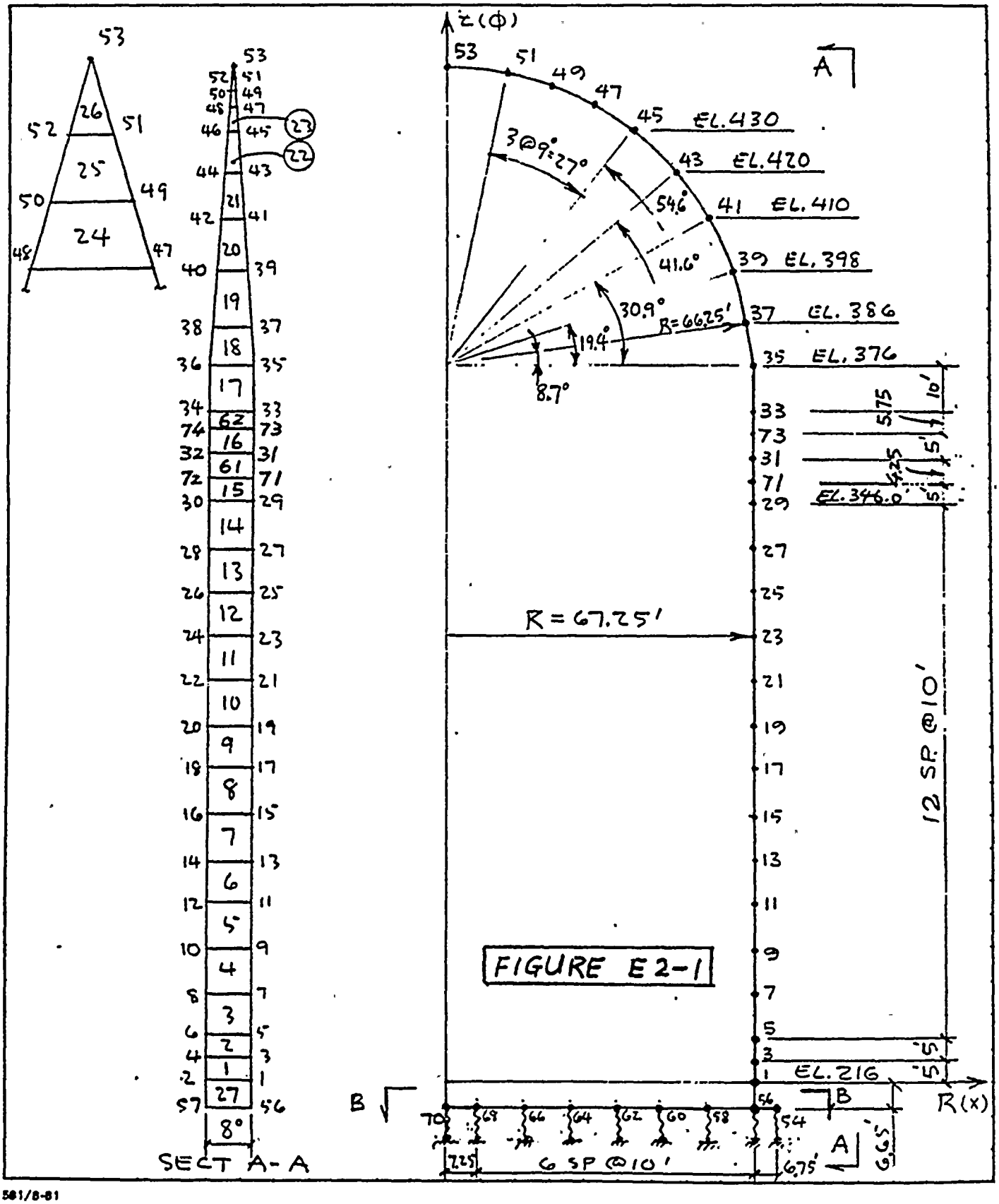
BY J. SHIEH DATE 9-12-84 SHEET 1 OF

CHKD. BY Y Chen DATE 10-2-84 CAROLINA POWER & LIGHT COMPANY DEPT. NO.

CLIENT SHEARON HARRIS NUCLEAR POWER PLANT
900,000 KW UNITS 1, 2

PROJECT

SUBJECT CONTAINMENT BUILDING AXI-SYMMETRICAL MODEL



581/8-81

EBASCO SERVICES INCORPORATED

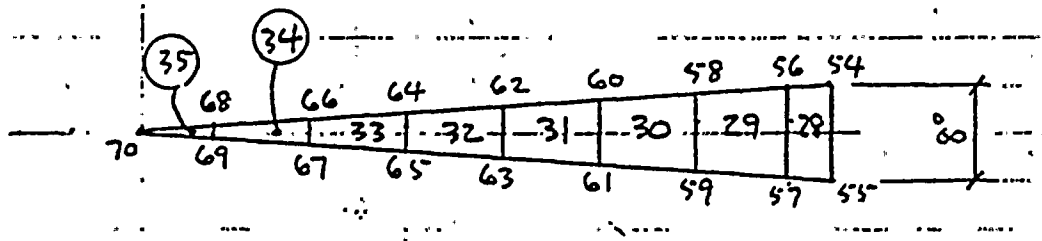
BY J SHIEH DATE 9-13-84 SHEET 2 OF 2

CHKD. BY Y.Chen DATE 10-2-84 OFS NO. DEPT. NO.

CLIENT CAROLINA POWER & LIGHT COMPANY

PROJECT SHEARON HARRIS NUCLEAR POWER PLANT
900,000 KW UNITS 1, 2, & 6

SUBJECT CONTAINMENT BUILDING AXI-SYMMETRICAL MODEL



SECT'L. PLAN B-B

FIGURE E2-2

581/8-81

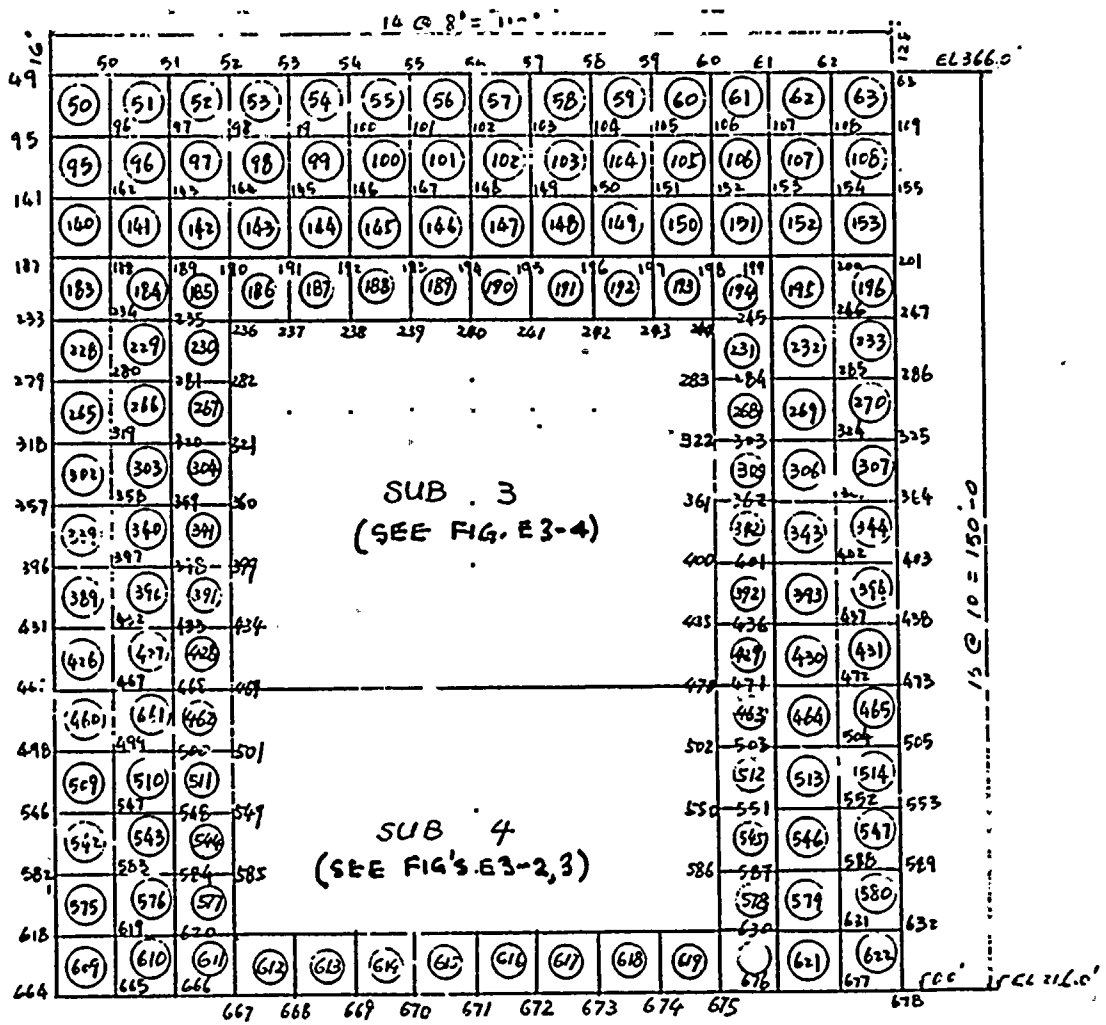


FIGURE E 3-1

NODAL POINTS & ELEMENTS DEFINITION FOR PARTIAL LOCAL MODEL 1

FOR LOCATION SEE FIGURE E-1

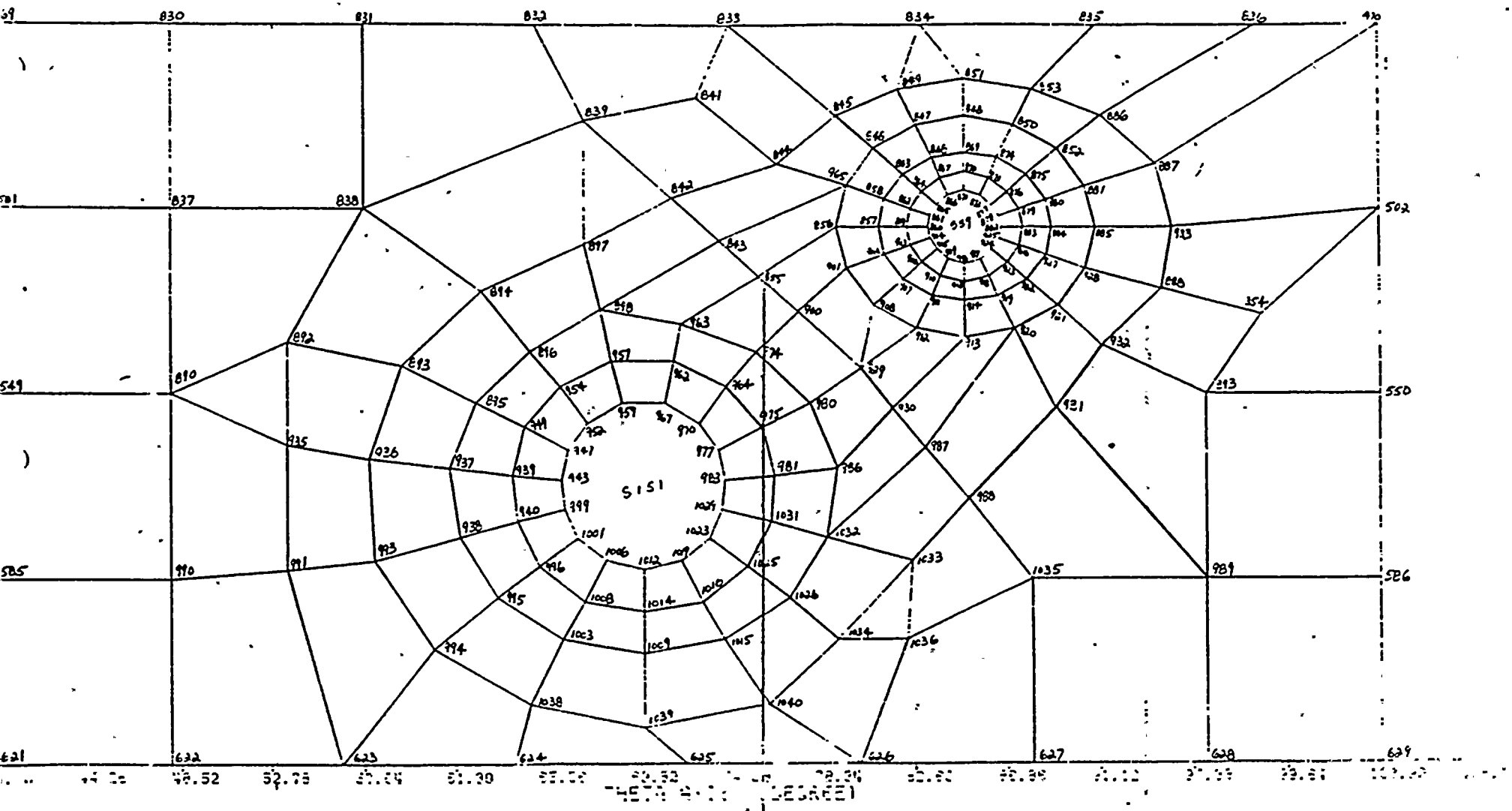


FIGURE E3-2

NODAL POINTS DEFINITION FOR PARTIAL LOCAL MODEL 1-SUB4

FOR LOCATION SEE FIGURE E 3-1.

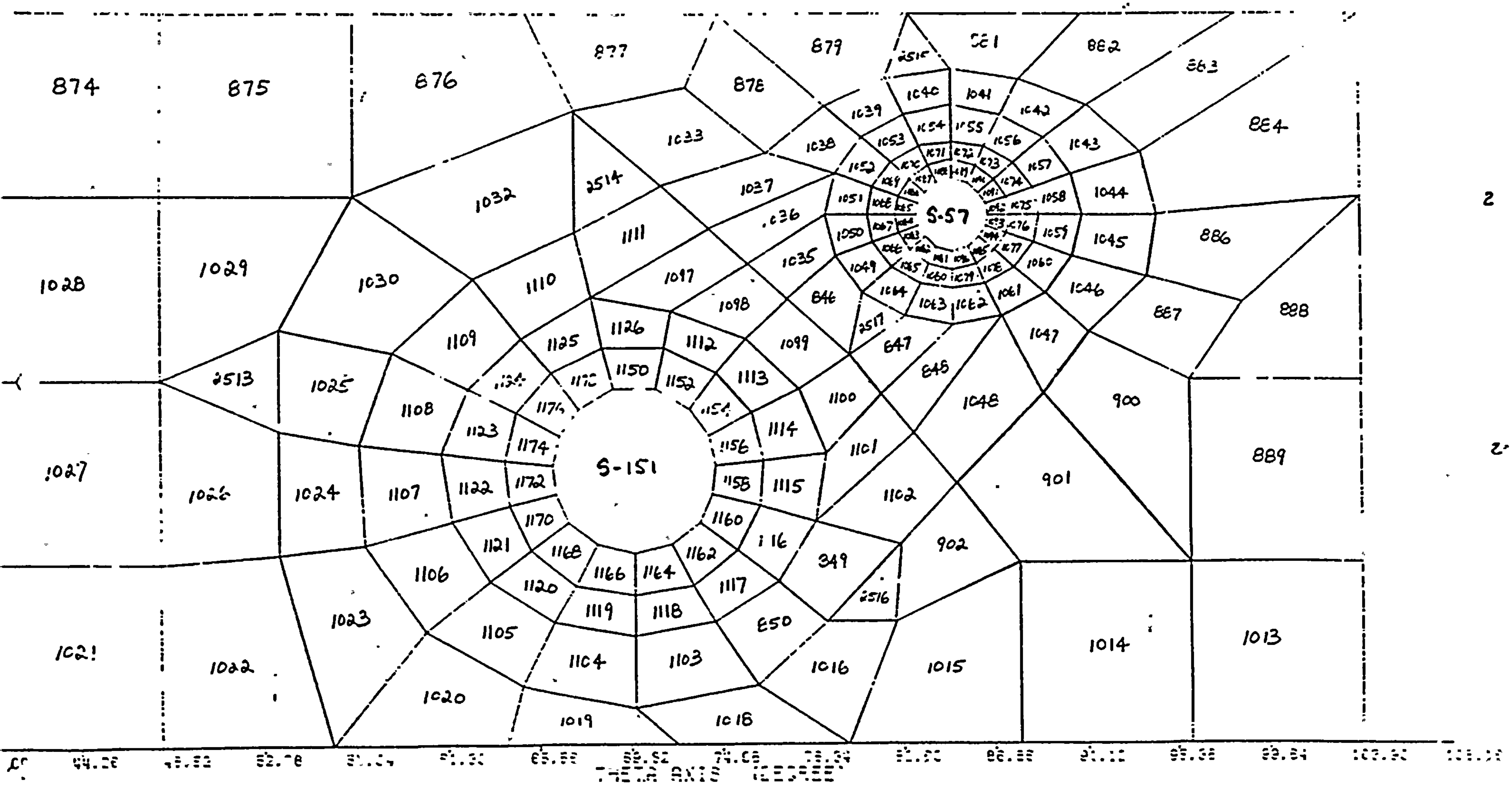
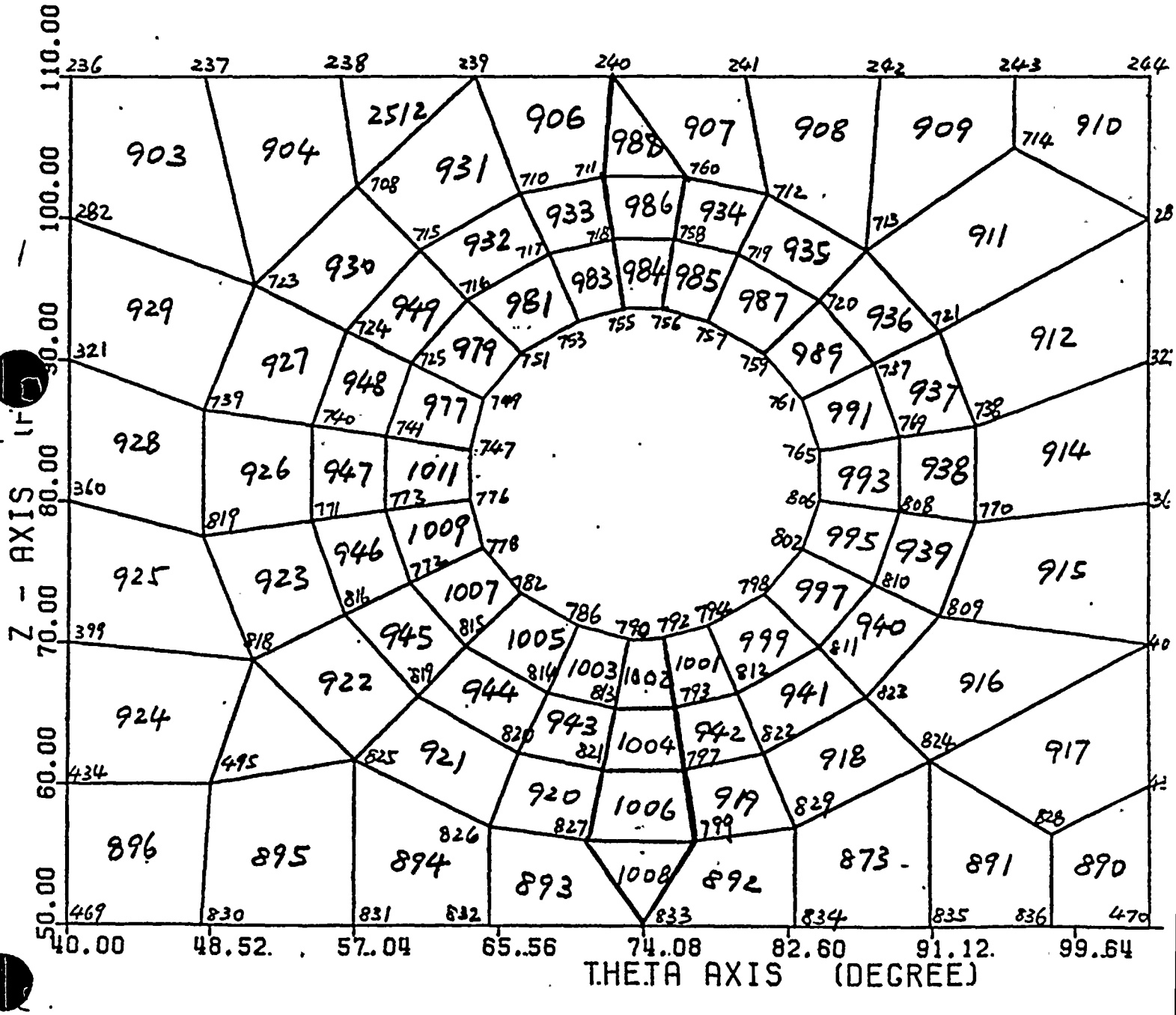


FIG. E3-3

ELEMENTS-DEFINITION FOR PARTIAL LOCAL MODEL 1-SUB 4

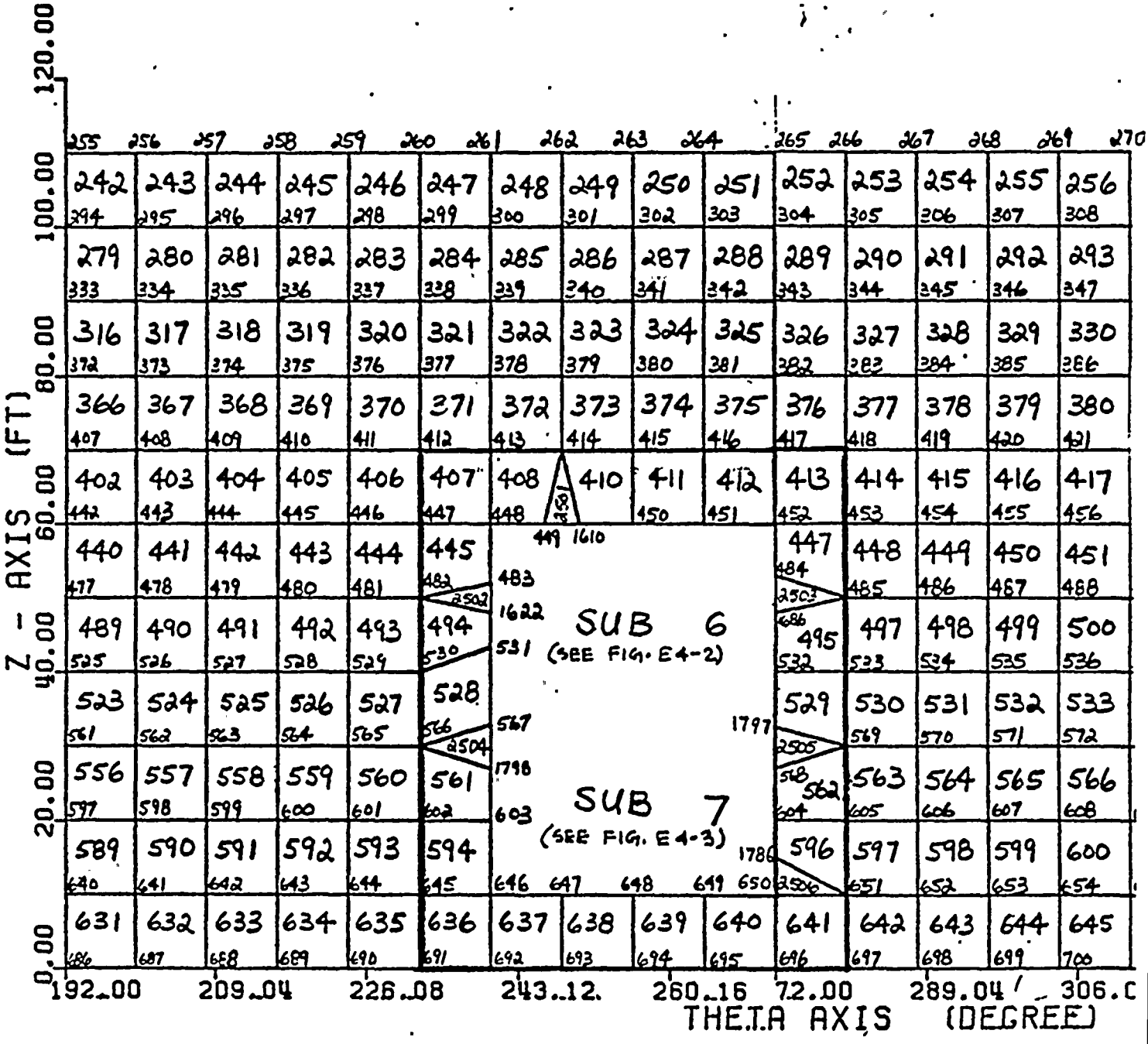
FOR LOCATION SEE FIGURE E3-1



NODAL POINTS AND ELEMENTS DEFINITION FOR PARTIAL LOCAL MODEL 1 - SUB 3

FOR LOCATION SEE FIGURE E3-1

FIGURE E3-4



NODAL POINTS & ELEMENTS DEFINITION FOR PARTIAL LOCAL MODEL 2

FOR LOCATION SEE FIGURE E-1

FIGURE E4-1

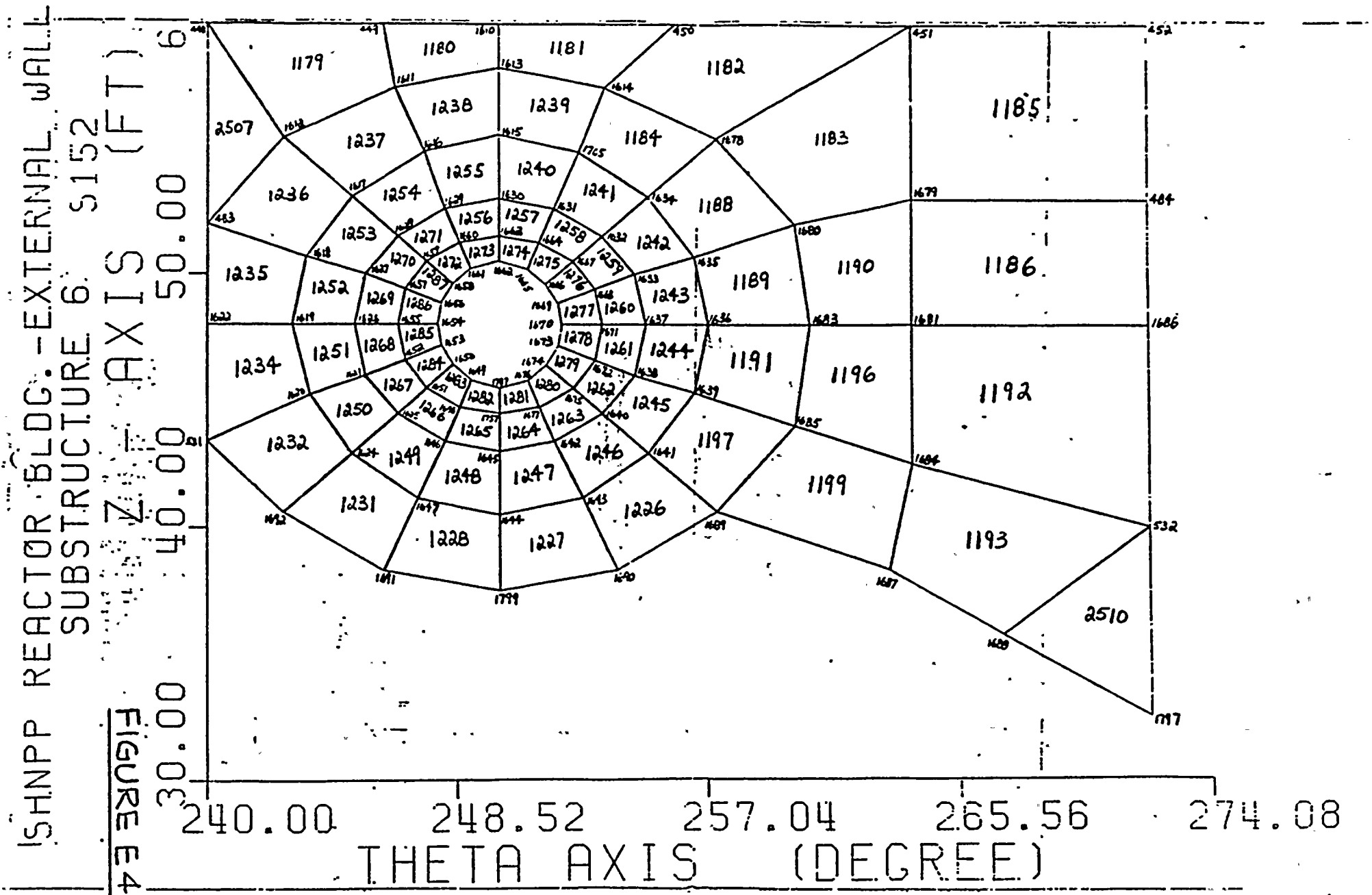


FIGURE E4-2

NODAL POINTS AND ELEMENTS DEFINITION FOR PARTIAL LOCAL MODEL 2 - SUB6

FOR LOCATION SEE FIGURE E4-1

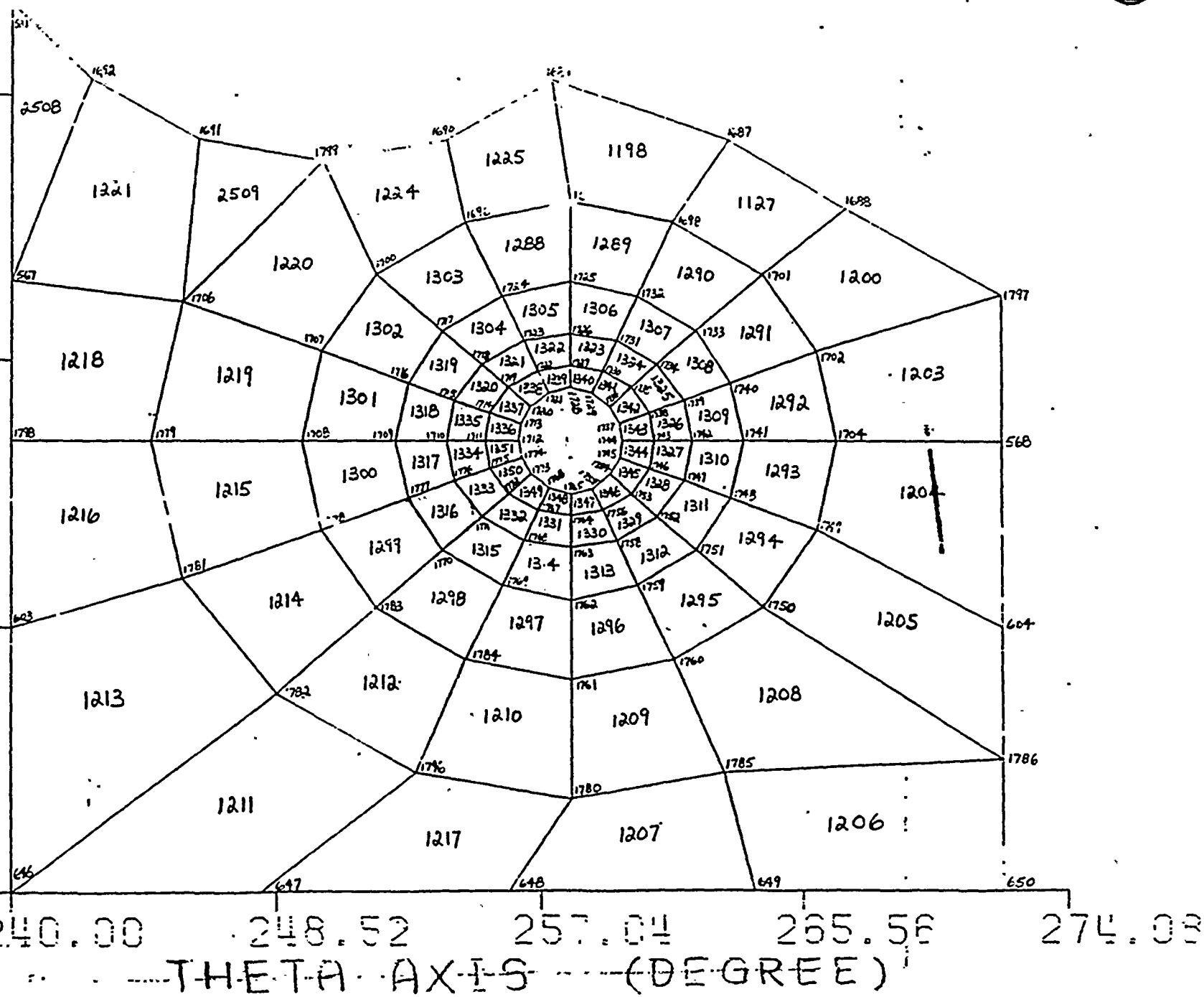
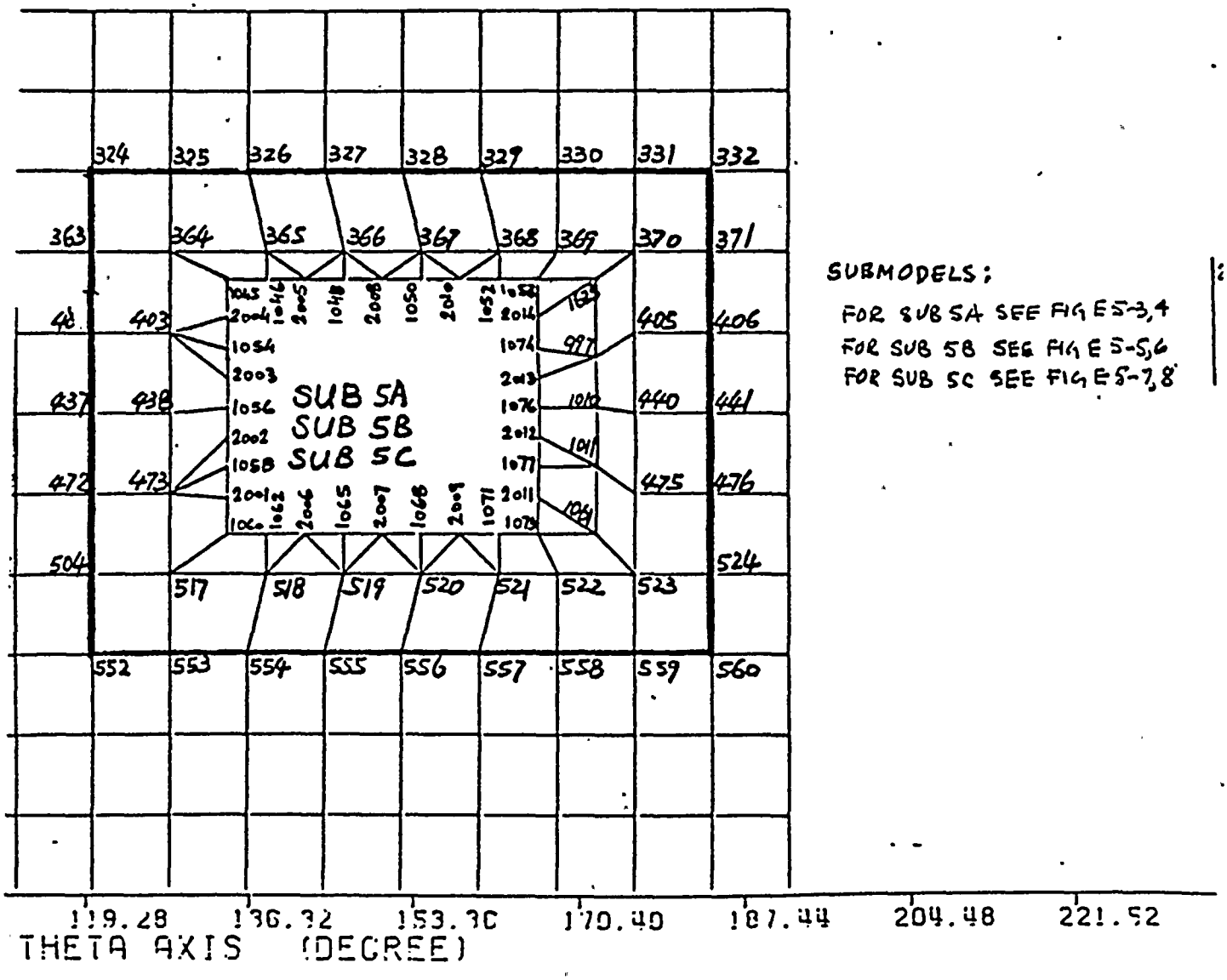


FIGURE E4-3

NODAL POINTS AND ELEMENTS DEFINITION FOR PARTIAL LOCAL MODEL 2-SUB 7

FOR LOCATION SEE FIGURE E4-1



SUBMODELS;

FOR SUB SA SEE FIGES-3,4

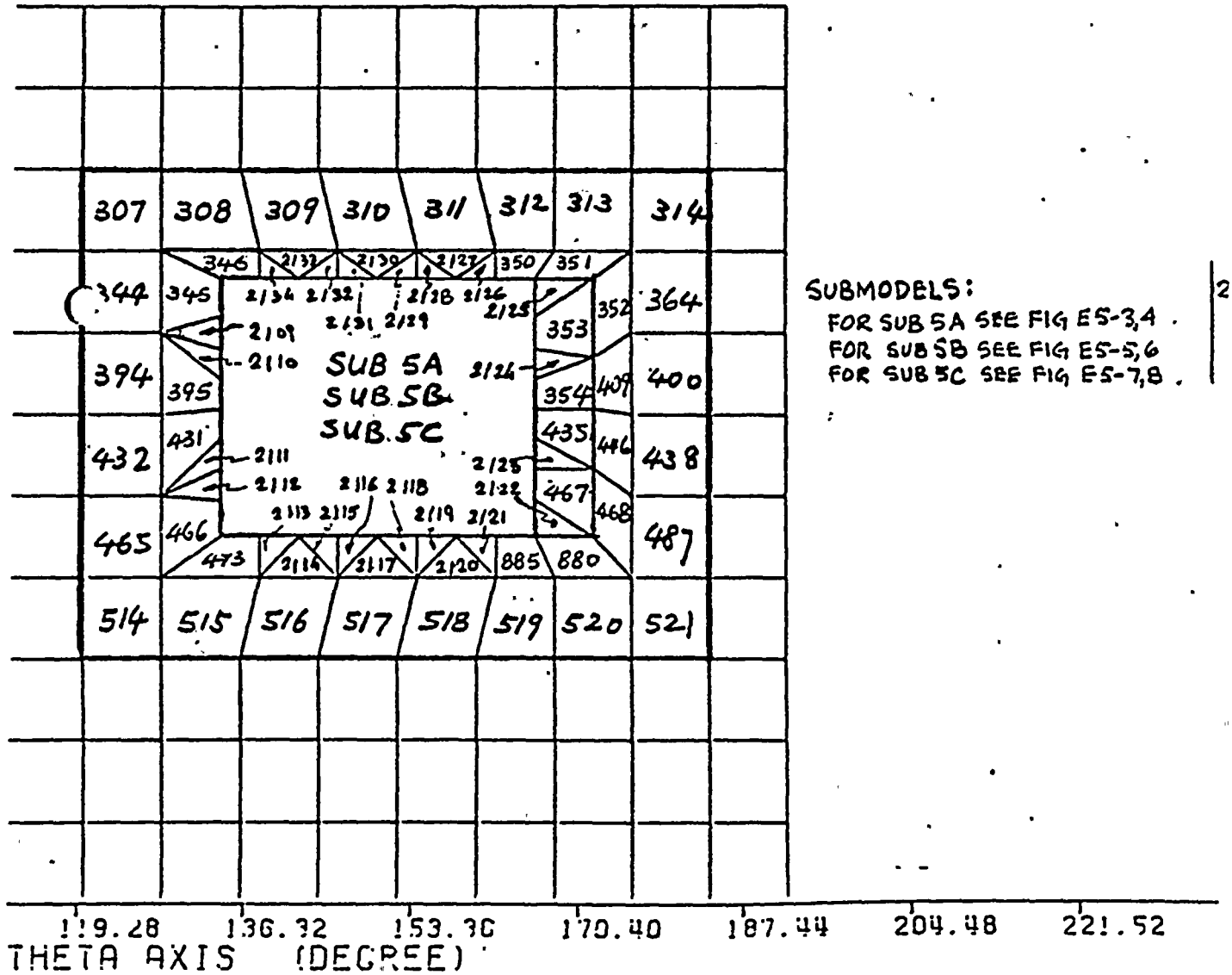
FOR SUB SB SEE FIGES-5,6

FOR SUB SC SEE FIGES-7,8

NODAL POINTS DEFINITION FOR EXTERIOR PORTION OF LOCAL MODEL 3

FOR LOCATION SEE FIGURE E1

FIGURE E 5-1



SUBMODELS:
FOR SUB 5A SEE FIG E5-3,4
FOR SUB 5B SEE FIG E5-5,6
FOR SUB 5C SEE FIG E5-7,8

ELEMENTS DEFINITION FOR EXTERIOR PORTION OF LOCAL MODEL 3

FIGURE E5-2

SHNPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER AREA
SUBSTRUCTURE.SA

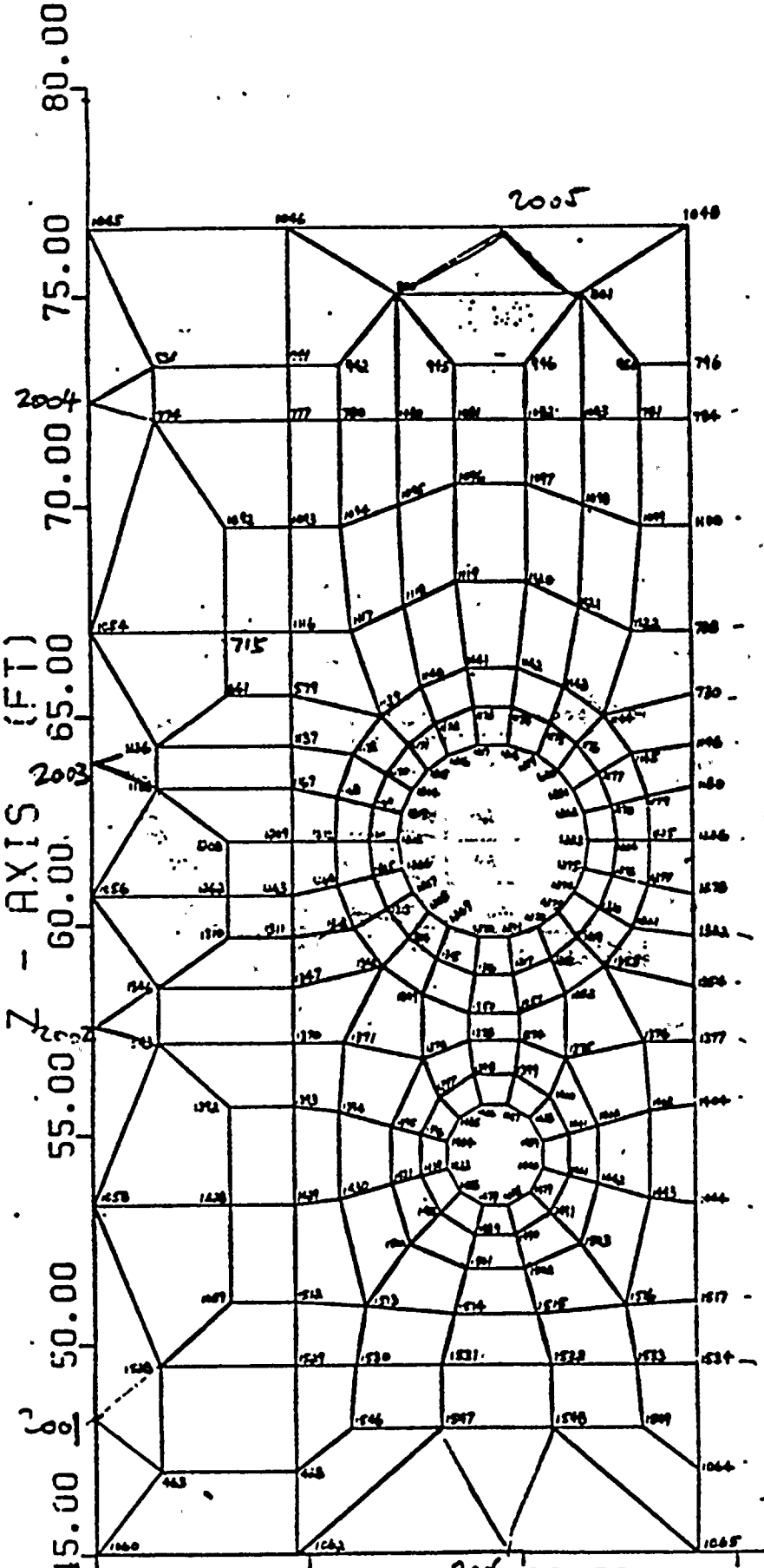


FIGURE E5-3

NODAL POINTS DEFINITION FOR LOCAL MODEL 3-SUB SA

FOR LOCATION SEE FIGURE E5-1

SHVPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER AREA
SUBSTRUCTURE 54

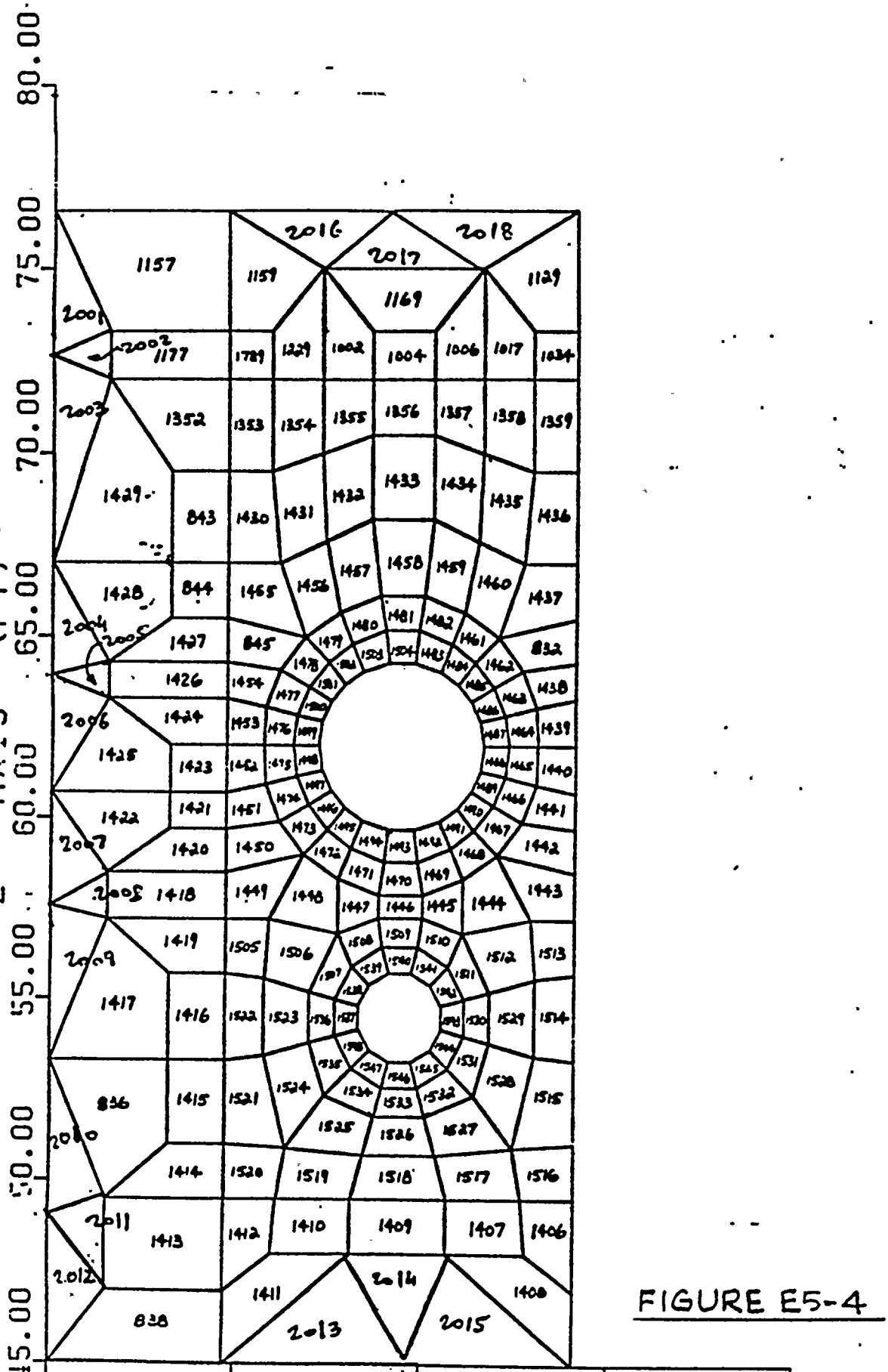


FIGURE E5-4

ELEMENTS DEFINITION FOR LOCAL MODEL 3-SUB 5A

FOR LOCATION SEE FIGURE E5-1

SHNPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER HATCH
SUBSTRUCTURE SB

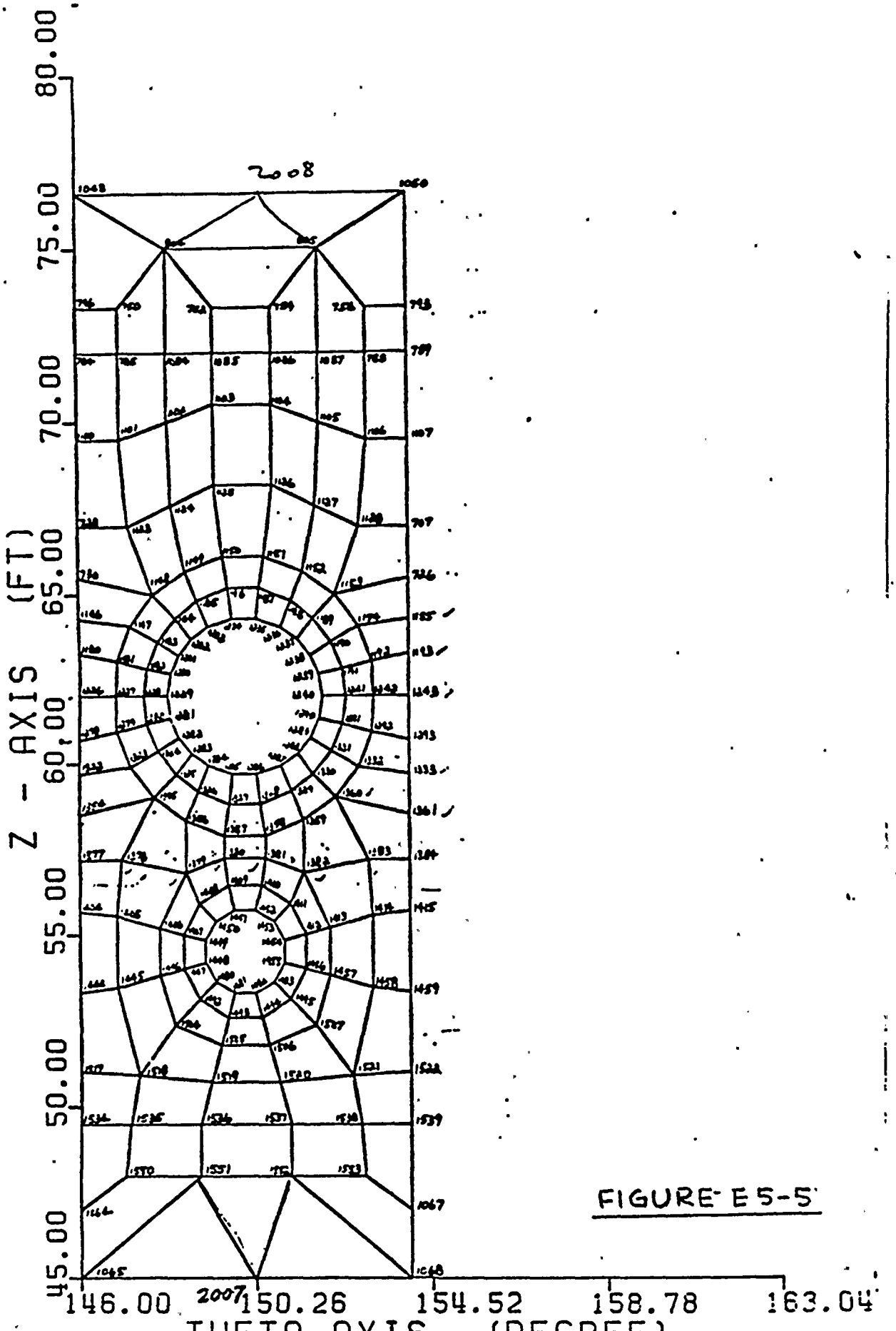


FIGURE E5-5

NODAL POINTS DEFINITION FOR LOCAL MODEL 3-SUB 5B

FOR LOCATION SEE FIGURE E5-1

SHNPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER PEN
SUBSTRUCTURE SB

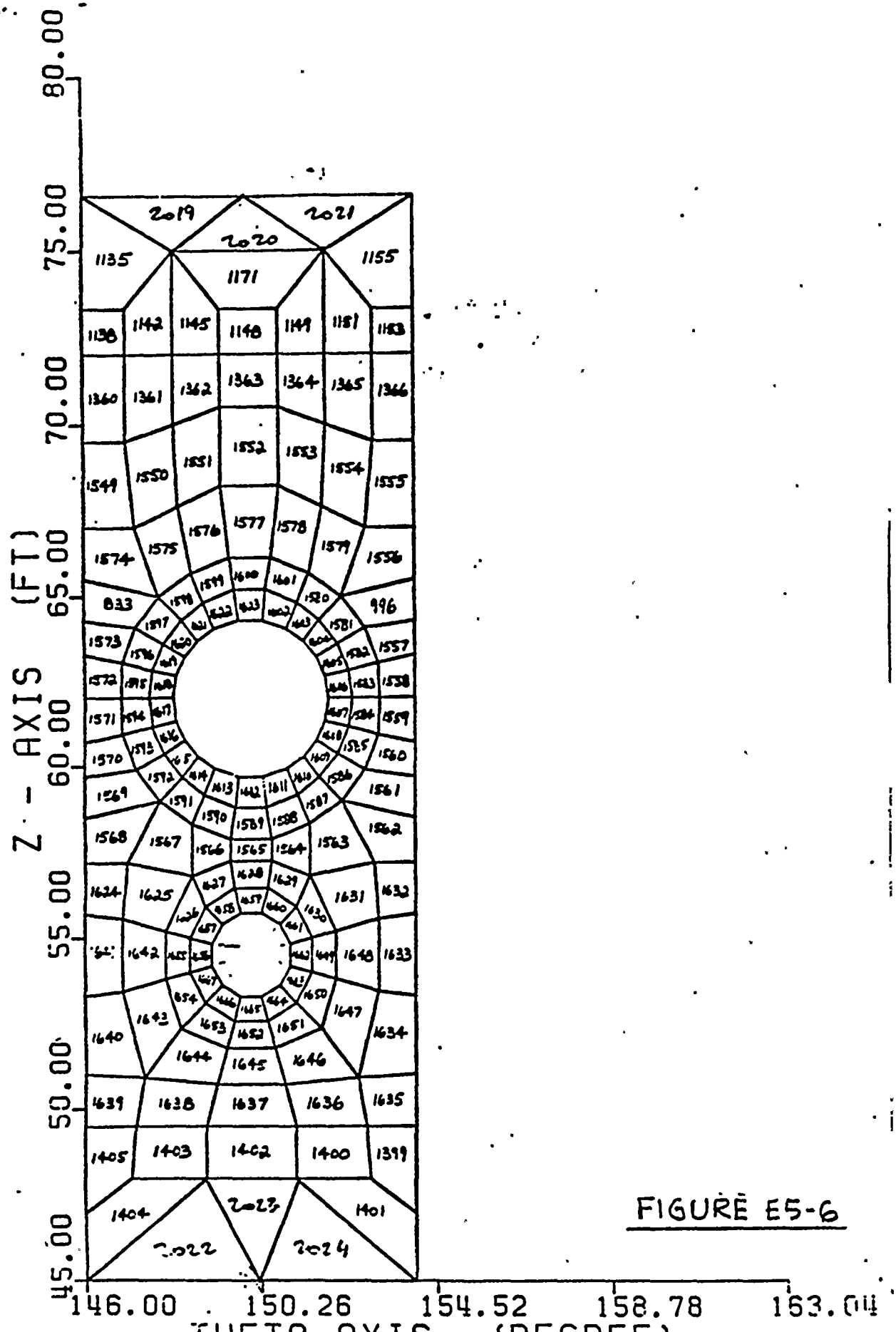


FIGURE E5-6

ELEMENTS DEFINITION FOR LOCAL MODEL 3-SUB 5B

FOR LOCATION SEE FIGURE E5-1

SHNPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER AREA
SUBSTRUCTURE 5C

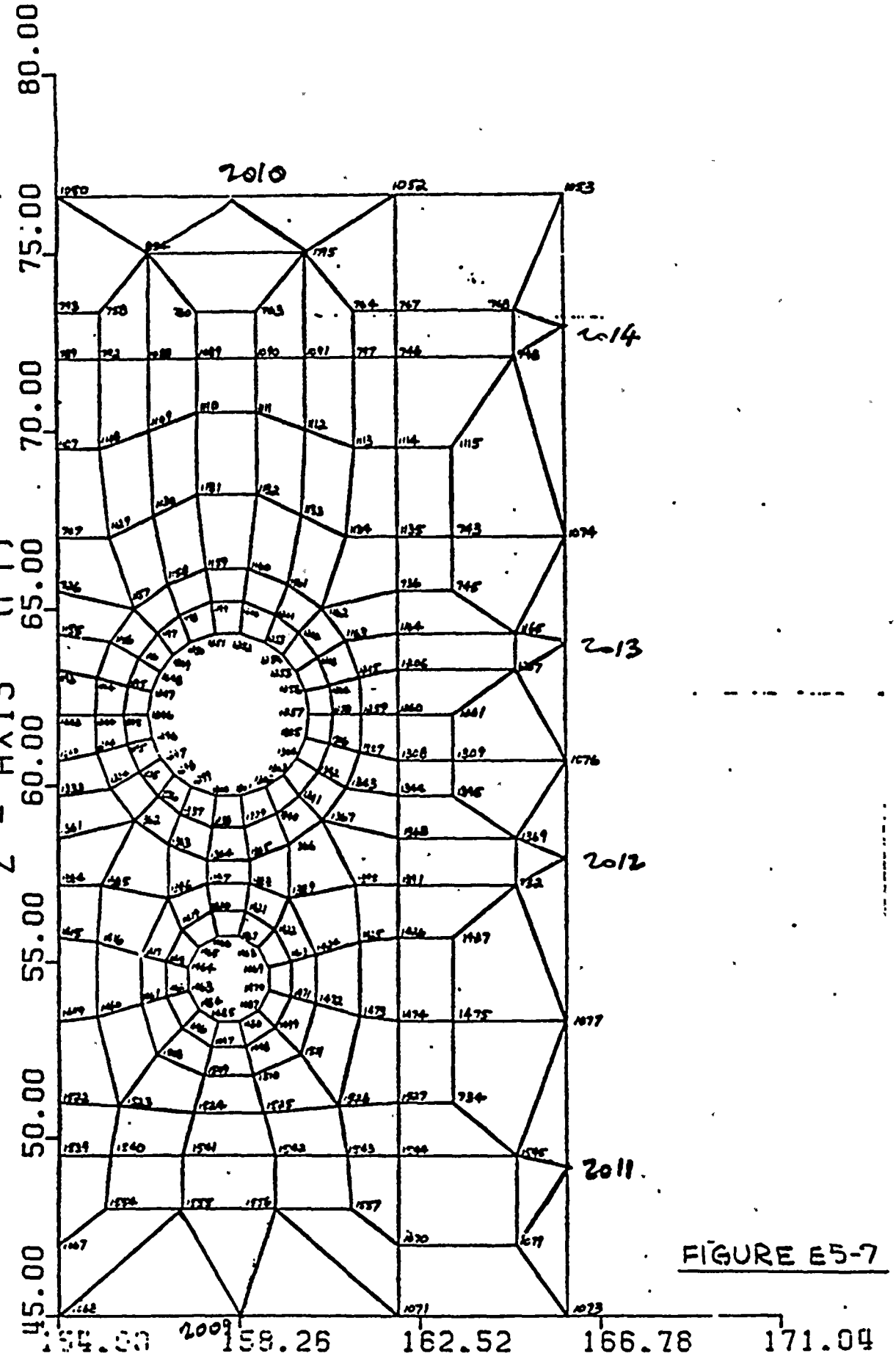


FIGURE E5-7

NODAL POINTS DEFINITION FOR LOCAL MODEL 3-SUB 5C

FOR LOCATION SEE FIGURE E5-1

SHNPP REACTOR BLDG.-EXTERNAL WALL...MAIN STEAM AND FEEDWATER AREA
SUBSTRUCTURE 5C

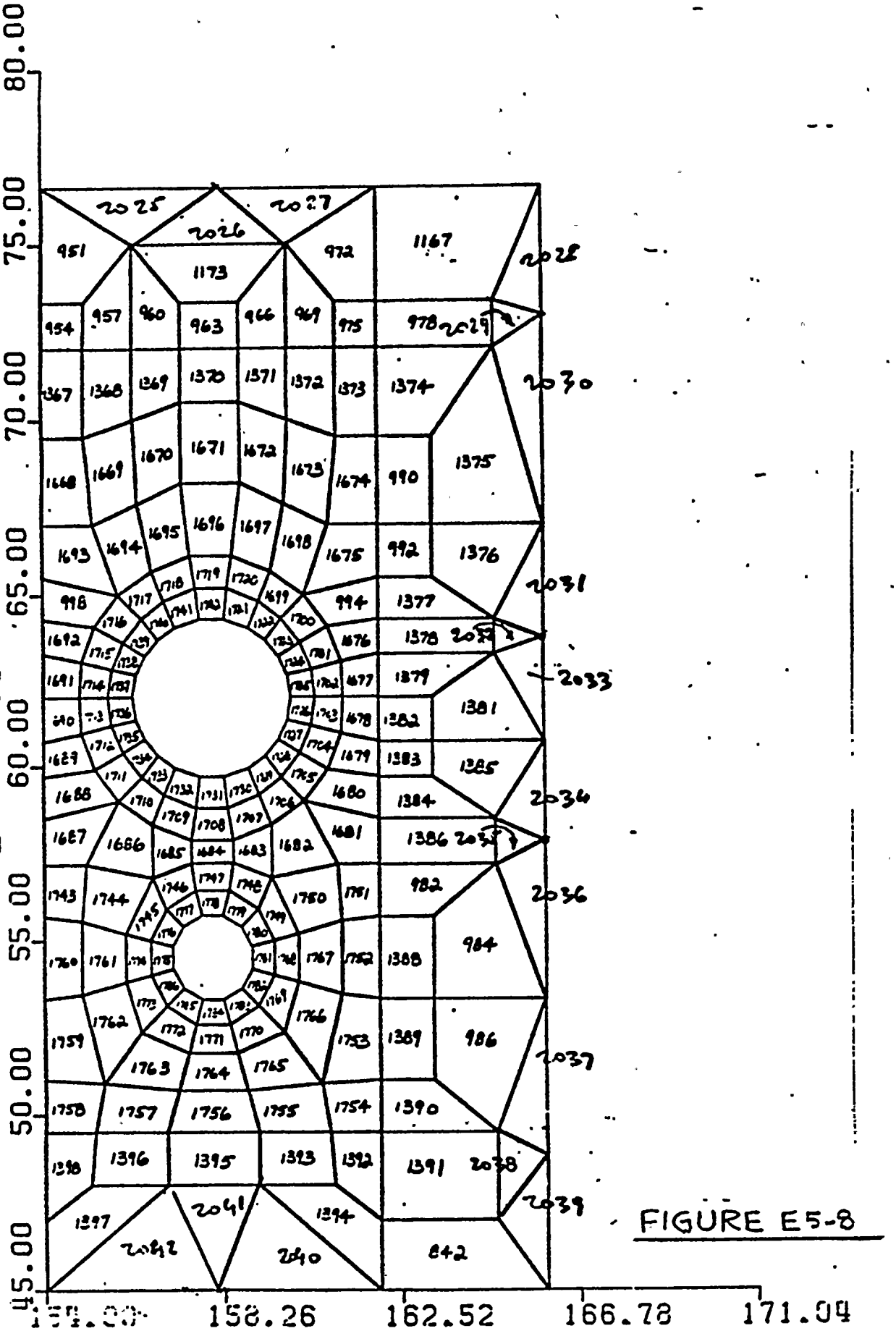
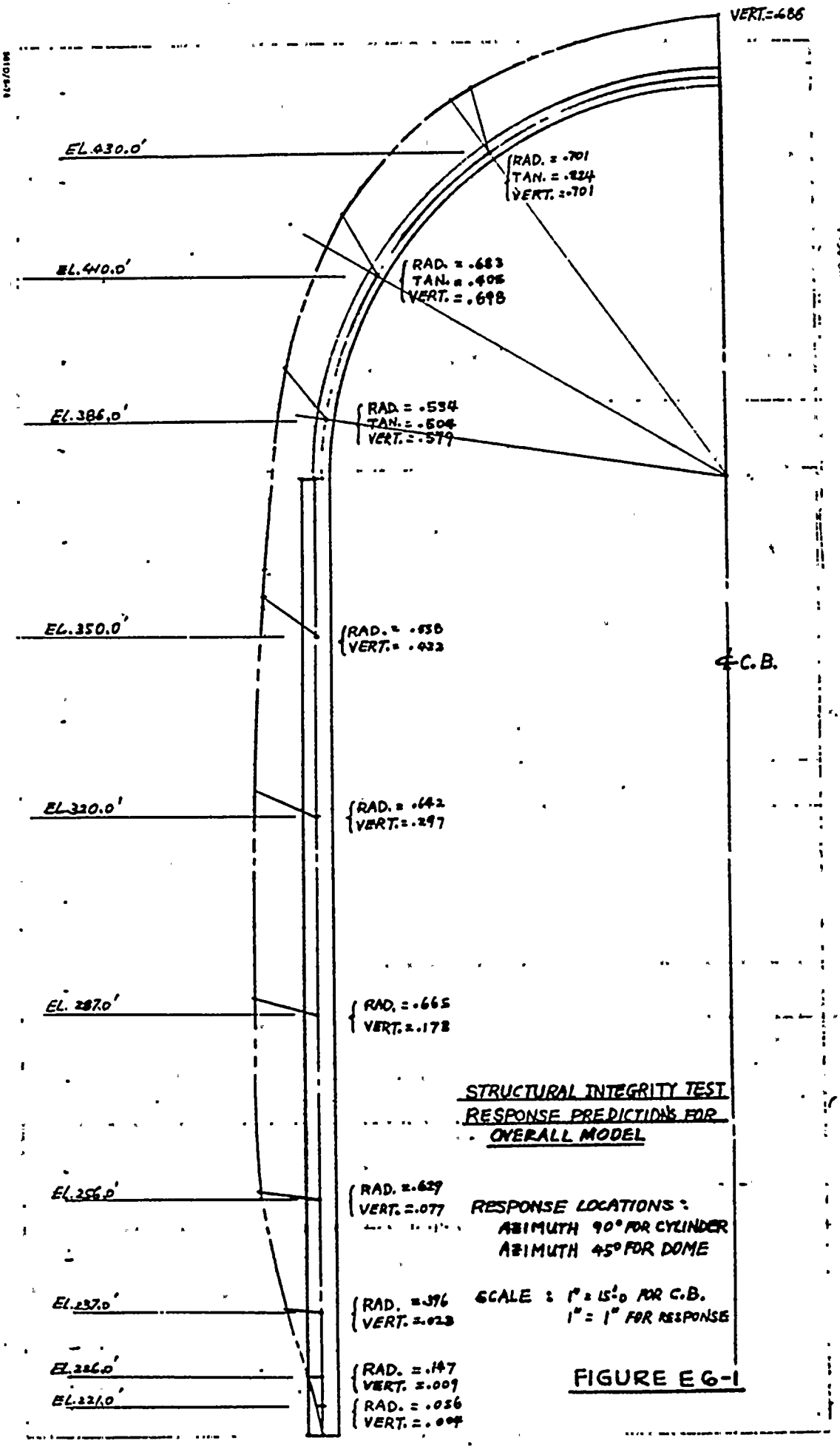


FIGURE E5-8

ELEMENTS DEFINITION FOR LOCAL MODEL 3-SUB 5C

FOR LOCATION SEE FIGURE E5-1



STRUCTURAL INTEGRITY TEST
RESPONSE PREDICTIONS FOR
OVERALL MODEL

RESPONSE LOCATIONS :
AZIMUTH 90° FOR CYLINDER
AZIMUTH 45° FOR DOME

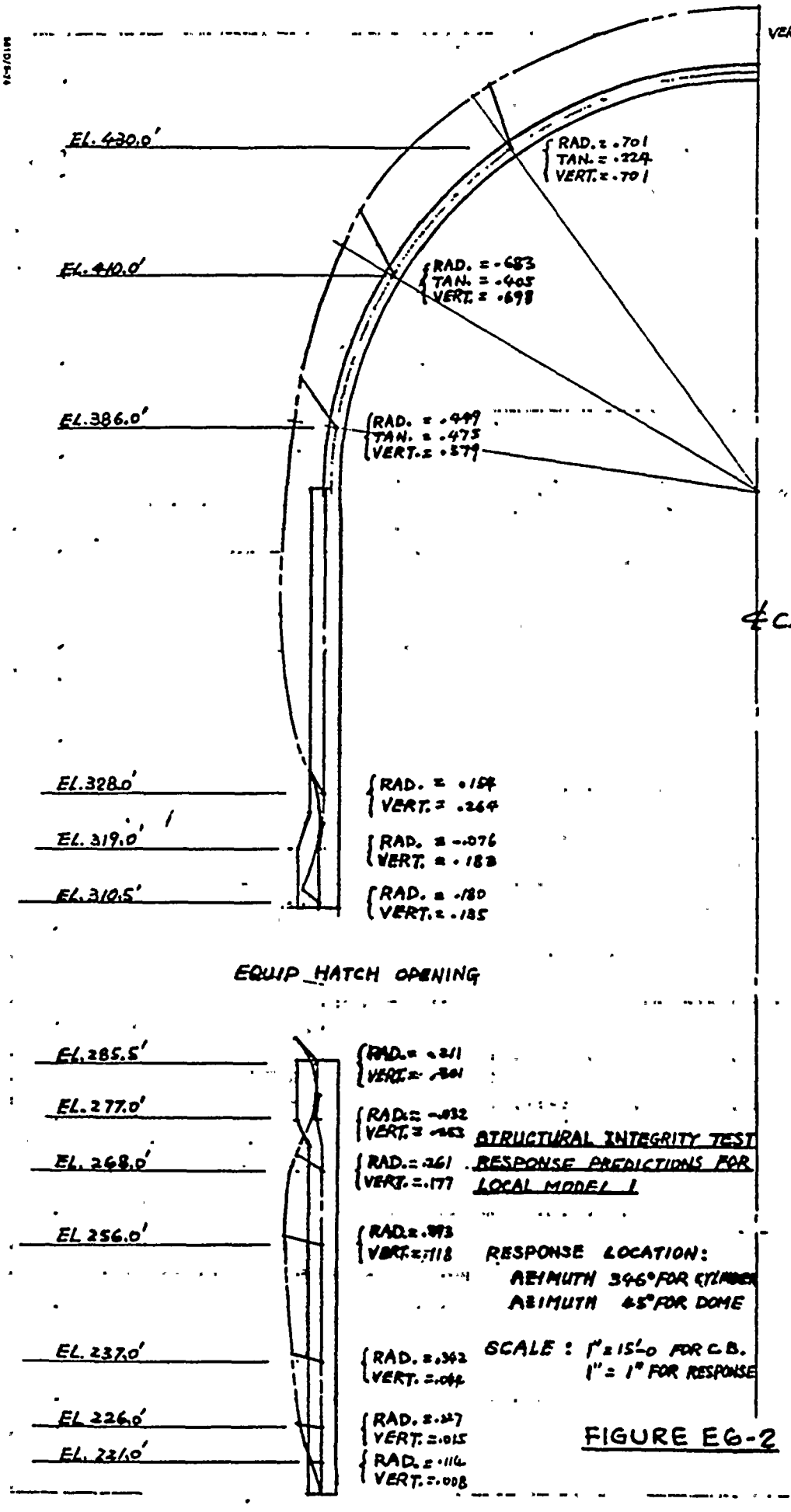
SCALE : 1" = 15'-0 FOR C.B.
1" = 1" FOR RESPONSE

FIGURE E 6-1

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
9-10,000 KW UNITS 1, 2
1984 BIS

EBASCO SERVICES INCORPORATED

BY Y. Chen 10-28-85
CHKD BY M Hsu 10-31-85



STRUCTURAL INTEGRITY TEST
RESPONSE PREDICTIONS FOR
LOCAL MODEL 1

RESPONSE LOCATION:
AZIMUTH 346° FOR CYLINDER
AZIMUTH 45° FOR DOME

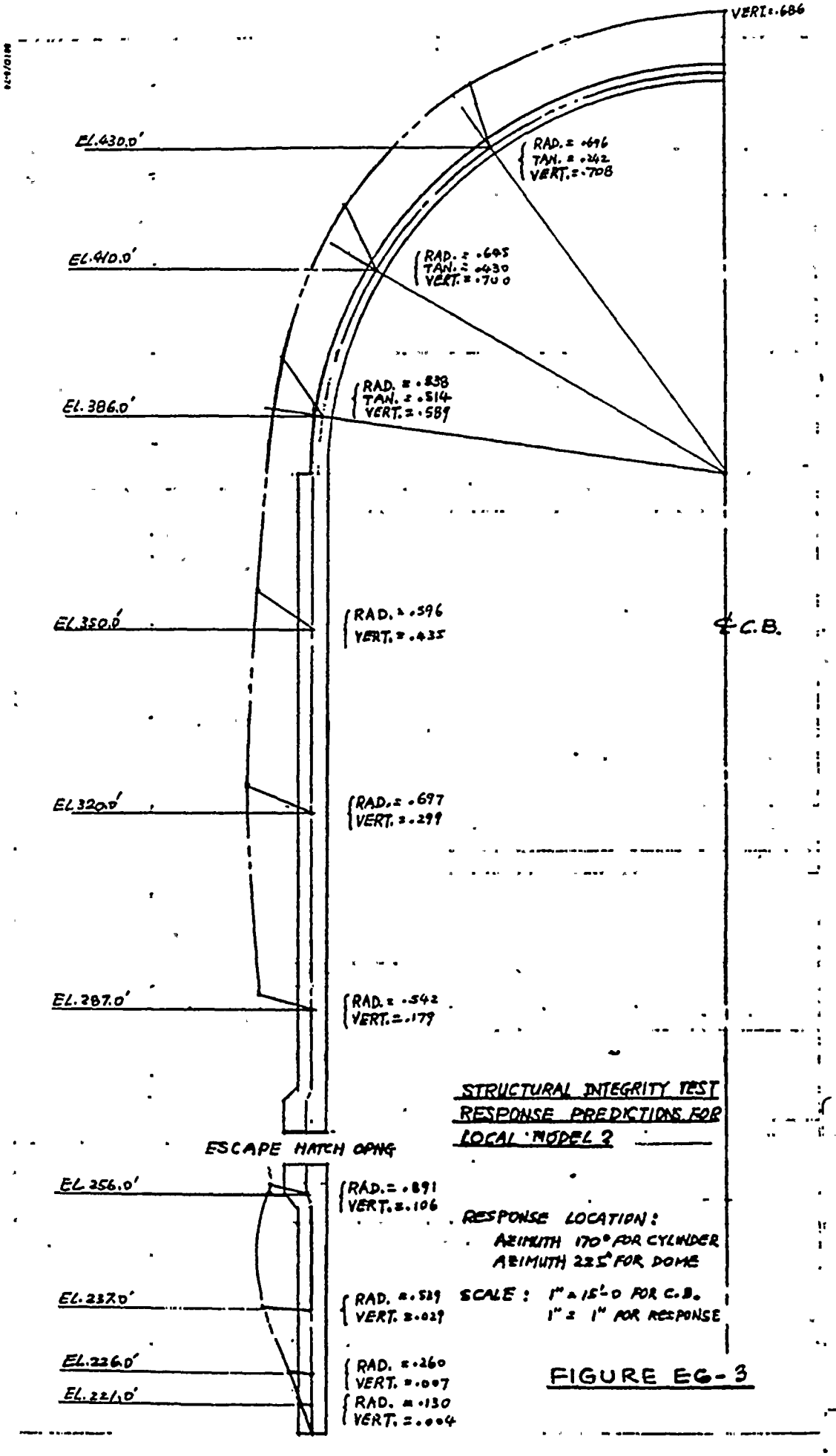
SCALE : 1" = 15'-0 FOR C.B.
1" = 1" FOR RESPONSE

FIGURE EG-2

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
1984 AB
900,000 KW UNITS 1, 2

EBASCO SERVICES INCORPORATED

BY Y. Chen 10-28-85
CHKD BY M Hsu 10-31-85



CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
900.000 KW UNITS 1, 2
1984 86

EBASCO SERVICES INCORPORATED

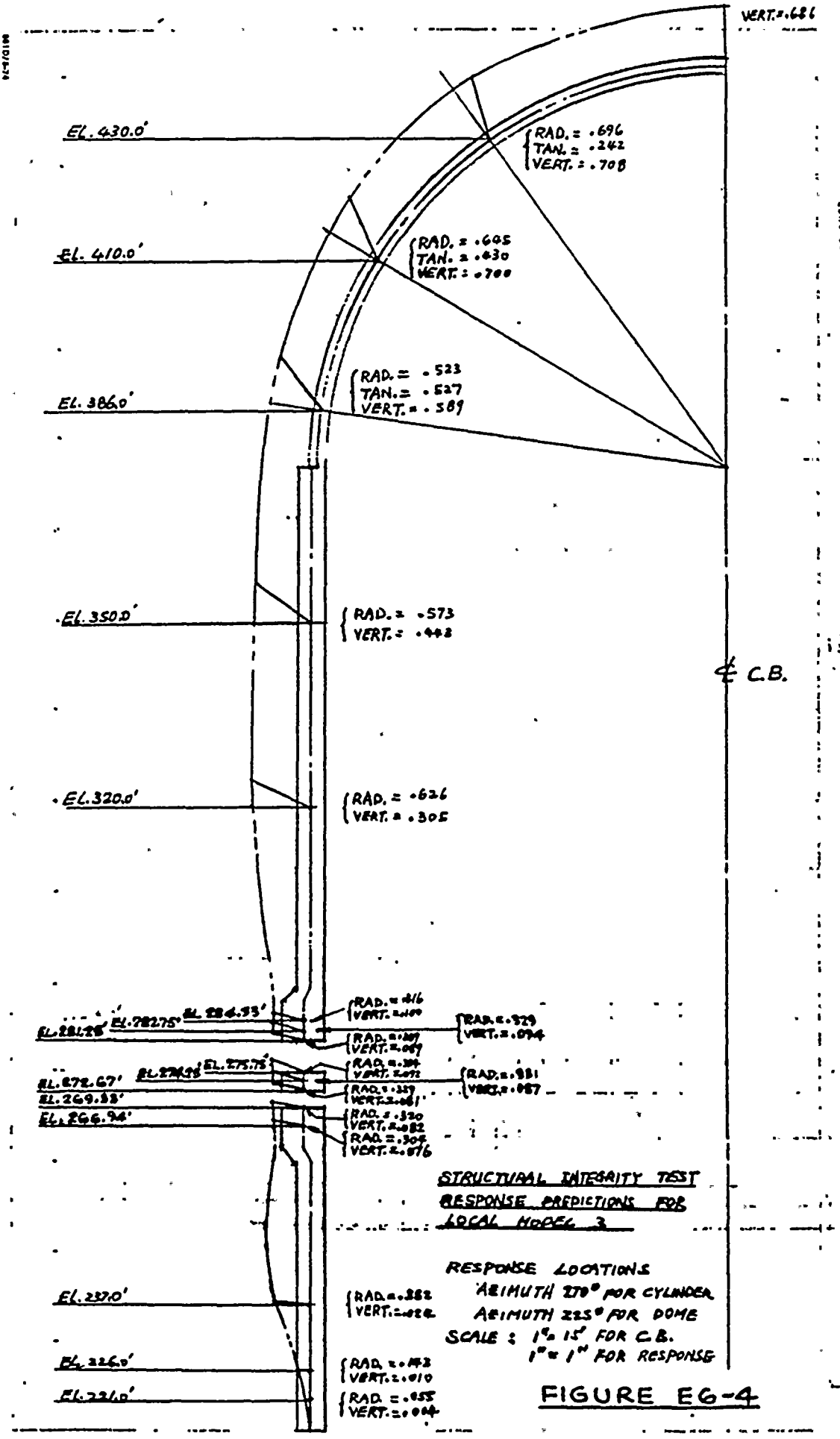
STRUCTURAL INTEGRITY TEST
RESPONSE PREDICTIONS FOR
LOCAL MODEL 2

RESPONSE LOCATION:
AZIMUTH 170° FOR CYLINDER
AZIMUTH 225° FOR DOME

SCALE: 1" = 15'-0 FOR C.B.
1" = 1" FOR RESPONSE

BY Y. Chen 10-28-85
CHKD BY H Hsu 10-31-85

FIGURE EG-3



STRUCTURAL INTEGRITY TEST
RESPONSE PREDICTIONS FOR
LOCAL MODEL 3

RESPONSE LOCATIONS
AZIMUTH 270° FOR CYLINDER
AZIMUTH 225° FOR DOME
SCALE : 1" = 15' FOR C.B.
1" = 1" FOR RESPONSE

FIGURE E6-4

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
900,000 KW UNITS 1, 2
1984 86

EBASCO SERVICES INCORPORATED

BY Y. Chen 10-28-85
CHKD BY M Hsu 10-31-85